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POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, NO. 40428

REG. U.S. PAT. OFF.



SEE PAGE 170

J— BROUGHT A NEW GIRL
TONIGHT. SEEMS AS IF HE
HAD A DIFFERENT GIRL
FOR EVERY PARTY

WHY DOES SUCH A
SWELL FELLOW HAVE
TO BE CARELESS
ABOUT "B.O."

POOR J— HE HAS TO!
GIRLS LIKE HIM AT
FIRST BUT SOON....

I WASN'T SUPPOSED
TO HEAR THAT —
BUT I DID. SO "B.O."
IS WHY MARY.....
WHY LOUISE.....
CAN'T BLAME THEM
FOR DROPPING ME.
I'LL GET SOME
LIFEBUOY
AT ONCE



"B.O." GONE

—*girls flock about him now!*

J— AND MARY ARE
PRETTY THICK
THESE DAYS. LOOKS
SERIOUS!

SHE'LL HAVE TO
WORK FAST. ALL
THE GIRLS ARE
AFTER HIM NOW



LIFEBUOY LATHER GETS
ME EXTRA-CLEAN
—KEEPS MY SKIN
CLEAR, TOO

ANOTHER Lifebuoy user
singing in the shower—
singing praises to this creamy,
rich-lathering toilet soap. He
just can't help it! He feels so
gloriously clean—pores purified,
deodorized—no chance of
"B.O." (*body odor*). His face
pores are purified, too. Dirt-
clogged wastes gone—his skin
glows with clear, healthy radiance.

Notice its scent

Like millions everywhere—
you, too, will learn to love
Lifebuoy's fresh, clean,
quickly - vanishing
scent. Winter Note:
Overheated rooms increase
"B.O." danger.

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• • **First to Emerge From the Boiling Caldron of Economic Change, This**

Sensational New

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**Will Sweep Thousands of Men (and Women)
To Independence—Hundreds to Wealth!**

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				EXPENSES

Those level-headed, clear-thinking men (or women) who have the vision to see and the courage to act, plus a small initial investment, will find in this—our first public announcement—the most extraordinary money-making plan ever presented to readers of this, or any other, magazine. Not since 1929—not even DURING 1929—could you find an opportunity such as this in which an investment of as little as \$50.00 could pyramid so swiftly into big money—could return so much in daily cash income.

First 200 to be Started at Once

If you have the qualifications set forth below, you can be among the first 200 men or women to be set up in this new business, to be put in charge of from one to sixteen manufacturing

units, from one to five employees, to be given the entire profit from each unit, to be shown how a steady, dependable income can be obtained immediately.

THE Machine Age is floundering. Mechanization and centralization of industry with attendant over-production has plunged the world into the worst economic chaos of history. Now, for the first time, certain clear-cut, definite ideas begin to emerge. Among the most definite of the new trends is that toward manufacturing decentralization. "The old order changeth" and born of the change comes an opportunity for both men and women, which can make the thinking people of today the dominant leaders of tomorrow. Whereas, in the past, great companies have controlled the distribution of America's food (the most basic of all industries); whereas most manufactured and cooked foods have been turned out by the thousands of dozens in great bakeries and factories with the aid of huge machines and distributed far and wide; there is, today, the clear-cut, unmistakable trend toward having these same foods manufactured locally by local people, who will turn out smaller quantities, but will make a larger profit.

The Opportunity of a Generation!

It is because this revolution in manufacturing and merchandizing has come with such lightning-like rapidity that this company, for years a leading manufacturer of food producing machinery, has converted its entire physical and financial resources to the manufacture of small units. To keep in step with breath-taking changes, we have decided to be the first to give men and women in scattered communities an opportunity to cash in, even as these stupendous changes take place. Now, instead of having all profits go to a few big corporations, one of America's most staple, every day articles of food—a product that is consumed by hundreds of millions yearly—is to be manufactured locally in

every community in the United States, distributed by these local manufacturers through outlets that are already established, and the profit is to remain where it belongs—in the community in which the goods are consumed.

Fits Your Ideas— Your Community!

This plan necessarily had to be flexible. It had to be adaptable to the smallest community as well as to the largest city. As a result, the unit system of manufacturing has been perfected. By this plan anyone can take advantage of the system—anyone can start with one unit at a total investment of less than \$50.00. The monthly profit which can be realized from the operation of one unit is \$162.00, while a battery of eight units, with two employees and with your supervision and help, can net you \$1,026.00 per month, after paying for labor and all other costs. (See Chart.) This is what we mean by "flexible." This astonishing business can be adapted not only to your community, but to your personal ambition and your ability. You can start small and add additional units to your system as demand justifies.

No Tedious Building Up— No Canvassing!

This business is a manufacturing business. It is in no way related to house-to-house canvassing. You manufacture and sell at wholesale only. Your entire output is disposed of for you by outlets that are already established. It is not an experiment and not a business in which the demand for your product must be built up. While the product itself is old and established, as staple as "sugar in a grocery store," we have, in our experiments, developed an absolutely new way to produce a sensational improvement, which has been shown by carefully

conducted tests to considerably increase the already enormous consumption of the product.

Complete Plan Sent Free

This is as much as we can reveal concerning our unit system in the public prints. We are ready now to start with the appointment of the first 200 men and women. We do not care to hear from curiosity seekers, dreamers, or people who dabble in every new thing that comes along. We invite inquiry from serious minded men or women, who are willing to put forth great effort for great rewards. If you are that kind of a person, then write for complete information. Facts and exact figures will be sent you by return mail. You do not obligate yourself in any way. No salesman will call on you and no "high-pressure" literature will be sent you. After you have digested the facts, you can decide for yourself.

There is, at present, no way to calculate how great this business can become, how much you can take from it. But, unquestionably, the opportunity is greater today than it ever will be again. It is always the people who get in on the ground floor who reap the richest rewards. We have intentionally omitted a coupon from this announcement. Coupon clippers are not wanted. But, if the facts presented lead you to agree that this opportunity is worth a letter—or a telegram—we shall send you without cost or obligation all of the figures and complete plans that will enable you to take advantage of the newest and most revolutionary plan we know for making money at once. Address inquiry to

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 OF
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3 La Belle Sauvage, Ludgate Hill, E. C. 4

Paris: Hachette & Cie.,
111 Rue Reaumur

Melbourne: Gordon & Gotch
509-513 Little Collins St.

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February, 1934

No. 2

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Entered as Second Class Matter Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3rd, 1879.

Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

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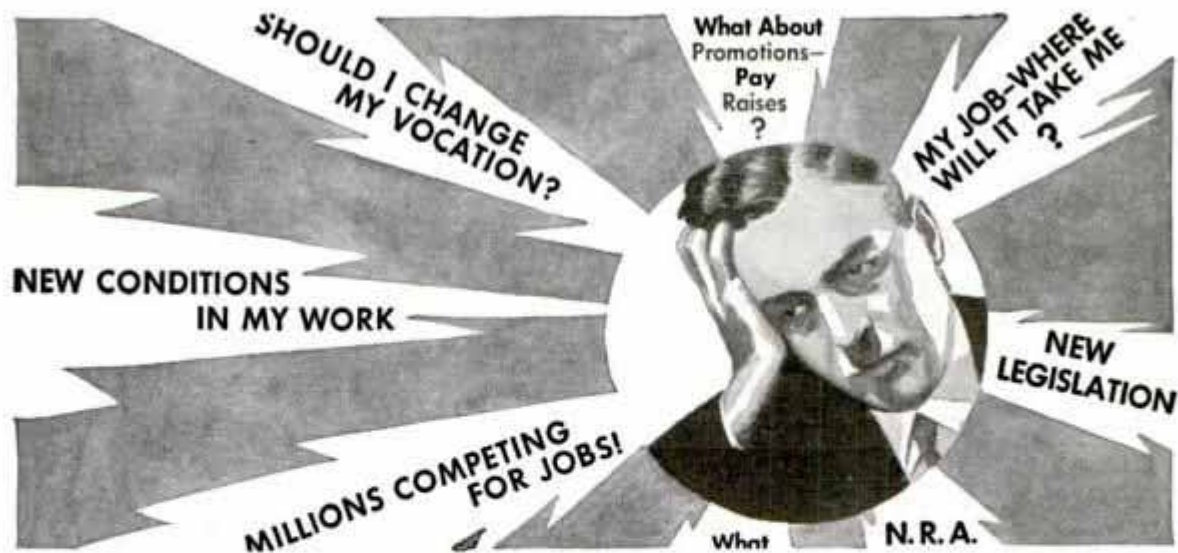
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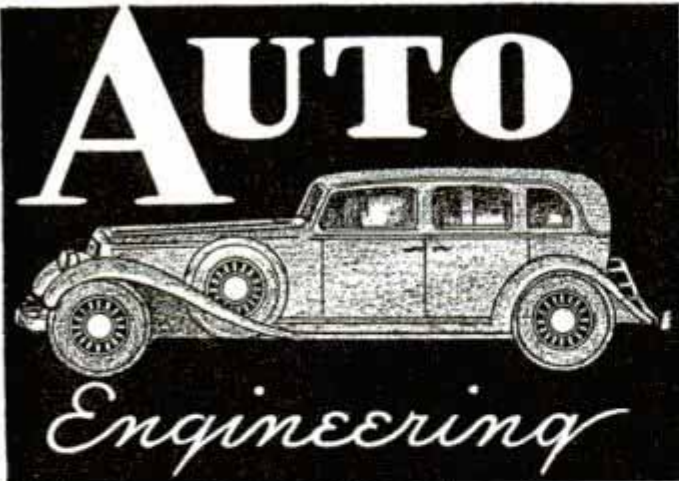
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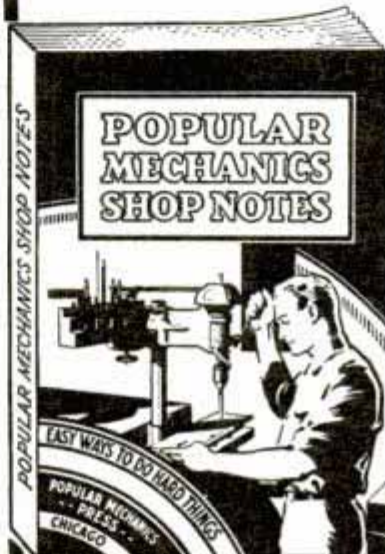
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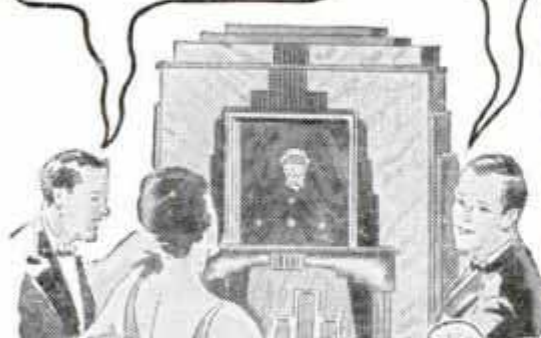
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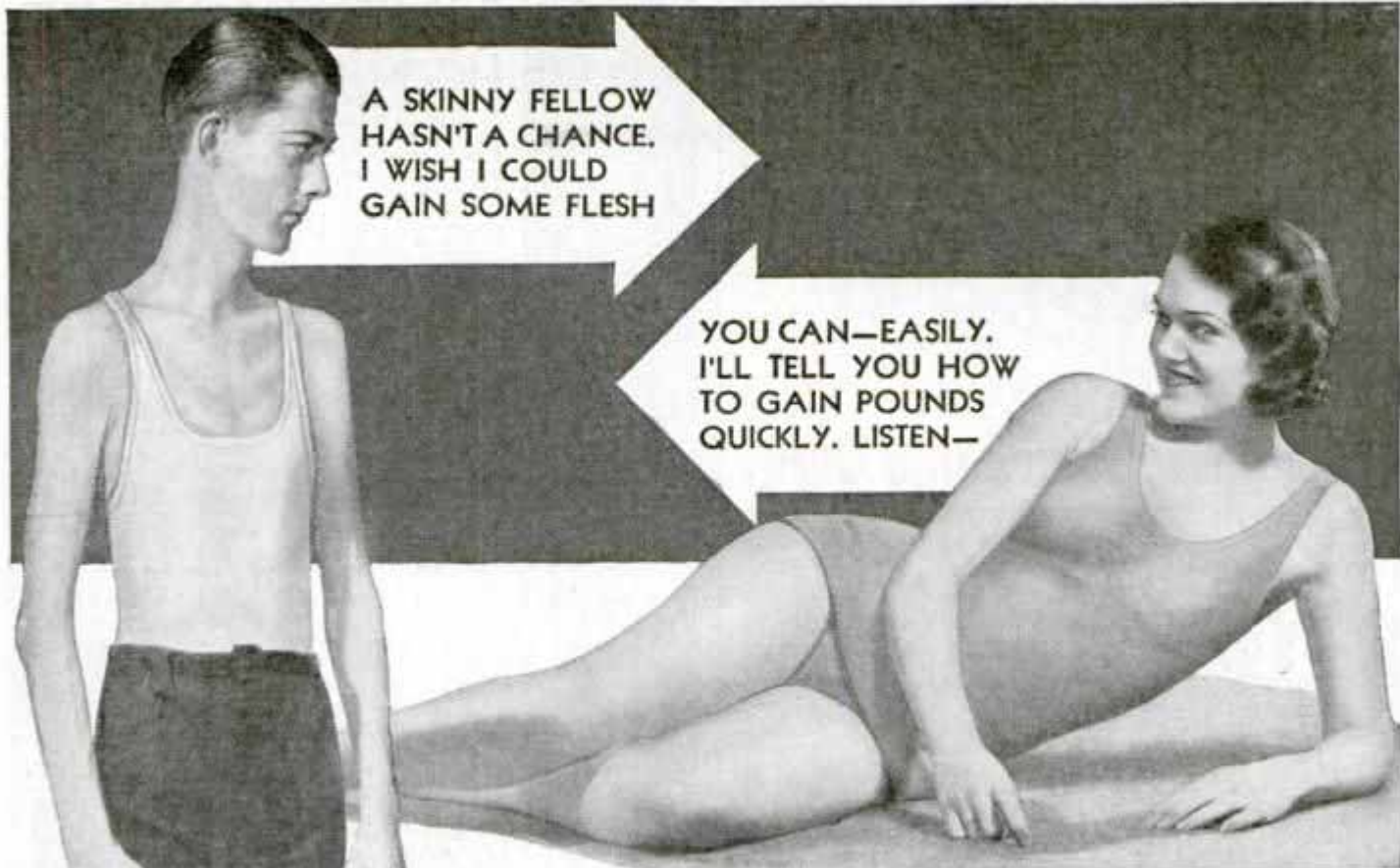
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FILMS Developed. Two free enlargements. 8 gloss prints 25c (coin). Reprints 3c each. Rapid Film Service, Unionville, Mo.

TRIAL Offer. Roll developed and 8 prints 25c. Reprints 3c. Photo calendar from any negative 10c. Beautiful 10-inch enlargement 25c. Young Photo Service, 405 Bertha St., Albany, N. Y.

20 **REPRINTS** 25c. Films developed two prints each negative 25c. Studio, 4118-J Overhill, Chicago.

MAKE Money in photography. Learn quickly at home. Spare or full time. New plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 343H, 3601 Michigan Avenue, Chicago.

TWO Crystal stiple enlargements free with first roll 25c. Photoshop, 4112-J Oriole, Chicago.

ROLLS, Developed, printed, 25c. Mail your films to the biggest and best. Rolls developed and 8 good prints guaranteed plus free 8x10 enlargement coupon only 25c. Reprints any size 3c each. Geppert Studios, Dept. 130, Des Moines, Iowa. Member NRA.

FILMS Developed 5c per roll; prints 3c each. Ask for special bargain list. Roanoke Photo Finishing Company, 161 Bell Ave., Roanoke, Va.

YOUR Favorite kodak pictures enlarged, size 5x7, 10c. Three for quarter, coin. Send best negatives (film) today. Address Darmer Photo Lab., Enlarging Dept. 9, Des Moines, Iowa.

INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. 104, 10 West 33rd St., New York.

HAVE You a camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 116 Camera House, Boston, 17, Mass.

MOTION PICTURES AND SOUND EQUIPMENT

BASS Bargain headquarters will save you over 50% on a brand new 100 ft. capacity Stewart-Warner 16 mm. motion picture camera, four speed including slow motion, long running speed, direct sight finder, with waterproof case. Each camera is brand new and guaranteed. Price \$22.75. Order yours on a money back basis. Dupont Mono film, 100 ft. reversible, free developing, \$3.50. Bass Bargaingram No. 212 is ready. Hundreds of other bargains. Write to Value Headquarters. Bass Camera Company, 179 W. Madison St., Chicago, Ill.

16MM **BARGAINS**. Projectors \$3.00. Any length comedy cartoon 2c foot. 100 ft. Chaplin-Felix-Mickey Mouse-Ourgang complete stories \$3.00. Big features rented, \$7.50. Lists. Excelsior Films, Cincinnati, Ohio.

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

FREE 16mm, 8mm Bargain lists. Art sample 25c. Home Movies, Box 32, Easton, Pennsylvania.

ALL Sizes of film, equipment, silent sound library. Free catalogue and library membership. Mogull Bros., 1914-J Boston Road, New York City.

CATALOG—Film samples, 3c stamp. Victor Film Co., Harvey, Ill.

FILMS, 100 ft. 35c; list. Riedell, 352 E. 248th, Euclid, Ohio.

DIME Brings big catalogue 16mm. films and two "end" titles. Eastin Films, Dept. 10, Galesburg, Ill.

LEARN Motion picture theatre business. Catalog. Theatre Institute, Elmira, N. Y.

WESTERNS—Reels \$1.45. 500 ft. 85c. Jersey Films, 2075 Richland, Lakewood, O.

35-MM FILMS, Projectors. Stamp for lists. Box No. 6, Rosedale, Kans.

\$1,250 FOR Original photoplay story. Our sales department sold unknown author's first story for above amount. We revise copyright and submit to studios stories for talking pictures. Being located in the heart of motion picture industry we know production requirements. Established 1917. Free booklet. Universal Scenario Company, 206 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

FEATURES—\$1.00 Reel; odd reels 80c plus postage. Lists 3c. Hoffman Film Service, 57 Broad, Albany, N. Y.

BUSINESS OPPORTUNITIES

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for big 1934 business now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

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

LEARN Flexible mold making using our Rubberite composition. For lining all kinds of molds, apply Cellotex with brush making transparent film. Stands 200 F. Resists water. Learn Marbleizing cements for novelties, statues, concrete products, exterior and interior work, etc. Stain-proof. Produces high gloss resembling polished marble. Without equal. Send dime for literature, Rubberite and Marbleized samples. The Cowell Institute, Grayling, Mich.

CASH Income daily resilvering mirrors at home. Replating autoparts, tableware, etc. Outfit furnished. Write Sprinkle, Plater, 127 Marion, Ind.

PROFITS! Generous, expanding, no selling. Men, women, startling facts! McArthur Co., Desk 5, Butte, Mont.

NEED Work; more money? Hundreds proven money making opportunities, many new. \$1 postpaid. Refund if dissatisfied. Enterprise Bureau, Dept. P, Tower, Syracuse, N. Y.

100 **MONEY** Making ideas \$1.00. Adams Sales Co., 200 Adams St., Newton, Mass.

FURNITURE Refinishing; job painting; handyman shop. Start yours on nearly nothing; mostly all profit. John Braceland, So. Ninth Philadelphia, Pa.

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

FREE Particulars your many mailorder opportunities! Merriam Service, 4649-D Woodlawn, Chicago.

SALESMANAGER Who has built national organization wants to connect with a product which needs national distribution. Will invest small capital. Write: R. W. Caldwell, 3030 Euclid Avenue, Cleveland, Ohio.

EARN! Start razor blade exchange. German machine and method. Kell, 520 German, Erie, Pa.

START 1934 Right! Realize liberal income making today's leading specialties. Have others selling for you everywhere. Interesting new formula lists, valuable information free. Miller, Chemist, 1706 BPM, Tampa, Fla.

BIG Money for you. Make, sell printing cuts. Tremendous market. Learn quickly, amazingly easy copyrighted process. Specimens for stamp. Hughes Products, 41 Miami, Terrace Park, Ohio.

100 **PAGES** Money making information, 10c. Home Industries, Irvington, Nebr.

MAIL Order book, 200 pages, tells how I built \$10,000 business. Free information. Author, 3103 E. 18th, Kansas City, Mo.

\$5 TO \$50 Weekly. Grow fancy "White Queen" mushrooms in cellar or shed. Free mushroom book tells how. American Mushroom Industries, Ltd., Dept. 375, Toronto, Ontario.

EXPERT Will furnish superior formulas or information on any line. Write Modern Research Bureau, Box 58, Chicago.

PATENT Your idea. Other men have read and profited by our free book, "How to Obtain a Patent." Fully explains many interesting points to inventors and illustrates important mechanical and electrical principles. With book we also send free "Record of Invention" form. Prompt service, reasonable fees, deferred payments, thirty-five years experience. Avoid risk of delay. Write immediately to: Victor J. Evans & Co., Registered Patent Attorneys, 601-B, Victor Building, Washington, D. C.

START Novelty candy factory at home. Make exact imitations fruits, vegetables, etc. Big demand. Easy to learn. Sample free. Deluxe Box \$1.00. Novelty Candy Factories, 4919 Twining St., Los Angeles, Calif.

FREE Books mail order business. Stamp appreciated. Dolsen Herald, 36 Liberty Street, Brooklyn, N. Y.

MAIL Order selling—Ten articles on ten different business lines, copyrighted. Start right, continue profitably. One dollar. Geo. E. Cassidy, 509 Fifth Ave., New York.

BIG Profits in sensational women's skin beautifier. Guaranteed formula dollar. No capital, machinery. Dr. Baykur's Laboratory, Box 304, Somerville, N. J.

STEADY Income from drained auto oil. Instructions 20c. International Agency, Cincinnati.

BARGAINS—Paint spray outfit, gasoline engine drive. Terms—trial. Helmick Paint Spray Exchange, Box M242, Troy, Ohio.

ASSISTANT Advertising manager. Lady, gentleman, anywhere, for mailing concern. Write Mercur Co., 225 West 46th Str., New York.

PHOTOS Without negatives. Build enlarger. Plans \$5.00. Information 10c. Fotokraft, Logan, Utah.

AMAZING Money making opportunities disclosed, 10c. F. Thompson, Sheridan, Ore.

OLD Spark plugs worth 3c each. Large company rebuilds. Thousands wanted. Work yourself or hire unemployed. Instructions, how to collect, sell, ship, 25c coin. Hammond Co., Paulding, Ohio.

PROFITS On your own goods. Make, sell them. Guaranteed formulas. Special prices, leads. Catalogs free. Gibson, Chemist, BD-4702 N. Racine, Chicago.

BIG Money growing mushrooms. Cellar, idle places. Supplies furnished. Free book. Mushroom Growers Association, 431-HN N. Clark, Chicago.

FREE Circulars and information. Mail order business. Stamp appreciated. Buckman, 177 State, Boston, Mass.

WIN Thousands cash! Send 10c, list, contests. World Contests Magazine, 6823L 17th N. E., Seattle.

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

"SCHEMER" Alliance, Ohio, prints schemes—big winners. Subscriber reports \$10,000 from one; another \$25,000 from three. Try it! Copy, 10c. Special: 6 months only 30c.

1000 WAYS To Make Money book. formulas and trade secrets for every manufacturing line. Illinois Universal, 800-P N. Central Ave., Chicago.

BIG Profits. Sell watches, fountain pens, razor blades, tooth paste, novelties, etc. Wholesale catalog 10c. Hagn Co., 223 Madison, Chicago.

DIME Brings 48 pages of amazing money-making information. Spare Time Selling Magazine, Box Four-PM, Cleveland, Ohio.

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

INVENT Something! Sell your inventions before patenting. Write W. T. Greene, 963 Barrister Building, Washington, D. C.

MANUFACTURE—Sell your own beverages, extracts, candies, soaps, perfumes, etc. Free booklet. Truway Laboratories, 1623 W. Grand, Chicago.

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

CHEMICAL Expert will furnish formulas and trade secrets. All lines. Lists free. W. L. Cummings, Ph. D., 228 Gordon Ave., Syracuse, N. Y.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

SELL By mail. Books, novelties. Bargains! Large profits. Particulars free. B. Elfeo, 525 S. Dearborn, Chicago.

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

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

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

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

TELEGRAPHY

FREE—Radio and Morse telegraphy book. Learn code in short time. New easy method. Fisher Electric Company, 3801 Riverside Avenue, Cleveland, Ohio.

FORMULAS AND TRADE SECRETS

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

MILLER'S Foremost formulas. Exclusive, inexpensive, practicable, correct for guaranteed goods, all lines. Successful manufacturers use no others. Latest interesting literature free! Miller, Chemist, 1707-FPM, Tampa, Fla.

THREE Professional foot formulas with large samples \$1.00. Laboratory, 1441 First Ave., Oakland, Calif.

THERMOLINE, Sobermint; formula \$1.00. Moscato, 757 East 107th, Brooklyn, N. Y.

20 FORMULAS, 20c. Latest; best—why pay more? International Agency, Cincinnati.

PAINT Remover. A wonder. Manufacturing cost 50c gal. Formula 50c. Ferris Household, 437 N. Illinois, Indianapolis, Indiana.

MAKE—Sell products people must buy. Profit 1000% with our Master formulas. List free. Expert Analysis. Thermo Works, Peoria, Ill.

NEWEST Guaranteed formulas. Catalogs free. Special prices. Leads. Gibson, Chemist, BD-4702 N. Racine, Chicago.

ANY Formula three dimes or money refunded. Ogg Laboratories, Tampa, Fla.

LATEST Formulas for almost any preparation. Particulars. Chemist, 830 South 41st, Omaha, Nebr.

FORMULAS, Practical plans. Particulars free. M-Koller, 231 Hamilton, Trenton, New Jersey.

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

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

FORMULAS, Business plans. Literature free. Belfort, 4042 N. Keeler, 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.

CHEMISTRY

WONDERFUL Offer, special chemical set and valuable catalogue. Send 25c in money or stamps. Kemkit Chemical Corporation, 135B Johnson Street, Brooklyn, N. Y.

FREE! Book of experiments and science catalog. Also free!—"Sciencecraft" magazine for 6 months! P-5049 Bernard, Chicago.

CHEMICALS, Laboratory glassware and apparatus. Catalog CP. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

AGENTS WANTED

AGENTS: Make 600% profit selling cleaner, polish, shampoo, vanilla, tonic laxative, spot remover, etc. Your name on labels. Free sample. Standard Chemical, Dept. E-24, Dayton, Ohio.

SELL Cosmetics, big commissions, quick results. Write for proposition. Sample, 35c, two for 50c. Baldwin Sales Co., Baldwin, New York.

MONEYBACK Gas savers guarantee heat where wanted—selling them guarantees money where you want it. 20 years successful business makes selling easy. F. G. Wright, 4362 39th St., San Diego, Calif.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8 1/2c. \$1.00 size tonic 14c. Razor blades 5 for 8 1/2c. 100 sticks chewing gum 12c. 150 other bargains. Experience unnecessary. Write, Carnation Co., P.O. St. Louis, Mo.

NEW Hand film, the wonder compound for garages, mechanics, battery stations, etc. Cash in now. Sample and agents proposition 25c. Carlon Products Company, 1210 East 113 St., Cleveland, Ohio.

\$2.00 HOURLY With new scientific cream that mends all cloth easily, quickly, invisibly, without needle and thread. Stands laundering. Free sample. Sew-No-More Co., Dept. R-744, Cincinnati, O.

"CRE-MOFF" Cream siphon. Starts itself. Stops itself. Every demonstration a sale. Sample and catalog 25c. Dickey, Lawndale, Calif.

SELLS Like hot cakes. Big profits. New laundry soapflakes. Perfumes clothes lastingly when washing. Canvassers, etc. Sunset Laboratories, Lynbrook, N. Y.

AGENTS—Sell rich quality shoes \$2.95 up. Adams, of Calif., 90 pairs in 4 days, profit \$70.00. You can do same. Write for catalog and selling plan. Exclusive territory. Sample pair \$1.95. Avon Shoe Co., 100 Court St., Brockton, Mass.

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

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

CASH Income daily resilvering mirrors at home. Replating autoparts, tableware, etc. Outfit furnished. Write Sprinkle, Plater, 128, Marlon, Ind.

BURNING Perfume candles. Sure fire quick sellers. Repeater. Particulars free. Mission, 2328 W. Pico, Los Angeles, Calif.

MEN With cars wanted for tea and coffee routes. No experience needed. Routes pay \$27.50 weekly up. Pay begins immediately. Write Albert Mills, Route Mgr., 4442 Monmouth, Cincinnati, O.

AGENTS 100% Profit demonstrating the new "Automatic Service Fork." Every housewife a prospect. Sample 25c. See editorial page 255 this issue Popular Mechanics. Hutchison Mfg. Co., Nashville, Tenn.

BIGGEST Scoop in direct selling. Relieves itching, rectal irritations. Unlimited market. Russell Products, 144 East 34th, New York.

SUEDE Raincoats, jackets. Union made. Low price. Selling fast. Commission advanced. Beautiful outfit free. Goodyear, W-714 Roosevelt, Chicago.

BIG 7 Soap, pearls, neckties, pens, all big sellers. Get our list. H. Premium Co., Gaylord, Minn.

REDSTAR Liniment sells easily! Big profits! A. Bucknam, 1219 Washington, Bath, Maine.

PROFITS On your own goods. Make, sell them. Guaranteed formulas. Special prices, leads. Catalogs free. Gibson, Chemist, BD-4702 N. Racine, Chicago.

SELL Reflectoplastics—cards? The 8 world wonder. Sensational money maker. Samples 30 cts. or new magazine, 20 copies 10 cts. Set for 60 cts. Schollmeyer, Box 35, Lefertast, Brooklyn, N. Y.

SELF-THREADING Needle packages. Sample 10c. Wm. Oglesby, Vandalia, Ill.

A BUSINESS Of your own for only \$3.00! Sell new device that keeps ice, snow, frost off windshield. Easily attached. Every auto owner a prospect. Sells for 90c. You pay \$3.00 per dozen on attractive display card. Sample \$1.00 postpaid. The Vell-A-Vett Co., Belvidere, Ill.

BIGGEST Food bargain in America! \$2.60 worth of necessities retail for \$1.00! Write for amazing details free. Kennedy Tea & Spice Co., Kokomo, Ind.

DISTRIBUTORS—Agents: Patented water pump tightening support for Ford model A and AA. Stops leaks, end play and wear. Sample 55c. F. P. Madress Co., 302 E. Vine St., Kalamazoo, Mich.

HAVE You spare time at home? Need extra money? Hetzel, 802 Garden, Hartford, Connecticut.

MAKE \$50.00 Weekly. Sell California orange jelly. 5 glasses 25c. 200% profit. 5 glass sample 25c. Cutter-Clarke, 5515M Ruthelen, Los Angeles.

REDSTAR Liniment sells like hot cakes! Big profits. A. Bucknam, 1219 Washington, Bath, Maine.

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

\$6 HOURLY With amazing canned rubber. Renewes tires for 8c. Thousands of additional miles guaranteed. Sample free. Write MorMiles Co., Dept. R-1105, Cincinnati, O.

300% PROFIT Selling mystery gas lighter. Retail 25c. Costs you \$1.00 per dozen. Sample 10c. Square Deal Co., Desk PM1, Bradford, Pa.

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

100% PROFIT In the mystery cigar lighter. No flint or friction. What makes it light? No wind can blow it out. Retail 50c. Sample and sales plan 25c. New Method Company, Desk PM-2, New Method Bldg., Bradford, Pa.

WHY Sell goods with stingy profits? Make today's most profitable, biggest-selling specialties yourself. Have 1934 your best year. Valuable information free! Miller, Chemist, 1707-APM, Tampa, Fla.

300% PROFIT Selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. Sample 10c. New Method Co., PMM-2, Bradford, Pa.

STRANGE Ironing cord. Prevents scorching. Saves electricity. Abolishes kinks, snarls. Approved by Good Housekeeping. For telephones also. 166% profit. Samples furnished. Neverknot, Dept. 2-A, 4503 Ravenswood, Chicago.

SAMPLE And sales kit free—Write for our big free offer, and catalog of over 150 daily necessities. Clyde Collins Chemical Co., Dept. PM-1, Memphis, Tenn.

AMAZING Match—Gives million lights. Selling like wildfire. Big profits. Everlasting Match Co., 441 S. Dearborn St., Chicago.

SELL Fade-A-Way, household necessity; good profit, repeat sales. Build your own business. Write for information. Fade-A-Way Co., Mt. Vernon, Ohio.

1000 BARGAINS—Drygoods, notions, toiletries. Agents—undersell stores. Free catalogue. Jobbers, Z-504 S. Crawford, Chicago.

REPRESENTATIVES For non-irritating Cabana Club brushless shaving cream in pound jars. Easily sold. Send 50c for sample pound. Special wholesale rate to representatives. Frenchee Laboratories, Dept. P, Richmond Hill, N. Y.

DISTRIBUTORS—Agents. Territory open. Segment, oil-proof piston rings (etc.) Otto Haling, Rochester, Minn.

ANTI-FREEZE—Make it yourself, equals best nationally advertised brands, formulas, manufacturing processes, practically any product, "automobile specialties," etc. Reasonable. Information free. Murphy, Chemist, 1024 Douglas, Los Angeles.

SOMETHING New in fire extinguishers. Red Comet automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write Red Comet, 404 Comet Building, Littleton, Colo.

MAKE Money. Collect \$6, keep \$5. Two quick selling dollar per month "hard times" life policies. Write the Fidelity Mutual Benefit Association, Rockford, Ill.

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.

AMAZING Cleaner. Cleans everything. Sample free. Bestever, 5007P Irving Park, Chicago.

OUTSTANDING Money-Making line. Quick profitable repeat sales. Free details. Sample 10c. Mint Co., Baroda, Mich.

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.

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

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

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

A BUSINESS Of your own making sparkling glass name plates, numbers, checkerboards, medallions, signs. Booklet and sample mailed free. E. Palmer, 512, Wooster, Ohio.

SOMETHING New, electric bulb attachment perfumes home. Purifies air. Destroys cooking odors. Attractive package. Quick seller. Sample 25c. Werner Mfg. Co., 172 Court St., Brooklyn, N. Y.

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

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

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

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

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

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.

HIGH-GRADE SALESMEN WANTED

MEN Wanted: Permanent, steady cash income up to \$15.00 a day offered in the fourth largest industry in the world. Service business and professional men with necessities they need and must have. Startling low prices save buyers up to 200% to 300% and bring you flood of orders. You get your pay in advance. Repeat orders pyramid your profits. Master sales portfolio furnished makes previous experience unnecessary. No house to house canvassing, peddling or delivery work. No capital needed now or ever. Nothing for you to buy. No stock to carry. Rush name for complete information. Kaeser & Blair, Inc., Dept. 506, Cincinnati, Ohio.

TRADE? Buy? Sell? Can you obtain more people to list an article in our files for the purpose of exchanging, selling or buying? We offer a 90 day checking service from our files and notify nearest parties who might benefit. Cost customer only \$2.00 for 3 months service. Nets representative 50% profit. To prove you mean business send 50c for order blanks, instructions, etc. Deduct from first order. National Trading System, Salisbury, Mass.

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 \$4,000 annual sales year after year; we supply stocks, equipment on credit; 235 home necessities; selling experience unnecessary; wonderful opportunity to own pleasant, profitable, dignified business backed by \$17,000,000 world-wide industry; for complete information write Rawleigh Co., Dept. B-U-PPM, Freeport, Ill.

SALESMAN: Sensational new discovery. Fabric shampoo, 16 times concentrated. Saves housewives up to 90% on cleaning bills. Used by hotels, apartment houses, office buildings, garages, private car owners. No competition. Nothing else like it. Up to 150% profit. Big repeat sales. Rush name for exclusive rights. Becker Products Corporation, Dept 16B, South Bend, Ind.

SALESMEN—One sale daily is good for \$120 monthly profit! Live leads furnished. Write our \$10 accident-sickness policies. Pays insured \$10,000 principal sum. \$25 weekly benefit. Permanent income from renewals. Territories going fast. Special contract plan sent on request. Write now. North American Accident Insurance Co., 505 Wallach Bldg., Newark, N. J.

NEW \$30.00 Value radio given in "free deal." Earn up to \$100.00 weekly. New sales plan. Meritone Mfg. Co., 3857 North Hamilton, Chicago.

NEW Million dollar diamond mop, patented product, approved by Good Housekeeping, now appointing local canvassers. Address Mop Production Dept., Box 929, New Orleans, La.

MAN—Handle regular store route. Place nationally advertised 5c, 10c counter card merchandise. Complete line; world's largest firm. Over 100% commission for you and merchant. No investment. Catalog free. World's Products Co., Dept. 2810, Spencer, Indiana.

80% COMMISSION And a monthly income for several years from each sale. No call backs to earn your monthly ever-growing dividend check. This is a very popular and dignified big paying opportunity for men and women who can sell. Write me for particulars. A. Holzman, 901-D Bergen Avenue, Jersey City, N. J.

DISTRIBUTOR! Piston rings. New invention. Require finances for merchandise. Should net \$100.00 weekly. 5716 Cass Avenue, Detroit, Mich.

HIGH Grade salesman wanted. New marvelous bulb gives concentrated light, cuts electric bills in half. Shaped like mushroom—sells on sight. Pays big profits. Exclusive territories now being assigned. Write at once. E. Masterlite, 110 East 23rd Street, New York.

STRANGE Chemical sponge cleans wallpaper like magic. Banishes housecleaning drudgery. Women amazed. Agents cleaning up. Outfit free. Kristee Mfg., Box 1432, Akron, Ohio.

SALESMEN! Brand new! Sell tear gas fountain pens. Every home, store, bank, etc., prospect. Sample furnished. Atlas, Chesterfield Station, Dept. 4902, Chicago.

HERE'S An unusual opportunity to make \$200 monthly extra. Nationally known line work uniforms, coveralls, jackets, pants, shirts, caps. Advertising embroidered. Every business a prospect. Outfit free. Write Master Co., Dept. 413, Ligonier, Ind.

ANYONE Can sell mineral crystals for health, profitable. T-K-S Products, PM-35-S, Dearborn, Chicago.

DISTRIBUTORS: Represent manufacturer. Sell Latex—self-sealing bandage that breathes. Great demonstrator. Lowest prices. Tremendous profit. Good repeater. Exclusive territory. Neway, 3815-BM Harrison, Chicago.

BE Independent. Three \$7.50 sales a day pays \$100 a week. Every business man or physician a prospect. Write S. Loder, 489 Fifth Ave., New York.

GIVE Away genuine RCA Victor radios on unique salescard plan. Big money for hustlers. Small investment. Write for particulars. Lipault Corp., Dept. P., 1028 Arch St., Philadelphia.

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.

BIG Money in tire patches. Sell new auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 678 Burkhardt, Dayton, Ohio.

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. \$250,000 deposited insurance department. Universal Policy, 716-A Lefcourt Bldg., Newark, N. J.

BRAND New guaranteed business building plan for all retailers. Sweeping country. Inexpensive. Salesmen cleaning up. Big selling outfit free. Stimulators, Inc., 4311 Ravenswood, Chicago.

FINANCIAL Independence and income for life through constant, ever-increasing repeat commissions without call backs. The business made rich by the depression. Business and professional men buy on sight. 400% initial profit. Commonwealth-F Co., 508 S. Dearborn, Chicago.

WONDERFUL Opportunity. \$20.00 daily can be earned. No experience necessary. You can start at once. Showing latest thing out. Self protection and home protection at cost. Ages 1 to 80. Not insurance but provides benefits up to \$1000.00 natural or accidental death. \$20.00 per week if sick or injured. Address National Aid Society, Dept. B, Springfield, Illinois.

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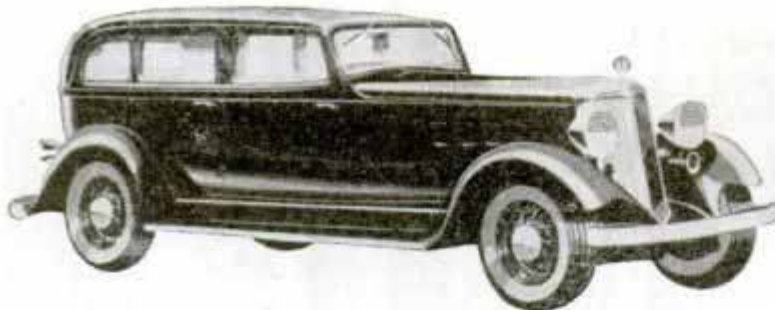
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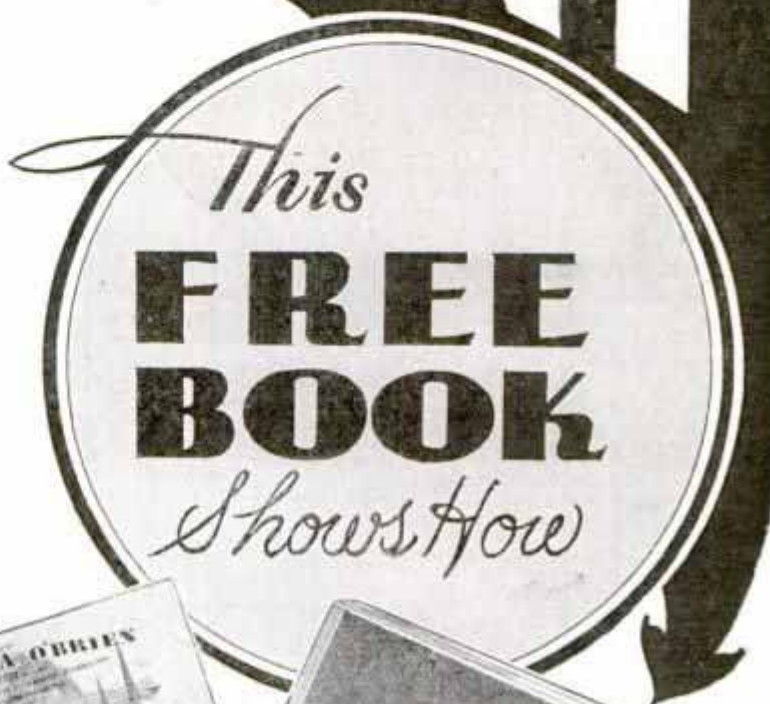
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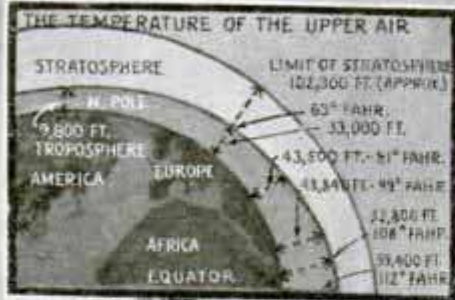
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50 KILOMETERS (31 1/2 MILES)

PATH OF DETONATING METEORS

HEAVISIDE LAYER IN DAYLIGHT (DISAPPEARING AT NIGHT)

40 KILOMETERS (25 MILES)

GREATEST HEIGHT ATTAINED BY AN INSTRUMENT-CARRYING BALLOON (ABOUT 22 MILES)

TOP OF STRATOSPHERE

30 KILOMETERS (18 1/2 MILES)
HEIGHT FREQUENTLY ATTAINED BY INSTRUMENT-CARRYING BALLOON

HEIGHT IDEAL FOR FLYING

11 MILES

30 KILOM. (18 1/2 MILES)
SETTEE, 1933
11.6 MILES

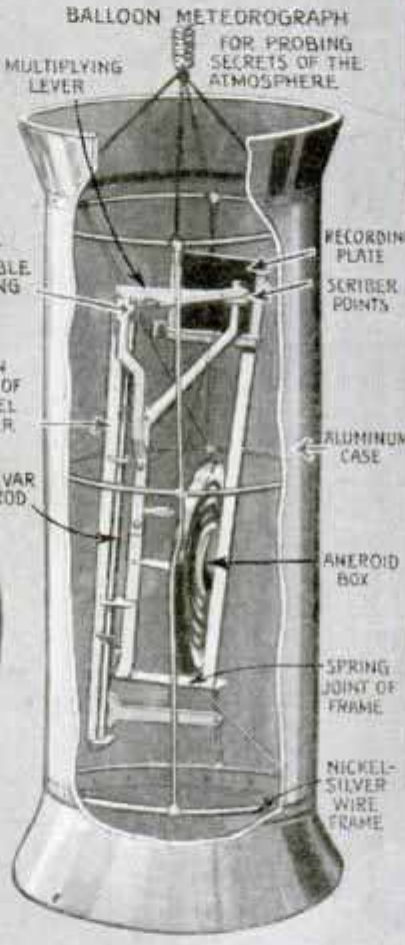
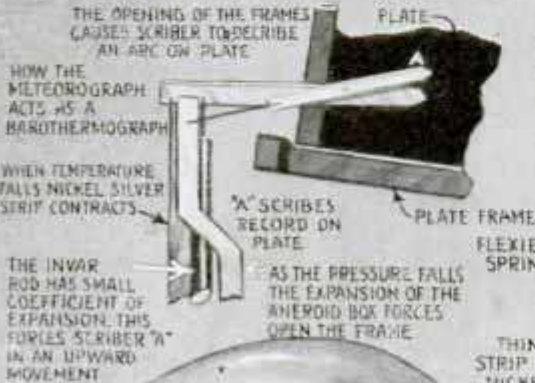
RUSSIAN EXPEDITION 1933
HEIGHT 33,151 FT.
PICCARD, 1931
HEIGHT 35,300 FT.

GREATEST HEIGHT REACHED BY CLOUDS 7 1/2 MILES

10 KILOM. (6 1/2 MILES)
AIRPLANE HEIGHT RECORD (FRANCE) 35,000 FT. (SEPT. 1931)

MT. EVEREST HIGHEST MOUNTAIN 29,101 FT.

SEA LEVEL



While Men Have Climbed Nearly Twelve Miles into the Upper Atmosphere, Free Balloons Carrying Recording Instruments Have Gone Nearly Twice That High; Such Balloons Have Penetrated into the Stratosphere and the Meteorographs They Carried Have Brought Back on Tiny Plates Records of Atmospheric Pressures and Temperatures Which Have Added Much to Our Knowledge About Conditions Miles above Us; It Has Been Found, for Instance, that the Calm of the Stratosphere Offers Ideal Conditions for High-Speed Flying and Planes Are Already Being Constructed for Use in the Rare Atmosphere Found There; the Above Drawing Shows the Operation of One of the Fact-Revealing Meteorographs Which Writes a Story about a Lonely Space of Perpetual Calm That Man Has Not Yet Been Able to Penetrate, Except on the Lower Fringes

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

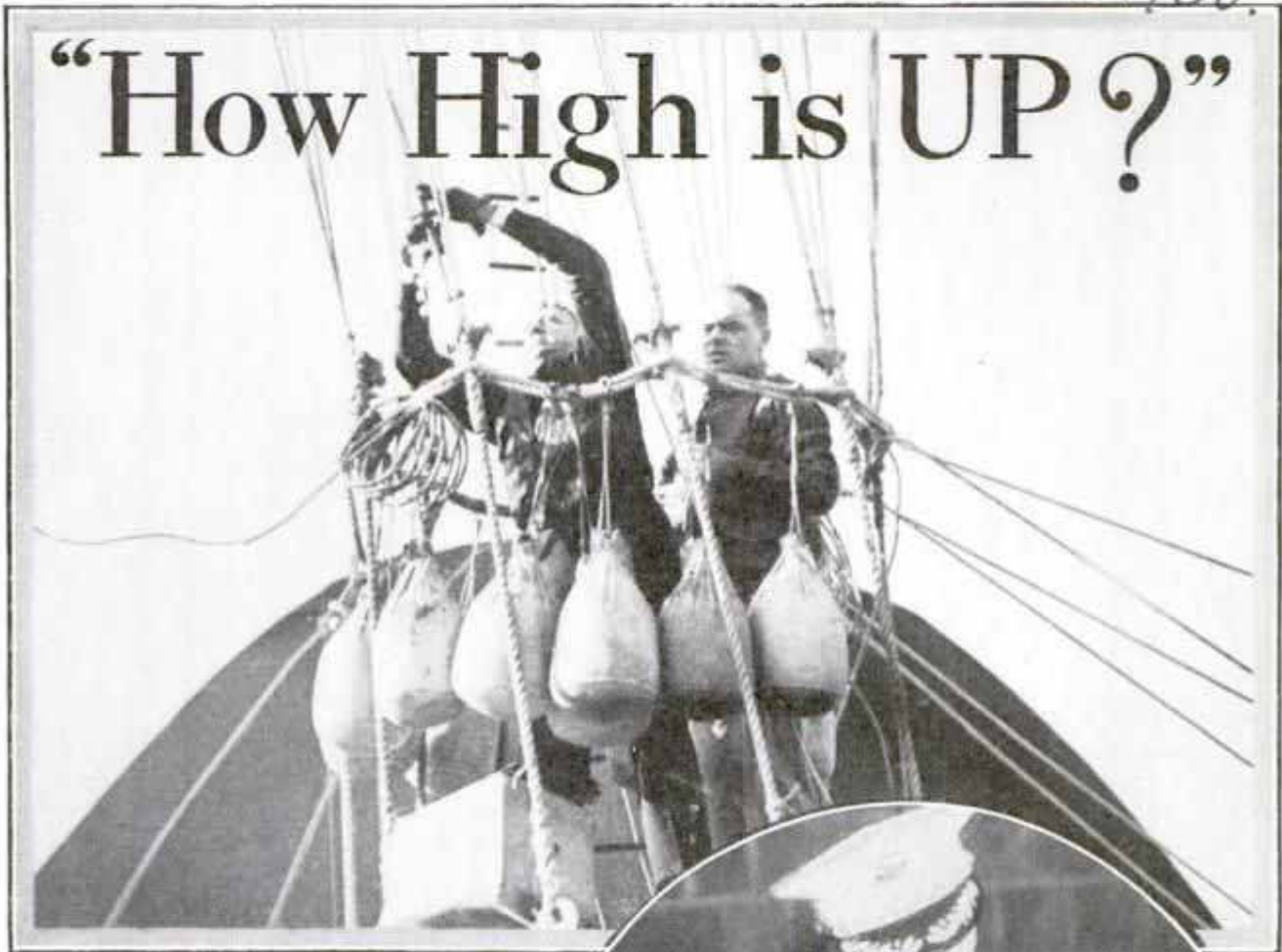
Vol. 61

FEBRUARY, 1934

No. 2

C1930

"How High is UP?"



By TYRRELL KRUM

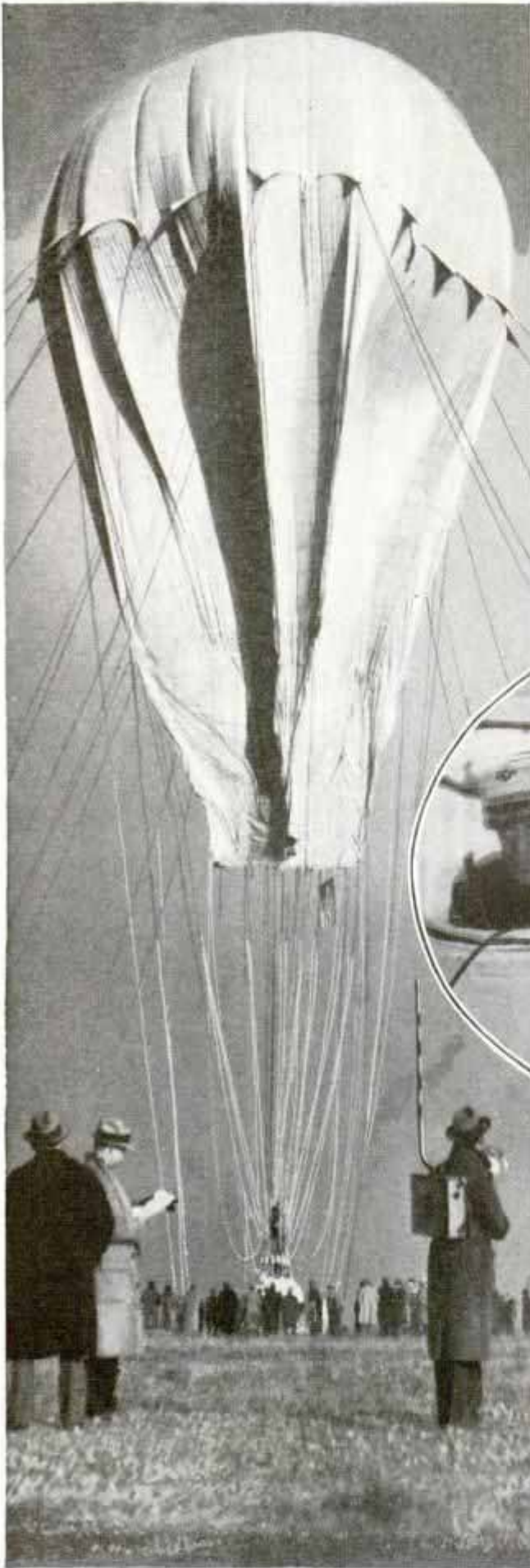
IF science continues to push forward plans already underway, explorations of the heavens will, within a few years, result in an ultimate victory over one of the mightiest elements of nature ever challenged by man.

Lieut. Comm. T. G. W. Settle and Maj. Chester L. Fordney have been pretty close to the top, Professor Piccard and his aides, Charles Kipfer and Max Cosyns, have ventured far into space, and a trio of Soviet Russians, George Prokofiev, Konstantin Gudenoff and Ernest Brinbaum, piloted a



Top, Tying Cotton Balls Containing Plant Spores to Rigging of Stratosphere Balloon; Below, the Spectrograph

Cmt. Walter E. Burton



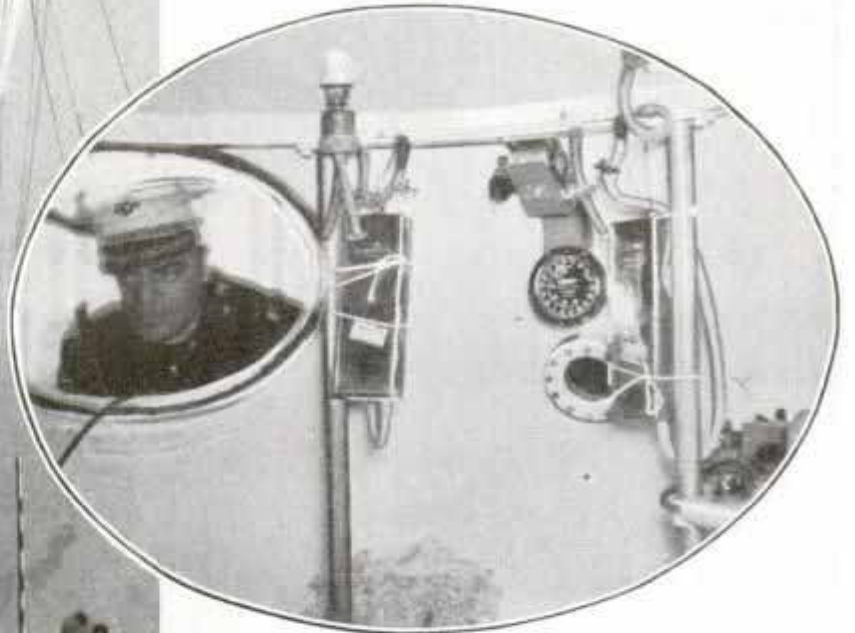
Balloon Ready for Flight, and Variometers, Attached to the Gondola, Which Indicated Rate of Climb or Descent of the Balloon

balloon high into the heavens. Such is the meager list of those who have responded to the lure of adventure into the mighty unknown.

But what of the future? Already preparations are underway for additional ventures. A balloon greater than any yet conceived will lift far into the stratosphere a veritable experimental laboratory where investigations may be conducted for days at the highest point possible to attain.

In discussing the matter recently with Glenn O. Carter, widely known consulting engineer of Union Carbide and Carbon corporation, Lieutenant-Commander Settle expressed the opinion that it is entirely within the realm of possibility for a balloon to go higher than the eleven and six-tenths miles attained in his flight.

"There is little doubt that it would be



possible to go up around fifteen miles in a balloon of sufficient capacity," he observed.

"Would it be possible for a balloon to remain up more than one day?" Mr. Carter was asked.

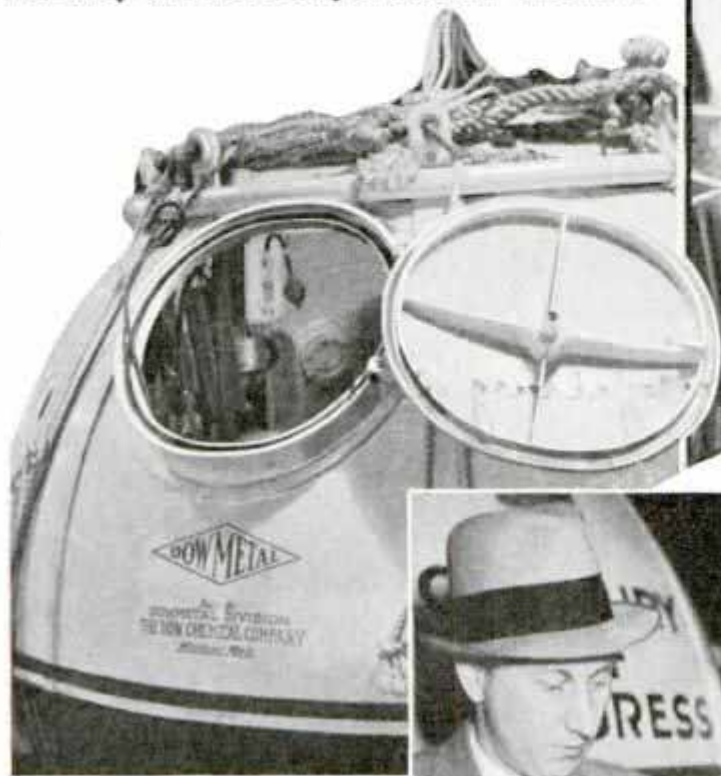
"I believe a gondola could be constructed along the lines of a vacuum bottle in which the occupants would be comfortable during the night despite the seventy degrees below zero temperature of the stratosphere," he answered. "With a new type of gondola we have in mind it would be possible to remain up for a period of three or four days."

But what difference does it make whether a balloon goes up ten miles or twenty?

Handwritten notes at the bottom of the page, including the name 'Glenn O. Carter' and other illegible scribbles.

Let's get an answer to this question from Commander Settle.

"There is a vast amount of work still undone in the stratosphere," he observed. "The instruments for cosmic-ray investigations were the best that could be made, but they fell short of perfection. The next

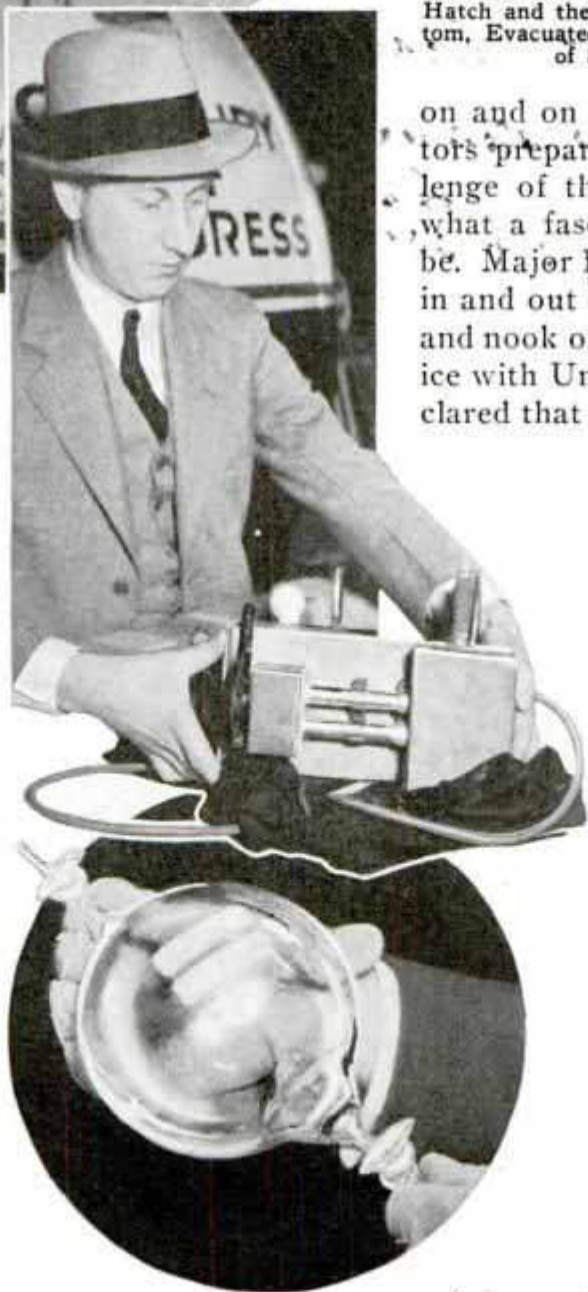


Above, Instrument to Measure Carbon-Dioxide Gas in Gondola; Left, Gondola Hatch and the Cosmic Ray Telescope; Bottom, Evacuated Bottle for Securing Samples of Stratosphere Gases

time these instruments should bring better results. It would also be of value to take photographs of the earth and the sun's corona and, perhaps, a picture showing the curvature of the earth could be obtained. The development of aeronautics of the future depends a great deal on investigations of the stratosphere."

"More information on the movement of air currents and the density of the higher strata would be of great value in the design of heavier-than-air craft which may use the stratosphere as an aerial highway," was the suggestion of Major Fordney.

And so discussions of plans for the future go



on and on as scientists and aviators prepare to answer the challenge of the great beyond. And what a fascinating place it must be. Major Fordney, who has been in and out of nearly every corner and nook of the world in his service with Uncle Sam's marines, declared that it was the most inspiring sight he had ever witnessed.

"Despite the work we had to do in the two hours of our maximum elevation, Commander Settle and I will never forget the beautiful spectacle of the stratosphere itself," Major Fordney said. "A great dome of color without brilliance, where the sun is a shining disk at which one may not look without hurting the eyes. Overhead a dome of blue as deep in shade as the trousers of a marine uniform, the edges resting upon a horizon of

misty blue and white—below a stretch of very light blue, and flecked with scurrying white clouds. Looking down through the ports, the earth looked as the sky does when one sees it from the ground. The illusion was that of a world upside down."

One interesting experiment was conducted in the use of a string of cotton balls containing plant spores, lashed to the rigging. It was thought that no animal life could exist in the open stratosphere, but there was a theory that plant life might survive the intense cold and almost complete absence of oxygen. And upon the return of the spores to Washington it was found they had been unharmed.

Information that may lead to a new

Electric portable tree felling saw

TREE SAW WITH LOG FRAME PRODUCES LUMBER

Portable and adapted to manipulation by two men, a chain saw driven by a small *Iron Works, Elmira*



motor is capable of felling trees and converting them into lumber. All operations may be performed in the woods, the necessity for hauling the logs to a sawmill being eliminated. Gasoline engine or electric motor may be used with the saw. In tree-felling, the saw is handled in the conventional manner, but for cutting the logs into boards, it is equipped with a log frame. Planks and boards of any thickness are produced easily as the operators move the saw along its carriage. Precision cutting of boarding only one-twelfth of an inch thick also is possible. In tests, the

method of predicting weather was obtained with a quartz spectrograph that made photographic records of the sun's spectrum at various altitudes. A layer of ozone is believed to exist above the earth's surface at a height of at least thirty-five to forty miles. It was indicated by the Fordney investigations, however, that the layer is considerably closer to the earth, possibly ten to twelve miles. If so, it will mean that further trips to the stratosphere may result in a new way of determining weather conditions through observing the ultraviolet radiation and absorption at high altitudes, inasmuch as there is a correlation between the intensity of ultraviolet light and the atmospheric pressure.

equipment has made ten cuts of sixteen-inch diameter in less than four minutes, representing a large saving in comparison with the same work produced by hand. An automatic slip clutch protects the motor and saw chain against shocks. Automatic lubrication and automatic chain-tension are other features. The saw chain is endless and easily mounted. Every tooth is accessible for sharpening. Saw gates and pits are unnecessary in operation of this two-man sawmill.



Left, Sawing Log into Boards After Equipment Has Felled Tree, Shown at Right

Patentfeld, Wandmanstr. 10, Germany
1956
U. S. Agent - Vulcan
Iron Works, Elmira
maker: Idmar Maschinen
Gesellschaft, Hamburg, Attma,
Germany

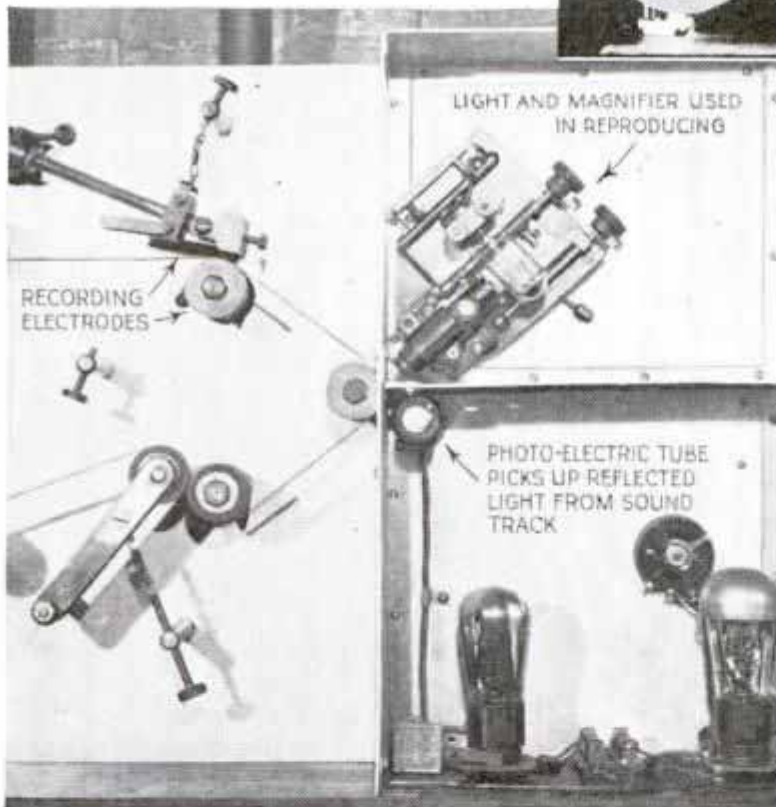
Cent. Haus, F. Kutschbach, P. L. 1

Talking Paper Tape Keeps Sound Records

1918 7 Fenelon Ave

After years of experiments, Meric Dutton, of Detroit, has worked out a method for recording sound on paper tape. An hour of talk can be set down on fifteen cents worth of tape. The reproducing unit may be plugged into an ordinary radio. The tape looks much like ticker tape except that it is only one-half inch wide. It is prepared for recording by passing it through a tray of chemicals and then drying. A microphone serves as "mouthpiece." A small motor starts the tape moving and the record is made when the paper passes between two electrodes, the lower of which is a brass roller over which the strip glides. A spring-steel stylus, which presses lightly on the paper, vibrates in

Top and Bottom, Views of Equipment Used for Recording and Reproducing Sound



tion is about the same as that of the "talkies." A photo-electric cell translates the black-and-white marks of the sound track into electric modulations that finally issue from a loud speaker in the form of sound. The talking tape has innumerable applications.

WEED ONCE A NUISANCE IS WELCOMED BACK *1924*

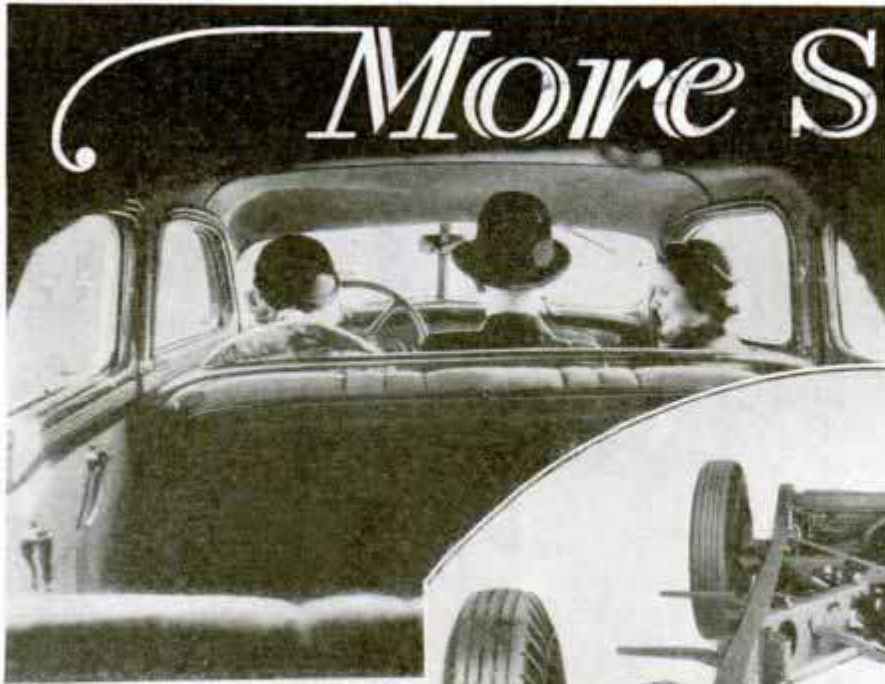
Eelgrass, once known as a nuisance weed, was accorded a hearty welcome when it reappeared last year in Rhode Island waters. The mysterious disappearance two years ago of this grass put many industries out of business, menaced sea and bird life and even threatened to make marked changes in the coast line. No one knew why it vanished and now no one knows why it has appeared again. Hundreds of men who formerly relied on scalloping as their chief source of income, lost their means of livelihood and a blow also was struck at eeling. Geese and brant which lived on the roots of the grass grew scarce, farmers missed the grass in fertilizing and builders missed it as an insulation.

response to modulations of sounds picked up by the microphone. When the tape reaches the electrodes, it blossoms forth with black and gray markings, mostly in the form of horizontal bars, forming a visible and indelible sound track. If desired, the record can immediately be "played back," with a lag of only an instant. A monitor with earphones may check up on reproduction. The method of reproduc-

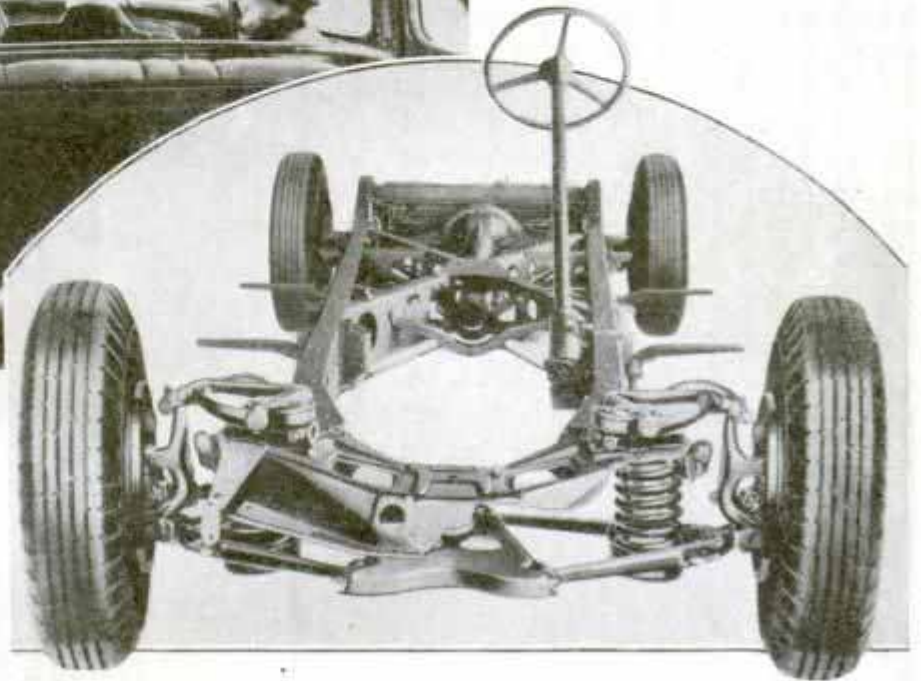
Cont. by H. Langley

07938 Regger

More SPEED



Left, Showing Roominess of 1934 DeSoto; Right, Buick's Wheel Suspension



WHETHER American motorists want speed or not, they are going to get it in the 1934 models. All down the line, engines are more powerful, compressions higher, acceleration faster and bodies more advanced in streamline effects. The net result is an increase of five to twenty per cent in the top pace, the "cruising" speed and the "getaway," depending upon the individual automobile.

Few highways are in such condition that the eighty, ninety and even 100-mile speeds of the new cars may be used safely, but owners will derive considerable satisfaction from the knowledge that the power is there, that the engine is practically loafing while the car is traveling at sixty or seventy miles per hour.

Hand in hand with this capacity for rapid travel comes new comfort in the form of seats placed between the axles instead of over them, improved springing and shock absorbing devices, radical changes in wheel mounting and low-pressure tires.

The 1934 DeSoto is a vast departure from conventional design. It has a rounded nose, a wide front and a tapering rear, an attractive automobile that offers little resistance to the wind. Headlamps are sunk into the front of the body and the radiator is concealed. More scientific distribution of weight is accomplished by

moving the engine and the seats ahead about twenty inches so that passengers ride midway between axles. Together with longer springs and low-pressure tires, this results in unusual comfort on all kinds of roads.

Under the smoothly rounded hood is a 100-horsepower motor capable of developing more speed than the average driver will care to use. Patented rubber engine mountings reduce vibration to a minimum. Free wheeling is standard. Luxuriously cushioned chairs with chromium-tubing frames are used instead of conventional seats, giving the passenger a sensation of "floating" instead of riding. This effect is due, in part, to the natural springiness of tubing construction. The interior of the DeSoto is roomier, the design making it possible to add eight inches to the width of the front-seat compartment. Two persons may ride beside the driver without being crowded.

An important contribution to comfort is introduced this year. It is independent suspension of wheels. The entire General Motors line, including Chevrolet, Pontiac, Oldsmobile, Buick, LaSalle and Cadillac,

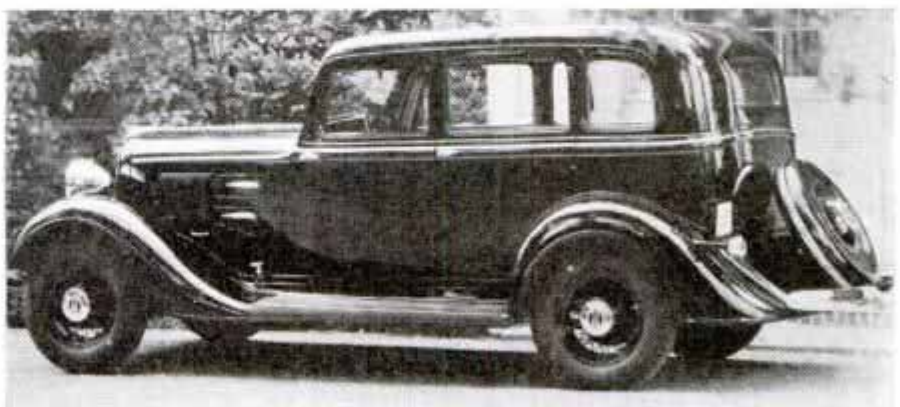
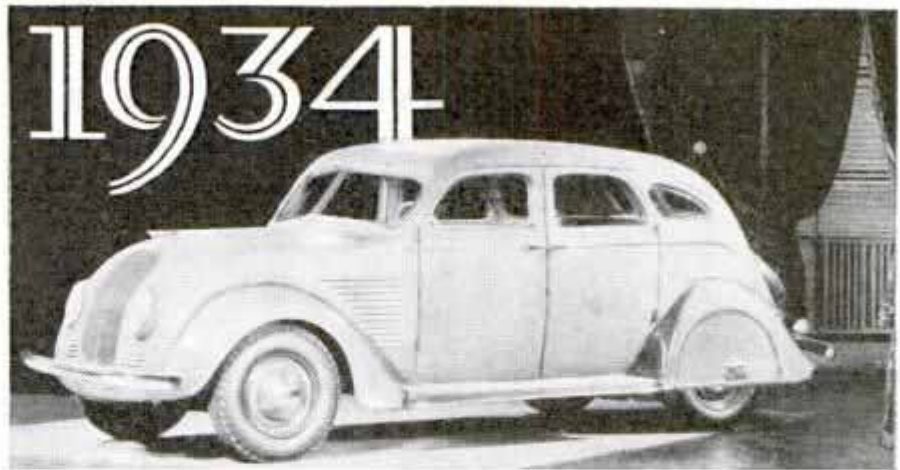
for

1934

is equipped with this feature. In the Buick, each front wheel is independently carried on a frictionless coil spring, the front axle being replaced by a special front cross-member and the stiff leaf springs by the coil springs and "V"-shaped arms. The result is that one wheel may pass over an obstacle without communicating the shock to the other wheel or to the frame and body. A ride stabilizer, mounted just ahead of the rear cross-member in the Buick, prevents sway or body-roll on curves and high-crowned roads.

The Plymouth and the Dodge offer another type of wheel suspension that produces remarkable freedom from road shock, giving a smooth ride on rough surfaces.

Bodies of General Motors cars for 1934 are more advanced in streamlining than last year's models, but conventional lines are followed. The Chevrolet is two inches longer over all and four inches longer inside. Its motor develops seventy-nine brake horsepower. A water-jet arrangement plays a tiny stream on the exhaust valve sets to keep the engine cooler. The Pontiac motor produces eighty-four horsepower. The car, with a wheel-base of 117¼ inches, weighs 3,480 pounds.



Top to Bottom, 1934 DeSoto, the New Buick, Nash Coupe, Studebaker with Built-In Trunk and the Deluxe Plymouth; Note Advanced Streamlining Employed in the DeSoto



There are no radical changes in body lines. A ten per cent increase in gasoline mileage at high speed is claimed for both Chevrolet and Pontiac.

Buick has more powerful engines than in 1933, the smallest developing eighty-eight horsepower and the largest 116. Power brakes and a dual controlled automatic starting mechanism are other features. When the ignition is turned on and the accelerator pedal pushed down or the hand throttle advanced, all operations for starting are performed automatically.

Refinements in body lines, increased power and acceleration, improved springs and a new ventilation system are features of the 1934 Ford. The engine is equipped with a dual downdraft carburetor and dual intake manifold, stepping up the power by twelve per cent and giving a top speed of between eighty-five and ninety miles per hour.

Auburn introduces two eights for 1934, in addition to entering a lower-priced field with two new sixes. Flowing lines and motors capable of high speed are characteristic of all models. One feature is the radiator grill which has small air scoops at its base to keep down engine temperatures. Free wheeling is retained, springing is improved and dual ratio featured in custom models.

Nash features advanced streamline effects, twin ignition and a coincidental clutch starter that starts the motor when

the driver turns the ignition key and steps on the clutch pedal. The motors are powerful, ranging from eighty-eight horsepower in the six to 125 in the advanced eight-cylinder models.

Studebaker also leans more to streamlining than before. There is new comfort in the form of spring treatment known as quadripoise suspension, which is said to re-

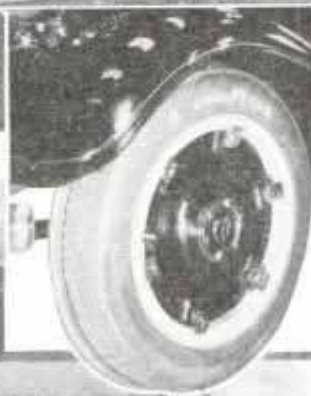


Top, Rear Seat of DeSoto; Note Tubing-Seat Frame; Bottom, Plymouth's Wheel Suspension

sult in balanced, level riding at all speeds. Free wheeling is retained by Studebaker, who pioneered the device.

That these high-speed automobiles must have means of stopping quickly has not been forgotten by the manufacturers. In general, braking power has been increased in proportion to speed. There are several different types of brakes, including the mechanical, the hydraulic and what is known as the power brake. In several cars, the mechanical brake is given a helper this year, a booster arrangement that permits the driver to apply the brakes firmly without as much foot pressure as formerly. Increased braking areas, wider linings, improved drums and more efficient mechanisms for stopping the car smoothly are other safety factors in the 1934 models.

Railmobile Gives Smooth Ride at High Speed



Top, Old and New on Rails; Left, Center, View from Railmobile; Right, Center, Pneumatic-Tired Wheel; Bottom, Driver's Compartment

Smooth riding at all speeds is among the features of a new vehicle designed for use on railroads. Actually it is a bus on rails, equipped with pneumatic-tired wheels with steel flanges and special springs to increase the comfort of passengers. An aluminum safety ring within the tire solves the problem of blowouts at high



speed, the ring taking the load when the tire goes flat, in addition to conducting heat out of the tire. Produced by an automobile manufacturer, a railroad equipment house and a rubber company, the vehicle seats fourteen passengers. Powered by a bus engine, the two-car "train" attains speeds of seventy miles per hour. Safety brakes stop the railmobile smoothly over short distances. Operation costs are said to be low, even less than for similar vehicles running on highways.

X-RAYS BARE METAL "BRUISES" INVISIBLE TO EYE

1910

Invisible "bruising" of metal when automobile crankshafts or any of many other objects are drilled or cut by cold-work machining can be detected and measured by X-rays. Prof. Lars Thomassen, of the University of Michigan, points out that engineers have long known that when a piece of metal is machined, the pressure and tearing motion of the cutting tool upsets the structure of the metal for some distance below the newly cut surface. By

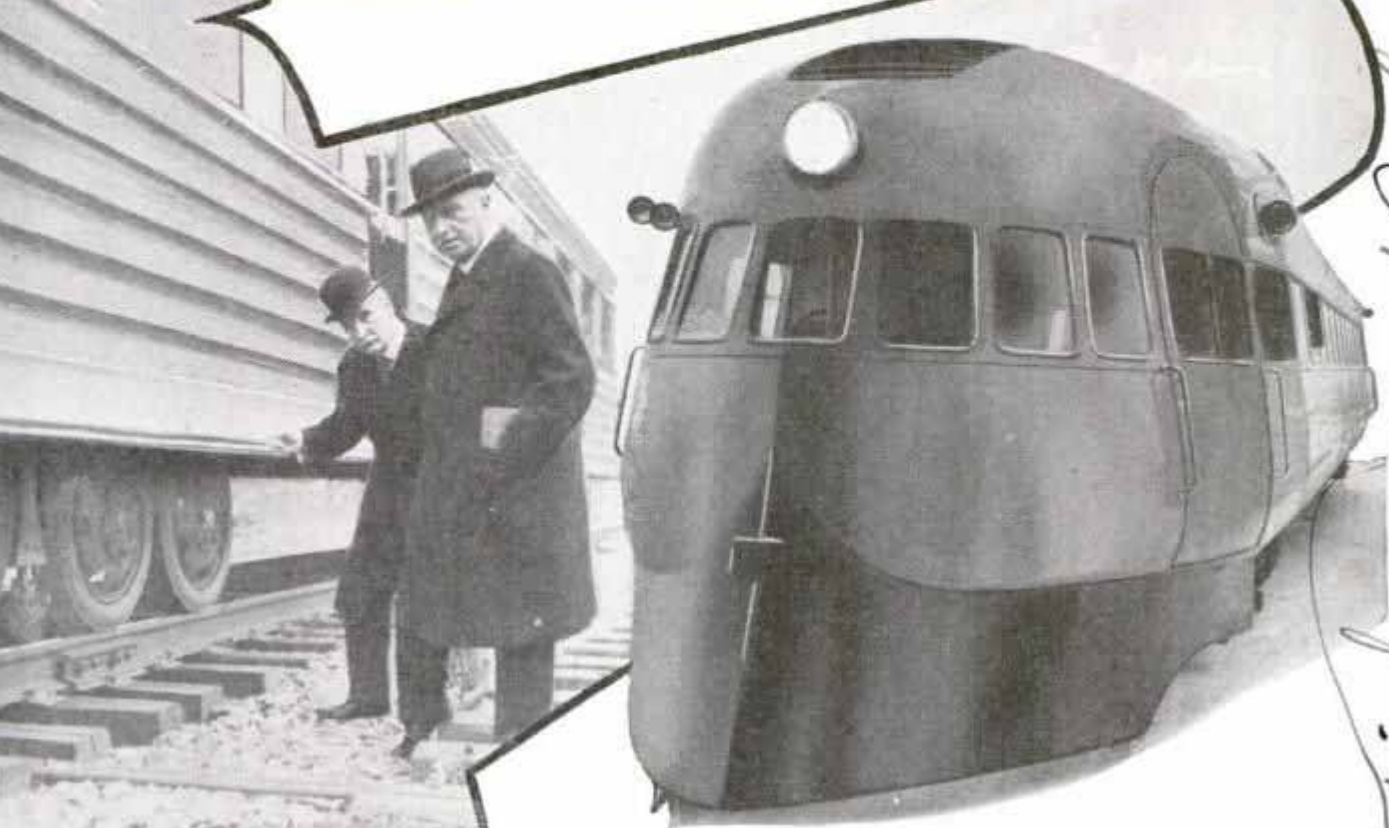
shooting a beam of X-rays on a machined metal surface at a slight angle and then catching and photographing the reflected rays, Professor Thomassen found that the top layer of disturbed metal crystals gave a picture of jumbled spots and blurred rings. Photographs of the top skin of un-machined metal show regularly arranged spots. To discover how far machining affects the metal, one one-thousandth of an inch is etched off and another X-ray picture taken. This process is continued until a layer is reached which corresponds to the un-machined surface.

U. of Mich. News Service

Ann Arbor Mich

Chicago

RAILROADING



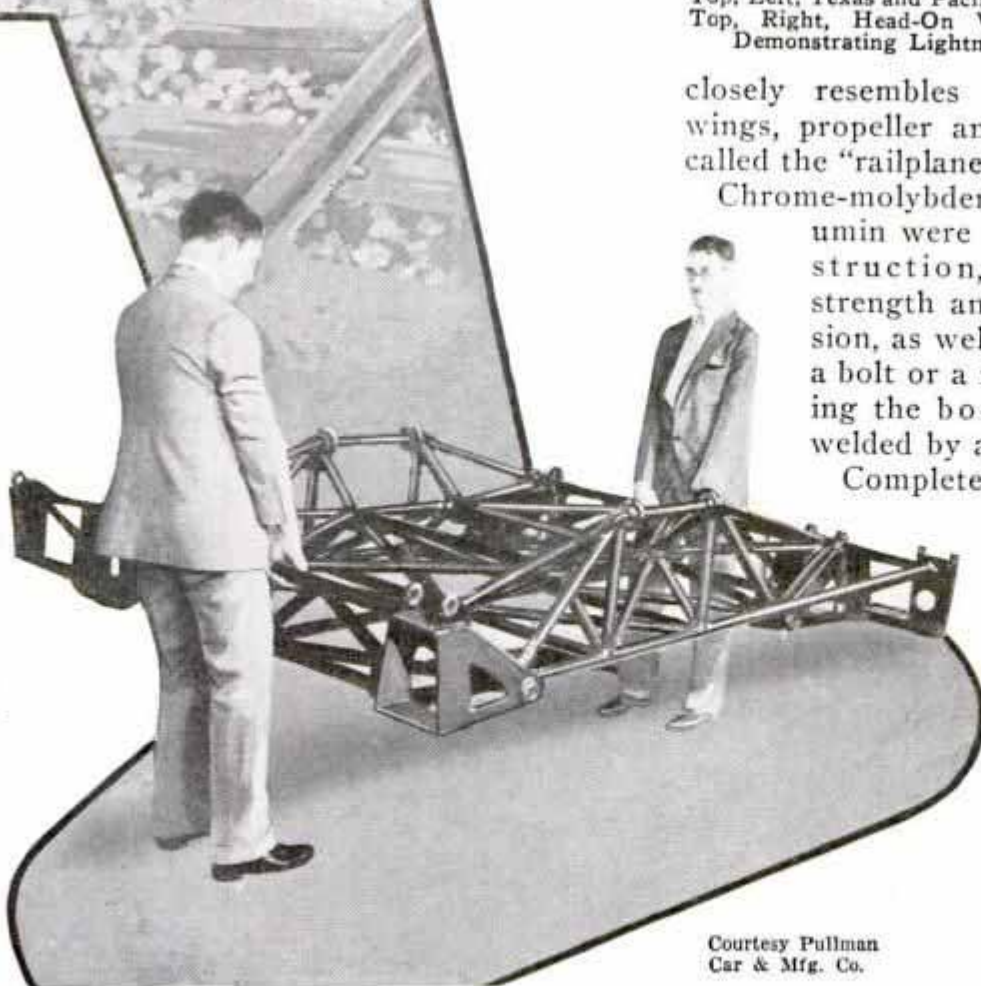
Top, Left, Texas and Pacific Train with Rubber Wheels.
 Top, Right, Head-On View of Railplane; Bottom
 Demonstrating Lightness of Structural Material

closely resembles an airplane without wings, propeller and tail assembly, it is called the "railplane."

Chrome-molybdenum steel and duralumin were used in the car's construction, giving it unusual strength and resistance to corrosion, as well as light weight. Not a bolt or a nut was used in building the body, all tubing being welded by acetylene torch.

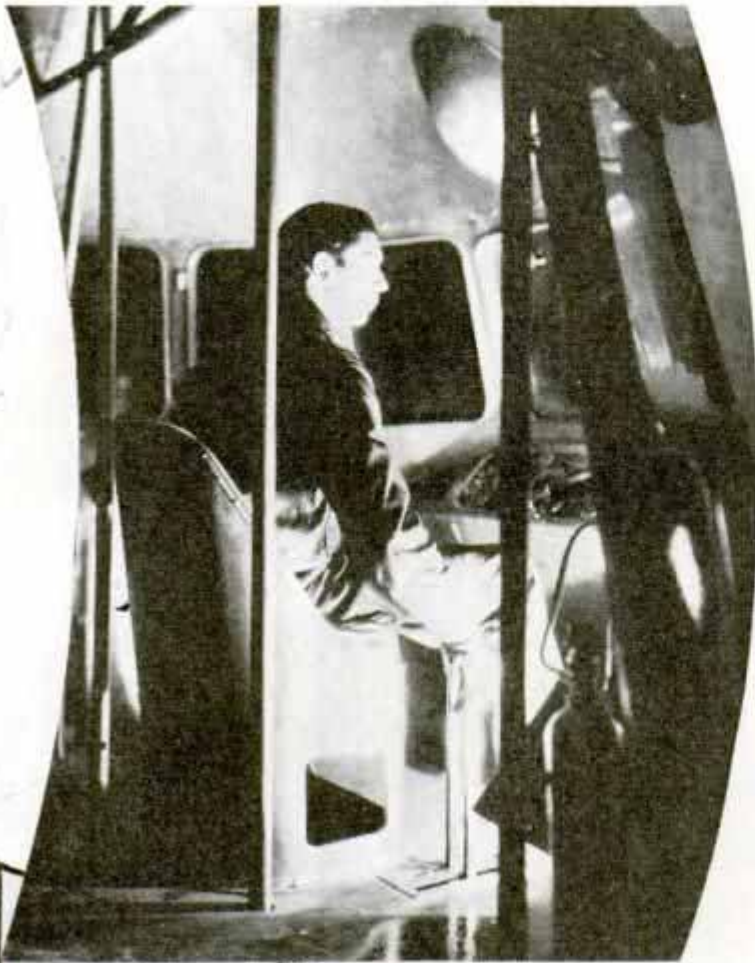
Complete streamlining is a feature, not a break appearing in the smooth outer surface of the car. The steps fold to conform to the contours of the body and even the bottom is smooth, save for the protruding eight wheels.

Two 160-horsepower gasoline engines, taken from



Courtesy Pullman Car & Mfg. Co.

*Timber - Bryant Car Co
 100 Clark Ave. Electroh. Mill
 Akron, O.
 Rubber - Liberty
 Firestone Tire & Rubber Co.*



to drive the car forward or backward. A separate set of indicators is mounted on the instrument panel to show the driver how each engine is performing. Other dials, switches and signals on the panel aid in the control and operation of engine starters, all lights, brakes and the like.

Special air brakes, two to each set of trucks, stop the car without a jar in ten seconds from a speed of fifty miles per hour. The rapidity with which these brakes operate was demonstrated recently on one of our test runs when a child fell as she crossed the tracks. The railplane was backing along the main line. With only a few feet to spare, the driver applied the brakes upon signal from the flagman standing in the rear of the car. In the parlance of the auto

Left, Driver's Compartment in Railplane; Bottom, Side View of Car



Courtesy Pullman Car & Mfg. Co.

the production lines of a bus motor factory, propel the car six miles to the gallon of fuel. An automatic monodrive transmission carries the power from engines to axles by means of direct gearing. So well has this drive been arranged that the railplane starts smoothly, moving away in low gear, then changing to second without attention and finally into high. The driver simply opens the throttle as the car gains speeds. Acceleration is rapid.

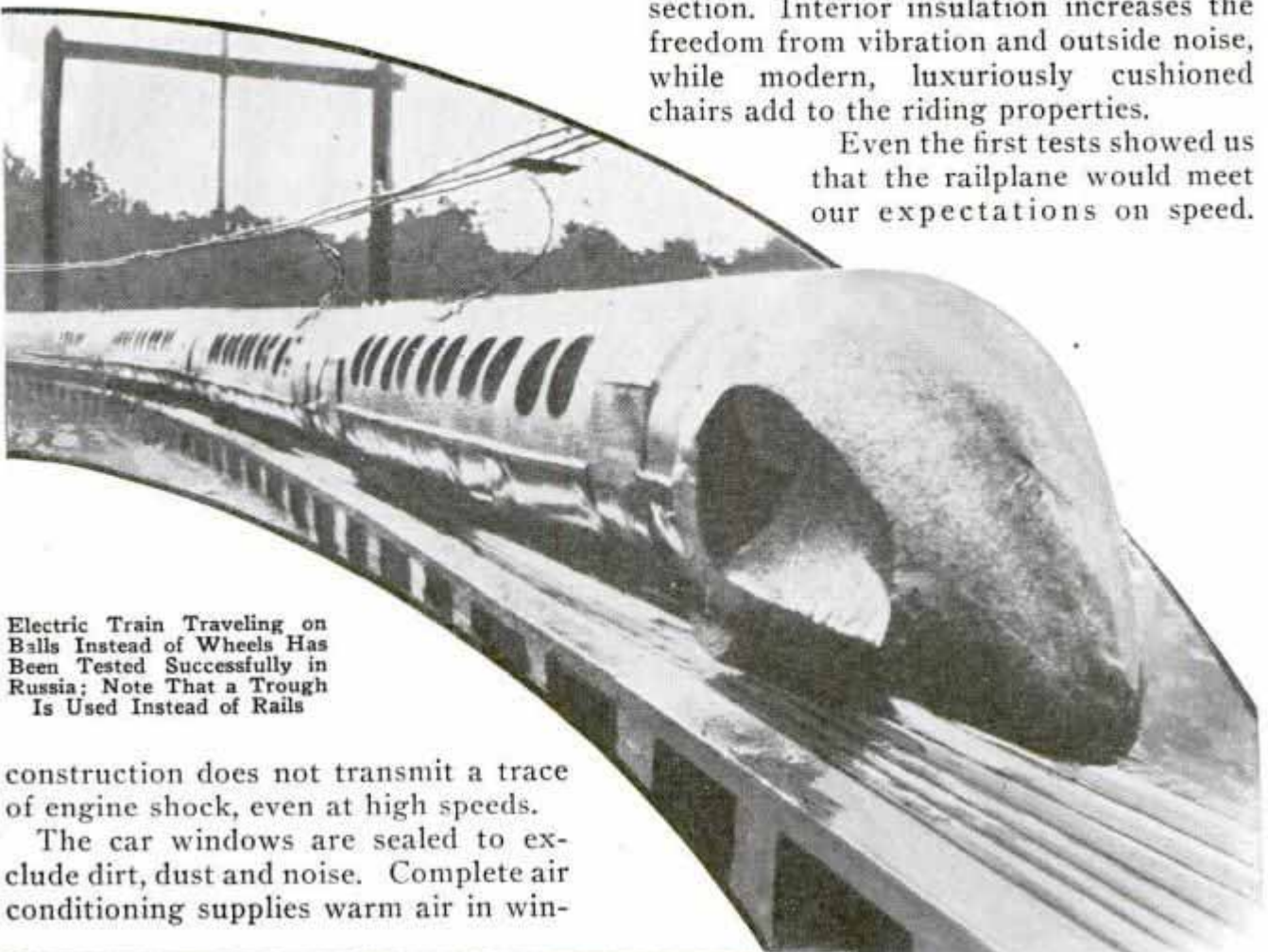
One motor is mounted between the wheels on either side of the front trucks. The single throttle controls both power plants, either of which may be removed quickly and a substitute installed in emergencies. One motor is powerful enough

repairman, we stopped "on a dime," yet without that severe jerk common to the heavy train of today. The railplane's light weight contributes considerably to its stopping power.

Twenty-three thousand pounds is the weight of the car, or about 490 pounds to the passenger, an amazing figure when compared to the 5,000 pounds per passenger of the steam train. Fifty persons may be carried comfortably in the single unit which we have constructed. Riding qualities are excellent, due to the mounting of special springs in rubber and to the ring of rubber inserted between the steel wheel and the axle. Vibration from the track is reduced to a minimum, while the tubing

section. Interior insulation increases the freedom from vibration and outside noise, while modern, luxuriously cushioned chairs add to the riding properties.

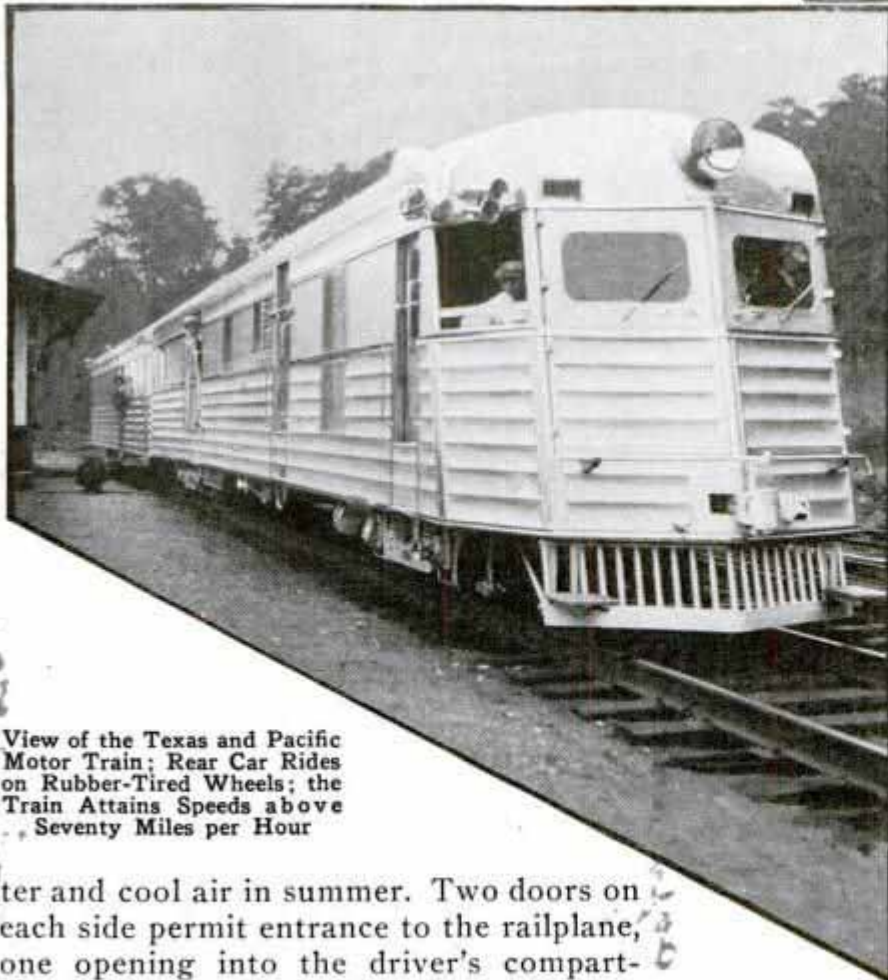
Even the first tests showed us that the railplane would meet our expectations on speed.



Electric Train Traveling on Balls Instead of Wheels Has Been Tested Successfully in Russia; Note That a Trough Is Used Instead of Rails

construction does not transmit a trace of engine shock, even at high speeds.

The car windows are sealed to exclude dirt, dust and noise. Complete air conditioning supplies warm air in win-



View of the Texas and Pacific Motor Train; Rear Car Rides on Rubber-Tired Wheels; the Train Attains Speeds above Seventy Miles per Hour

ter and cool air in summer. Two doors on each side permit entrance to the railplane, one opening into the driver's compartment and the other into the passenger

During one run on a rough freight track, the car exceeded eighty miles per hour with engines turning over at 1,650 revolutions, leaving a reserve of 600 revolutions and indicating that the car could easily attain 100 to 110 miles per hour. This speed, of course, is not intended for regular operation. The vehicle has a "cruising" speed of ninety miles.

This rapid pace with low power is the result of direct gearing, since experimental work has shown that about twenty-five per cent of the engines' output is lost when the engines turn a generator to produce cur-



rent for an electric drive instead of driving the wheels direct.

The Pullman Car and Manufacturing company also is building a three-car unit for the Union Pacific system, a distillate-powered train in which our laboratories had a part in the designing. Another three-car unit is under construction elsewhere for the Burlington railroad, while the Texas and Pacific already has placed a two-car train of this type in operation. Both of the three-car trains will be streamlined to the greatest degree thought possible at the time they were designed, and both will attain high speed.

Depending on the traffic, the railplane may be produced in one, two, or three-car units. The engines used will propel a two-car train at ninety miles per hour, while the installation of more powerful motors would give a three-car train the same speed. We visualize sleeping compartment trains of the railplane type, so economical to operate that costs will be a fraction of what they are now.

To the railroads, floundering in the midst of too-heavy and too-expensive equipment, the railplane and similar streamlined motor trains bring new hope. I am

Top, Interior of Railplane Before Installation of Soundproofing, Insulating and Decorative Materials; Note Tube Construction; Bottom, Showing Neat Instrument Panel Resembling That of Airplane

convinced that we stand on the threshold of an era of fast, safe, comfortable and convenient transportation that might well be described as air-minded railroading.

PENCIL FOR BLUEPRINT WORK HAS COLORED LEAD

Notations that will not strain the eyes may be made on blueprints with a pencil which also may be used on plain white surfaces. Colored leads, red, yellow and orange, are used.

C-1884
U.S. Army
W.C. Swan Pencil Co
6-721

FUEL GAS FROM CORNSTALKS CAN BE PRODUCED ON FARM

Engineers at Iowa State college are attempting to harness nature's forces on the farm to provide the farmer with free fuel gas by developing a plant which will manufacture the family's gas for heating and lighting from cornstalks and cesspool sewage from the barn and house. A test plant has been erected which is expected to be capable of producing about 200 cubic feet of gas a day by utilizing forty to fifty pounds of shredded stalks. It is estimated such a plant would cost the farmer between \$300 and \$500, exclusive of the distribution equipment within the home. It has long been known that the decomposition of vegetable wastes is accompanied by the evolution of gases with considerable fuel value. Such fermentation proceeds from natural organisms at a slow rate. For application to fuel production purposes, the fermentation is impossible unless a nitrogenous waste is added to enable the bacteria to function. The real problem in producing gas by such a process lies in proper maintenance of the chemical balance and bacterial efficiency in the fermenting mass. In producing the gas, the sewage is run into a fermentation chamber with the cornstalks.

Science Service 12/4/33

see Sept. 1934. 154



Tacking Special Paper on Screen Door to Make It Proof against Cold and Wind

STORM PAPER ON SCREEN DOOR KEEPS OUT THE COLD

Conversion of screen doors into storm doors when cold weather arrives may be accomplished by means of a new kind of paper which is applied over the screen and tacked in place around the frame. Use of a half-round molding around the edge gives the door a more finished appearance. The paper is water and wind proof and exceptionally tough. When the winter is over, it may be removed, leaving the screen in place for the summer.

AUTO BUILT FOR RUTTED ROADS HAS LARGER CLEARANCE

Engineered especially for high-crowned, rutted roads and for use in foreign countries where there are no roads, an American automobile has twenty-inch wheels and special springs. It is the Plymouth. The auto has nine and three-fourths inches of clearance, thus enabling it to pass over road obstructions that would stop the low slung modern automobile.

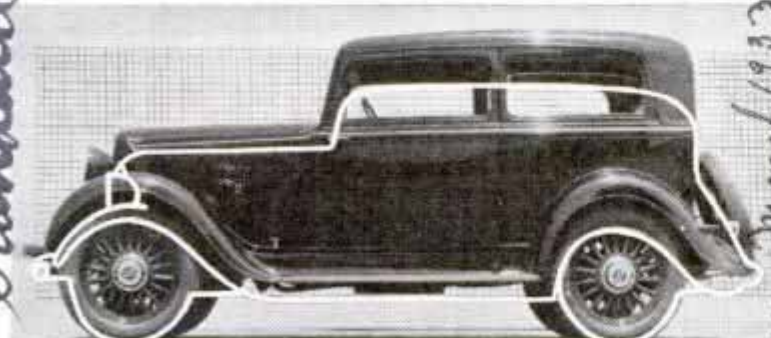
Standard Six

1857

NOTCHED LUMBER IS FASTENED WITHOUT USE OF NAILS

Factory prepared lumber which comes to the consumer with its integral parts so arranged that any type of building can be erected by interlocking the parts is now being turned out. No nails are required and rafters, studding and joints are notched at intervals so systematized that all parts can be dovetailed in place. All parts are seasoned and finished and the system of fastening members will not only help prevent the settling of a building, but will also stop the cracking of plaster, it is claimed.

192



see March 1933

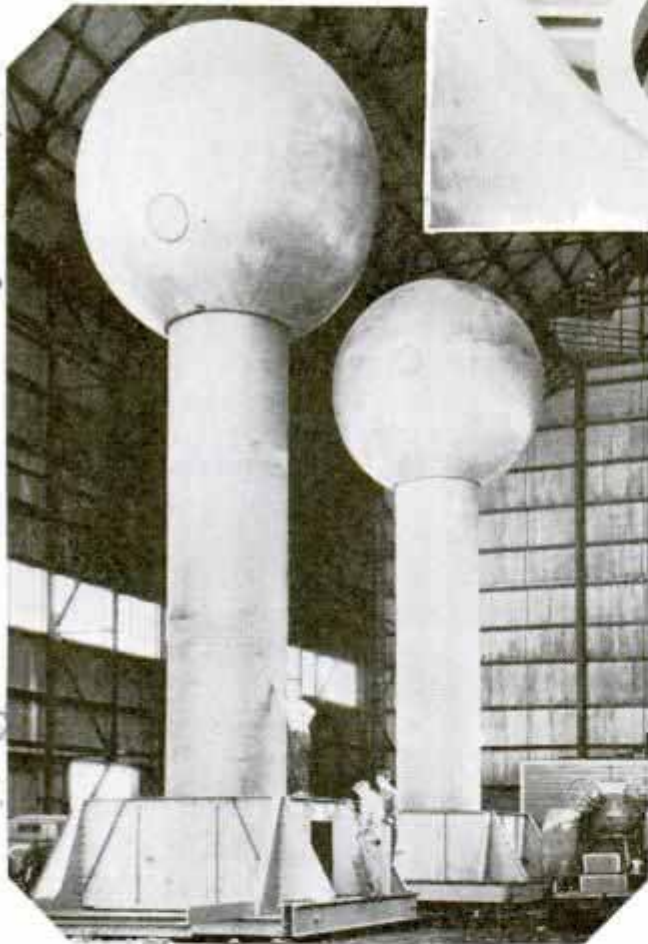
White Lines Show Size of Modern Car as Compared with Automobile Constructed Especially for Use on Country Roads

*Longwood Wash. Md
Edwards City, Md*

Plymouth Motor Corp Long Bell

Ten-Million Volt "Gun" to Bombard Atoms

Ten million volts, man's closest approach to lightning, will be used by scientists seeking new information about the creation or release of energy. A giant electrical "gun" will fire this powerful bolt or "bullet" into the heart of atoms in a bombardment that may lead to realization of a scientific dream of modern alchemy, the useful conversion of mat-



Left, Giant Spheres of Generator for Bombarding the Atom; Right, Interior of Sphere

ter into energy. President Karl Compton, of Massachusetts Institute of Technology, has pushed to completion this new weapon for attacking the atom, after its invention by Dr. Robert J. Van de Graaff. The annihilation of one pound of matter, Doctor Compton computes, would create enough energy to heat 100 million tons of water from freezing to boiling temperatures. The ratio is so enormous that if even a modest part of the energy in matter could

be made available for mechanical use, all other forms of energy storage, such as fuels, explosives, dammed water, storage batteries and the like, would be eliminated. The Van de Graaff atomic weapon consists of two large hollow columns, twenty-five feet high and six feet in diameter, surmounted by a hollow polished aluminum sphere fifteen feet in diameter. The spheres are charged in an unusual manner, paper belts, four feet wide, carrying up the electrical charges sprayed upon them at the base at the comparatively low pressure of 20,000 volts. Or, the generator may be operated without any artificial source of electricity, drawing necessary charges from the earth. In tests, with the generator discharging close to ten million volts, scientists were able to work within the hollow terminals. When the real bombardment begins, a large vacuum tube made of laminated paper will extend from one sphere to the other. The electricity will be discharged through this tube, creating the most powerful X-rays ever known, hurling electrical bullets against a metal target. This attack on atoms contained in the metal targets may result in release of energy on a considerable scale.

Cambridge, Mass see June 1935-576

near Westford, Mass
at Round Hill, Mass
at Col. G. H. A. ...

... ..

ter
are

C1742

SECRETS INSIDE OF EARTH CHALLENGE EXPLORERS

With all unknown lands mapped, the explorer of tomorrow must turn his attention to the earth's interior. Exploration of the surface is nearing completion, yet the earth a few miles beneath is still as secret as was the western hemisphere before Columbus. Man has penetrated two miles down by means of oil-well drills and has descended one mile into a gold mine, but these depths are mere pin pricks compared to the 4,000 miles that lie between the earth's surface and its center. It will not be necessary to drive a tunnel through the earth to learn about its interior, according to Prof. W. T. Thom, Jr., of Princeton University. One possible aid to exploration of the interior is the airplane, with which photographs may be taken to disclose interrelations between widely separated geological structures. Delicate gravity balances are available for disclosing rock formations buried under less dense deposits. Devices have been produced for "listening in" on explosion waves started through the earth by setting off TNT charges.

Science News Letter 10/28/32



How Sidecar May Be Used as Boat; Note Floats Attached at Rear to Steady This Unusual Water Craft

CYCLE SIDECAR USED AS BOAT BY ATTACHING PONTOONS

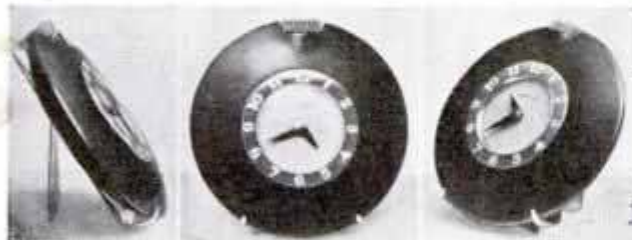
Use of the motorcycle sidecar as a boat has been found practical in Germany. Pontoons are fitted on each side of the car, which is propelled by double-ended paddles. Changing the sidecar into a boat may be accomplished quickly. German manufacturers are considering a plan for building sidecars equipped with rudders.

COD-LIVER OIL IN CANDY FORM HAS A PLEASING FLAVOR

Cod-liver oil can now be taken in candy form. Fresh cod livers are being mixed with cocoa in such a way that the health-promoting qualities of the livers are retained without any objectionable taste or odor. The mixture can be used in chocolate-coated confections, or even in making ice cream and egg shakes. It can be preserved for a year, it is claimed, without loss of food value. A small bar of candy made from it contains the equivalent of a tablespoonful of cod-liver oil.

WATCH WITH BRACKET STAND IS OF STREAMLINE DESIGN

Trains, automobiles and airplanes have been streamlined, and now a streamlined watch is being offered for the woman's handbag. The stem is set into the lustrous black case of molded material and the white-enamel numerals stand out in relief



Streamlined Watch for Woman's Handbag with Recessed Stem and Bracket for Support

against the ebony background. A bracket is provided to stand it on the table or hook it onto the inner pocket of the handbag.

Western Clock Co
L. S. Colle

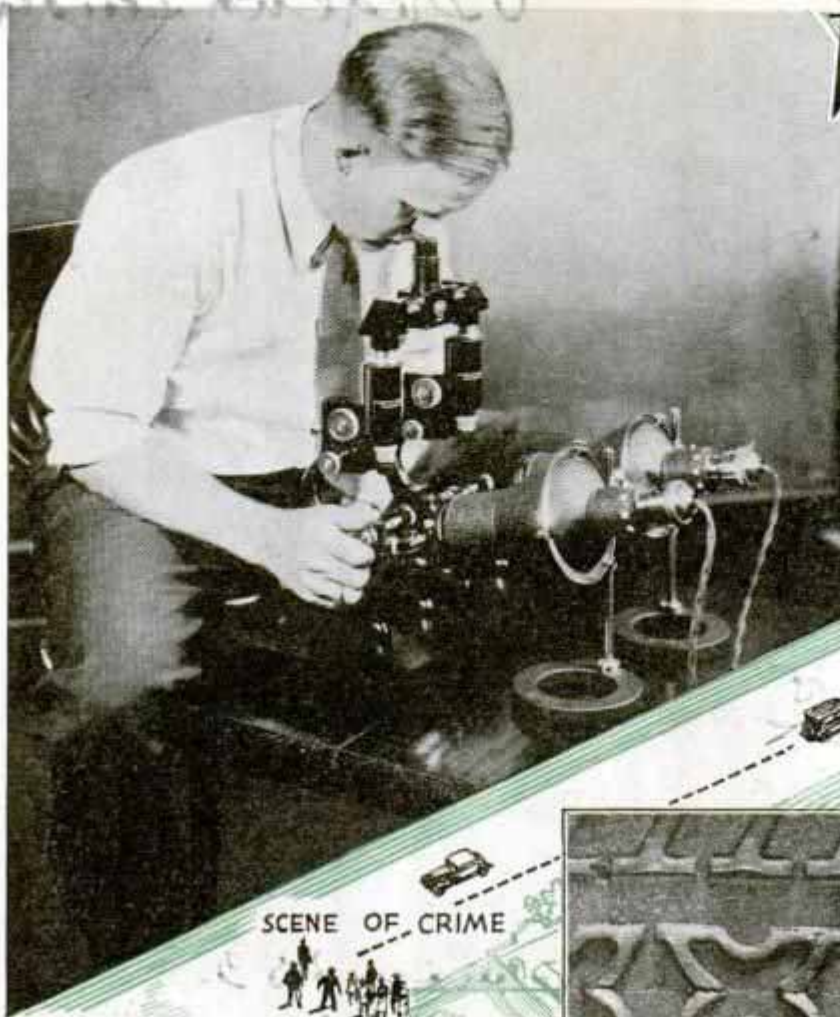
Canadian Dept. of
Fishing

see also 253

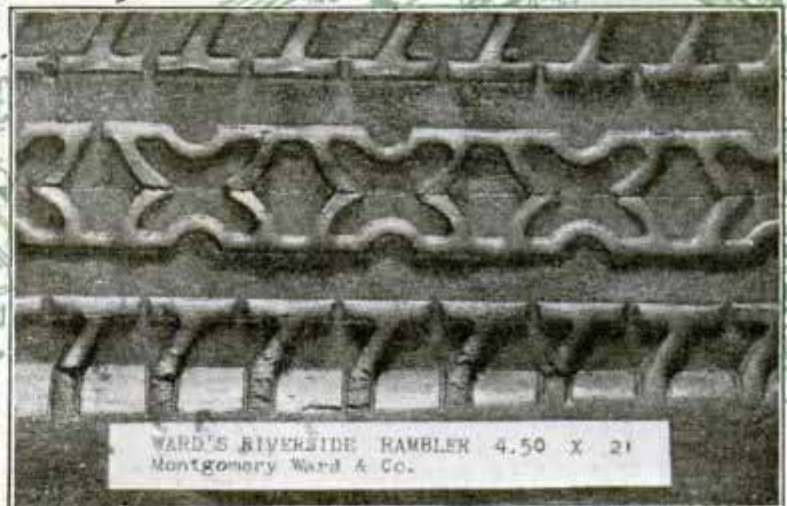
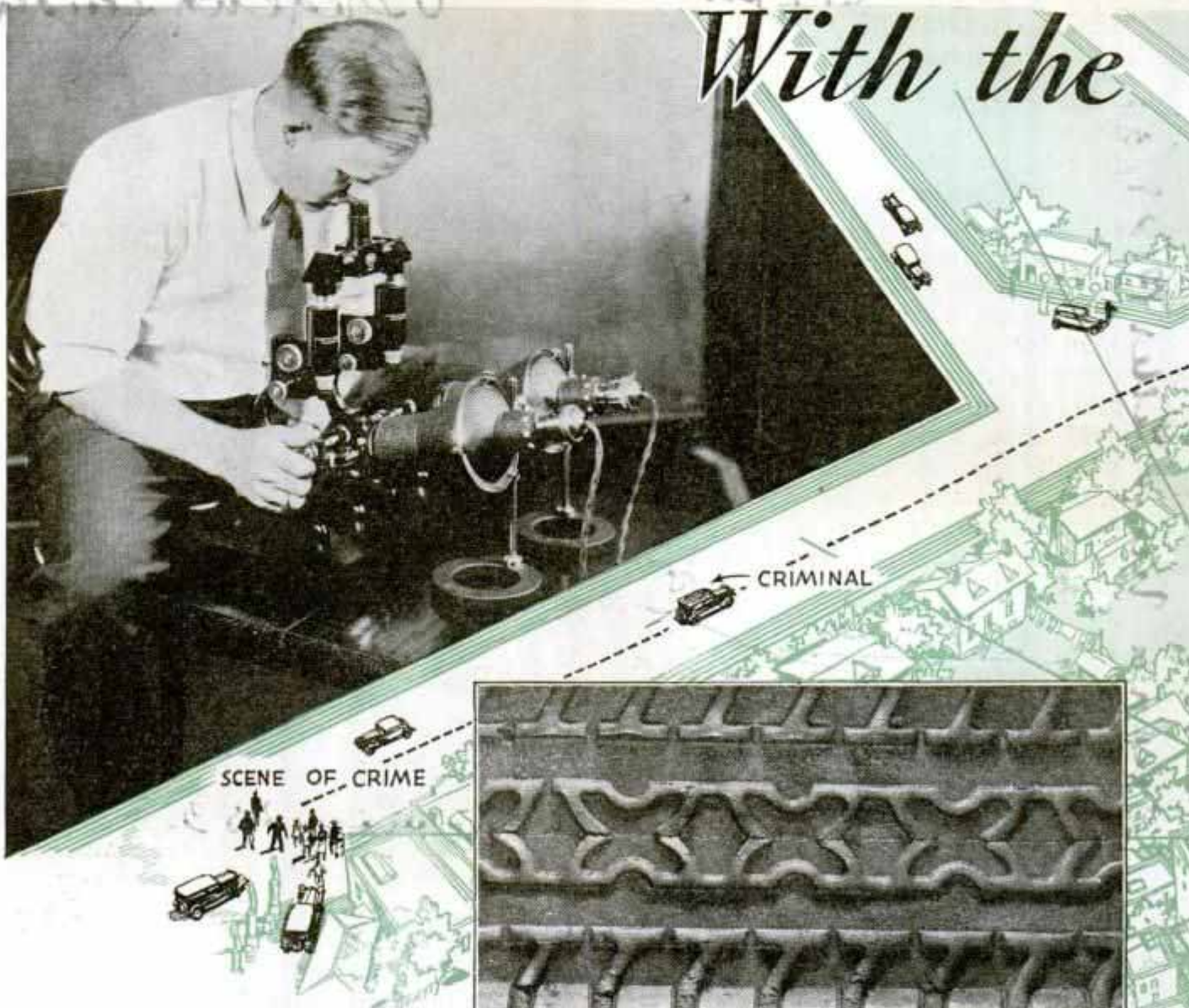
Dr. H. A. Wentworth, Vancouver

Am Bodensee

Dr. Brunau, Canada
Mr. Dr. Brunau, Canada
Mr. Dr. Brunau, Canada



With the



Above, Examining Bullets for Any Markings; Right, Tire Track Used for Comparisons

WARD'S RIVERSIDE RAMBLER 4.50 X 21
Montgomery Ward & Co.

By H. W. MAGEE

IT was just an ordinary "stick-up" with no added thrills or frills. Three men held up a motorist in Chicago, took his money, yanked him out of his car and sped away. From the viewpoint of the thugs, it was a good night's work. Nothing to do now but keep going.

But they made one mistake. They headed direct for Michigan and its state-wide police radio system. The Chicago police learned of this and asked the Michigan authorities to watch for the fugitives. Two minutes after the request was made more than 300 cruising police cars and peace officers in 120 Michigan cities and towns were on the lookout. And nine minutes after the police broadcast, the men and

the car were in custody! A man in northern Michigan fled in a car after a killing. Ahead of him, over the police radio, went the report of the crime and the description of the slayer and his car. Two troopers on patrol duty several miles distant consulted their maps and decided the fugitive might follow a near-by main artery. They guessed right and had him under arrest before his flight was well started!

Three negroes held up a store north of Grand Rapids. The proprietor resisted and in the resulting shooting, he was killed after wounding one of the bandits. The killers fled in a car with Illinois license plates, but were hardly out of sight before an alarm was being broadcast over the state. Two troopers, about 100 miles distant, on a highway leading from the

© 1293... 279 E. 44th Street

Handwritten notes on the left margin.

Vertical handwritten notes on the far left margin.

1293

RADIO PATROL



Above, Examining Stamps under Ultraviolet Light; Left, Police Radio Operator Broadcasting a Message

scene of the crime listened to the report, pulled off the road and waited a while. In a short time the bandits rode directly into their hands!

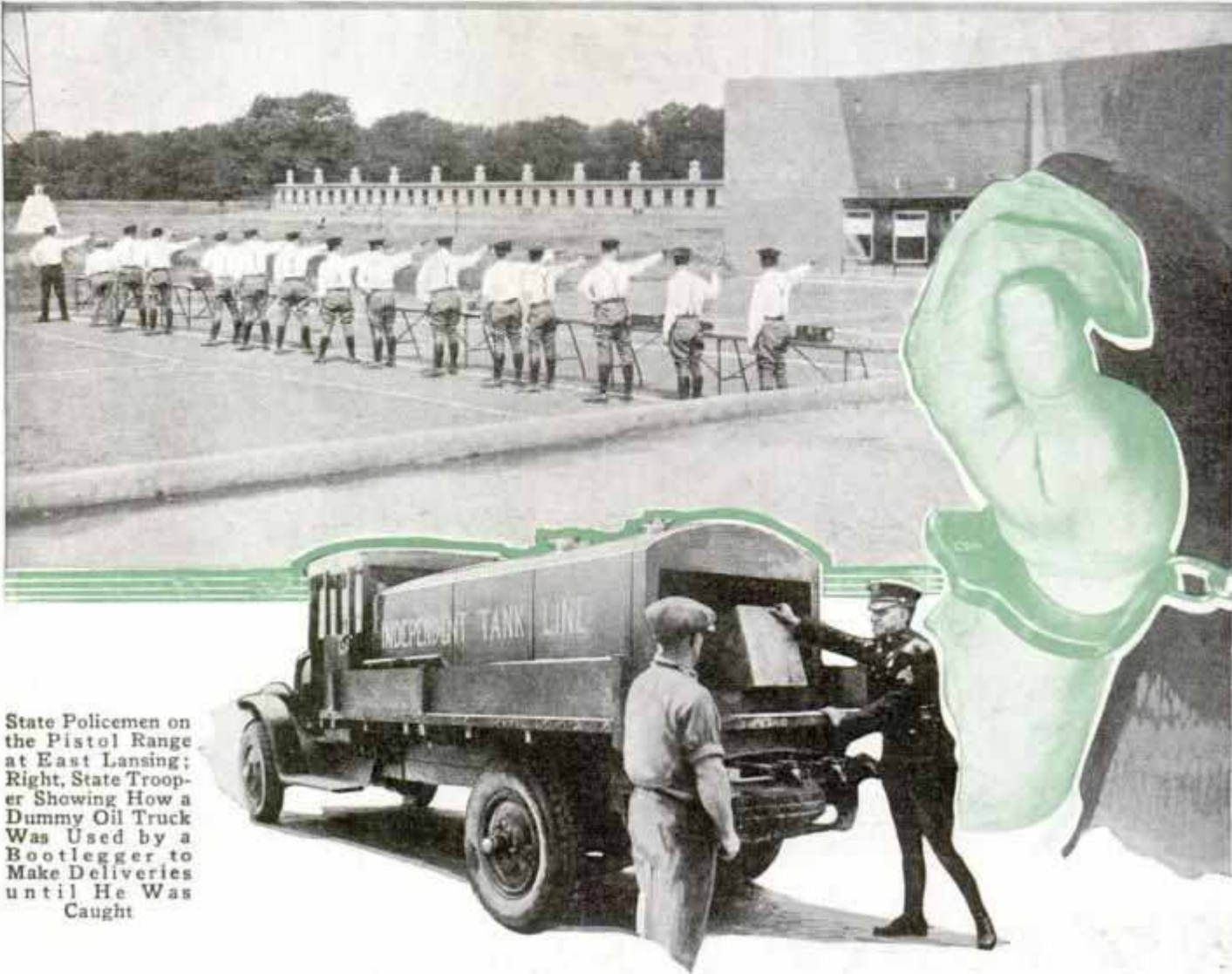
These instances, taken from the records of the Michigan department of public safety, show how the Wolverine state is using the radio to augment manpower in battling crime. With the aid of the police

radio system, a mere handful of troopers is doing a job which would require a small army without radio communication.

With radio's assistance, the state of Michigan with nearly 5,000,000 population and more than 57,000 square miles of territory, is being policed today by less than 150 troopers. These men cover 7,500 miles of trunk-line highways and almost as

many more miles of county roads. Their job is simplified by the fact that eighty per cent of the population reside in an area comprising only one-fourth of the state.

The headquarters of the state police is at East Lansing where is located the 5,000-watt transmitter. The system is divided into eight districts with nineteen substations, each with its own receiver. In



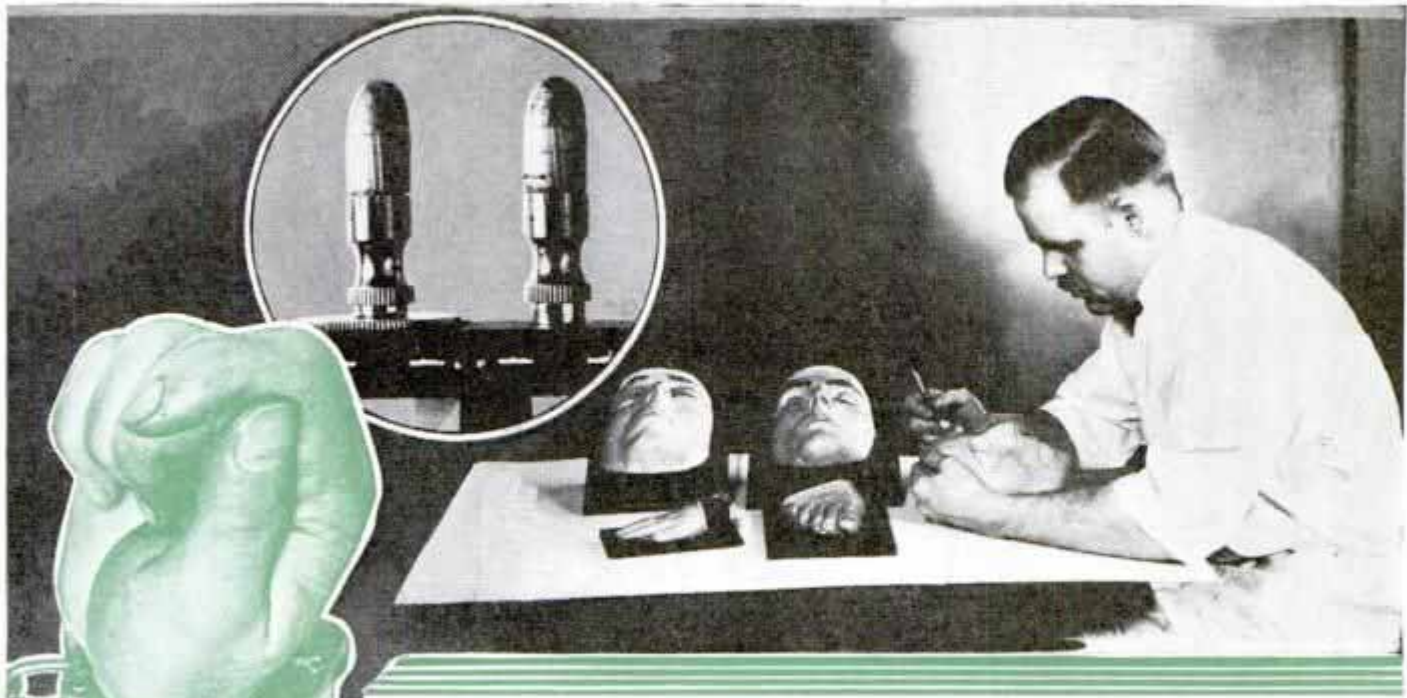
State Policemen on the Pistol Range at East Lansing; Right, State Trooper Showing How a Dummy Oil Truck Was Used by a Bootlegger to Make Deliveries until He Was Caught

addition, seventy-four local police departments and sheriffs' offices are equipped with state police receivers bringing in the East Lansing broadcasts, and a number of smaller police departments and communities have installed their own receivers in order to obtain these messages, so that about 120 law-enforcement agencies are hooked up together.

The mobile equipment includes eighty-three radio-equipped cars operated by the state police and eighty-one others owned by cities and towns but equipped to receive messages from East Lansing. In addition to these 164 cars, several cities maintain their own local police radio stations and these can re-broadcast East Lansing messages to about 150 more city-police squad cars tuned to local frequencies. Thus, assuming all cars are operating simultaneously, and all fixed stations are tuned in, a general alarm over the police radio system reaches more than 300 cruising squads and about 120 sheriffs, chiefs

of police, town marshals and other peace officers. But this is not all. Michigan citizens are vitally interested in their police radio and scores of crossroads garages and hundreds of citizens have sets tuned to the police transmitter so that actually an entire state is likely to know when a man-hunt is on. In fact, the troopers often rely on information furnished by these citizen-listeners in running down offenders.

How is it possible for less than 150 men to maintain law and order in a state the size of Michigan, even with the aid of radio communication? In the first place, they leave the larger cities to the local police and concentrate in the wide-open spaces and small towns with little or no police protection. In the second place, the radio releases every man for active duty. In the old days, about one-third of a police force was held in reserve for emergencies. Today every trooper is on patrol and often is in a better position to respond to an alarm than if he were at headquarters. If



Above, Bullets Photographed for Comparison; Right, Finishing Death Mask; Below, Car Equipped to Lay Smoke Screen

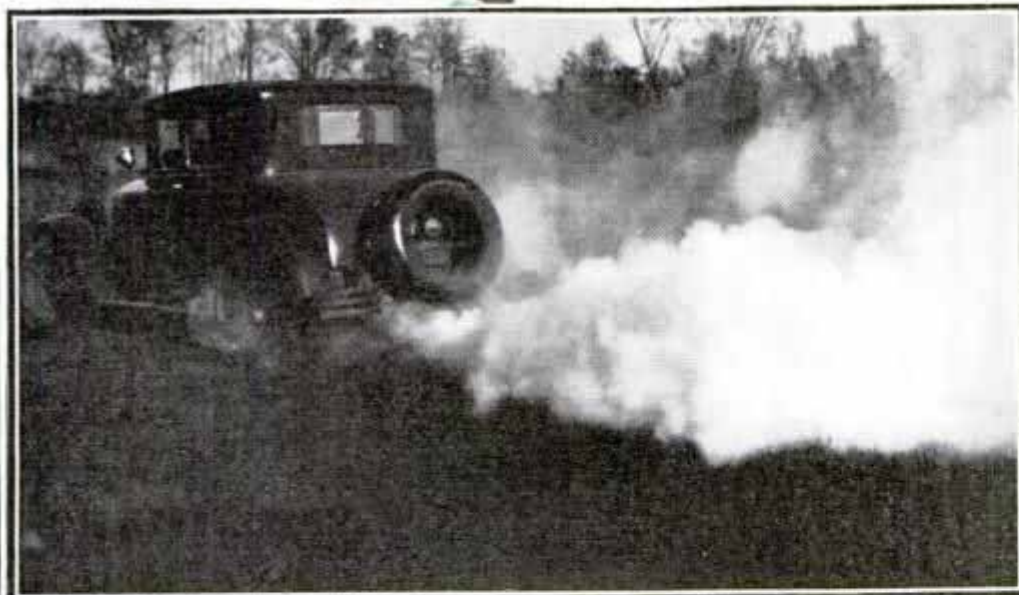
tails of a bank robbery, for instance, may be in the hands of every officer in the state within a few minutes after the crime, and precious minutes in the chase are saved. If a crime occurs in one of the several cities with local police radio facilities, the information is picked up at East Lansing and relayed throughout the state to

every receiver on that frequency. If the scene is a community that is isolated, the sheriff has only to telephone the state police station to have the news transmitted.

What has been the result of this statewide use of the radio to overtake lawbreakers before they have hardly left the scene of their crimes? In the first place, Michigan has virtually put a stop to bank robberies.

Only seven were recorded the first nine months of 1933, and five had been cleared up. Most bank robberies have occurred in counties bordering other states, the bandits being unwilling to try to run the police radio gauntlet in the interior of the state. Also, the hijacking of trucks carrying valuable merchandise, something rather common in

(Continued to page 116A)



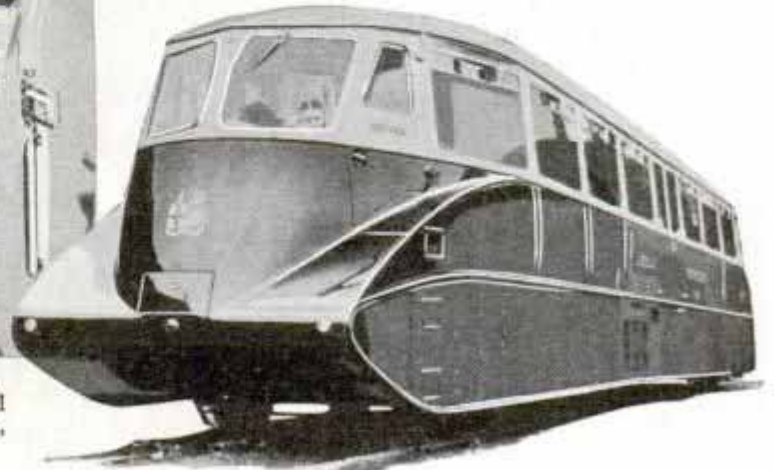
he is wanted at the station, the operator has only to speak into a transmitter to get him there.

The state radio system is used primarily to disseminate information rather than to dispatch squad cars, as is usually the case with a city-police radio system. It serves as a clearing house for the police activities of the state. In this manner, the de-

Streamlined Rail Car Is Like Plane Pontoon



Great Britain's first streamlined railroad car has been completed and is being used in suburban service. It looks like a huge seaplane pontoon and is driven by a 130-horsepower heavy-oil engine. It seats sixty-nine persons and has a maximum speed of sixty miles per hour.

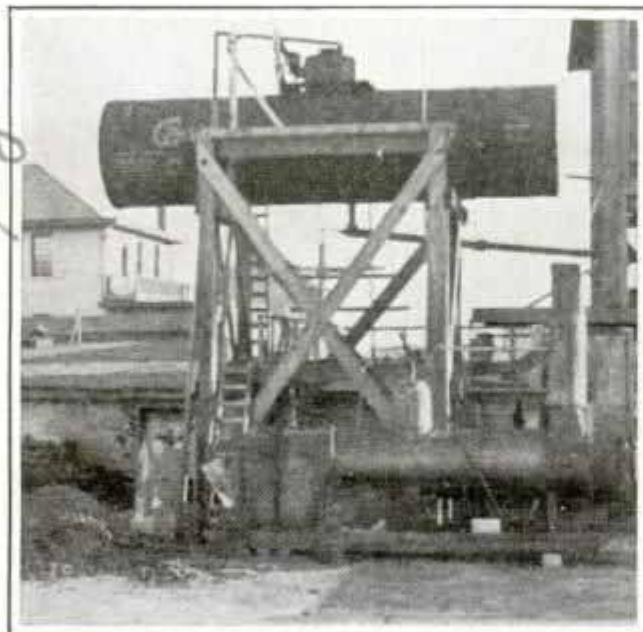


View of Great Britain's First Streamlined Rail Car with Lines Like an Airplane Pontoon and, Above, Driver Seated at the Controls

TANK CAR ON STILTS EMPTIED WITHOUT USE OF PUMP

In the yard of a New Jersey contractor is a railroad tank car standing on stilts twenty-five feet above the ground. The car, minus its running equipment, was obtained from a junk dealer after a railroad wreck and the tank is used by its present owner as a reservoir for asphaltic road-building compounds, being elevated so no

pumps are needed to force the material into a mixing chamber. To keep the compound in a fluid state in cold weather, coils of pipe inside the tank are supplied with steam from a boiler below.



Rail Tank Car on Stilts, Permitting Road-Building Compound to Move by Gravity to Mixing Chamber

SEA CONTAINS ENOUGH WEALTH TO MAKE EVERYBODY RICH

There is enough gold in the sea to give every man, woman and child in the world about \$14,000 worth, with gold at twenty dollars an ounce, if it were all removed and distributed equally. Such is the conclusion which might be drawn from the most recent estimates of the composition of sea water contained in the 1933 physical tables of the Smithsonian Institution. Each kilogram of sea water contains about forty-five millionths of one milligram of gold. The total ocean surface area is estimated at 365,500,000 square kilometers and the average depth at three kilometers. The seas therefore contain about one billion cubic kilometers of water with an estimated weight of one sextillion kilograms—a number represented by the figure one, followed by twenty-one ciphers. This would mean about 1,500,000,000,000 ounces of gold or 700 ounces for each human being. Recently, with gold prices up, the 700

C1709

England

Acme

C1726

C1792

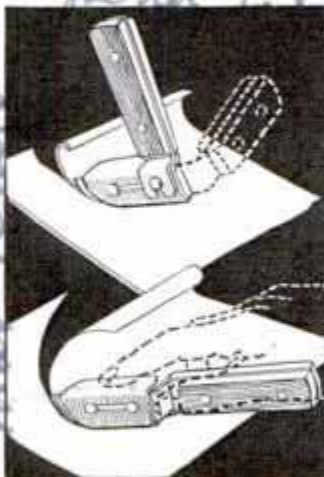
Emb W. G. Stewart, Box 630, Swanton, N.J.

Washington, D.C.

ounces would bring much more than twenty dollars each—if you could get the gold. The trouble is that no bank ever protected its treasure more securely than Father Neptune watches over his gold. If you could recover the gold from the ocean, there is no reason why you might not also extract your share of silver. It is estimated the oceans contain silver 1,000 times greater than the amount of gold. Also there are vast stores of iron, manganese, phosphorus, iodine, copper, barium, arsenic and zinc—all present in sea water in minute amounts along with such vastly more abundant elements as chlorine, sodium, magnesium, calcium and potassium. It has been found that the cost of extracting the precious elements from sea water is vastly out of proportion to the returns. While it has been assumed that the amounts of the various elements found in the surface water also would be found throughout the sea, this is by no means certain, as there is some reason to believe the amount decreases with depth.

**SAFETY-RAZOR BLADE HOLDER
MAKES PAPER KNIFE**

Ten or more different positions are possible with a cutting tool which consists of a holder for safety-razor blades, the blade forming the edge for cutting paper, leather, carpet, cloth and similar materials. The handles can be reversed for left-handed persons and any depth of cut can be made by changing the length of the blade. Any type of wafer blade can be used and the cutting edge is guarded so there is no danger of cutting a guide or nicking a T-square. The handles are so designed that the muscles of arm and forearm are brought into play, thus preventing cramps in the hand.



■ A British authority estimates that 29,000,000 tons of steel costing \$1,400,000,000 are destroyed by rust each year.



Sheep Trained by a Boy in Brazil to Double as a Pony When Its Master Decides to Go Places

**TAME SHEEP SERVES AS PONY
FOR ITS BOY OWNER**

Almost every boy has ridden a pony, but a lad in Brazil boasts of a tame sheep as a steed. He trained the animal to "steer" by knee pressure on its ribs and the sheep appears to enjoy its role as a beast of burden as much as its master, following the boy about when it is not serving as a means of transportation.

**AMERICA HAS OVER ONE THIRD
OF LISTED RADIO STATIONS**

There are 1,426 radio broadcasting stations of record operating throughout the world and 585 of them are located in the United States. Russia ranks second to this country with seventy-three, while Canada has sixty-three. Twenty foreign countries listed have only one station each. Several very high-powered stations are being operated in foreign countries. One at Villa Acuna, Coahuila, Mexico, is authorized to use 500,000 watts.

*Serve brands sugar mill
State of Alagoas, Brazil
C 1683
pend \$1.50
C 1796
Not real equipment etc.*

Just Knives

W. Cantor, Surgical Dept. of Commerce

SMALL METAL SAFE FOR HOME PROTECTS VALUABLES



Small Safe Shown in Open Position; Note Abundant Space for Valuables and Documents

Made of metal to provide protection against fire, as well as theft, small metal safes are available for the home. There are several models, two of which are electrically lighted. When the door is opened, the interior is illuminated automatically. Ample room is provided for legal-size papers, small boxes and jewels. A shelf conveniently separates the contents. A special combination lock permits easy operation in the dark. The owner sets his own combination.

JET NOZZLE CONVERTS AIR LINE INTO HANDY BLOWER

Any compressed air line may be adapted to blowing dust and dirt out of corners of the automobile and its engine by attachment of a simple nozzle that fits the hand. The device is a metal tube with a pointed outlet and a blunt end which fits in the end of the air hose. Circular finger grips make it easy to hold. In use, the nozzle is held in the right hand with the blunt end inserted in the air chuck. The palm of the hand presses on the chuck, opening the valve and releasing



a powerful jet of air. The nozzle is useful for blowing dust from under rugs, drying out wet distributor heads, cleaning clogged gas lines and the like.

FAULTY PARTS OF AIRPLANES DESTROYED FOR SAFETY

Defective parts of airplanes are pounded to pieces in order that they may never be used again. One engine inspector of the Transcontinental and Western Air lines has destroyed more than \$4,000,000 worth of faulty parts since 1918. If such parts were not broken up, they might find their way to the junk yard and might be used as replacements in a plane, thus endangering the lives of pilots and passengers.

THREE-POINT MASONRY DRILL EASY TO RESHARPEN

More durable and easier to sharpen than the ordinary drill, a new three-point masonry drill is said to reduce costs considerably. The drill may be re-sharpened on any grinding wheel right on the job. Clean, accurate holes may be drilled until the device wears right down to the shank. Breakage is reduced to a minimum, due to the rugged construction of the cutting lips. The drill, which is heat-treated, is produced in several different types for both hand and power drilling.



LIGHTNING WORKS FOR FARMER BY PRODUCING NITROGEN

Despite its reputation as a destroyer, lightning actually works for the farmer. K. B. McEachron, lightning research engineer of the General Electric company, estimates that natural lightning produces, free of charge, about 100,000,000 tons of fixed nitrogen yearly over the earth's surface. The bolt of lightning comes through the air, which is composed of about four-fifths nitrogen and one-fifth oxygen, breaks down the air's chemical constitu-

Safe Lock Co. Canton Ohio

10.00 16.00 22.00

C1748

Kansas City

Paul Lester

C1733 C1733

Paul Drill

C1749
Universal Specialty Co.

C1793

Paul Lester

Universal Specialty Co.

Schneider

ency and deposits fixed nitrogen on the soil, and the farmer does not pay a cent for the service. But if you are scared of lightning, there is only one perfectly safe place around the ordinary dwelling, this engineer says. Go down in the basement and crawl in the furnace. You then are in a solid iron room perfectly grounded—a very safe place to be. But if you don't want to get in the furnace, you are fairly safe if you stay away from overhead wires, the radio, the telephone, large metal objects and also stay out of the bathtub. The belief that it is not wise to stand in an open door or near an open window during a lightning storm has some basis of truth in it, for lightning can be blown from its path and moved by the wind, and there is a chance that the wind might blow the flash your way. Despite the disrepute into which the lightning rod has been plunged by unscrupulous salesmen, Mr. McEachron says that a good rod, properly installed, will protect a structure ninety-nine times out of a hundred.

Victor & Pearlman Corp. 208 Michigan Ave. Chicago

LAMP WHICH FASTENS TO BOOK MAKES READING LIGHT

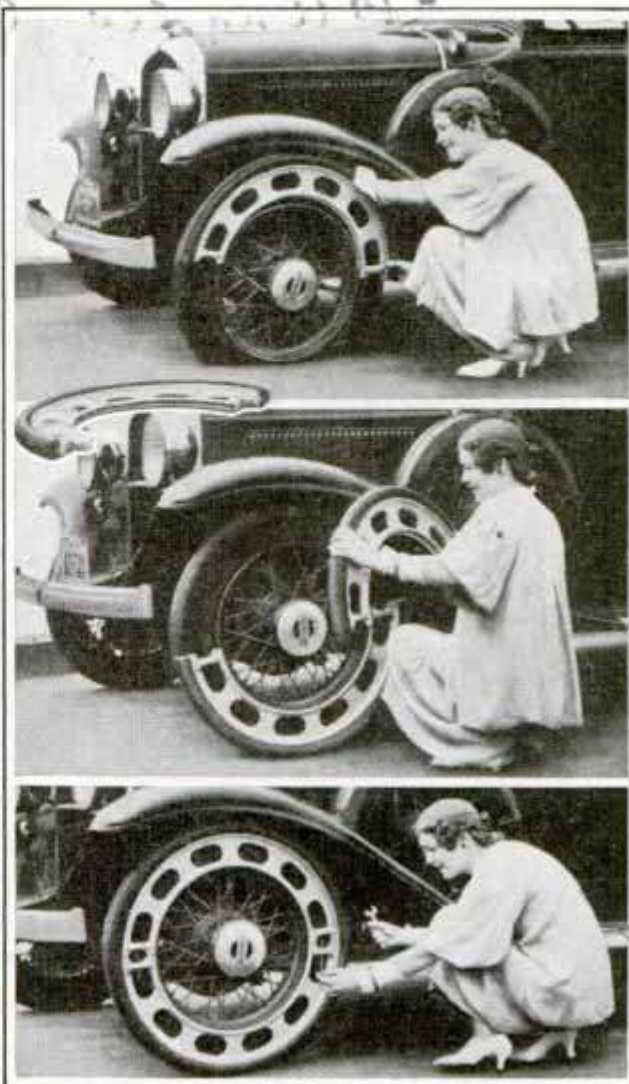
C1737

Attached to any book cover in an instant, a midget lamp only four inches high provides a good light for reading without the trouble of moving or rearranging floor lamps or other light fixtures. It is equipped with a small shade, can be tilted at any angle and comes in a variety of colors.



Electric Reading Lamp Only Four Inches Tall Which Can Be Attached to the Book Cover

Victor & Pearlman Corp.



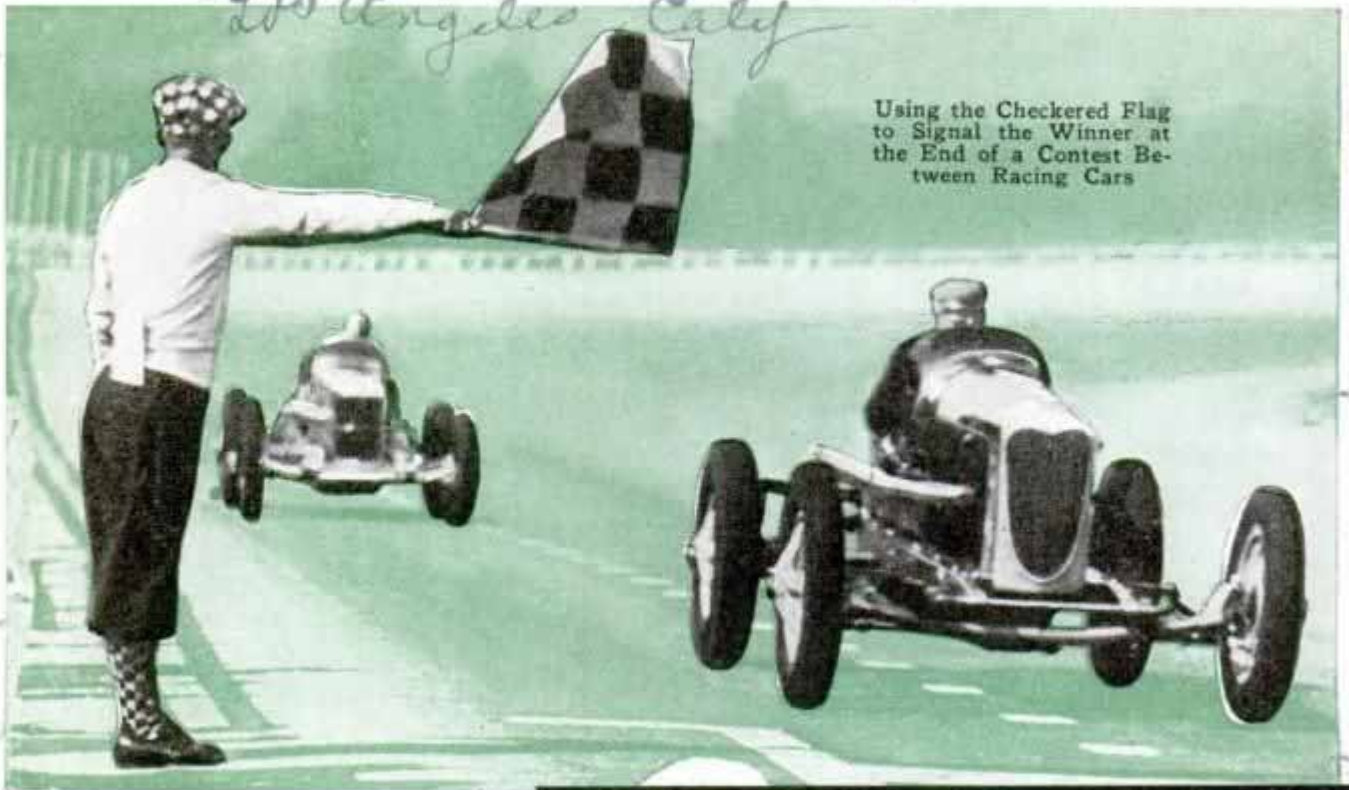
Emergency Wheel for Auto Which Fits over Regular Wheel and Can Be Attached Quickly

EMERGENCY WHEEL FOR AUTO TAKES PLACE OF TIRE

Attached in a minute without using a jack, a rubber and aluminum emergency wheel for the auto has been introduced for use as a spare when it is inconvenient to repair a flat tire on the road or to change tires. It is not even necessary, in attaching it, to remove the flat from the rim. Each section is made of an aluminum alloy casting fitted with a groove which slips into the flange of the rim in which the regular tire rests. The outer edge of each section has a solid rubber tire vulcanized to it. To attach the wheel, one section is fitted into the groove at the top side of the wheel, then the car is driven forward until the wheel rises onto this section. The second section is then applied in the same way and the two are bolted together with special bolts and a special wrench. The car can then be driven on the emergency wheel.

Escherbach Hecht Tire Wheel Corp. 1101 Clark Point Ave. Brownsville, Texas

Cont. Thomas E. Stinson, Jr.
430 S San Pedro St
Los Angeles Calif



Using the Checkered Flag to Signal the Winner at the End of a Contest Between Racing Cars

RACING on

IF, a few years ago, you had asked one of America's speed kings to drive a 500-mile race on fifty gallons of gasoline, he would have laughed at you. Fifty gallons, he would have explained, was enough for only half that distance. Six miles a gallon was good mileage for a thirsty racing engine.

But if you should ask him again, this year, he would merely shrug his shoulders and offer to bet on the amount of fuel he would have left. Drivers are stingy with their gasoline this year. Economy is the order of the day and more miles per gallon instead of more miles per hour is the slogan of the racing world.

Not only are racing cars covering more miles at top speed on a tankful of gasoline than they formerly did, but orders are out that they must be still more economical in the future. At the Indianapolis race of 1934 only a limited amount of fuel will be allowed each car and the heavy-footed driver who burns his gasoline too fast will be left on the track with a dry tank before the race is finished.

The reason for this, says T. E. Myers, general manager of the speedway, is to create new developments that may be passed on to factory engineers for use in stock cars, thus maintaining the track in

its status as laboratory for the automotive industry. High speed and endurance, two problems which have been solved on the track and passed on to the industry, are old stories now. Economy is the latest goal for which drivers are striving.

As a matter of fact, the conservation campaign has started already. Race cars that normally consume many times the quantities of lubricating oil used by pleasure cars were limited to six and a half gallons each at the last Indianapolis race. Some drivers believed that it would be impossible to keep their high-speed creations moving on such small amounts, but they worked over their oil systems so well that only three cars ran dry. The car that placed second finished with barely a pint remaining in the reservoir, so closely had oil consumption been gauged.

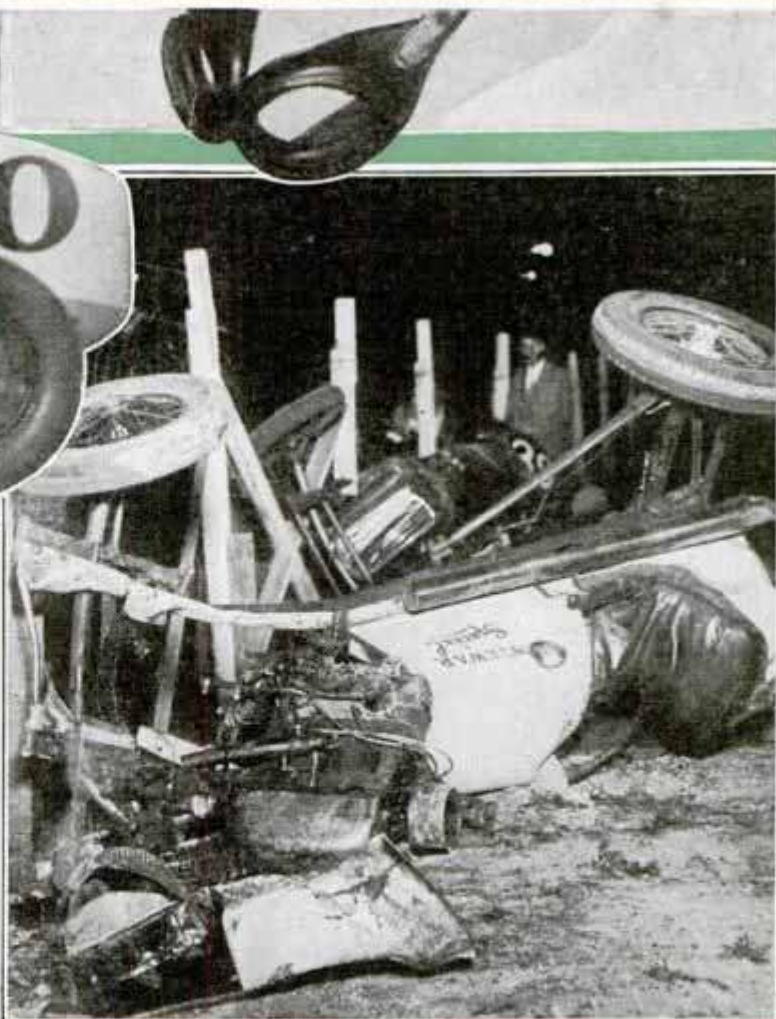


Will limiting the amount of gasoline slow the cars down? Not necessarily, say the drivers, in spite of the fact that engines are more greedy for gasoline at high speeds. They are confident that they can make their motors more economical without reducing speed and pick-up. The truth is that racing cars already have more speed than they need, for they have outgrown the present speedways. The tracks used today were built for the race cars of several years ago.

Race-car speeds have advanced more rapidly in the last few years than track records indicate. Three years ago at Indianapolis the pole position



SHORT RATIONS



Above, the Driver Stayed with This Car When a Broken Oil Line on an Exhaust Stack Looked Like a Fire; Top, New Type of Crash Helmet; Right, "Ticking" Wheels Caused This

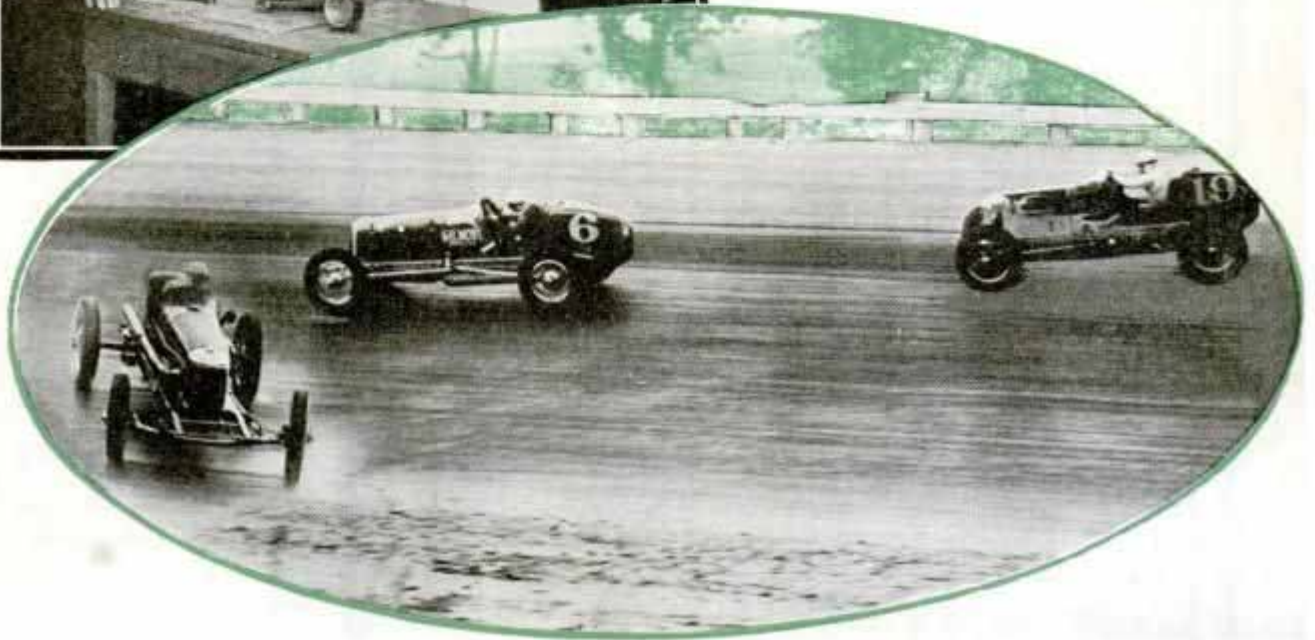
went to Billy Arnold who qualified at 113.25 miles per hour. In the last race a dozen cars qualified in excess of Arnold's mark, one of them averaging 118 miles per hour. All of them could beat that speed by twenty-five miles on a straight course. Nevertheless, the record for the 500-mile grind remains just above the

C1356



gallon in the last Indianapolis race and some of the cars in the same contest did twelve miles per gallon.

The "get in front and stay in front" driver who likes to lead the field from the start will have to change his pace in the future, according to one owner. Driving brains are to be at a higher premium than ever and the smart driver who learns his exact fuel consumption ahead of



Top, Experts and Drivers Examining Race-Car Crankshaft for Flaws by Means of X-Ray Tests; Below, Car at Left Is in Skid, Result of Opening Throttle Too Wide after a Turn

100-mile-an-hour mark. Louis Meyer, winner of the 1933 race, averaged 104.16 miles an hour, barely beating the previous record. Speed alone does not always win.

"With good luck a driver should be able to average close to 112 miles an hour in the Indianapolis race," Meyer says. "At that speed he is making 125 miles or more on the stretches and taking it easy on the turns. But if he tries to average a mile or so faster he is fighting the wheel and is working hard for every extra bit of speed. Weather, the conditions of the track, and accidents during a race are the things that really set the pace."

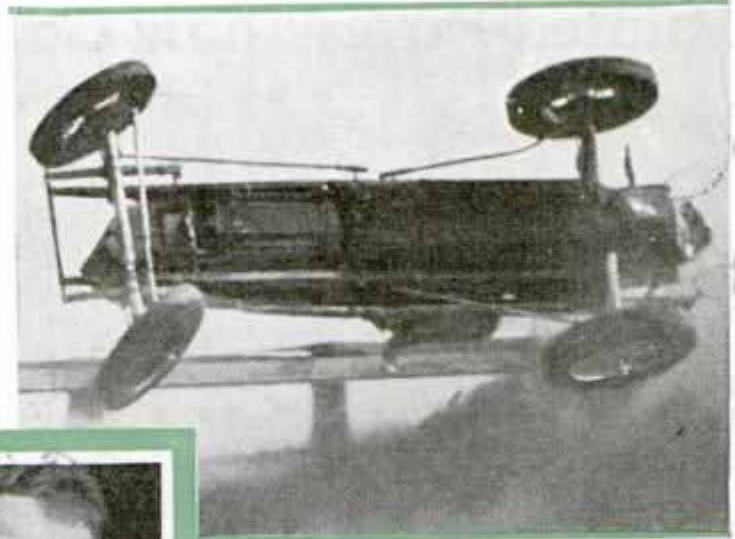
Strangely enough, better gasoline mileage is being attained hand in hand with higher top speeds. Racing cars, faster than ever today, go nearly twice as far on a gallon of gasoline as they did six or seven years ago. The reason is that the smaller, faster engines are more economical than their heavier, more cumbersome predecessors. Meyer averaged nearly ten miles a

time and plans his race accordingly will stand the best chance of winning. Mechanics grooming the cars for the coming season are experimenting to make them economical. Compression ratios of thirteen to one and fourteen to one, considered impractical only two years ago, are accepted as a matter of course. Meyer has increased the compression on his eight-cylinder special so much that the tops of the pistons barely miss the roofs of the combustion chambers and a burned-out connecting rod at high speed would put him out of the race with a wrecked engine.

Some mechanics are trying different combinations of valve settings and timing and others are trying once more the updraft carburetors that were discarded some time ago. Downdraft carburetors distribute the fuel more evenly, but the updraft type are considered more efficient. Instead of one carburetor for every pair of cylinders, one large one may prove to be the best. Four cylinder engines, more

lenient on gasoline than the eight, may also become more popular.

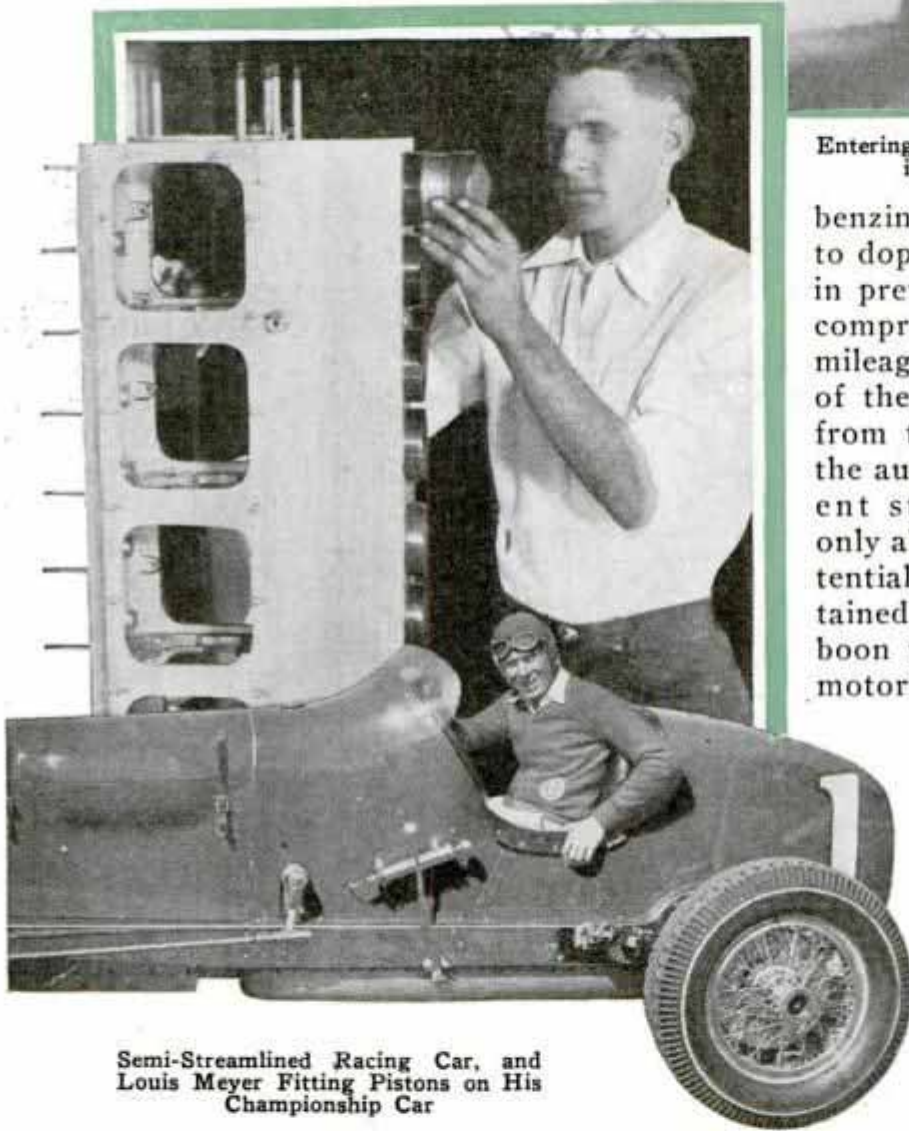
So far, free wheeling has yet to find a place on the track in spite of the economy it gives. Drivers like to control their speeds with the braking action of the engine. For the same reason, completely streamlined cars may not be adopted for the closed tracks until a new type of positive braking system is developed. A



Entering a Turn at High Speed and Cramping Wheels Caused This Spill

benzine, and tetraethyl lead, used to dope racing fuels, are effective in preventing detonation at high compression, but do not increase mileage beyond the normal ability of the engine to extract power from the gasoline. Inasmuch as the automobile engine in its present stage of development uses only about five per cent of the potential amount of power contained in gasoline, it would be a boon to the speed world and to motorists at large if a fuel were developed from which more of the energy could be extracted. In the last Indianapolis race all places from the fifth to fourteenth were won by revamped passenger-car engines. Hardly any changes were made aside from increasing the compression ratios and using special camshafts.

More and more the gap between racing engines and stock engines is vanishing. The preponderance of overhead camshaft engines on the track against the use of L-head engines for stock cars is the biggest difference today. Still, several makes of pleasure cars have adopted the more efficient overhead camshafts, and L-head engines are being used to power some race cars. Auxiliary apparatus like spark plugs, coils, and tires, are so satisfactory that race cars and stock cars alike use the same types and models.



Semi-Streamlined Racing Car, and Louis Meyer Fitting Pistons on His Championship Car

thoroughly streamlined car seems to coast as if it were free wheeling and drivers are forced to shut off a third of the way back in the stretch in order to enter a turn at a safe speed. A streamlined body combined with a type of brake that operates smoothly and easily, drivers agree, would be an ideal combination.

One thing that the racing fraternity now needs, in the opinion of Harry Hartz, is a new long-mileage fuel that can be used in the high compression engines. Alcohol,

Painted Boxes Show Coolest Color for Liner

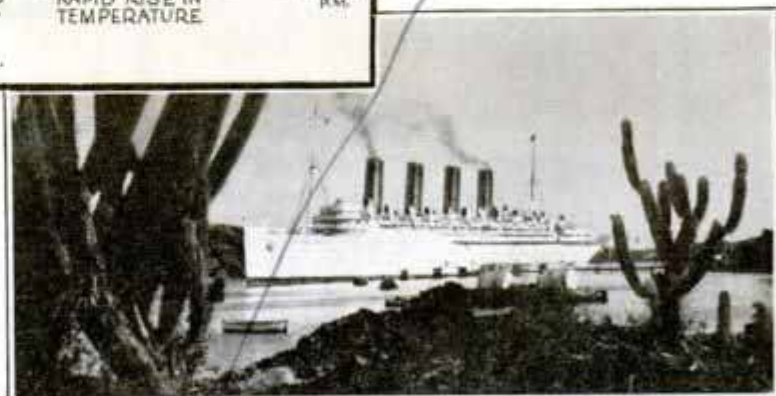
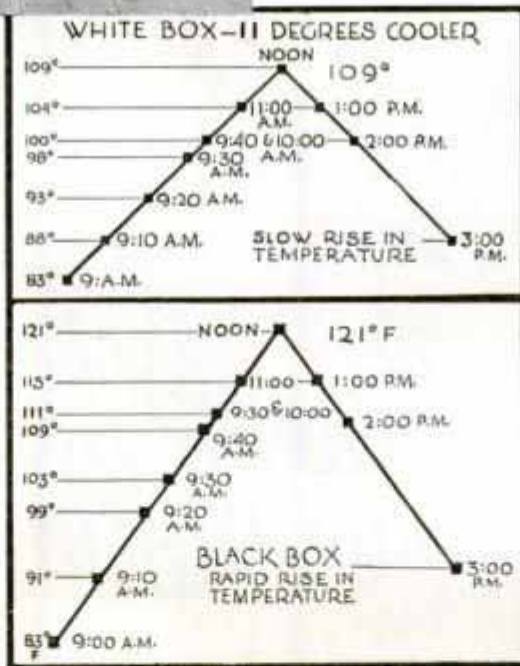


box registered as much as eleven degrees of heat more than that in the white box, due to the fact that black absorbed more of the sun's rays. As a result of the test, painters set to work changing the color of the 64,000 square feet of surface above the water line. So enthusiastic were passengers that another liner which will go on a tour of the world, principally through tropic waters, is also being painted white.

MIRRORS IN CAT'S EYES CAUSE THEM TO SHINE AT NIGHT

Everyone has seen a cat's eyes glisten like little mirrors when a light is flashed in them at night, but few know that the gleam actually is caused by a mirrorlike substance in the eyes, or that this substance accounts for the fact that the animal sees better at night than does man. In all of the cat family, in some other animals and in fish, a light-reflecting substance lines the interior of the eye just back of the retina, the network of tiny nerves which receives the picture of objects and transmits the images to the brain. The little light at night which makes things visible at all enters the cat's eye, passes through the retina where the visual impression is registered and is reflected back again to its source by the mirrorlike mem-

When the "Mauretania" was placed in service between New York and the Caribbean, the steamship company decided to give the liner a new coat of paint. Someone suggested that painting the vessel white would give travelers a suggestion of coolness and comfort, but it remained for an experimenter on the boat to prove conclusively that white not only suggested coolness, but actually made the vessel cooler than a coat of black paint. Two cardboard boxes, one black and the other white, were used for the experiments. Thermometers were suspended inside them, the lids closed and they were placed on the sun deck, where each received the full effect of the sun's heat. Careful records were kept and it was found that the thermometer in the black



Temperature Tests with the Black and White Boxes, Above, Indicated That White Was the Cooler Color for Ocean Liner; Charts Tell the Story and Below Is the White Liner

Better Vision Institute

Cunard Steamship Co
250 Broadway N.Y.C.

190
c1695

c1781



Single-Runner Sled Made from Piece of a Broken Ski and a Block of Wood for a Seat

SINGLE-RUNNER SLED IS MADE FROM A BROKEN SKI

When a ski is broken, its usefulness is not ended, for the curved end can still be used to make a single-runner snow sled. A block of leather-covered wood serves as a seat and is supported on the sides by two pieces of iron. It is a tricky steed, however, for the rider must balance it as it speeds down hill.

NO SHORTAGE OF LUMBER SEEN FOR MANY YEARS TO COME

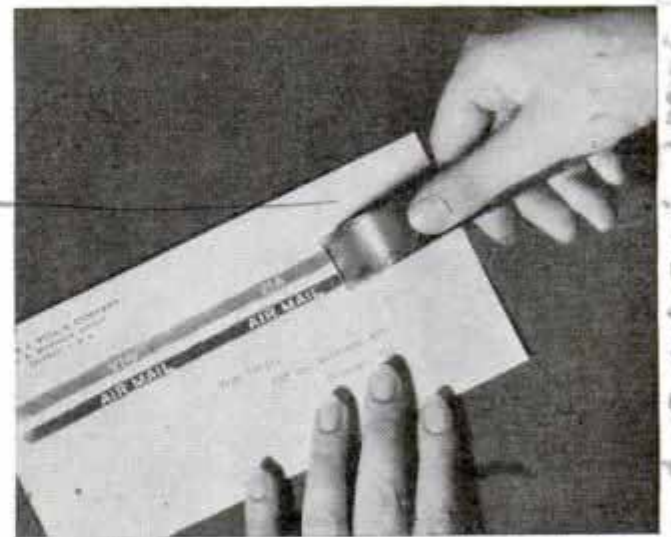
Even under present conditions of rather haphazard forest conservation, there is no danger of a world timber shortage for a long time to come. This is the view of the National Lumber Manufacturers' Association which says the problem today is to find more uses for the over-supply of lumber, rather than to decrease the consumption. In the United States, this organization estimates, there are about 500,000,000 acres of land which probably never will produce anything of economic value except timber, but at present there is no incentive to grow trees. Even without much conservative management of forests, natural regeneration is already accountable for about one-third of all the lumber produced in this country, and the growing stock of American forests insures an ample supply of lumber at present rates

of consumption after the present stand of mature timber has been cut, which may be anywhere from thirty to seventy-five years, the association estimates. In the past few years, it has been estimated that the annual growth of timber in this country has about equaled the consumption, but owing to the increased area productive of new forests after the mature trees have been removed, the normal ratio of regrowth to consumption is gaining steadily. It is not until the demand for timber becomes great enough to consume the natural growth that the managed growing of trees is likely to prove profitable, lumbermen believe.

C1729

HAND-OPERATED PRINTER MARKS LETTERS TO BE SENT BY AIR MAIL

Printing the words, "Via Air Mail," in colors across the face of an envelope, a simple and inexpensive hand tool for office or home correspondence work quickly marks all mail to be sent by airplane. It has two rollers encased in a metal frame which is extended to form a handle. A double ink reservoir is contained in the handle, one part holding blue and the other red ink. The roller to which the blue ink feeds has the word "Via" cut into it, the other roller containing the second and third words. Starting at the left side of an envelope, the printer is drawn quickly across it. The letters appear in white and



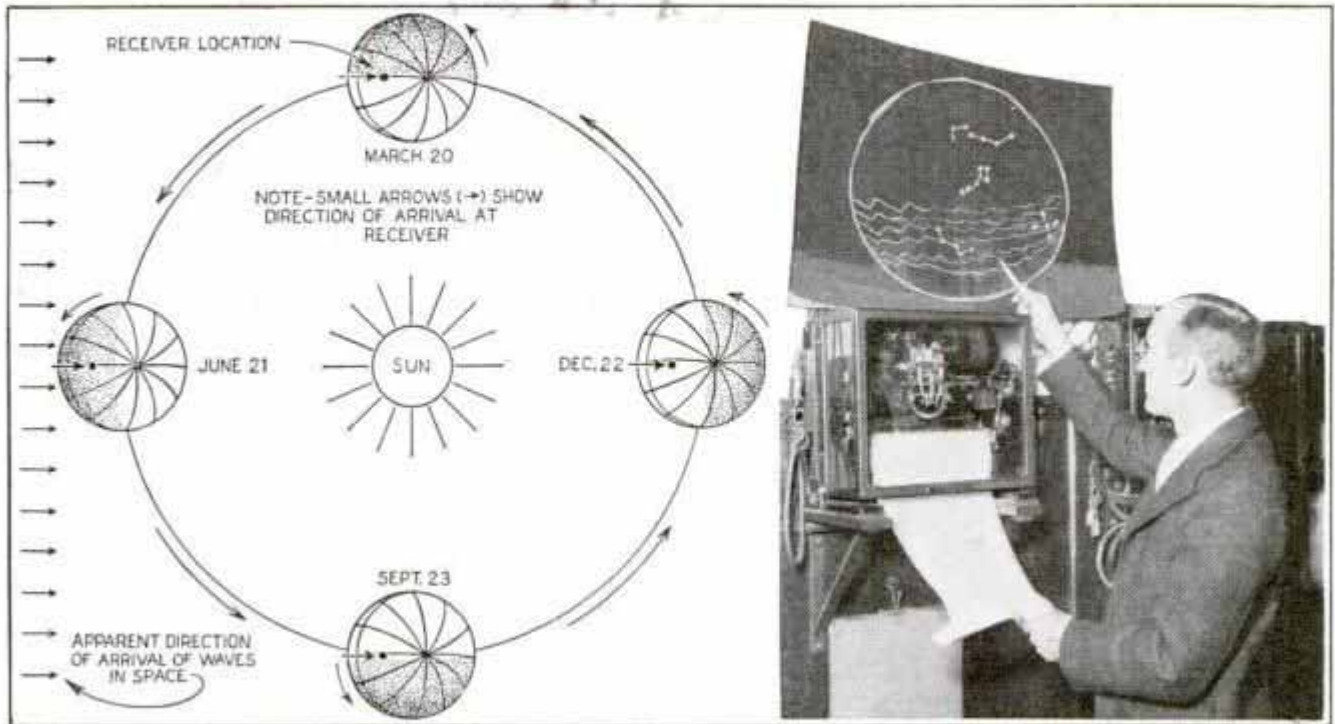
Hand-Operated Printer Which Stamps "Via Air Mail" in Two Colors across Face of Envelopes

the tool eliminates the use of stickers to designate air-mail letters.

Washington, D.C. Cont. Editor of Popular Mechanics
 108 E. 42nd St. New York City
 C1729

Via Air Mail
 7-3-7
 N. Macchegnan

Mystery Radio Waves May Come from Stars



Left, Diagram Showing Apparent Direction from Which Mystery Waves Are Received; Right, Apparatus for Recording the Waves as They Are Picked Up by Sensitive Equipment in Experimental Laboratory

Mysterious radio waves which seem to come from the direction of the center of the Milky Way are being received on a delicate set constructed by Karl G. Jansky, of the Bell Telephone laboratories, for the purpose of studying these electromagnetic impulses from outer space. These star waves, with a length of 14.6 meters, are of extremely low intensity and appear to stream endlessly across space from a distance of some 40,000 light-years from the earth. When a sensitive, directional antenna is turned toward the Milky Way, the incoming waves show their presence in a faint hiss. This sound increases if the antenna is pointed in line with the center of our universe. Unlike most forms of radio disturbances, these waves do not seem to be due to any form of terrestrial phenomena and, while their source is unknown, it has been suggested that they may originate in the energies of some of the youngest stars, or that the direction of the waves has something to do with the fifteen-mile-a-second motion of the entire solar system. A third possibility is that the hiss is a secondary radio wave set up in the earth's at-

mosphere when star radiations strike the ionized layer of air which envelops the earth at an altitude of 100 miles or more.

463 West St. New York
C1866

WRINGER SHELLS GREEN PEAS TO SPEED UP CANNING

Adaptation of the clothes wringer to the shelling of green peas has speeded up work in a northwestern community cannery. While one man turns the crank, another places the sharp end of the pod between the rubber rolls, feeding it through lengthwise. The peas pop out of the pod easily. To facilitate the process, the pods are put in boiling water for five minutes.



Using Clothes Wringers to Shell Green Peas after Shells Have Been Dipped in Hot Water to Soften Them

Wm. Roy C. Suggs

Metropolitan Bldg. Vancouver, Wash

Planes Carry Fresh Fish to Canadian Cities

Canada



Top and Center, Catching Fish to Be Transported by Plane to Market or to New Homes; Bottom, One of the Aircraft Used in Carrying Fish to Large Cities

Canadian fish, alive and dead, are taking to the air these days. Airplanes are flying across Canada daily with loads of fish, some going to market, others to new homes. Inland lakes in Manitoba, Saskatchewan and Alberta are fished through holes in the ice in winter with the aid of nets. The catch is packed in boxes or sacks and planes call regularly to fly the fresh fish to the larger cities, replacing the long trains of horse-drawn sleds formerly used. In British Columbia and along the Pacific coast where salmon are the principal catch, aerial observers keep an eye on the fishermen to see that they observe fishing regulations, and also watch the schools of fish, aiding the fishery patrol boats in this task. In eastern Canada lakes are being restocked with fish brought from the hatcheries by airplane, the saving in time making the use of planes for such a purpose practical. Planes carrying fish to market often bring in fifteen-ton loads.

SPEED BREEDING OF NEW HOPS BY ARTIFICIAL COLD

By applying two new ideas, plant breeders in Oregon have speeded up their campaign against a serious hop disease. In the past, it has taken about five years to grow hops from seed to fruiting maturity.

State and Federal

Vertical handwritten notes on the left margin, including '1895' and other illegible characters.

James ... 688 Harbour ...

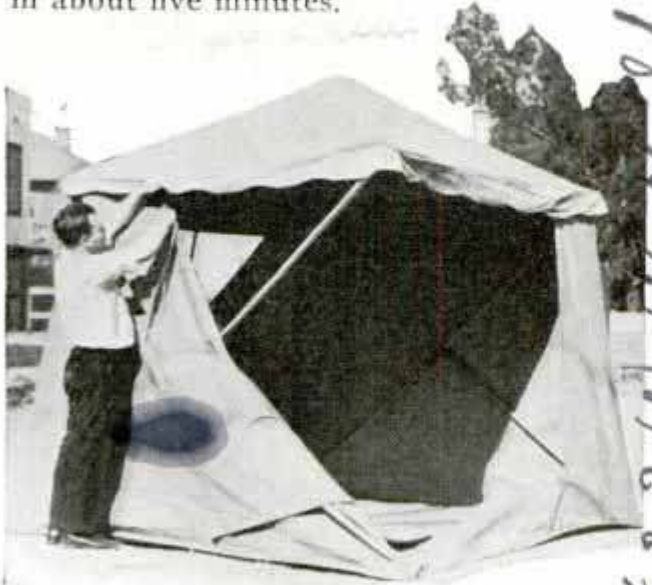
Press release 11/27/32

By the aid of some of the newer methods, it is possible to reduce this time to two years, and for certain tests to nine months. Downy mildew disease, which attacked hop vines in Washington and Oregon in 1930, is what the experts are fighting. First they crossed varieties of hops, using as one parent a variety resistant to the disease. These hybrid seeds produced in the fall would lie dormant and not germinate until spring. But the investigators packed the hybrids in sand and peat moss and subjected them to freezing temperatures, a sort of artificial winter, for a month or more. That treatment overcame the dormancy and the seeds sprouted in the greenhouse in the fall, a gain of six months. Then the breeders supplemented the short sunlight of winter days with artificial light, which caused the vines to develop crowns and roots, thus reducing growth periods another six months. By the following year, the hop vines were similar to vines produced from cuttings.

0847

FOLDING BRACES SUPPORT TENT WITHOUT POLES OR STAKES

Poles and stakes are unnecessary in erecting a tent supported entirely by folding side braces, leaving all the floor space clear. It can be set up without a roof for sun bathing, or without one side for use as a beach pavilion. The entire unit can be folded and carried on the running board of an automobile. It weighs forty-five pounds and one person can set it up in about five minutes.



Showing How Tent May Be Erected without Use of Pole or Stakes; Side Braces Are Used

Clw. Earl H. Morgan



Tower from Which Machine-Gun Crew Watches Streets of Shanghai to Prevent Uprisings

MACHINE GUNNERS IN TOWERS GUARD SHANGHAI STREETS

To prevent Chinese uprisings in Shanghai, the streets are guarded day and night by machine gunners stationed in bullet-proof towers overlooking the principal thoroughfares. These machine-gun "nests" were erected by the authorities to make it possible for a comparatively small force of men to guard the streets, the towers forming tiny fortresses in which the soldiers are safe from gunfire.

"DEAD MAN" CONTROL ON AUTO KEEPS DRIVER AWAKE

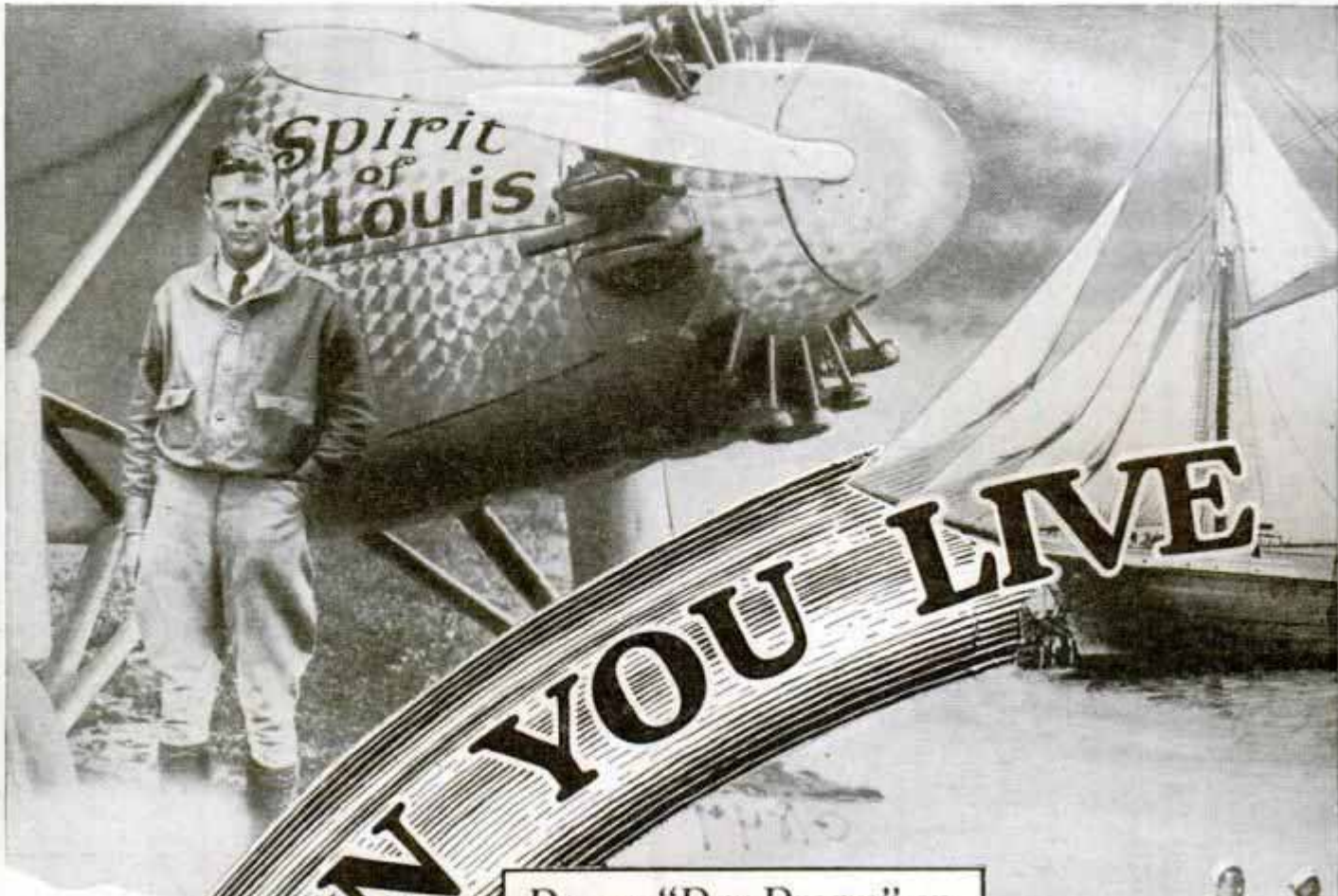
Adaptation of the "dead man's handle," used on railroads to stop trains if the driver collapses, to the automobile has been accomplished in England. A button was fitted to the steering wheel of one car entered in the 1,000-mile Royal Automobile Club rally. As long as pressure was maintained on the button, nothing happened. But any laxity of grip sets a shrill buzzer in action, calling the driver's attention to his duties.

Danger

Con. Harrison F. Morgan, Oakland, Calif. 3833 N. Oakland Ave.

International Section

622 W. 1st St.



CAN YOU LIVE

Do you "Day Dream" on the job? Perhaps you can "Live Your Dreams" in your hobbies and recreations—and cash in on them

By EMILE C. SCHNURMACHER

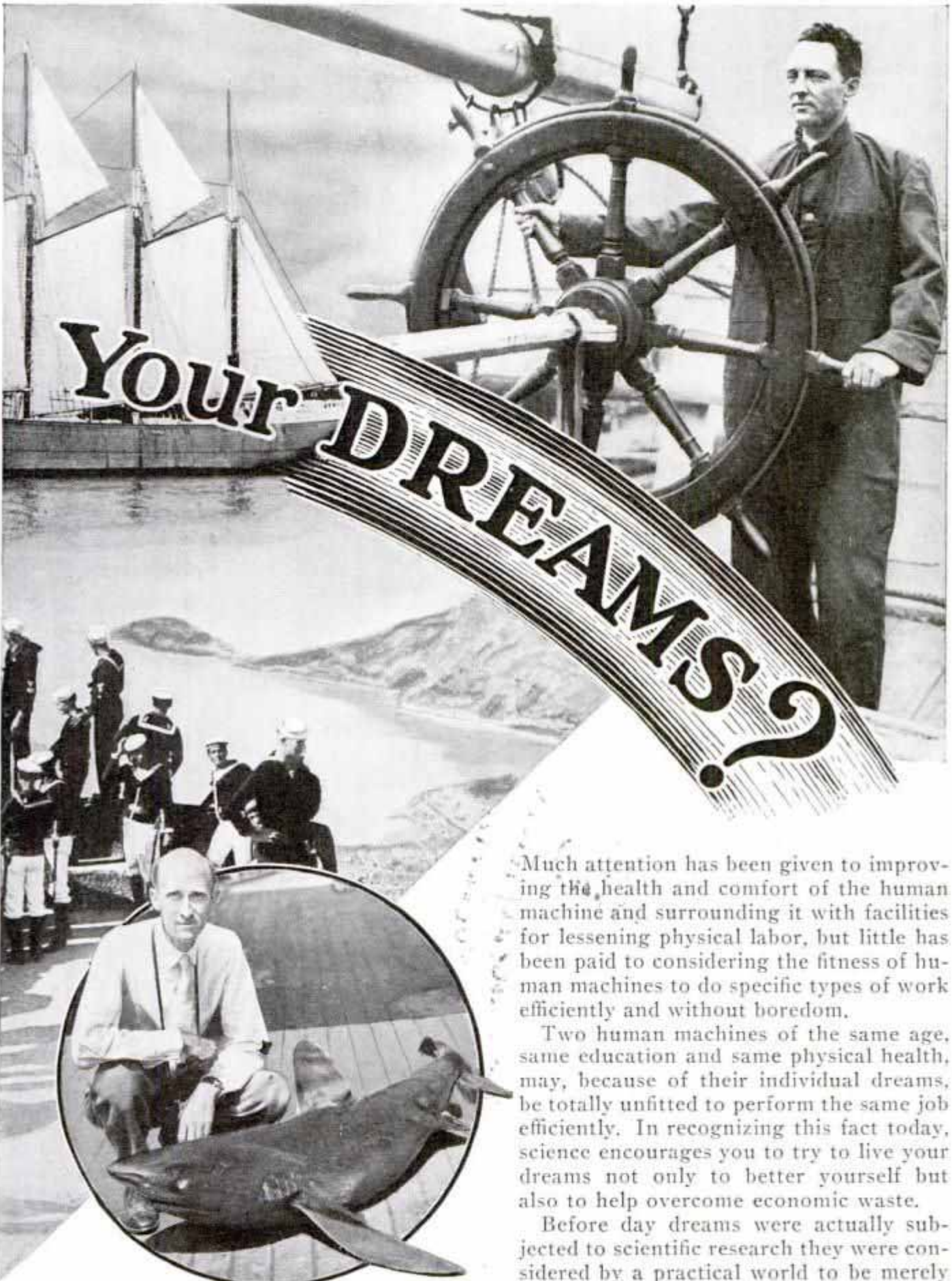
ARE you bored with your present job and do you day dream during working hours? Do you fear that by stepping out of that humdrum job, you will find it very difficult to get another? In this matter-of-fact, workaday world in which a man's position in relation to others is apt to be measured in terms of dollars and cents, would you dare to try to live those imaginative day dreams in which you picture yourself as an inventor, an explorer, a professional man or aviator?

Day-dreaming on the job is indicative of discontent and, according to Prof. Newman L. Hoopingarner, New York University psychologist, if you do something about those day dreams and try to realize them even partially you may really better yourself. If you do nothing about these

Top, Left, Colonel Lindbergh Realized His Dream; Right, the "Georgette," Carrying Phillips Lord to Places He Has Dreamed About; Below, Sailors in Rio de Janeiro

"autoistic" dreams, as science calls them, you are apt to continue in a boring job and delude yourself through life. During the past few years scientists and psychologists have been attaching increasing importance to "day dreams" created by your human machine.

C167 2-15



Your DREAMS?

Much attention has been given to improving the health and comfort of the human machine and surrounding it with facilities for lessening physical labor, but little has been paid to considering the fitness of human machines to do specific types of work efficiently and without boredom.

Two human machines of the same age, same education and same physical health, may, because of their individual dreams, be totally unfitted to perform the same job efficiently. In recognizing this fact today, science encourages you to try to live your dreams not only to better yourself but also to help overcome economic waste.

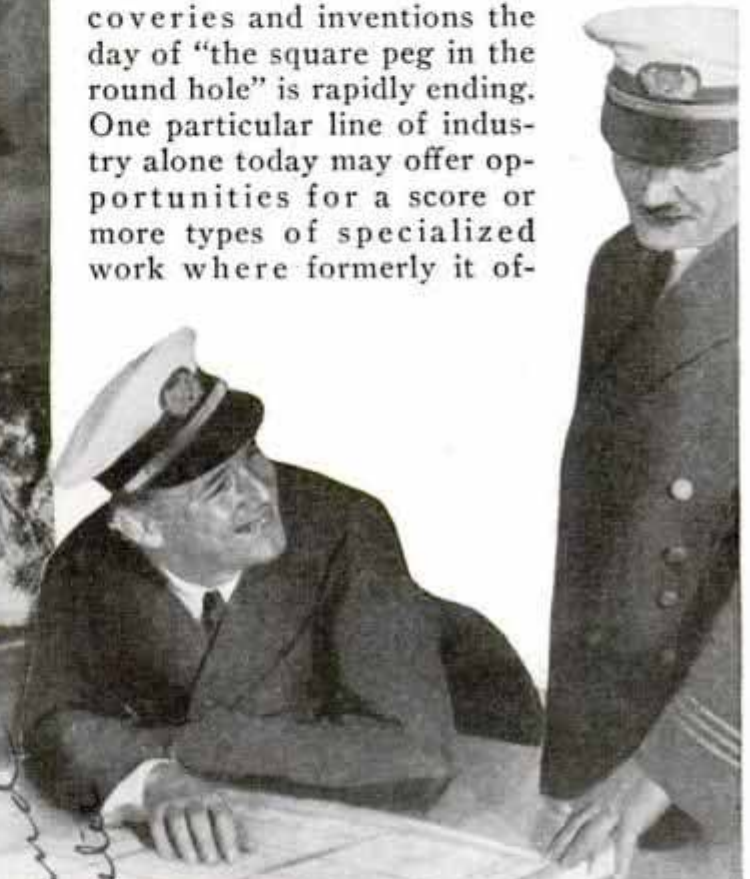
Before day dreams were actually subjected to scientific research they were considered by a practical world to be merely indicative of a desire to loaf or as an imaginative outlet for persons who had a strong sense of inferiority. Yet Lind-

Top, Commander Byrd Who Visited Both Poles; Below, William Beebe, Eminent Deep-Sea Naturalist Who Lived His Dream of Exploring the Ocean



Above, Merian C. Cooper Who Wrote and Helped Produce and Direct the Movie, "King Kong"; Right, Phillips Lord Planning His Trip around the World

Seth Parkes



difficult for him to try to live his dreams."

Only two out of every hundred people have definite objectives, according to Professor Hoopingartner. The other ninety-eight per cent may day dream and never realize that those day dreams may be partially or entirely achieved. As a message of encouragement for those who actually set out to live their dreams and are afraid of being regarded as drifters, he points out that with new scientific discoveries and inventions the day of "the square peg in the round hole" is rapidly ending. One particular line of industry alone today may offer opportunities for a score or more types of specialized work where formerly it of-

bergh's epochal flight across the Atlantic, Byrd's exploration of the South pole, Roy Chapman Andrews' explorations in the Gobi desert and thousands of other events which led to notable contributions to science and knowledge, were originally day dreams in the minds of those who conceived them. The earlier you start your day dreams the better are your chances of realizing them, according to Professor Hoopingartner, who has conducted extensive research in this field.

"The happy people are those who know quite early in life what they want to be and shape their careers toward that end" he states. "As a person approaches the age of forty, it becomes increasingly dif-

ferred one or two. Science has not yet developed machinery and measuring devices which scientifically and accurately translate your day dreams into rules by which you may determine your fitness to carry them out, but a step in this direction was made recently by two Englishmen who devised what they called a dotting test to gauge sustained attention.

This apparatus was a box about two feet square equipped with a phonograph motor. On top of the machine, which was electrically wired, was a rotating disk in which holes had been perforated. The individual taking the test touched the perforations in the disk while it was turning with an electrically wired pencil. Each

me long all and the Schuster

An Russian Camera

Below, James L. Clark, Naturalist, Riding a Yak While Seeking the Breeding Ground of the Ovis Poli; at Bottom, Sailors Enjoying Life in Egypt

*Asst. Director
American Museum
of Natural
History,
New York*



time the applicant touched a perforation a register jumped one number. A score of more than 240 was regarded as indicating an "obsessional" type of individual who functioned almost as an automaton while a score of less than 120 was regarded as a "neurotic" type unable to concentrate. Out of forty-three young men examined, eight were found to be either obsessional



motorless

*was with shooting apparatus
Meph. Paramount & Under*

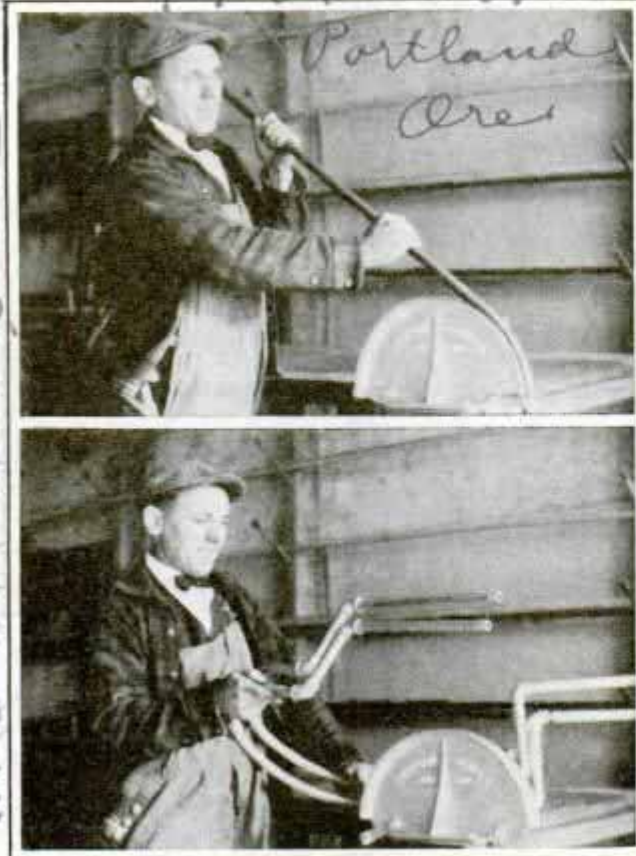
George Walters Who Invented a Camera That Shoots Four Times as Many Stills as Old Type—and Cashed in on His Hobby

or neurotic and the machine's results were found to check accurately with the personal interviews by examining psychologists. All of these eight cases would create economic waste in a factory job and would be far better off if given the opportunity to live their dreams.

But just how much opportunity is there today for anyone to live their dreams and until what age should they try to live them? There are three main possibilities open to you. You can either cut entirely away from the work which you are now doing if it is not to your liking, an action which depends in part upon your financial condition, your courage and your ability. You can temporarily continue in the job that is distasteful to you and in your leisure time study or qualify yourself for the work which you like to do, or you can continue to do the work you are doing, even if it is boring, and "live your dreams" in your hobbies and your recreation.

By far the greatest number of people are

(Continued to page 128A)



Two Views Showing How Half-Moon Form Aids the Workman in Bending Iron Pipe

BENDING IRON PIPE MADE EASY BY USING CURVED FORM

Bending iron pipe is made easy by employing a half moon of cast iron with a groove around the outer edge and a stirrup at each extremity of the curve. The attachment is bolted to the work bench and one end of the pipe is caught in one of the stirrups which is loosely hung on a bolt through the plate. By pulling down, a person of no great strength is able thus to bend one-half inch or three-quarter-inch pipe with comparative ease, and without crimping or marring it in any way.

EIGHTY TONS OF LEAD IN KEEL OF CUP RACE YACHT

Between eighty and ninety tons of lead have been molded with watchmaker's precision for the keel of England's challenger for the America's cup. Weeks of work preceded pouring of the metal. Skilled workmen constructed a flawless matrix which was lowered into the huge wooden box, strongly clamped with iron, packed with sand and then lifted to reveal the exact impress of the keel. The British yacht is being constructed rapidly for test races

before leaving for the United States in July. All the materials are being assembled with the greatest care, the steel hull plates undergoing special tests.

AIR IS WASHED IN "FOG" OF OIL TO KEEP ENGINE CLEAN

Dirt and abrasive particles are washed from the air before it enters the automobile carburetor if the car is equipped with an air cleaner which uses a "fog" of oil to do the washing. The device is box-shaped and is attached to the dash under the hood, a hose connecting it to the intake on the carburetor. The air enters through a hole protected by a strip of metal and the entire air duct is submerged in an oil reservoir at the bottom of the box. No air can pass into the cleaner without displacing and violently agitating the oil in the duct and this oil is circulated as a heavy fog in an upper washing chamber. The oil in the air channel is continually replenished from the main reservoir through a slot in the channel and a condenser, above the washing chamber, traps the dirt-laden oil and returns it to the reservoir where the dirt precipitates and the oil is ready for use again. The reservoir holds up to four quarts of oil and three to five pounds of dirt. The condenser never requires cleaning and the accumulated dirt



Photo and Diagram Show How Oil Device Cleanses Air before It Enters Auto Carburetor

is emptied about once a month. The cleaner is supplied in three sizes.

Chicago Daily News 4/12/39
CP 62 44 39 2 E. Freeman
Portland Ore
Handy Governor Corp.
CP 1843
CP 1849
Dept of Cleveland England

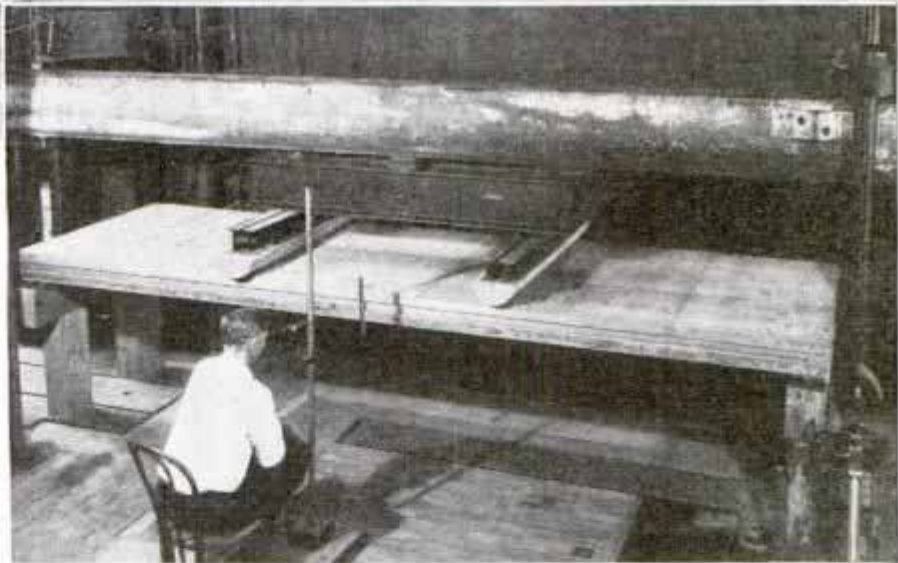
W. M. Schmitt

Joist-Plywood Floor Panel Carries Big Load

R. 110, 178 W. Adams Street



Top, How New Floor Panel Supports Unusual Loads; Bottom, Showing How New Type of Panel Occupies Less Space



Plywood sheets are glued to the top and bottom of joists in the production of a new type of floor panel which is said to speed up floor construction, save on materials and increase headroom in each story in which it is used. The top plywood, which is relatively thick, serves as a sub-floor, while the thinner bottom plywood forms the ceiling for the room below. By virtue of being glued to the joists, the plywood helps to resist the bending stress, forming what is known in airplane construction as a "stressed covering," that is, a shell which not only distributes but, to a large extent, relieves the load on the framework which supports it. For spans common in house construction, the required strength and stiffness can be obtained with a nominal six-inch joist, used with the plywood, instead of the usual ten-inch joist, a net

saving of four inches in the thickness of the floor system. The new panel is being developed by the United States Forest Products laboratory

Experiment! Madras Oil is

OLIVE OIL AS AUTO LUBRICANT IS USED IN AFRICA

©1909

On account of the high price of imported motor oils, olive oil is being used to lubricate automobiles in Tunis, Africa. The new oil was adopted after successful experiments. A racing event confined to cars using olive oil as lubricant has been organized in that territory.

Eckhardt

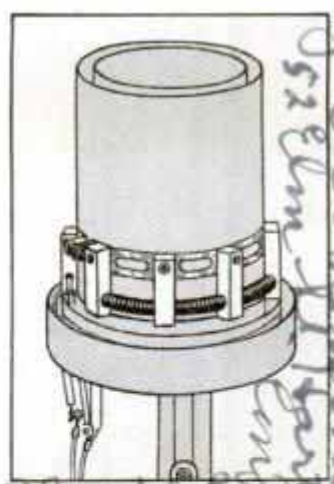
10 82-10-30

SEED MORE COSTLY THAN GOLD

More than worth their weight in gold, several varieties of seed are sold in small quantities, by the eighth, thirty-second or even sixty-fourth of an ounce. At prices ranging from \$120 to \$196 an ounce, there are choice varieties of gloxinias, mixed primulas, cape primroses and fringed giant petunias. Double petunias are worth \$240 per ounce, while choice strains of calceolaria and double-fringed petunias are offered at \$6 for one-sixty-fourth of an ounce, or \$384 per ounce. The seed of Chinese primula and a variety of coleus are to be had at \$56 an ounce, or nearly twice the present value of gold.

OIL-BURNING RANGE IS IGNITED BY ELECTRIC LIGHTER

Automatic ignition for the oil-burner range or other oil-fuel heating equipment without the use of matches, tapers or other awkward methods is made possible by using an electric lighter which consumes a negligible amount of current. It is claimed the igniter eliminates the danger of an explosion from accumulated gases in the fire box because the white heat of the resistance coil provides proper vaporization and ignition of such gases. Soot and odors prior to ignition are also eliminated and fuel is saved, because the wick is ignited completely in less than sixty seconds after the lighter current is turned on



LIGHTNING RODS FOR TREES

Protection from lightning has been provided for a number of fine trees in Maryland, some of which are of historic interest. The equipment is simple. A seven-strand copper cable is led to the top of the tree, its end unbraided to give a number of free discharge points, and the lower end soldered to the top of an iron pipe driven eleven feet into the ground. Thus, each tree has its own lightning rod.



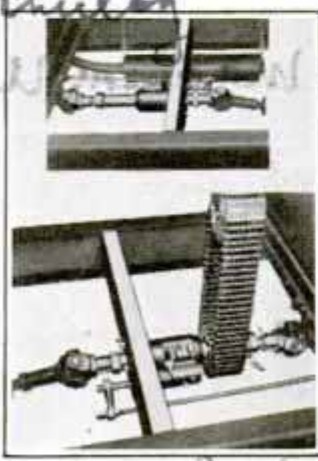
Demonstrating Size of Tiny Camera; Weighing But Two Ounces, It Takes Six Snapshots

CAMERA WEIGHS TWO OUNCES AND FITS PALM OF HAND

Weighing only two ounces, and so small that it fits in the palm of the hand, a midget camera takes six tiny snapshots which can be enlarged successfully. It is only three inches high and costs little more than a couple of rolls of film.

POWER TAKE-OFF FOR TRUCKS FITS ON DRIVE SHAFT

Designed to operate all types of portable farm, highway and industrial equipment, a power take-off for trucks is installed by removing a section of the drive shaft and replacing it with the device. By shifting a lever at the driver's seat, the entire power and speed of the motor can be utilized from the take-off. It operates



at any engine speed up to 3,800 revolutions per minute. A neutral position is provided to insure safety and convenience in operation. The take-off does not affect the power or road speed of the truck in any manner.

10 85 mill

C1864

C1824

C1902

Letwiler Mfg Co

Designed by Dean J. B. ...

4-22-42

Change size 13 wires

BODY IS REVERSED ON CAR TO CUT WIND FORCE

For a long time, Harry Hartz, automobile racing driver and theorist in aerodynamics, had an idea that the ordinary automobile sedan body encountered less wind resistance when going backward than when traveling forward, because he believed the rear of such a car was better streamlined, from a practical standpoint, than the front. In New York, recently, he reversed the position of a normal sedan on its chassis and set out to

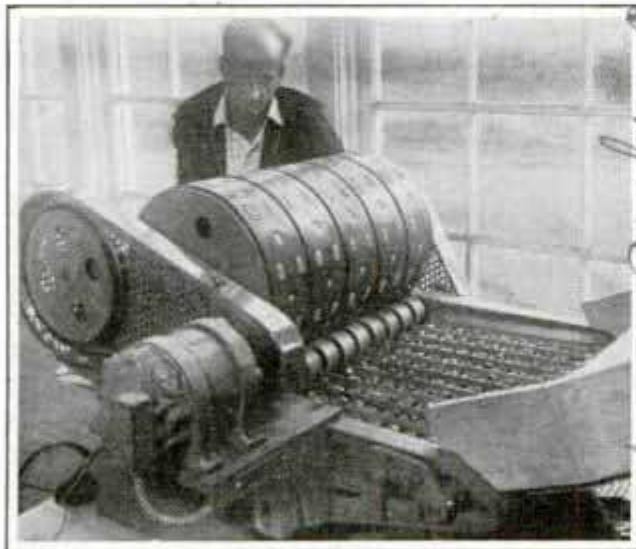


Body of Auto Reversed on Chassis; When It Is Going Forward, It Appears to Be Backing; This Demonstrates How Wind Resistance May Be Reduced

prove the point. The trip was not entirely successful because startled traffic policemen and astonished orthodox drivers soon blocked his path, but Mr. Hartz maintained the demonstration had shown him that the reversed body encountered twenty per cent less wind resistance and attained greater speed on less fuel than when in the usual position. By turning the body end for end, the driver had a car with three speeds reverse or one forward, or vice versa, depending on how you look at it. The steering wheel was left in the usual position but the driver sat in front

of the wheel instead of behind it and actually succeeded in driving from the back seat. The rear window was increased in area to give the back-seat driver the visibility necessary in a car of this type. When proceeding forward, his headlights were at the rear, the tail-light in front and the windshield wiper was at the rear. One agitated policeman figured out that the front seats face the back and the back seat faces the front, so a passenger in the back seat really is in front, but faces the back with his back toward the front, which really is the back.

Wide World
509 1/2 main St Wash
Vanermer Wash
North Pacific Nut Growers Association, Clark County Wash
Cooperative Wash
Science News Letter



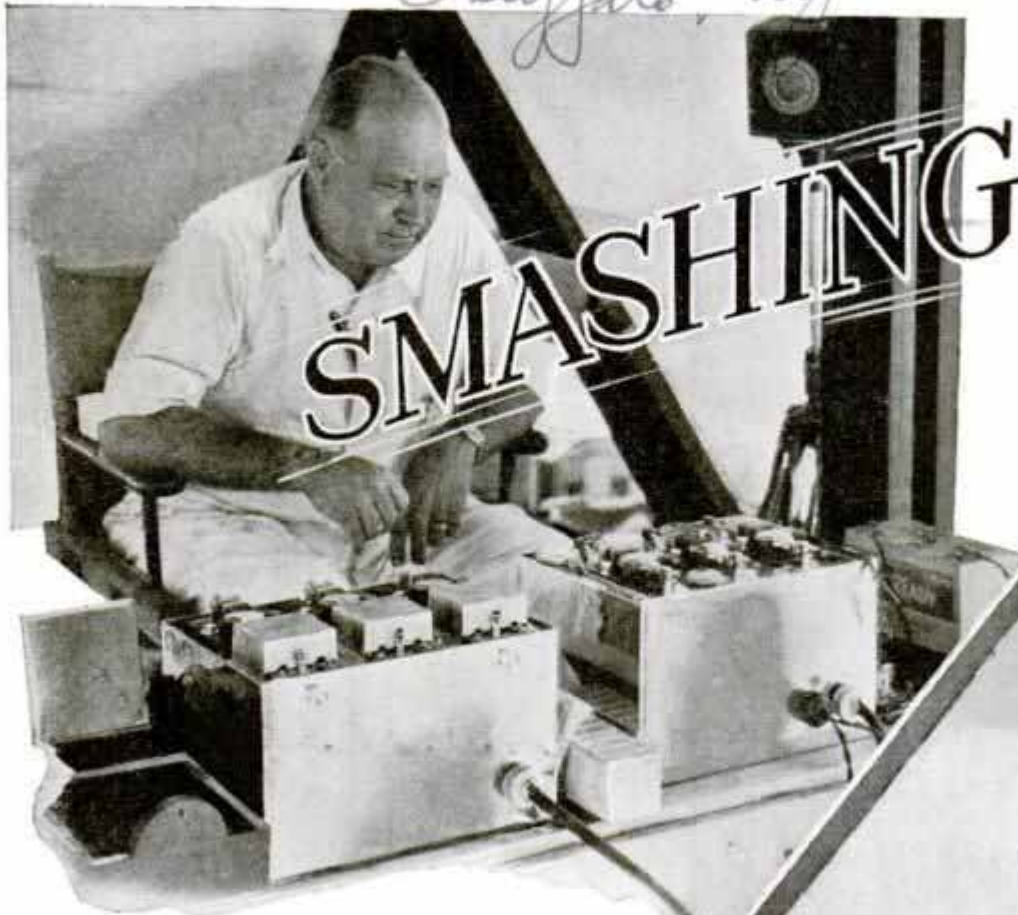
As Filberts Pass under Roller, Trade Name Is Stamped on Each Nut by Special Press

NAME STAMPED ON FILBERTS 1865 BY SPECIAL PRESS

Filberts handled by a nut growers association are being stamped with a trade name by means of a special press. The filbert also is known as the hazelnut. The small size and irregular shape of filberts made the stamping process difficult, but the machine developed for the job handles about one ton per day. Inked, rubber stamps are fixed to a large cylinder so that each nut may be given the imprint as it passes under the cylinder.

The last census showed that eighty-six per cent of the farms in this country were operated entirely with horses and mules.

C1476
1695 Elmwood Ave
Buffalo, NY



SMASHING ALL



THREE thousand miles in twenty-five and one-half hours—almost hurricane speed—is the world's record established in 1933 by an American driver in an American automobile as proof of the stamina, endurance and mechanical perfection of the modern car. During this all-day and all-night run, the hurtling auto averaged 118 miles per hour, sometimes crossing the 125-mile mark.

Only brief refueling stops were made on the run, which resulted in the upsetting of more than sixty-six official records, national and international, including the 200-mile, 500-kilometer, 500-mile, 1,000-kilometer, 1,000-mile, 2,000-kilometer, 2,000-mile and on through the list of American and world class records and world unlimited speeds.

While officials of the American Automobile Association watched their instruments, the special twelve-cylinder roadster shot across the starting wire of the ten-mile circle course laid out on the great Salt desert in Utah. From that time until the run had been completed, the small group of spectators were amazed at the fast pace. On the first five laps, fifty miles, the car traveled 125.5 miles per hour and at the 100-mile mark, the average was 123.3

Left, Instruments for Recording the Pierce-Arrow's 3,000-Mile Flight. Right, Workmen Mark Out the Ten-Mile Course on Great Salt Desert Before the Run

miles per hour. A short time later, the world's record for 200 miles had been shattered by nearly nine miles per hour.

As the evening shadows crept across the course, the driver, Ab Jenkins, kept up that dizzy speed until forced to the pit for refueling. A score of expert mechanics stood ready for every stop, performing their jobs in record time to send the car roaring away again.

Darkness came. Kerosene flares were lighted to guide Jenkins around the circle.

RECORDS!



Top, Left, Jenkins Flashing by Radio Announcer's Platform; Right, How Driver Appeared at Refueling Stop; Note Wet Salt on Goggles

Still the auto hurtled by the timer's stand, steadily grinding out the miles. In the dead of the night came more refueling stops, one of them lasting twenty-six minutes while engineers inspected the engine and

minor adjustments. In the early morning, holes began to appear in the cement-like surface and as the car crossed these spots, it frequently left the ground. A truck loaded with gravel was hurried to the scene and men worked frantically to fill the depressions. That emergency measure almost brought disaster because the sharp-edged gravel cut into Jenkins' tires. Just before dawn, the right rear tire blew out and the car careened sickeningly as it sped along at 123 miles per hour. For a moment Jenkins fought the wheel, then regained control and turned into the pit. Within three minutes, the tire had been replaced and the run continued through the morning.

About noon, a black cloud appeared in the southwest and moved rapidly toward the course, finally to release a forty-mile



corded, he whirled the car once more around, taking no chances of miscalculation of the distance.

To the general public, reasons for such a run may not be clear. What end could a 3,000-mile run at almost top speed serve? The answer probably will be found in future automobiles built by the Pierce-Arrow factory. This run revealed to the engineer many things—how the motor performs during a prolonged run above 100 miles per hour, how the body withstands vibrations from engine and road, how tires wear under such extreme conditions—and some of these findings will be used to construct even better cars for owners who never will subject them

to similar strain. The Pierce-Arrow captured practically every record for special automobiles, which are nothing more than stock models with special engine heads, special axles and other equipment for producing higher speeds than are needed on the open road. This fact is of importance to the American automobile industry in that it proves that this country is building cars equal, and in many respects, superior to those constructed in foreign lands.

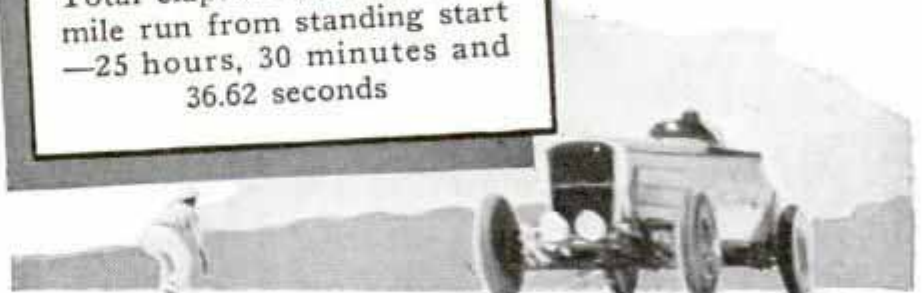
gale that flipped away tents, tore flags from their masts and rocked the timer's stand. Rain came down in sheets, yet the car was held to its two-mile-per-minute pace while its driver peered through the whirling storm. During those perilous moments, the driver's danger was increased considerably by the wet salt which his wheels flung into the air, at times obscuring his vision.

Finally the cloud moved on and the sun came out, leaving the course free for the end of the great run. Even beyond the twenty-four-hour mark Jenkins sped to attain that 3,000 miles, the 207-horsepower motor of his Pierce-Arrow roadster humming steadily. With that goal reached and officially re-

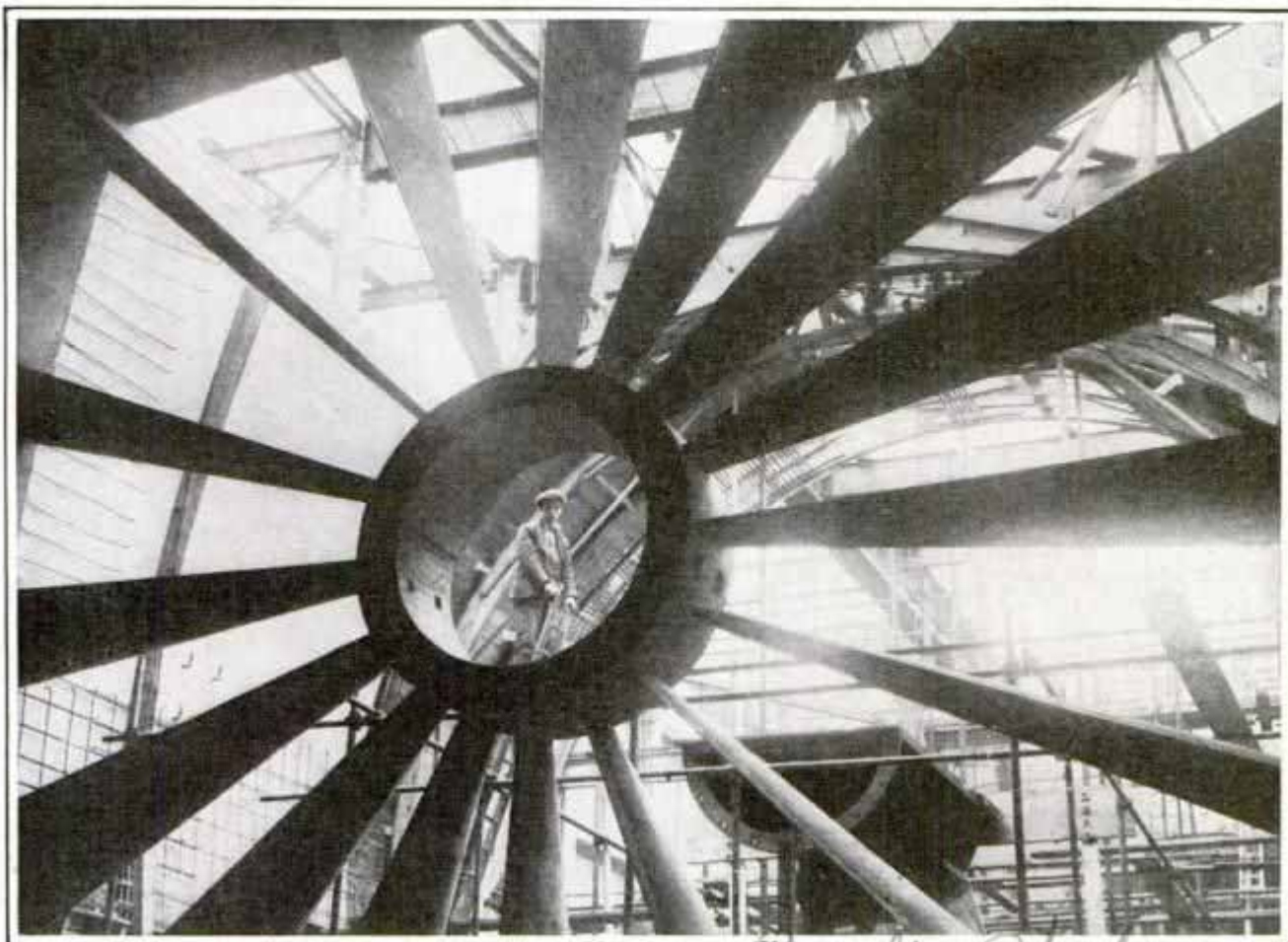
THE NEW RECORD
Salduro, Utah, Aug. 6-7, 1933

Distance or Time	Speed M. P. H.
200 miles	123.88
500 kilo	123.99
500 miles	124.04
1,000 kilo.	120 15
1,000 miles	123.01
2,000 kilo.	122.39
2,000 miles	117.04
3,000 kilo.	116.64
3,000 miles	117.98
4,000 kilo.	117.47
3 hours	124.08
6 hours	122.77
12 hours	120.5
24 hours	117.8

Total elapsed time for 3,000-mile run from standing start—25 hours, 30 minutes and 36.62 seconds



Top, Lighting Kerosene Flares at Dusk to Mark Course During the Night Run; Center, List of Major Records Which Jenkins Captured on His Twenty-Five-Hour Drive; Bottom, Signaling the Driver as Another Lap of the Long Grind Was Completed



Part of Gigantic Wind Tunnel Which Will Be Used in England for Testing Full-Size Airplanes to Determine Effect of High-Wind Velocities on Wings, Fuselage and the Like; Tunnel Produces Gale Force

GIANT WIND TUNNEL TO TEST FULL-SIZE AIRCRAFT

Full-size aircraft will be tested in a giant wind tunnel at the Royal Air Force establishment at Farnborough, England. The 200-foot tunnel, shaped like a circle, is made of reinforced steel. Air is driven, by 2,000-horsepower motors, around the tunnel by gigantic fans.

GROWTH OF THE AIR EXPRESS SHOWN BY FIGURES

Many companies use the air express daily, according to figures issued for the first year's operation of General Air Express, which includes five important air lines. Of all the shippers, thirteen per cent use the air express each day. During the year, 357 commodities were carried, totaling 429,149 pounds. These included cut flowers, automobile parts, motion-picture films, photo plates, cancelled checks, newspapers, photographs and advertising material. The motion-picture, printing and publishing industries supplied sixty per

cent of the business. Air-express packages flew an average distance of 781 miles and the average weight of each was eight pounds. An increase in shipments is revealed for the beginning of the second year.

SKULL AND CROSSBONES FORM AUTOMOBILE STOP LIGHT

For the motorist who wishes to draw attention of trailing drivers when he stops, a combination rear light and stop light in the form of a skull and crossbones is being produced in England. The stop-light sign shows through the eyes and nose and the rear light shines through the open mouth. The design is chromi-



umplated and replaces the standard tail light on the automobile or serves as a second light mounted on the opposite rear fender.

Paul's Photo

C1764

C1896

Eslobe Photo

E. D. W. Jones Eastern Air Transport

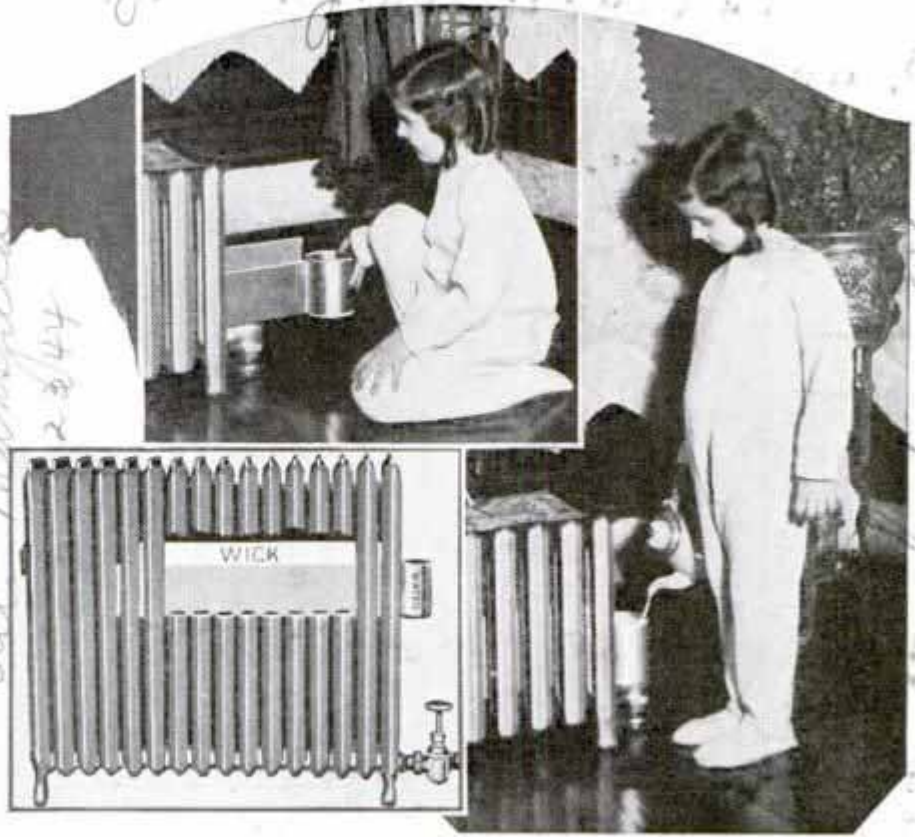
Chas. John Lutharis

distributed at Motor Show London. (London)

Museum, Balboa Park

MODEL OF SEA BED AIDS STUDY OF THE DEPTHS

Scientific study of the ocean floor is made easier by a relief model of the bottom of the Pacific. Twelve feet long by five feet wide, the model shows sheer ravines and submerged mountain ranges which rise above the surface of the ocean here and there to form islands. It was constructed from 17,239 soundings taken by the U.S.S. "Ramapo" and was built under the direction of Captain C. B. Mayo, United States navy. According to the model, the deepest spots in the Pacific are the Nero deep and Ramapo deep, in either of which Mt. Everest, 29,140 feet high, could be submerged and have several thousand feet of water above its summit. Captain Mayo discovered Ramapo deep.



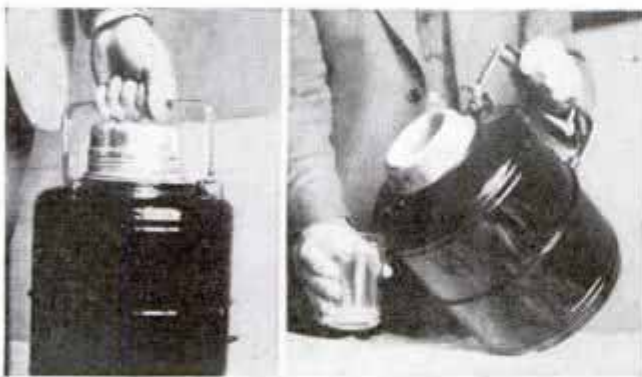
Humidifier Which Is Inserted between the Leaves of a Radiator; Nothing Is Exposed Except the Receptacle for the Water

HIDDEN HUMIDIFIER FOR HOME CONCEALED IN RADIATOR

Fitting between the castings of the radiator, a hidden humidifier for the home or office is invisible except for one can-shaped end which is exposed to receive the water. The portion extending into the radiator slits is a deep but extremely narrow pan, two feet long, six inches deep and less than one inch wide. A metal container, about the size and shape of an ordinary tin can, is soldered to one end of the pan, so water poured into the can runs into the pan until both are filled. A long wick rests in the pan and extends its entire length and several inches above it. As heat from the radiator warms the water, the wick draws it from the pan and increases the evaporation surface many times. It can be used with steam or hot-water radiators and rests within the slots of the castings without other support. It can be obtained in two sizes in bronze or aluminum finish.

BAIL FOR VACUUM JUG MAKES A HANDLE FOR POURING

Handling a large vacuum jug is greatly simplified if it is equipped with a convertible bail which also can be used as a handle for pouring. When the bail is connected to two supports at the top, it is used for carrying, but when detached from



Vacuum Jug with a Bail Which Is Converted into Handle for Pouring by Changing Its Position

one of these fastenings and joined to a connection on the side, it becomes a handle and the jug becomes a pitcher.

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

San Diego Amer. 11/19/33

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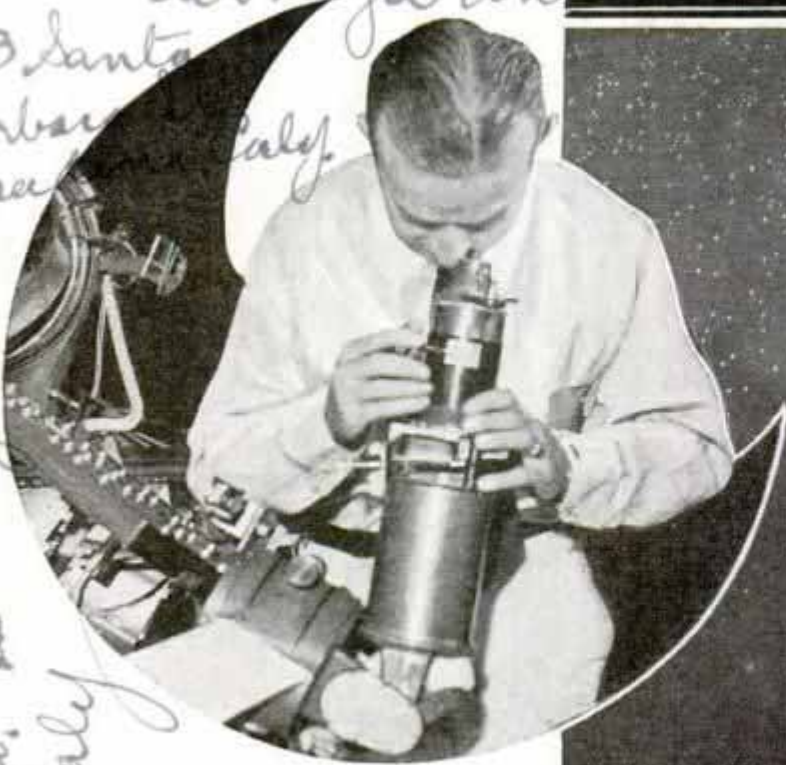
1827

Chicago, Ill. W. L. L. Co. 4527

Arrowhead Specialty Co

Secretary, Mt. Wilson Observatory
Carnegie Institute

513 Santa Barbara Pasadena Calif.



Left, Measuring Star's Diameter by Means of Interferometer; Right, "Horse's Head," Showing Plainly in Photo, Hides Light of Stars behind It



Carl Thomas E. Starnes, Jr. 420 S. San Pedro, Los Angeles, Calif.

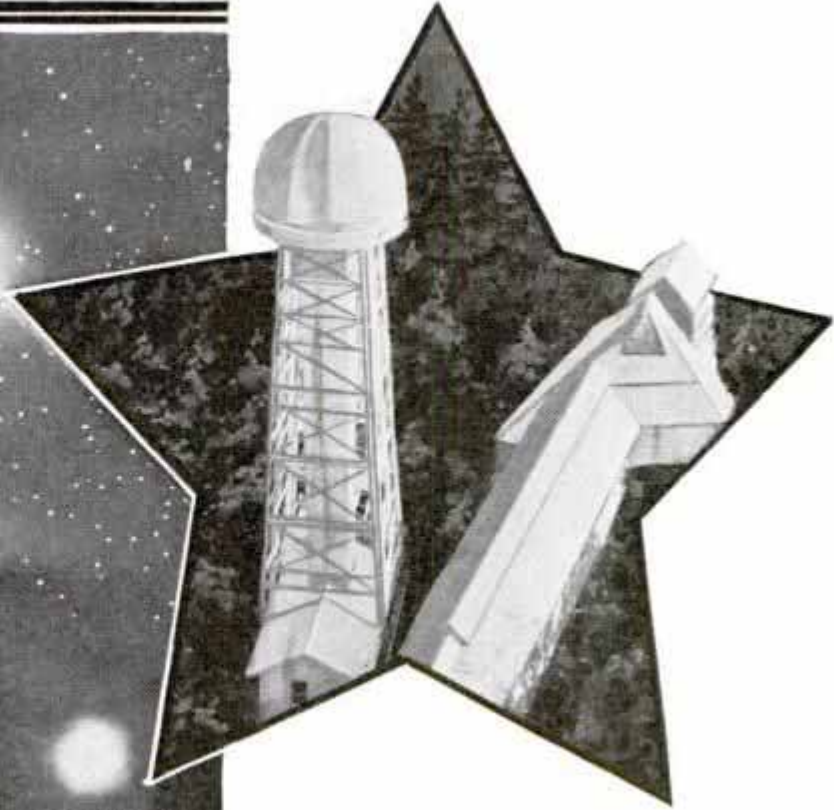
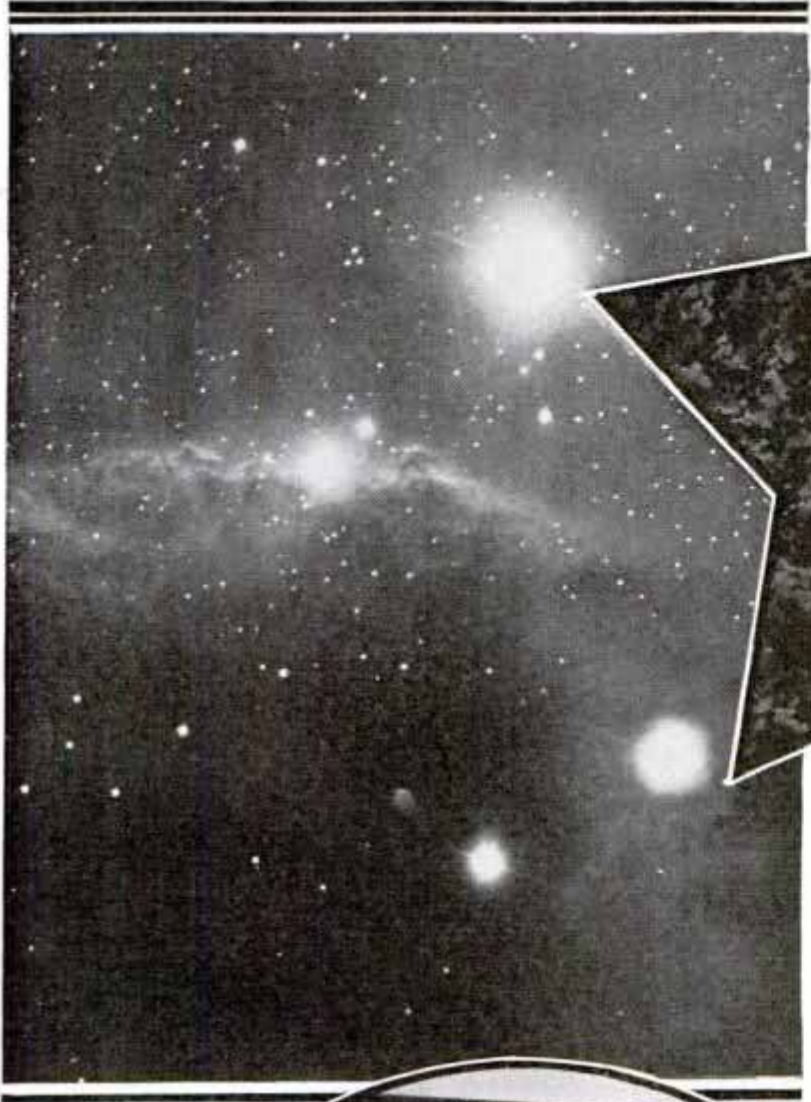
MYSTERIES of the STARS

WHY does the sun change its spots? How long will the stars shine? How wide is space? Is matter indestructible? These are a few of the questions puzzling astronomers today. In the last few hundred years science has amassed an amazing amount of knowledge about the universe. The age of the earth, about two billion years, has been estimated by studying the disintegration of uranium into lead. The age of the stars, about five trillion years, is found by studying the speeds of gas molecules. To find the distance to a star, astronomers use the orbit of the earth around the sun as a base line in the same way that a surveyor measures distances. Weights are found by estimating

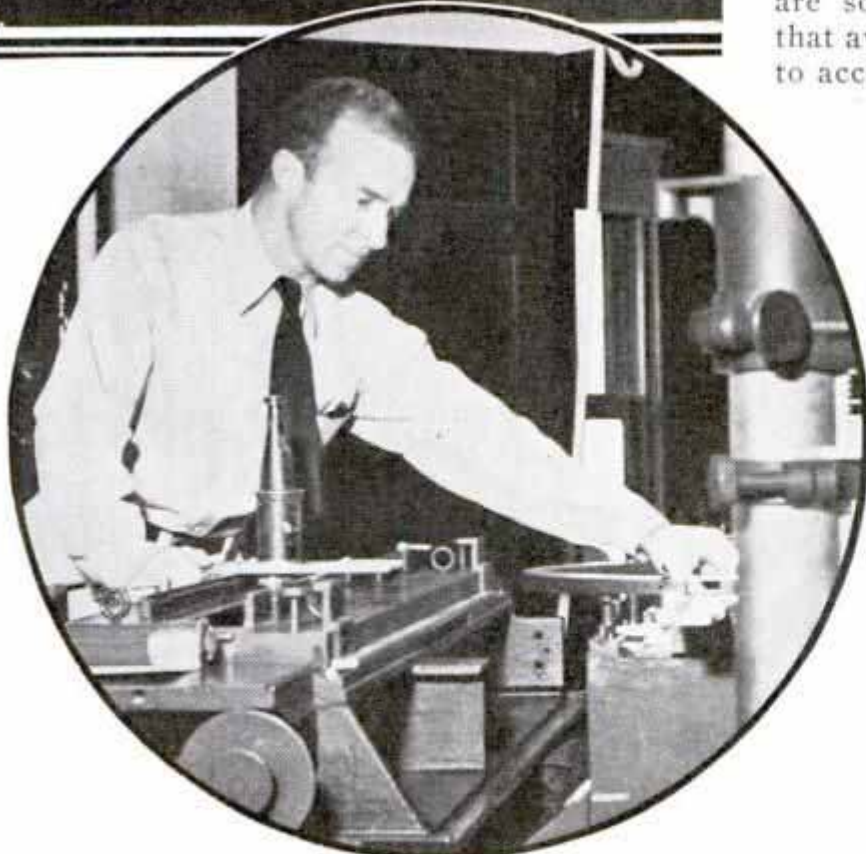
gravitational pull, temperatures by the colors, speeds by the spectroscope and diameters by the interferometer.

But these clever methods don't tell why some stars shine steadily while others flicker and waver. Apparently some stars explode to a thousand times their former brilliance, then fade and explode again. In spite of the millions of pounds pressure per square foot on the interior of a star, some authorities hold that it is still so thin that it would be possible to fly an airplane through it if one could escape the heat. The reason is that the atoms, although pushed closer together by the pressure, are still so far apart that the star is comparatively uncompressed.

C/69/.

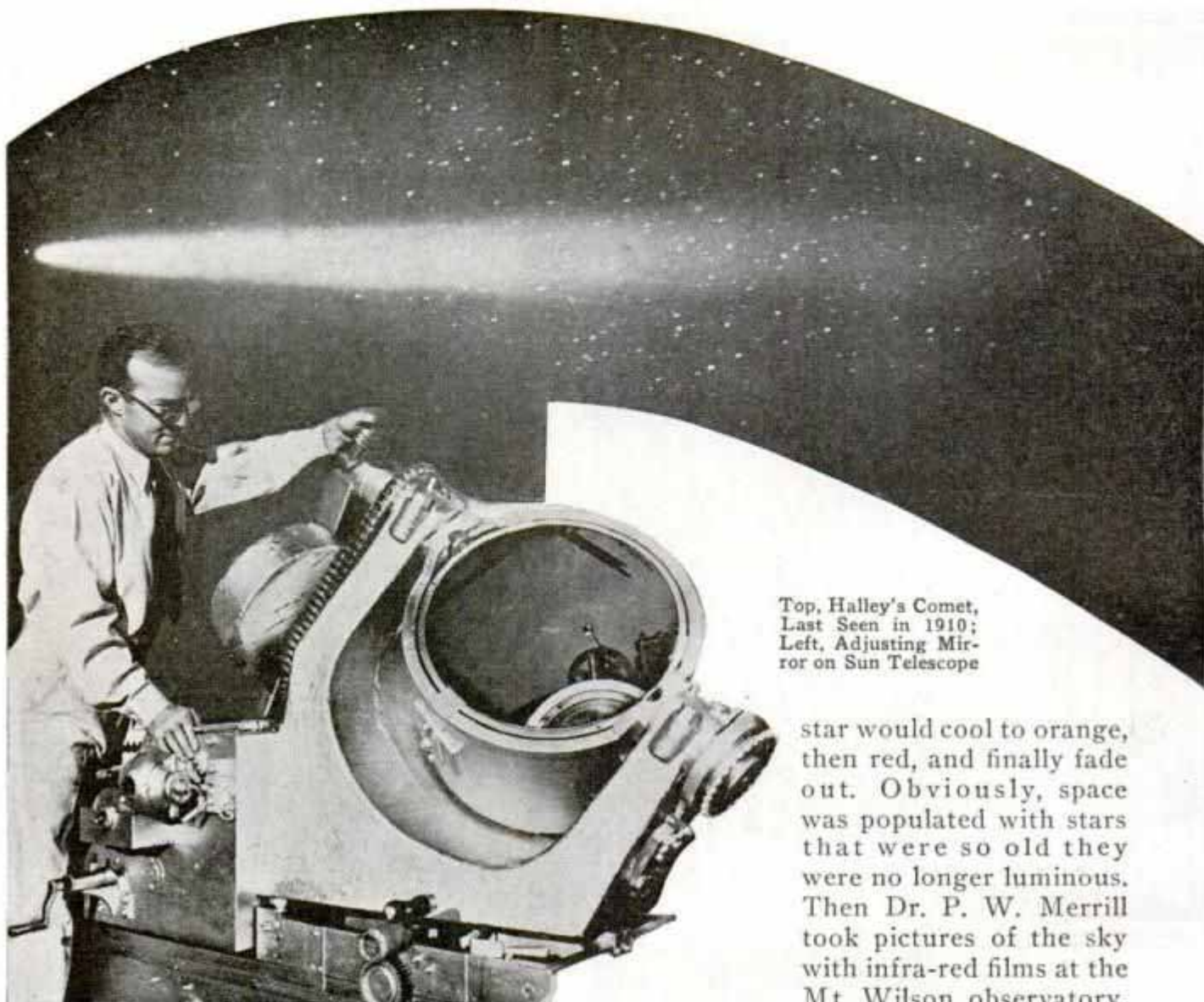


When astronomers are stumped for an answer to a question they gather all the facts they can and build a theory which may prove false or may stand the test of time and experiment. Some current theories are so startling and revolutionary that average men have not been able to accept them. To be told, for example, that matter can be completely destroyed or that space is curved goes against all that has been taught in the past. But this doesn't mean that the radical beliefs of astronomers are ridiculous. Dr. J. A. Anderson, astro-physicist of the Carnegie Institution, compares man's present attitude toward the universe to his lack of ability several centuries ago to accept the fact that the world was round. "Today we know that the world is round even though our senses tell us that it seems to be flat," Doctor Anderson explains. "We know better than to believe our senses."



Top, Right, One of the Horizontal Tunnels for Studying Sun at Mt. Wilson; Bottom, Opening Slot to Admit Sun's Rays to a Spectroscope Where They Can Be Broken Up for Study and Analysis

One thing that would clear up many mysteries is a good comet, Doctor Anderson



Top, Halley's Comet,
Last Seen in 1910;
Left, Adjusting Mir-
ror on Sun Telescope

says. An unheralded comet is likely to appear at any time. Not since 1910 has a comet brilliant enough to be seen in the daytime been observed. Practically nothing is known about a comet's physical properties, and the next time a comet appears it will supply the answers to many questions that can be applied to the universe at large. Photo-electric cells, spectroscopes, interferometers and other instruments will all be used the next time a comet appears.

A few years ago astronomers were satisfied that they knew the typical life history of a star. The theory was that a star, born from the gases of a whirling nebula, became smaller as it increased in age. It was believed that a "red giant" was a young star that had not yet attained the white heat of middle age, and that a "yellow dwarf" was an aging star that had passed its zenith. From a yellow hue the

star would cool to orange, then red, and finally fade out. Obviously, space was populated with stars that were so old they were no longer luminous. Then Dr. P. W. Merrill took pictures of the sky with infra-red films at the Mt. Wilson observatory.

When the films were developed not one new star was found. Apparently there are no stars that have cooled much below 3,000 degrees, the temperature assigned to the color red. Now there is no positive evidence that stars die, and astronomers are wondering whether the stars are everlasting.

Another failing theory is the one about "dark" stars. Many brilliant stars, because they appear to sometimes suffer partial eclipse, were thought to be accompanied by dead companion stars. But each time a more powerful telescope is built more of the dark stars are found. They are so small or so dull that less powerful instruments have missed them.

In some parts of the sky are dark patches in which few or no stars appear. Instead of being holes through space the dark patches seem to hide the light of stars that are probably shining beyond. The obvious conclusion is that patches like the "Horse's

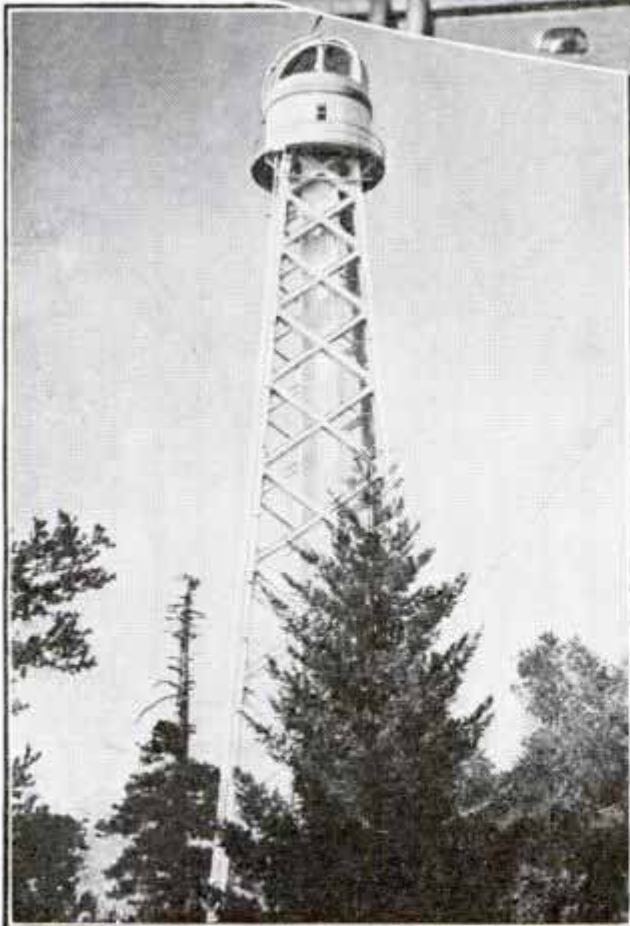
Head" or the "Coal Sack" are thick clouds of inert matter through which light does not pass. On the other hand astronomers are aware of numerous galactic nebulae, huge glowing clouds of gas that stretch from star to star. Why, they wonder, are

some of the clouds luminous and others dark?

Science is spending millions of dollars studying the sun on the assump-

tion that much that is learned about this nearest star will contribute to our knowledge of other stars. Astronomers have learned that the sun is approximately seven trillion years old, that its central temperature is about fifty million degrees, and that by radiation it is losing a quarter of a million tons of weight a minute.

Joseph O. Hickox, solar observer at the Mt. Wilson observatory, re-



Top, Tiny Switchboard and Clock Move Giant Telescope; Bottom, Mt. Wilson Telescope Tower

cently witnessed a strange phenomenon. Standing inside the base of the 150-foot solar telescope, he watched an eruption of burning gas shoot out 260,000 miles from the surface of the sun. He took four photographs, the last showing the gas as a burning cloud separated from the sun. Had the cloud been large enough and had it escaped far enough from the sun, a new planet might have been born.

The answers to many riddles of the universe may be solved by the 200-inch reflector telescope under construction that is to be erected in the southwestern part of the United States. Twice the size of the world's greatest telescope today, it will pick up light from stars four times as faint as the dimmest that can now be seen. The present 100-inch reflector at Mt. Wilson can "see" approximately 500 million stars. With the new instrument approximately one and a half billion will be visible.

☞ Cotton cloth that looks and is used like leather has been produced in Great Britain.

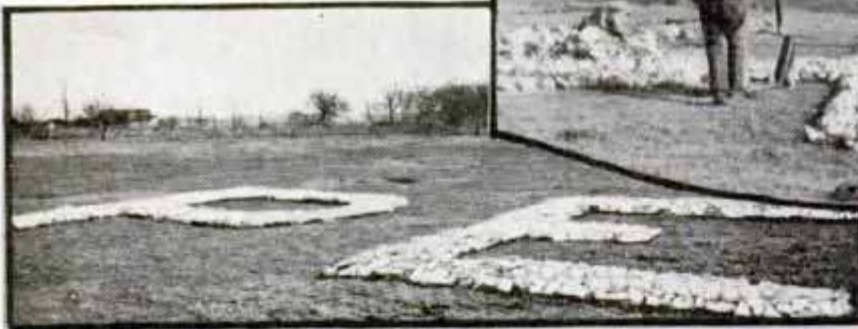
Skyway Markers Help Flyers Identify Cities



Cities Are Marking Their Names on the Ground with Huge Letters to Aid Lost Flyers in Identifying the Towns; Left, Cutting away Sod Preparatory to Filling Shallow Trench with Rock or Concrete; Below, Finished Marker



Right, Finishing a Skyway Marker by Filling Outline of Letters with Broken Concrete Which Is Then Sprayed or Painted with Lime Solution, Making the Letters, Twenty by Twenty-Six Feet, Visible at Great Heights; Below, Part of a Marker Made of Sandstone



Right, View of Marker at East St. Louis Taken from a Height of 1,500 Feet; Arrow at Left Indicates Direction, and That at Right Points to the Airport; When Atmospheric Conditions Are Favorable, Such Signs Can Be Read from an Altitude of Three or Four Miles; Spacing between the Letters Is about Eight Feet and the Letters Themselves Can Be of Crushed Rock or of Poured Concrete

Society
332 W. 42nd
New York N.Y. 10018

W. A. Ruff
Los Angeles, Calif.

EXPLOSIVE FORCE OF GASOLINE IS GREATER THAN DYNAMITE

Gasoline is an explosive ten times more powerful than TNT, but the latter cannot be put to work steadily because no way is known to control its explosion. This comparison of the properties of these two explosives was made recently by Dr. George Granger Brown, professor of chemical engineering at the University of Michigan. No one would think of trying to run an engine on TNT or dynamite because the explosive violence would tear the engine to pieces, but a gallon of gasoline exploded under the same conditions could do ten times as much damage. However, the chemist explained, we are able to use gasoline because we know how to control and harness its explosive power. The destructive force of gasoline has been tamed, but its behavior is still far from perfect. Better control of gasoline combustion, however, has marked the way for steady improvement in the efficiency of the gasoline engine. The chief factors in the improved control of combustion, it was pointed out, are improved design of combustion chambers, increased use of the cracking process to make fuel of anti-knock character, and the introduction of traces of chemicals in the gasoline to suppress the knock.

Dr. Leonard Gray Vocalphone
Box 2071 P.O. Hollywood
Calif.



Singer Uses Device Which Returns Voice Sounds; It Enables Her to Correct Faults

SINGER MAY HEAR OWN VOICE AS IT SOUNDS TO AUDIENCE

By means of a simple device called the vocalphone, a singer may hear his or her own voice exactly as it sounds to the audience. The device causes the sound of the voice to return to the singer's ears, thus enabling the correction of diction, tone or volume during practice.

Dr. Leonard Gray
Vocalphone
and
Vocalphone

HEALTH-LAMP UNIT PRODUCES TWO KINDS OF RAYS



Both ultraviolet and infra-red rays are produced by an inexpensive dual-purpose health lamp of the carbon-arc type. The unit can be used in any light socket or for converting a heating lamp into a sun lamp. It can be obtained with or without carbons, goggles and reflectors and produces enough infra-red light for all therapeutic purposes and enough ultraviolet to prevent rickets and to stimulate the skin. There is provision for automatic breaking of the circuit after about ten minutes to prevent any injurious effects from falling asleep under the lamp and getting an over-dosage of the rays.

SCREWS CHEMICALLY TREATED FOR EASY DRIVING

Wood screws which have been chemically treated to make them easy to drive are being offered as a time and labor saver for the woodworker. In appearance these screws do not differ from the ordinary kind, but they can be driven into the hardest wood with only a fraction of the effort required heretofore. The use of these screws also eliminates waxing, oiling or other forms of lubrication formerly found necessary to use screws in certain kinds of wood. It is claimed the chemically treated screws have greater holding power.



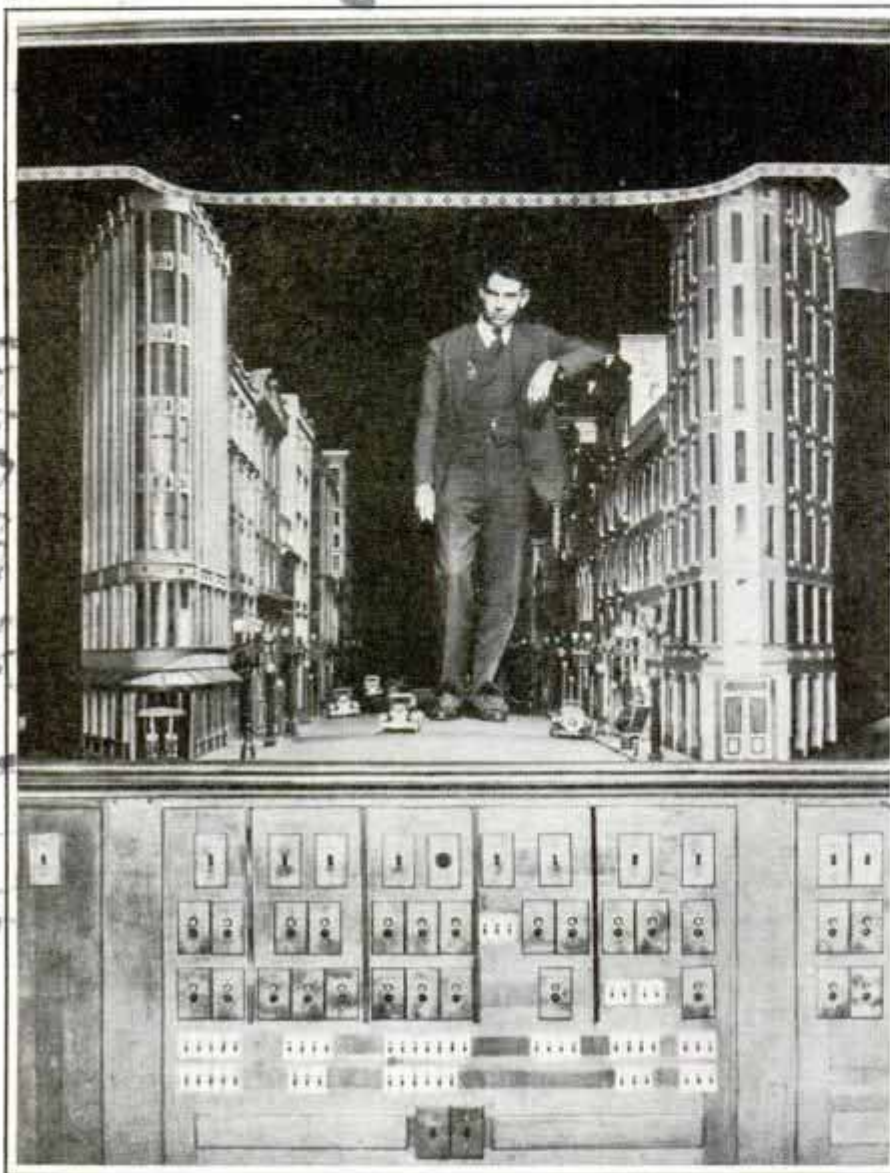
Wm. Beyer Corp.
April 1930

Wm. Beyer Corp.
45 E. 4th St.
New York, N.Y.

Elco Tool & Screw
1500 Broadway
New York, N.Y.

WEATHER REPEATS ITSELF LIKE SEASONS

If you want to know what kind of weather you may expect in the summer of 1934, just recall the summer of 1911. Discovery of what appears to be a fundamental climate cycle in nature, second only to the year itself, has been announced by Dr. Charles G. Abbot, secretary of the Smithsonian Institution. It is the double sun-spot period, also known as Hale's magnetic cycle, an interval of twenty-three years, and it is indicated that the weather everywhere substantially repeats itself at twenty-three-year intervals. The weather of 1956, therefore, may be expected to have the same general pattern, differing in day by day details, of course, as that of 1933. It is possible, however, that there may be a year's lag in the repetition of the 1933 meteorological phenomena, owing



Top, How Electrician Appears in Lilliputian Street Used in Testing Light Standards; Bottom, Control Board of the Model

MODEL STREET WITH LIGHTS TESTS ILLUMINATION

For testing types of street lighting, a miniature street with its business houses and lighting standards has been installed at the General Electric company's plant, Lynn, Mass. Two residential streets, similarly laid out, flank the business street. The engineers occasionally walk among the tiny autos in the Lilliputian traffic in changing connections or renewing lighting units. The light standards are built in proportion to the buildings so that the exact relative intensity of illumination may be determined.

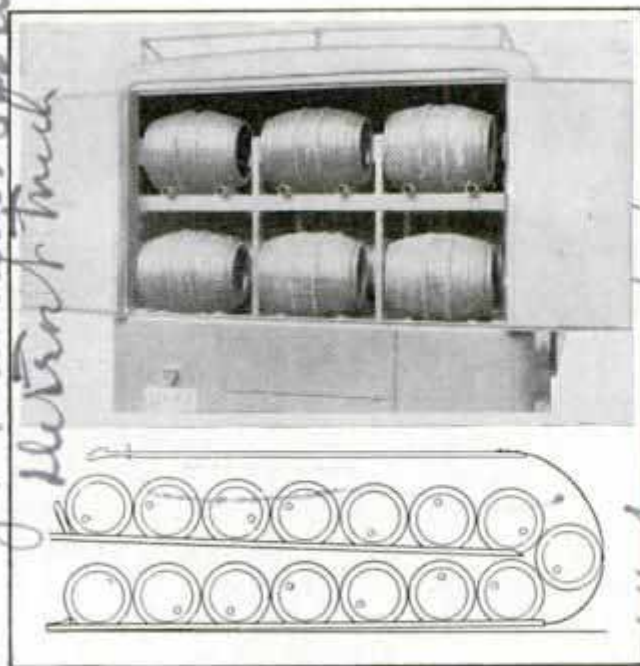
☐Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

ing to a complication which cannot as yet be exactly predicted. From most people's point of view, the two major features of weather are temperature and precipitation. These vary widely from year to year but records the world over for the past half century, which is about as long as accurate records have been kept, show clearly the twenty-three-year repetition with almost the regularity of the twelve-month temperature cycle. This discovery is expected to mark a long step forward toward the day of long-range weather forecasts. It has long been known that the earth's weather is slightly correlated with the eleven-year sun-spot cycle. Sun spots proceed from a minimum to a maximum number and decrease to a minimum again every eleven years. When the spots are at their maximum, the sun is hotter but most of the earth is slightly cooler,

due to secondary features like clouds overpowering the direct effect of increased radiation. Research by Doctor Abbot brought out the fact that the master weather cycle and probably the magnetic cycle are slightly longer than double the hitherto accepted sun-spot period, being exactly twenty-three years, a period which is the least common multiple of many variations in solar radiations and weather.

C1782
GRAVITY LOADS BARREL TRUCK AND THEN UNLOADS IT

Gravity is the only power employed in loading and unloading trucks with sloping runways designed for hauling barrels and other cylindrical containers. At the loading platform the barrels pass over a roller-coaster arrangement and enter the truck along three inclined pipe runways. The containers enter the upper level, pass to the front, strike a shock absorber and drop to the lower runway, rolling back to the rear on the lower level, where they are locked in position. The driver can unlock one barrel at a time from the lower tier by manipulating a lever. Each time a barrel is thus removed from below, a vacancy is created in the upper row to receive an empty container. To discharge the empties, the end locks are tripped and the barrels roll out, one after another. Using only



Barrel Truck Which Is Loaded and Emptied by Gravity; Diagram Shows How It Is Done

the force of gravity, the trucks take on a full load in less than two minutes.



Air Conditioner for Winter Use; in the Summer a Cooling Unit Can Be Added to It

AIR CONDITIONER FOR WINTER KEEPS ROOM COMFORTABLE

Fitting inconspicuously under a window, a winter air conditioner keeps a room comfortable in winter, and can also be used in the summer by adding cooling and drying units. For the winter months the conditioner supplies fresh, warm, moist air, cleaned of impurities and circulated without draft and without allowing street noises to enter. Such a unit can handle 16,800 cubic feet per hour. The cooling compressor, humidifier, filter and silencer all are contained in a metal cabinet resembling a radiator inclosure, which can be installed under a window without any costly alterations.

GIANT SEARCHLIGHT FOR ARMY HAS HUNDRED-MILE BEAM

Visible for 100 miles, giant searchlights have been purchased by the United States army to modernize its anti-aircraft equipment. The lights have a beam candlepower of 800,000,000 each and can pick up aircraft in flight at 15,000 feet under good atmospheric conditions. Two types of mounting are used. The light is carried on a truck or mounted on its own wheels. In either case, transportation is rapid.

There are about 500,000,000 apple trees in the world, one-fourth of them in the United States.

Scene News Letter.

*Build for hundreds of barrels
 the best truck*

My James 1/12/23

*Sperry Longwood Co. 60
 40. F. Lattuch Ave. 201. Bingham N.Y.*

*Metal Window
 100 E. 42nd St
 New York*

e1855

© 1698

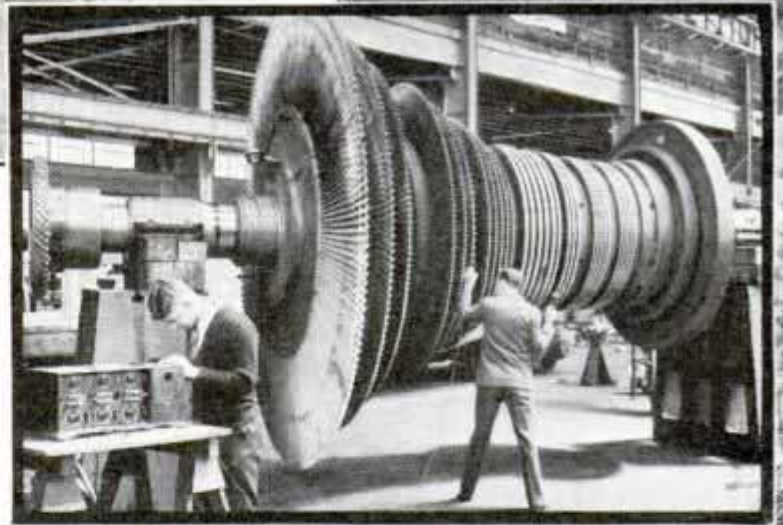
103 2 Florida Ave
Akron, Ohio

TOYS *Help* WAR



TOYS are helping scientists unravel the mysteries of electric-power lines that dance themselves to destruction and machines that shake themselves to pieces.

When the "Graf Zeppelin" started from Europe for the United States in May, 1929, it was forced to limp back to Friedrichshafen when four of its five engines broke their crankshafts. Engineers discovered that vibrations had caused the shafts to snap. When the twelve-cylinder V-type engines, each equipped with a torsional vibration damper, were installed, they had a negligible minor vibration at 1,390 revolutions per minute, but the stronger major vibration did not occur within the normal speed range. Just before the disastrous trip, however, the engines had been overhauled, and when reassembled the vibration periods had been changed unintentionally, so that both major and minor vibrations were set up at about 1,400 revolutions per



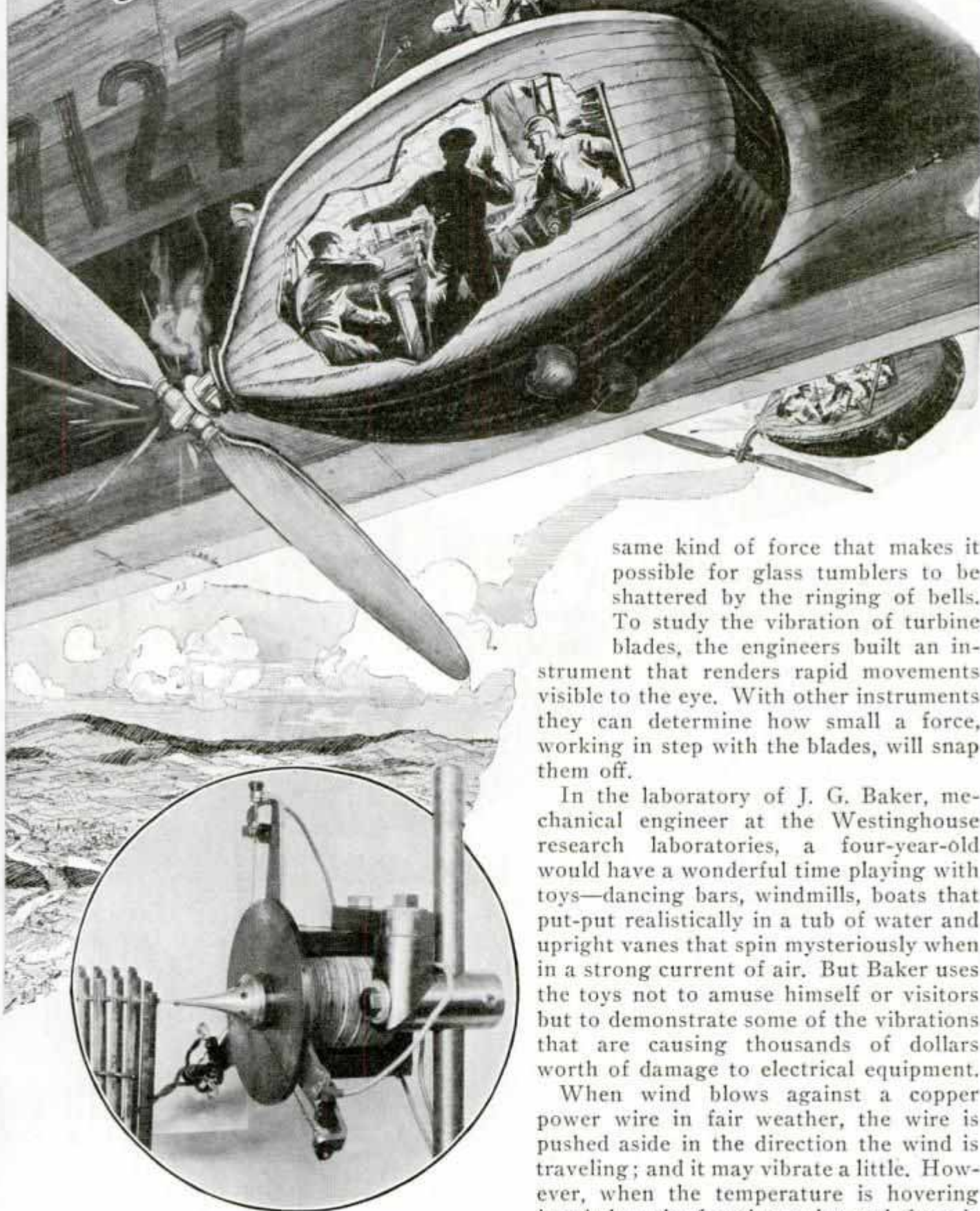
Top, Left, Part of Large Steel Shaft Snapped by Vibration; Bottom, Testing Blades of Turbine Rotor

minute. It did not take long for the combined vibrations to wreck the crankshafts.

Engineers at the Westinghouse Electric and Manufacturing company laboratories are working constantly to make more perfect the steam turbine, which aids in making electricity. Each turbine rotor is set with rows of curved steel blades, thousands of them. One blade coming loose while the rotor is whirling several thousand times a minute can wreck the machine. One of the things that can break a blade is resonant vibration, which is the

E. Pittsburgh

Against VIBRATION

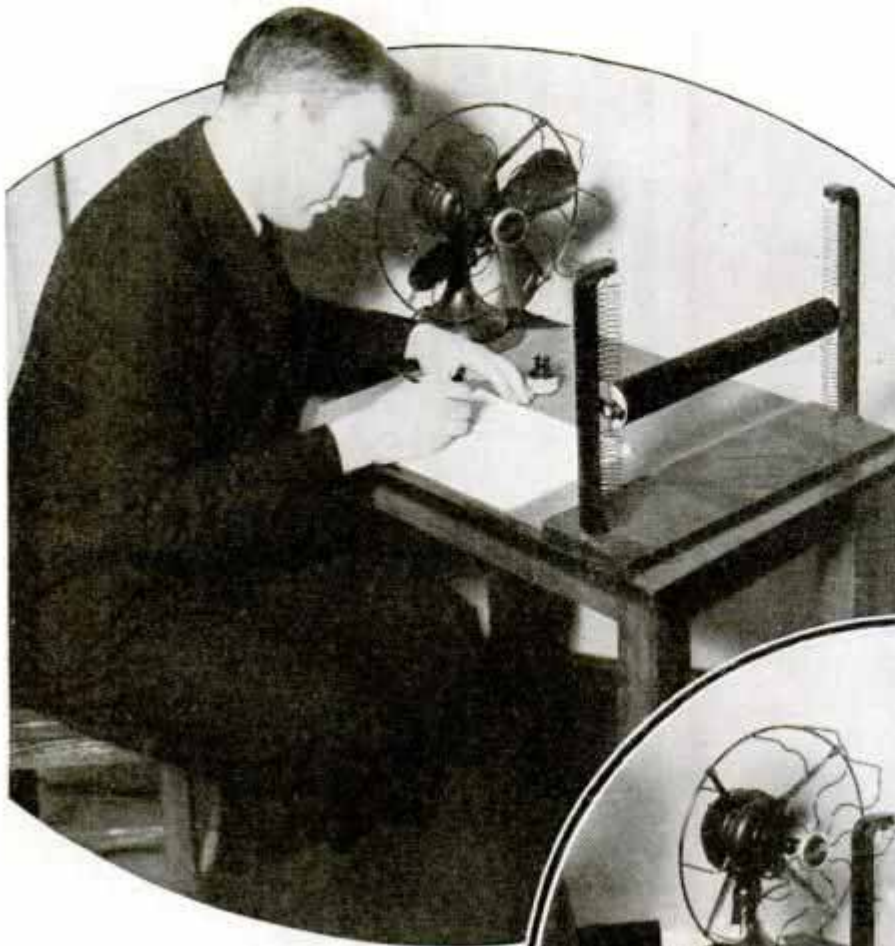


same kind of force that makes it possible for glass tumblers to be shattered by the ringing of bells. To study the vibration of turbine blades, the engineers built an instrument that renders rapid movements visible to the eye. With other instruments they can determine how small a force, working in step with the blades, will snap them off.

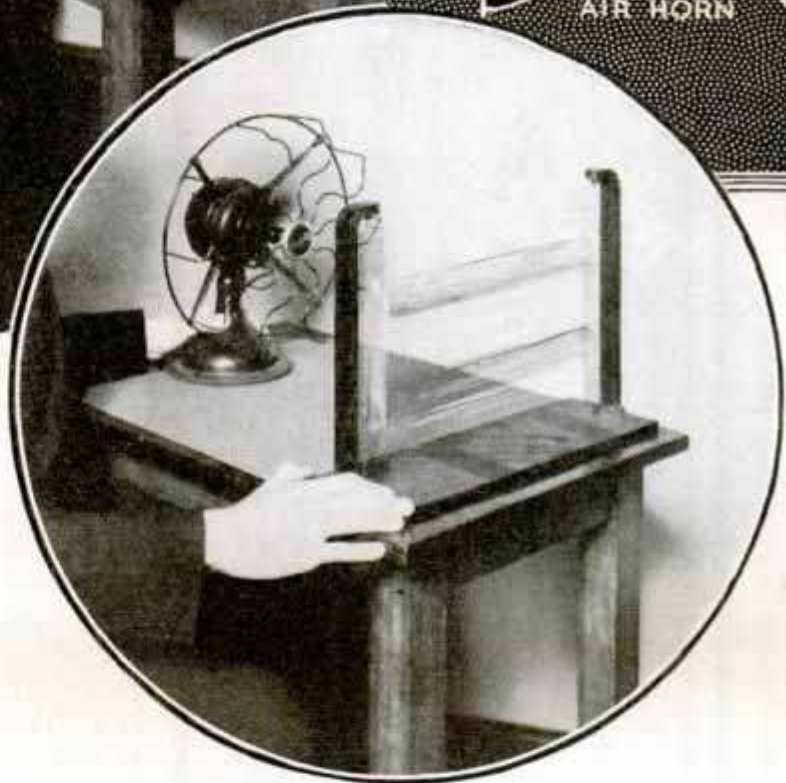
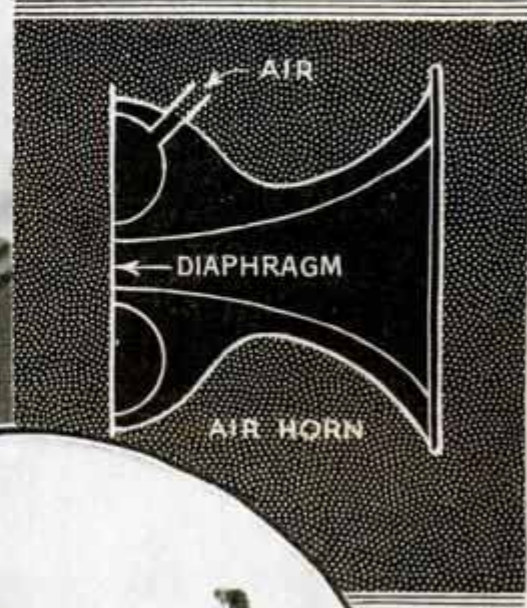
In the laboratory of J. G. Baker, mechanical engineer at the Westinghouse research laboratories, a four-year-old would have a wonderful time playing with toys—dancing bars, windmills, boats that put-put realistically in a tub of water and upright vanes that spin mysteriously when in a strong current of air. But Baker uses the toys not to amuse himself or visitors but to demonstrate some of the vibrations that are causing thousands of dollars worth of damage to electrical equipment.

When wind blows against a copper power wire in fair weather, the wire is pushed aside in the direction the wind is traveling; and it may vibrate a little. However, when the temperature is hovering just below the freezing point and there is super-cooled moisture in the air, ice collects on one side of the high-tension ca-

Top, Drawing of "Graf Zeppelin" at Time of Crankshaft Failure; Bottom, Device for Testing Blades of Steam Turbine



Below, Air Horn, Such as Bus Drivers Use, Gets Its Noise from Alternate Imprisonment and Escape of Air under Pressure



bles. Then the cable goes into a dance or gallop, often swinging through a distance of 20 feet—and sometimes breaking. Westinghouse scientists found that a toy, called the "aerial tourbillion," operates on the same principle as the dancing cable. It is really a simple form of windmill consisting of a stick of semicircular cross section pivoted to a handle. When held in the blast from an electric fan, flat side toward the fan, and given a start in either direction, it will spin like any windmill wheel. Using this toy, and making sticks of different cross sections, engineers can test the behavior of various forms of ice-coated cables.

A variation of the whirligig idea is another toy that might be called the dancing bar. It consists of a similar shaped stick with its ends fastened to the middles of two coil springs held vertically. When air strikes the flat side, the stick, after being started, will dance up and down, just like an ice-coated cable.

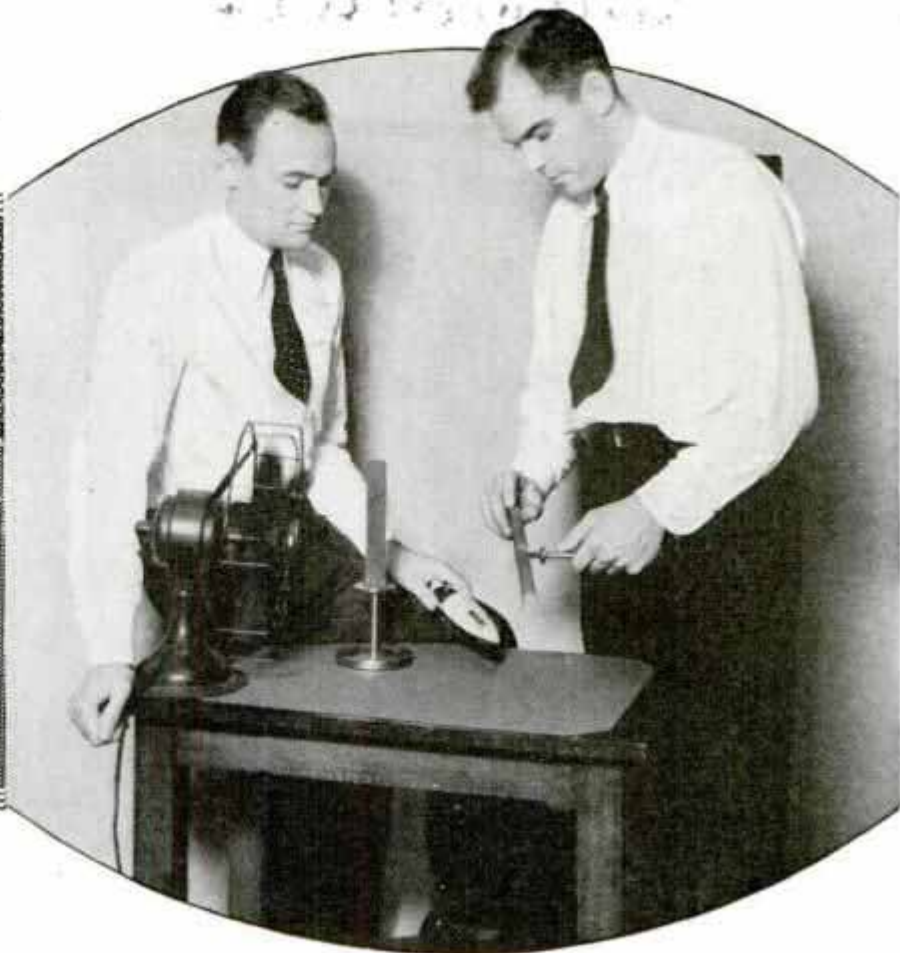
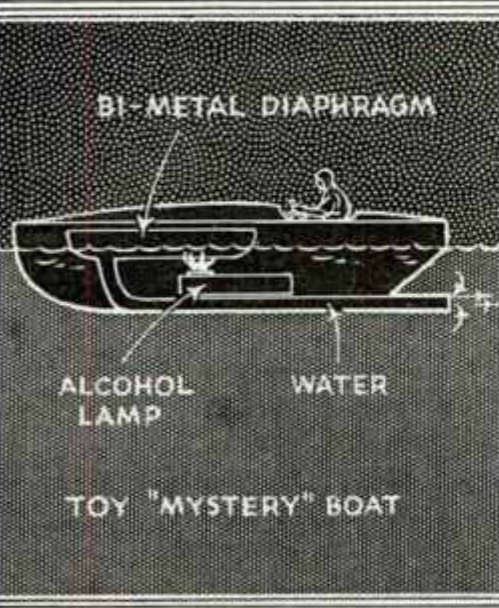
Still another toy that has been found in-

Top, Left, Experimenting with Model Which Imitates Action of Ice-Covered Cable; Bottom, Cable Dancing in Breeze of Fan

structive is a rotor that resembles remotely those used on rotorships. It is a narrow, rectangular piece of wood or sheet metal mounted upright on a pivoted disk. When placed in the current from a fan and turned so that the air strikes the flat side or the edge squarely, the rotor remains stationary. But if it is given a slight push in either direction, it will spin merrily. If you drill a hole in one end of a similar strip, tie a string a few feet long to it, and whirl it about your head, you have a well-known toy that sings as it spins.

Baker has a toy boat that he bought at a store. It employs a novel system of pro-

Left, How Toy Boat Operates; Right, Toys for Vibration Study Include Spinning Vane, Toy Boat and Novel Whirligig



ducing vibrations which make it run. There is a flat, closed chamber having a bi-metal top. Connected to this chamber is a tube that ends at the stern of the boat, this end being open. An alcohol lamp rests so that its flame strikes the bottom of the chamber. The tube and chamber are filled partly or wholly with water, the lamp lighted, and the boat placed in water. In a short time the bi-metal top becomes heated and snaps upward. This draws in water which cools the bi-metal, causing it to snap downward, forcing the water out. This occurs several hundred times a minute, the boat sounding for all the world like a tiny motored craft. Every time the water is squirted out, it emerges in the form of a jet, which causes the boat to move forward.

Vibrations in motors and other machinery of all kinds give rise to hundreds of problems, but the engineer who knows his vibrations usually can apply an effective and simple remedy, once the seat of the trouble has been located.

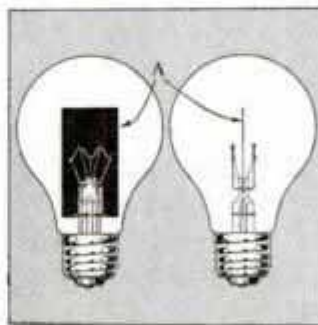
In the days when machinery moved at a slow pace, little trouble was experienced with unwanted vibrations. Today, however, the high speeds make the matter highly important. Only in the last few years have engineers been giving extensive thought to vibrations. By studying

them, analyzing them with scientific toys and delicate instruments, they have found the causes of many earlier troubles that, at the time, defied explanation.

01842

TWO-FILAMENT SIGNAL LAMP ENDS BURN-OUT HAZARD

Dangers surrounding the burning out of signal lamps at traffic intersections, railroad crossings, in hospitals, at emergency exits and the like are eliminated by a two-filament bulb. Instead of the conventional sixty-watt filament, the new lamp has two thirty-watt filaments separated by an opaque screen and operated in multiple with each other. With both filaments burning, the lamp glows with uniform brightness. A burn-out of either filament results in a shadow being



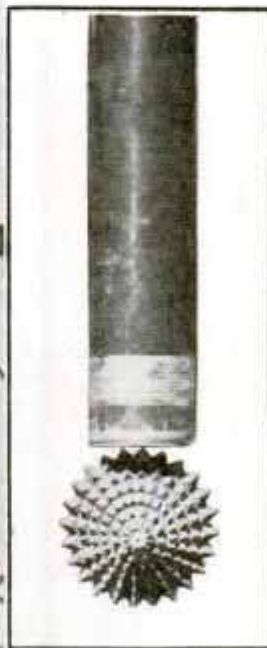
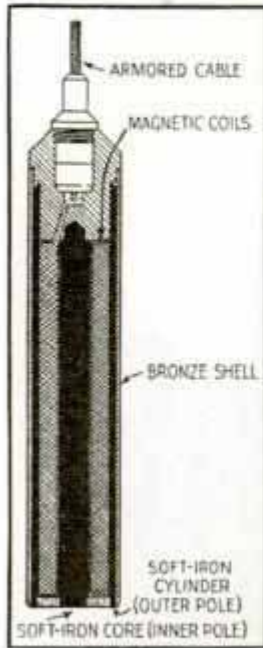
cast over about half of the signal lens area. This shadow indicates to maintenance forces that a lamp should be replaced.

*Chas. Charles Adler, Jr.
Adler Safety Control Co.*

General Electric Co. Chicago, Ill.

4439 Santa Fe Ave.
 Los Angeles Calif

Chas. Wilfred & Co. Wells



Two Demonstrations of Power of Electromagnet Used in Oil-Well "Fishing"

square inch. To prevent such pressures from forcing water inside the instrument and thus stopping its operation, the core is hermetically sealed within the case by electric welding. The electric current is supplied through an armored cable which also supports the magnet as it is lowered. The electricity is generated at the surface and the entire equipment is mounted on a specially designed truck which carries a generator to supply the current and a hoist, powered by the truck engine, to lower and raise the magnet and its 5,000 feet of cable. An indicator shows when the magnet contacts the metal

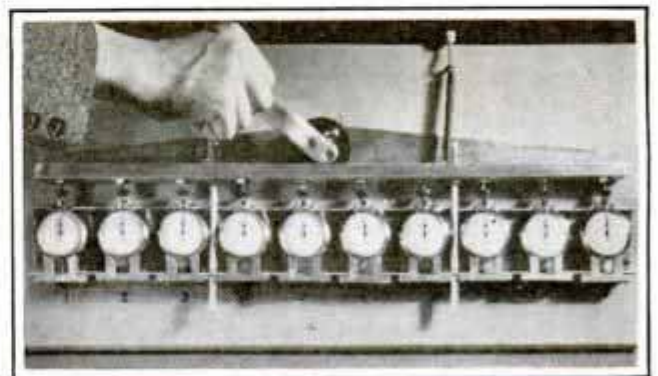
METAL LIFTED FROM OIL WELL BY ELECTROMAGNET

Broken bits and other pieces of metal lost in deep wells must be "fished" out before drilling can be resumed. Heretofore this has always offered a task taxing the ingenuity of oil men, but now the process has been simplified by using an electromagnet and utilizing the same principle as that by which an ordinary magnet picks up nails. Casing and large tools can usually be recovered with devices especially designed for the purpose, but broken pieces of metal are not so easily fished out since they often lodge crosswise of the hole and ordinary fishing tools cannot grasp them. In making an electromagnet for use in oil wells lined with pipe, it was necessary to have the magnetic force confined to the very tip, since otherwise it would adhere to the metal casing and difficulty would be encountered in pulling it up with the electric current turned on to create the magnetic field and attract the loose piece of metal. This difficulty was overcome by incasing the entire unit in a steel shell. Wells also are frequently filled with mud and water and a magnet lowered to the bottom might encounter pressures of from 3,000 to 4,000 pounds per

and also shows if the metal drops off during the ascent. Another indicator on the table shows just how far down the hole the magnet is at any time. The magnet can lift many times its own weight, and can hold a heavy body with little more than a point of contact. A magnet three and one-half inches in diameter can lift 450 pounds and one nine inches in diameter has a capacity of 1,600 pounds.

TEN STOP WATCHES ON BOARD TIME ALL BOATS IN RACE

Heretofore, timing a boat race usually required one stop watch and one timer for each entry, but now one person can time



Row of Stop Watches Attached to Board Enabling One Person to Time a Boat Race

Wilcox Crittenden Co

ten boats simultaneously with the aid of a simple device holding ten stop watches. It consists of a board on which the watches are clamped. Above the watches are a hand lever and cam which depress a horizontal member containing ten rubber-tipped contact buttons so arranged that each presses the stem of a watch and starts it when the lever is depressed. The lever is pressed when the race starts, then the first watch is stopped as the winner crosses the line, and each succeeding watch is stopped in turn by hand as the other boats finish. When the race is over, the watches give a complete record of the performance of each craft and are accurate to within about one-fifth of a second.



Above, Sending Radio Message from Police Car; Right, the Antenna Post and Truck Which Carries the Transmitter



TURKEYS ISOLATED TO KEEP WILD FOR HUNTING

Keeping wild turkeys wild is the object of an experiment in southern Illinois. Under the supervision of the state department of conservation, a group of 100 birds has been placed on an island so that human contacts may be eliminated. The final result, the department hopes, will be restoration of the game turkey, bringing with it more sport for hunters. The decision to isolate the birds was reached after efforts to raise wild turkeys on a state forest preserve failed because of the tendency of the bird to become domesticated. In other efforts of this kind, the turkeys multiplied rapidly but failed to develop a wild wildness. Efforts to put them on their own by taking them several miles from human contact were balked when the birds took to the air and flew back to feeding stations before the preserve workmen could return.

TWO-WAY POLICE RADIO UNITS SPEED UP PATROL WORK

Four patrol cars used by the police of Lake Forest, Ill., have been equipped with two-way radio units, enabling the auto details not only to receive messages from police headquarters, but to transmit reports to headquarters as well. The sets operate on a wavelength of only eight meters, thus virtually limiting the sending radius to the limits of the town. Each car carries its sending equipment in a truck mounted on spring rubber from which an aerial extends upward about ten feet. This aerial, of the single-post type, is mounted on a universal bearing, so it swings down if it encounters any obstacle.

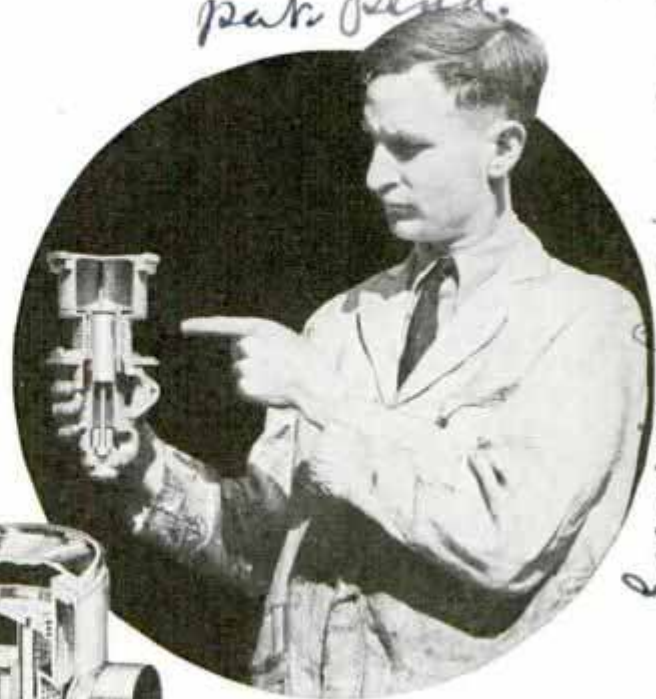
Chicago Daily News 11/21/33

Com. Exes. E. Thompson 48 Lane Ave. Waukegan, Ill. 409. Waukegan North Branch Waukegan, Ill.

Charles E. Thompson

Waste Gas Makes Efficient Automobile Fuel

Automobiles and trucks in some western states are being equipped with special mixers so they can use butane gas instead of gasoline for fuel. Millions of cubic feet of the gas, a by-product in petroleum refining, have been wasted in the past because few uses had been found for it. This gas is delivered to the cars in liquid form under pressure in steel tanks and reverts back to gas in the mixer which replaces the conventional carburetor. Butane delivers about one-sixth more mileage than gasoline, it is claimed, and has an octane rating of 120, as compared to a rating of about eighty-two for some kinds of ordinary gasoline. This permits raising the compression ratio of the engine until as much as twenty-five per cent more power is obtained. At present the liquid gas is sold for about three cents a gallon. The liquid gas weighs less than gasoline, forms no carbon and does not dilute the crank-



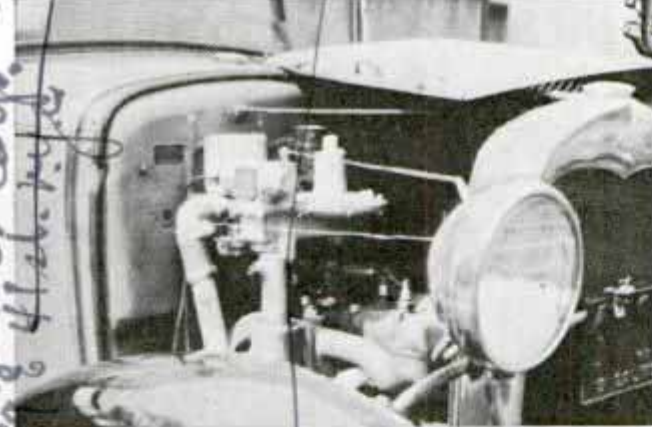
Gas and Air Mixer Which Replaces Conventional Carburetor in Car Using Butane Gas for Fuel



amount of it vaporizes upon contact with the air. The gas vapor is shut off automatically when the engine stops. The non-freeze regulator is self-cleaning.

TWO-TON HARVESTER FOR RICE WORKS UNDER WATER

Submerged rice crops may be harvested by means of a two-ton machine developed and tested by H. F. Hunick, of Holtville, Calif., and Dr. H. T. Cory. It consists of a series of six hollow rollers three feet wide and eighteen inches in diameter on each side. Around these cylinders revolves a conveyor belt in which are hard-rubber teeth. Corresponding teeth in the cylinders in the rear of the machine drive the belt. A forty-horsepower truck motor operates the harvester, which also is equipped with a stripper. This device strips the grain, the harvested kernels dropping into a circular trough through which they are forced sideways by an auger conveyor. The harvester eliminates a ten to twenty-day delay of waiting for the fields to dry for gathering the crop, since it works under water. The complete machine is capable of carrying a four-ton load without sinking more than two to two and one-half inches in the soft rice field.



case oil. Flowing from the tank, it sprays into a chamber attached to the exhaust manifold where a hot spot evaporates the heaviest parts of the liquid. From this converter the gas flows to the mixer where it combines with air in the proportion of one cubic foot of gas to thirty-one cubic feet of air. From there it goes to the standard intake manifold and on to the cylinders. At present the greatest outlet for this fuel is for trucks and stationary engines, since there are few stations where the motorist can have his fuel tanks recharged. No priming or pre-heating is necessary, it is claimed, as the gas can go into the motor cold, since a considerable

Phil gas Co General Motor Bldg

Submarine Carbon Chem...

Corps 1109 Santa Fe Ave Los Angeles, Calif. pat. pend.

Ensign Carburetor Co Huntington Park

Carl C. Esreer Carpenter



Above, Left, Executing a Slow Roll; Center, Ready for a Turn; Right, Making a Quick Turnover

SECRETS of the

By FLOYD SMITH

As Told to Lloyd Graham

Delaware Road, Buffalo, N.Y.

LESS than two decades ago even scientists were sure that a person would lose consciousness, certainly not be able to control himself, if he fell free through the air. Now we know better, but most people still believe that when you fall through the air you merely fall and that is all there is to it. Nothing could be farther from the truth. With training and experience you can maneuver your body almost any way you like.

In 1918 and 1919, when I was developing the modern free-type, manually operated parachute, I was sure there was no real basis for the belief that a man will lose consciousness in falling. So I set out to prove it. I got "Jimmie" Johnson, then chief civilian test pilot at McCook field, to take me up for a delayed-opening jump—the first ever made by anyone. At 1,200 feet, he throttled down to seventy miles

Left, Falling as Parachute Opens; Right, Going into Swan Dive to Decrease the Speed

per hour and I dropped off without having my hand on the ripcord. I fell with my feet a little below and ahead of my

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"SILK" SAILORS

Above, at Left, Inviting a Spin; Center, Ready to Land; Right, Going into Spiral; Below, at Left, High-Speed Vertical Fall; Right, Position for Falling Flat, Face Down

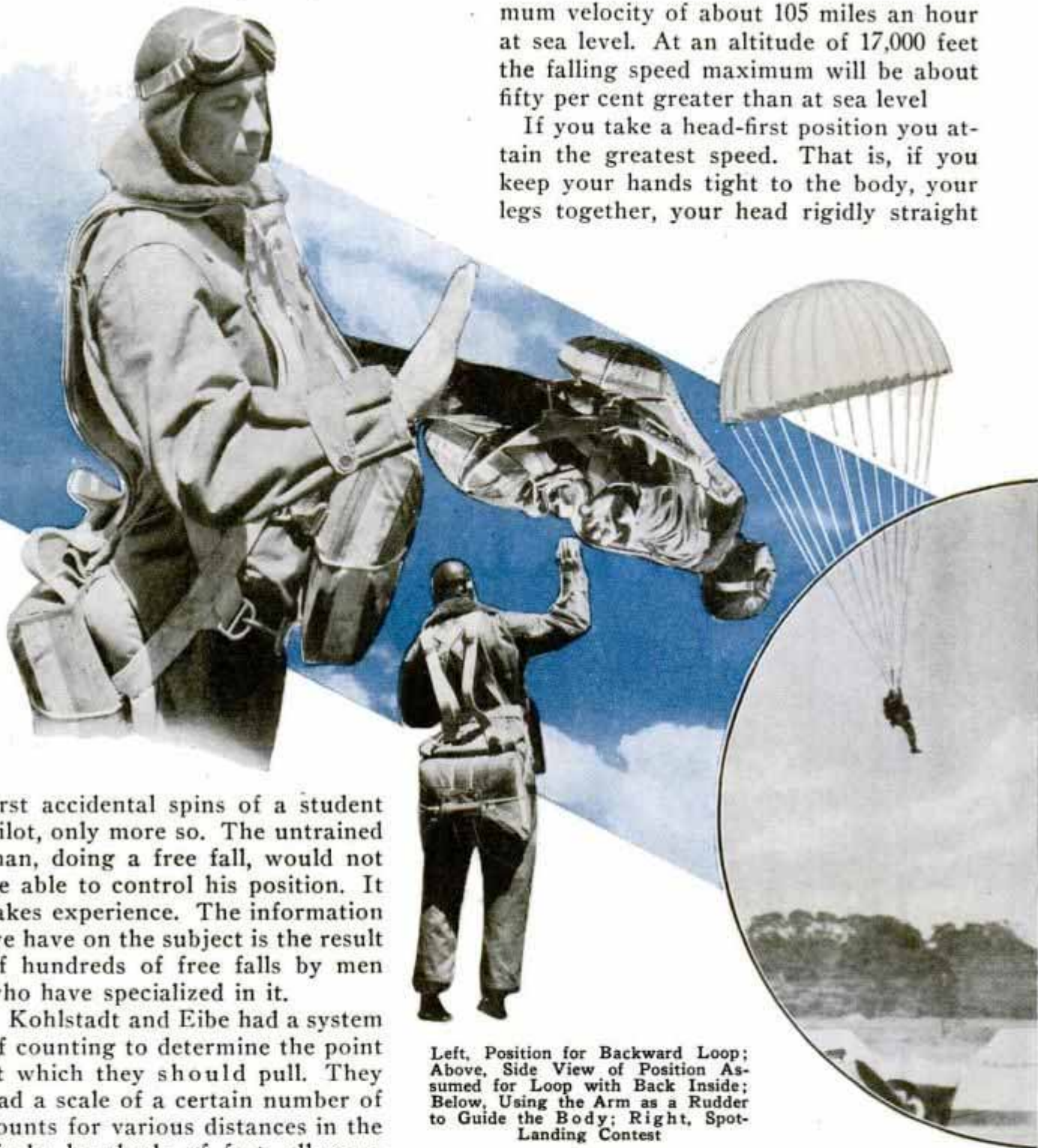
Since that day scores of men have made long free falls or delayed-opening jumps. As I have watched parachute development I have seen extraordinary progress in the control of the human body in the air. Ten years ago I used to watch "Kohley" Kohlstadt and Harry Eibe fall free from 1,000 to 5,000 feet, opening their chutes with a variation of less than 100 feet from the height at which they had planned to open. Neither of them ever lost consciousness or came anywhere near it. In more recent years free-fall jumps of more than three miles have been made with perfect results, the late H. E. "Spud" Manning holding the record in this country and John Tranum, of England, holding the world's record.

It is true that the senses—feeling, sight and mental calculations—react entirely differently while falling free than when falling or diving seated in a plane. The first free falls of a considerable distance produce mental sensations similar to the

body and was able to maintain that position, with my face up, watching the ship in order to judge distance of fall. I put my hand on the ripcord and when I guessed I had fallen 500 feet I pulled and made a good landing.

imum velocity of about 105 miles an hour at sea level. At an altitude of 17,000 feet the falling speed maximum will be about fifty per cent greater than at sea level

If you take a head-first position you attain the greatest speed. That is, if you keep your hands tight to the body, your legs together, your head rigidly straight



first accidental spins of a student pilot, only more so. The untrained man, doing a free fall, would not be able to control his position. It takes experience. The information we have on the subject is the result of hundreds of free falls by men who have specialized in it.

Kohlstadt and Eibe had a system of counting to determine the point at which they should pull. They had a scale of a certain number of counts for various distances in the air by hundreds of feet, all carefully worked out. They used the system hundreds of times with amazing accuracy.

In determining this counting scale we found, for example, that at the end of a five-second free fall the human body has fallen 400 feet and attained a velocity of 100 miles an hour. We found that up to this point the position of the body in the air makes no appreciable difference in falling speed. But from this point on the position of the body is of increasing importance. If you lie in the air flat with arms and legs outspread, you will reach a maxi-

Left, Position for Backward Loop; Above, Side View of Position Assumed for Loop with Back Inside; Below, Using the Arm as a Rudder to Guide the Body; Right, Spot-Landing Contest

and pointed toward the earth from five seconds to ten seconds, you will attain a velocity of about 250 miles per hour and, during ten seconds, will fall about 2,000 feet. The terminal velocity of a man falling free in the head-first position is about 265 miles per hour at sea level. At that speed, air resistance against your body balances the pull of gravity. Of course this varies greatly with air conditions encountered in the fall, for you, like a plane, may be slowed up or speeded up by up and down currents. A man in tights and with-

Left, Free-Fall Jumper as Parachute Opens; Right, Floyd Smith, Author of This Article, Ready to Make a Free-Fall Jump

Parachute Photo
Courtesy Parks Air College



out parachute equipment also would fall faster than a man in loose clothing and with two parachute packs. Weight of the man does not

affect speed. A heavy man will fall as fast as a light one, everything else being equal, for, as his weight increases, his size and, consequently, his air resistance, increases.

By laying flat and balancing with spread arms you can fall indefinitely at relatively low speed and in perfect position to calculate your distance from the ground. I refer here to a sort of swan dive with the body at an angle of about forty-five degrees to the earth. By pulling in one arm you can quickly roll over on your back. Or you do the same by merely arching your back in the swan dive, thus placing your legs vertically and eliminating their resistance,

causing the air resistance against your body to turn you over backward. You may then remain in that position for a moment, spotting the location of planes near you. If you should keep your back arched, you would continue to go around, looping with your body, the back inside the loop.

Turn partly on your side in a swan dive, slightly arch your back, at the same time move one hand forward with the swing of your body and the other backward, and you will spiral or turn right or left as the case may be. Over-control in this maneuver will cause a spin. If this body spin is allowed to continue it will tighten up into a very fast and dangerous rotation. Ev-

(Continued to page 130A)

Weston House
1799 & Pittsburgh

Cambridge, Mass

**TEMPERATURE IN EIGHT PLACES
SHOWN ON ONE INDICATOR**



Indicator Which Shows Temperatures in Eight Separate Locations in Industrial Plant

Temperatures at as many as eight remote points in an industrial plant are measured on an electric indicator little larger than a thermometer. Sensitive search coils are located at each of the points where temperature is to be recorded and these are connected to the instrument by a low voltage of electricity so that ordinary bell wire can be employed for the purpose. An indicating dial permits the operator to select each point successively for a temperature reading.

**LEAKAGE OF HELIUM IN EARTH
HELPS TO TELL ITS AGE**

Determinations of the leakage of helium through geologic rock materials are helping to clarify uncertainties in estimates of the earth's age. The helium method depends upon the amount of gas, which is used to lift airships, inside the rocks. The gas is split off when one radio-active metal changes into another. Since this change is known to be constant, scientists find the proportion of helium in a rock and compute its age. Sometimes this method produces incorrect estimates, because helium leaks out of various metals. To determine the rate of leakage, Dr. William D. Urry,

of the Massachusetts Institute of Technology, has placed helium in iron and bismuth containers and measured the loss after the gas had been subjected to various treatments. He found that there was no appreciable leakage. If helium is free inside a porous rock, it will slowly diffuse through the pores. Doctor Urry has set up a mathematical expression to account for this leakage. Another method of determining the earth's age, based upon the conversion of metal uranium into lead, gives an estimate of 3,000,000,000 years.

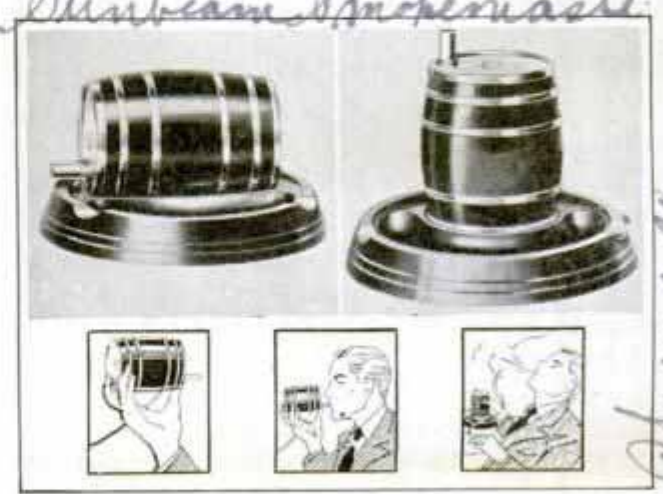
**CHEMICALS REPLACE HOT IRON
IN BRANDING CATTLE**

U.S. Marly 2/27/33

Germany is experimenting with a chemical preparation to replace the hot iron generally used in branding cattle and other animals. It is claimed the chemical method is not only painless, but does not damage the hide as a burned brand does. The preparation is applied with a brush to the coat of the animal and acts as a permanent depilatory, the resulting brand showing up clearer than a burned one.

**LIGHTED CIGARETS ARE SERVED
BY HANDY DISPENSER**

Lighted cigarettes are dispensed from a handy server which combines an ash tray, a container and an electric lighter in one compact unit in the form of a jet-black barrel standing upright or horizontally on a tray base. When the barrel is lifted and a button is pressed, a cigarette pops out and is lighted instantly by placing the tip in the mouth and puffing, the other end remaining in the barrel holder.



Two Forms of Cigaret Server Which Combine an Ash Tray, Container and Electric Lighter

Reported by J. L. Leff. Commerce by John F. Kelly

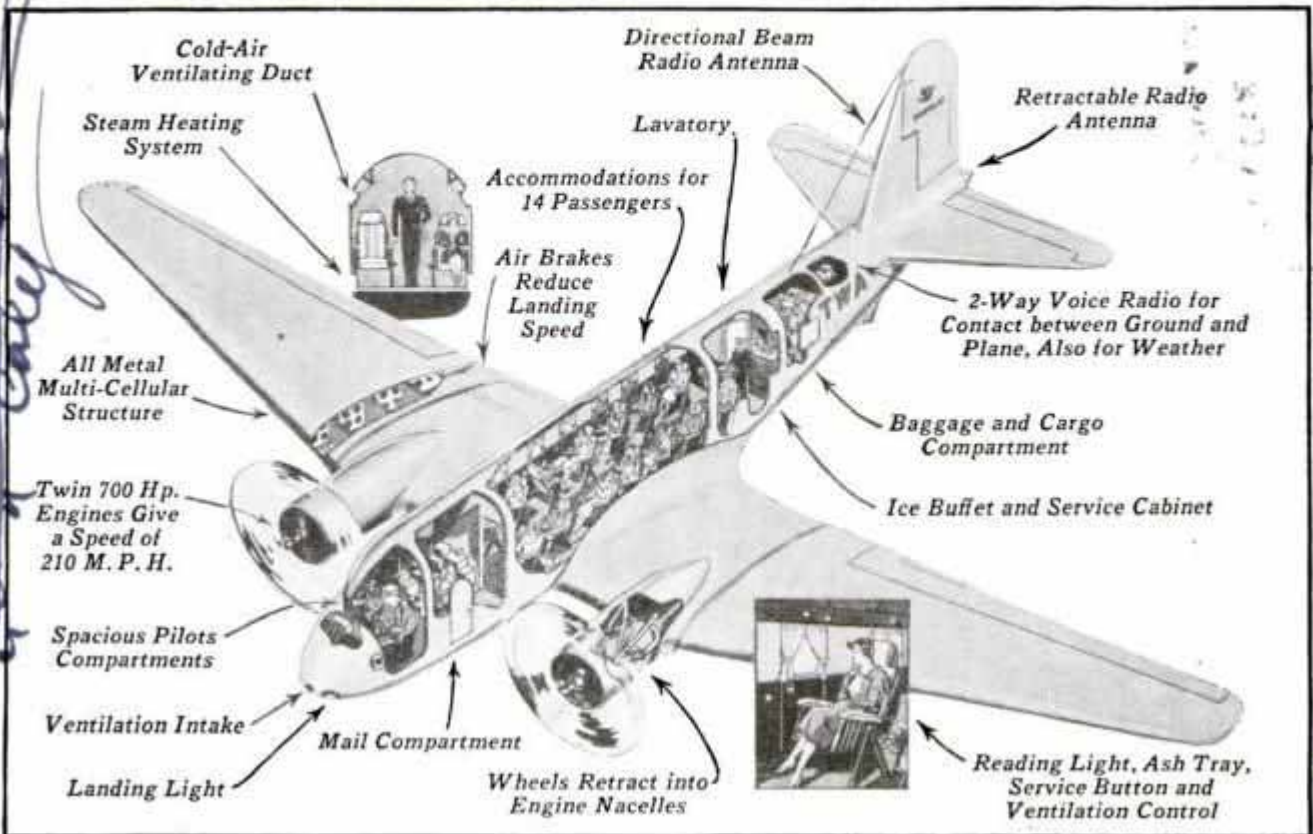
Chemical at Hamburg

C1876

*Science Service
11/24/33*

Chicago Flexible

Latest Airliner Combines Speed and Comfort



Drawing Shows Features of Douglas Transport Which Will Be Used on Transcontinental and Western Air Route; Note Absence of Obstructions in Passenger Cabin; Either Motor Is Capable of Propelling the Ship

Capable of a speed of 210 miles at 8,000 feet, a new airliner for use on Transcontinental and Western Air lines has a landing speed of less than sixty miles per hour. The passenger cabin is unusually silent, as quiet as the average Pullman car, enabling the passengers to carry on conversations without raising their voices. The fourteen seats are adjustable to any comfortable position and may be reversed if passengers care to ride face to face for playing cards or talking. An ice buffet and service cabinet permit the serving of meals in the air. The airliner is manned by two pilots whose cockpit is equipped with all the modern instruments for safe aerial navigation, including radiophone transmitter and receiver. The all-metal wings and fuselage are perfect examples of streamlining. Landing wheels are retractable into the engine nacelles. While the great transport is powered by two 700-horsepower motors, it can take off, fly for long distances and land with only one motor running. In tests, one motor propelled the ship from take-off to 9,000 feet altitude, then across country 250 miles at better than 100 miles per hour, to land safely

while overloaded. One feature of the ship is the abundance of head room. Another is the absence of aisle obstructions.

PORTHOLE IN WINDOW OF CAR MAKES SIGNALING EASY

Making hand signals in traffic in cold weather usually necessitates lowering the window of the automobile next to the driver, allowing a cold blast of air to enter each time. This is unnecessary, however, if your car is equipped with a porthole window, fitted into the center of the window next the driver. When the driver desires to signal, the round window raises on a hinged tension spring, closing again when the arm is withdrawn.



Copper sheeting is being employed for book covers where library volumes are likely to be subjected to hard usage.

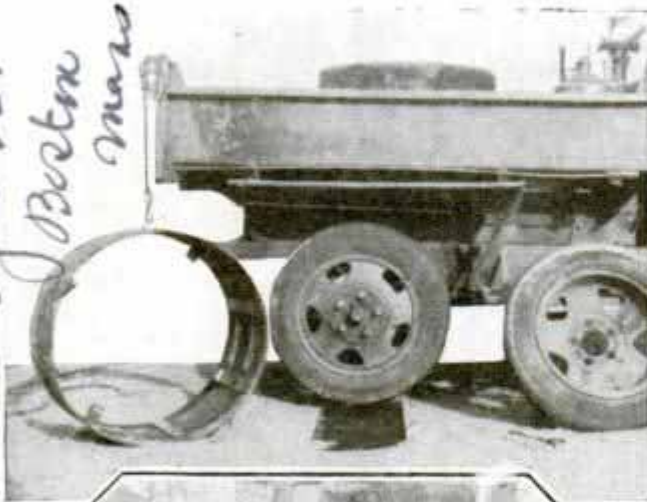
Cool. Elmer H. Creek 3011 Santa Monica Calif

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PORTHOLE IN WINDOW OF CAR MAKES SIGNALING EASY
Emb. George A. Posner 1917 26 7 3
Los Angeles Calif

I receive news letter

RIM WHEEL CONVERTS TRUCK INTO ROAD ROLLER



Top, Rim for Converting Truck into Roller; Bottom, Rim Shown in Use on Right Wheel

Attachment of a broad metal rim over the rear wheels changes a small truck into a road roller for use on highways, golf courses, lawns and the like. The device is designed for trucks equipped with dual pneumatic tires. It is a wide steel band that fits over the wheels, being held in place by flanges between the two tires on each wheel. The rim is installed by deflating both tires, removing the outer wheel, sliding the rim on and replacing the wheel. Inflating the tires completes the job.

HURLEY GOT IDEA FOR WASHER FROM POPULAR MECHANICS

While thumbing through a copy of Popular Mechanics Magazine one evening in March, 1908, the late Edward N. Hurley saw a photograph showing how someone had belted a motor to an old-fashioned hand washing machine. Next morning he took the magazine to A. J. Fisher, manager of his machine shop. "That job you're

doing now will not last long," he said. "We need to make something that will sell. I've got an idea out of a magazine—a washing machine with a motor attached." That night Mr. Fisher took home his drawing board and spent the evening planning a reversible-cylinder electric washing machine. His plan featured a power wringer which would wring only one way, but this was changed to a three-roll reversible wringer later. In building the first model, Fisher bought a washing machine from a Chicago department store and adapted it to electricity. From the start, this idea gleaned from a magazine caught the public fancy and the Hurley Machine company gradually expanded into a seven-acre space. More than 1,000,000 washers were produced without any material change in the original plan. Thomas A. Edison bought one of the first models and today it stands in the Ford museum at Dearborn, Mich., a carefully guarded relic. The national prominence of Mr. Hurley in later life was founded partly on this chance idea and its development.

HIVE OF BEES IN GLASS HOUSE KEPT IN LIVING ROOM

In order to be able to observe more closely the work and habits of a hive of honey bees, a California bee-keeper has established his pets in the living room of his home. The side walls of the hive are made of glass and an inclosed runway extends from the hive to an opening in the wall of the house, enabling the bees to come and go at will. Apparently the bees do not object to living in a glass house, for they go about their work as usual.



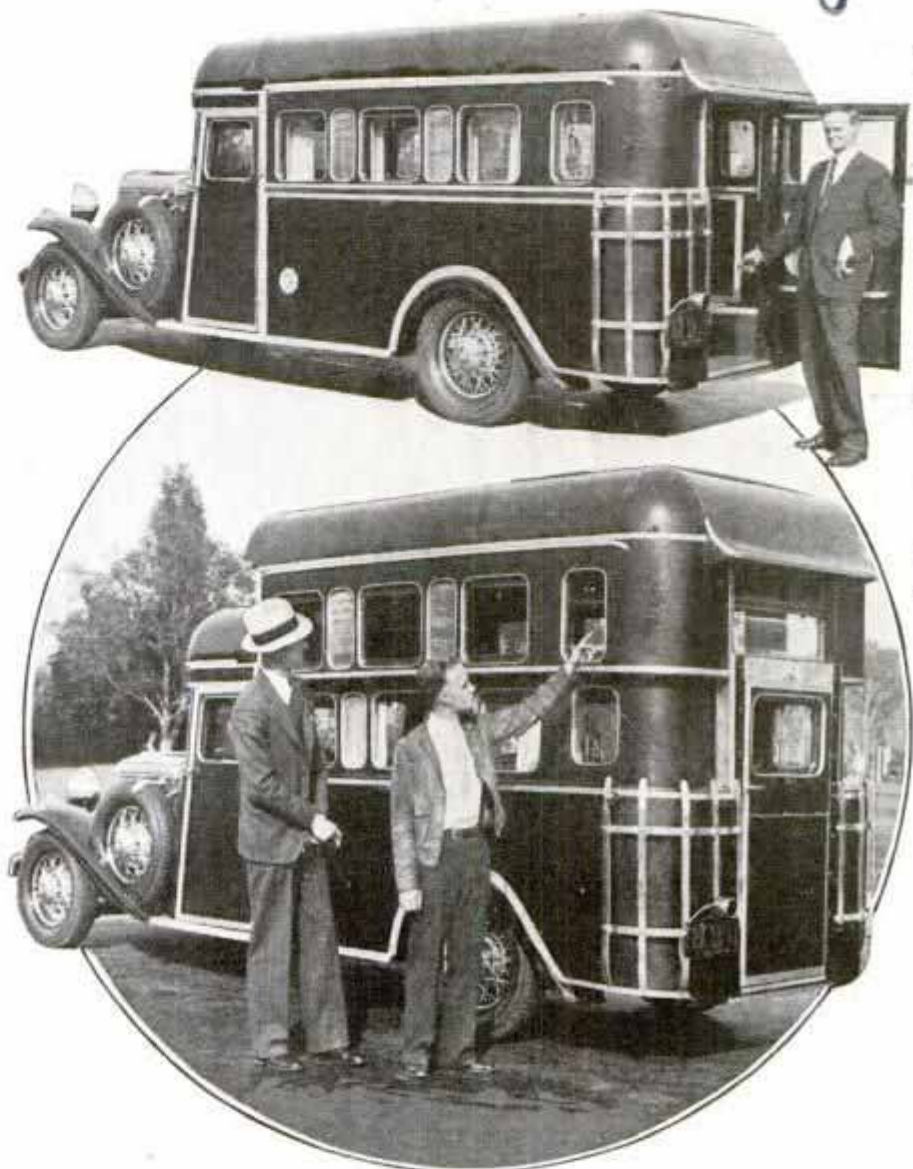
Beehive with Glass Sides Which Is Kept in the Living Room of a California Apiarist

*England Metal Culvert Co
10 Alger St
Boston
Mass
1875
Case of Hurley
1875
Almer H. Crook
Santa Monica*

Case of Tom F. Blackburn

Telescoping Auto Body Has Room for Beds

Room at night for several sleepers is provided in a family coach with a telescoping top which can be raised several feet when the motor car is parked. The roof and outer side windows slip up over the outside of an identically arranged group of inner windows. In the dropped position, the roof rests on a ledge below the windows and in this position, the windows of both parts coincide. The roof is raised by pressing a button on the instrument panel which operates an electric hoist. A full-size mattress is cradled in a frame just above the cab windows and, with the roof raised, there are several feet of space above this mattress. During the day this bed can be carried in the ceiling of the roof. Adjustable cushioned chairs are provided for five occupants and two additional single beds fold against each side wall. A table folds in a similar manner and there is also a refrigerator, sink with running water, folding kitchen table and utensil space mounted



Telescoping Auto Body in Lowered and Raised Positions; When Raised, Room Is Provided for "Upper-Berth" Sleeping Quarters

on rear door, wood and tool compartments in the floor and built-in spaces for clothing and other equipment.

FOUR-DIRECTION SIGNAL KEEPS FLYER ON HIS COURSE

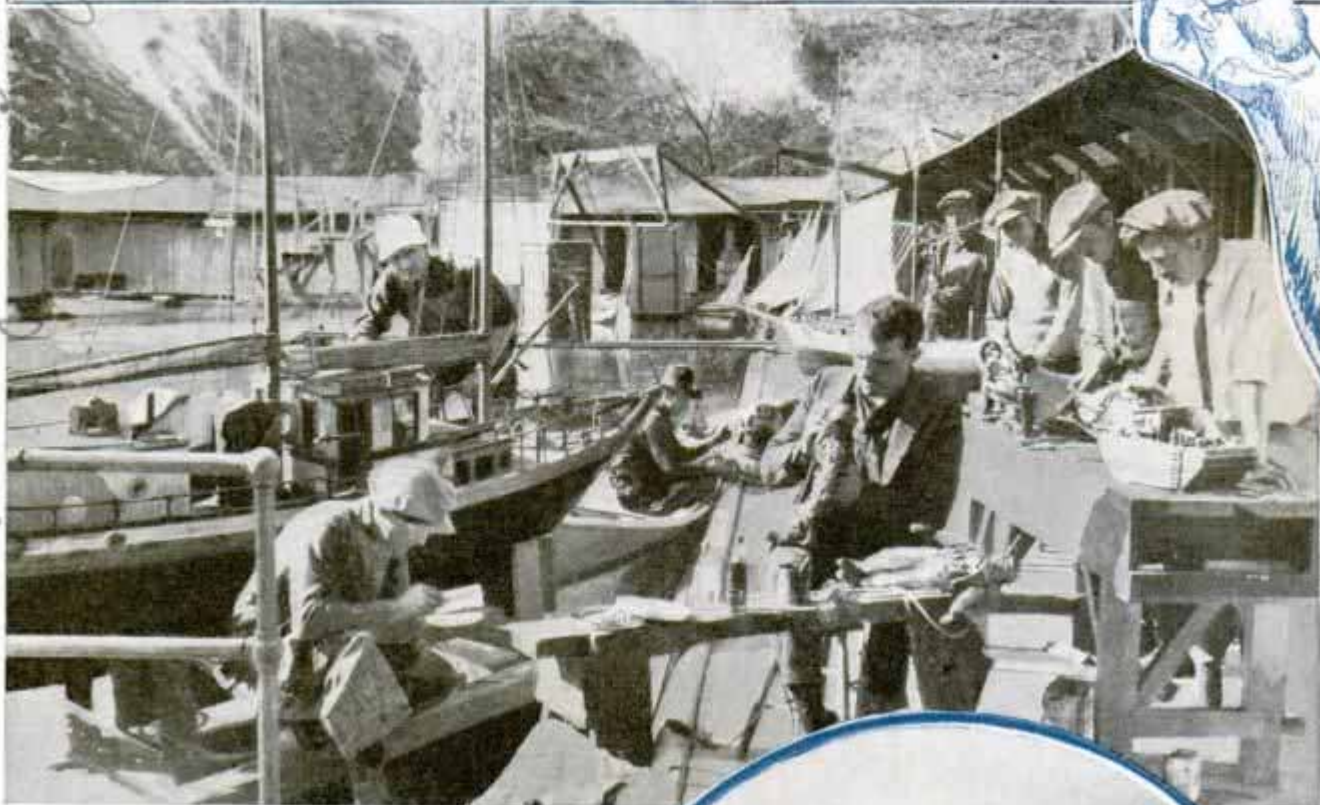
Chances for an air pilot to keep on his course or to reorient himself if he becomes lost have been increased by an innovation in the present type of radio range-beacon developed by F. W. Dunmore of the bureau of standards. The system makes possible the sending of four different signals in four directions—one dot west, two dots east, three dots north and four south. By noting which signal is loudest, it is easy for the pilot to determine his general di-

rection. With the radio beacon now in general use, the determination of absolute direction or position on airways is difficult because the same signal is sent to the four points of the compass and when the aircraft is near the beacon a pilot may pass from one course to another without knowing it. If lost it may take him an hour to reorient himself, and this often becomes hazardous, particularly when the fuel supply is low. No additional equipment on aircraft is required for receiving the new signals. The system has been subjected to extensive tests.

Washington D.C. Science Newsletter. 11/25/33

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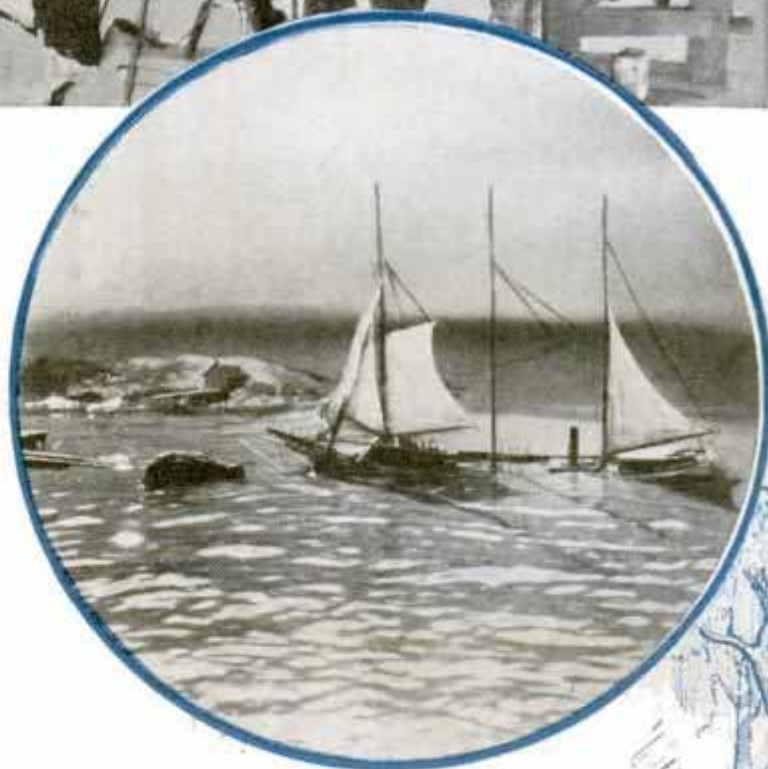
DOES *the* CAMERA



DO you know what a miniature is or how a "glass shot" is made? Do you know why the movie studios sometimes go to some lonely railroad crossing and film a crash between the five o'clock flyer and the villain's automobile, while at other times the same kind of a shot would be made in the studio by the "process photography" department?

Miniatures are most often employed to enable the cameraman to obtain "camera angles" which would be impossible in a lifesize location, due to limitations of construction or adjoining obstructions. In other cases, it is obviously impractical to photograph the lifesize object, as for instance, the wreck of a ship at sea in a storm. Many reasons, other than the sheer impracticability of the thing, appear—difficulties of lighting, camera set-ups and stability of the camera. Close-ups can be easily simulated, but long shots of such scenes are usually done in miniature.

The theory of relativity appears even in



Above, Preparing a Miniature Set for the Movies;
Below, a Miniature Boat Wreck

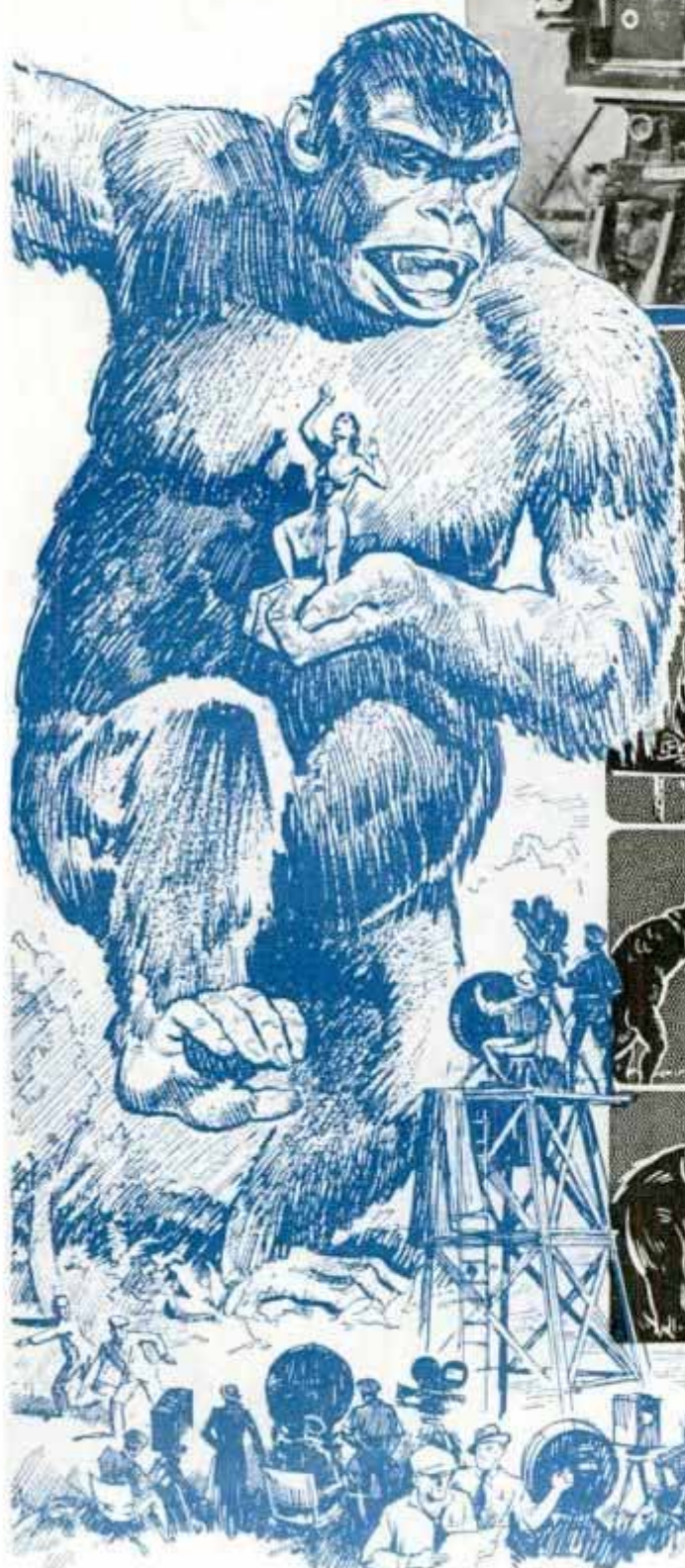
the motion-picture industry, in the making and photographing of miniatures. Anyone who ever had a toy boat to play with can remember that the rolling and pitching is much more rapid than is the case with a real liner. So the motion

Carl Cary Weber, Box 1982,
Hollywood Calif

27697

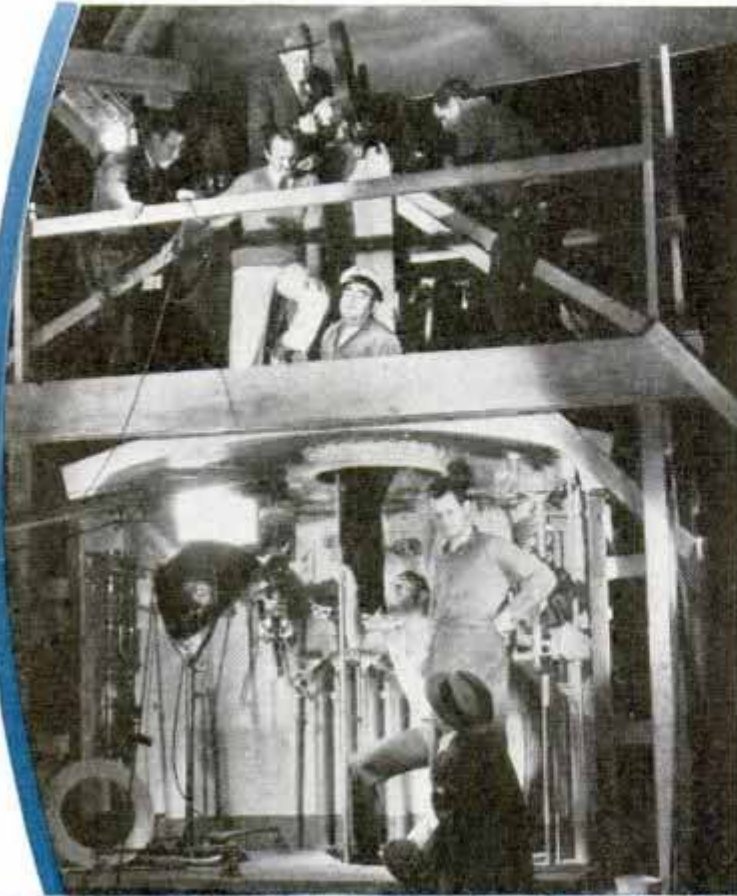
ever LIE ?

Right, Cameras Used in Ordinary Photography and for Trick Work; Below, "King Kong" Contained Many Unusual Effects Like This One Shown in the Making



of a miniature is slowed down to the speed of the object in its normal size, making the toy vessel look on the screen exactly like a huge ocean greyhound. Trains and boats are usually ridden through storms and wrecks only in miniature but automobile and airplane crashes are generally the real thing, because the driver of a miniature auto or the pilot of a miniature plane is hard to animate so that he would appear convincingly alive. Therefore a real stunt man usually takes the car through, or at least into, the crash that you see on the screen.

Natural phenomena such as earthquakes and volcanoes are most easily obtained by building them to order at a greatly reduced scale. Fires are cheaper in the small sizes and also much more pleasant to photograph, but a fire scene without people in it isn't convincing. So you see people appear on the screen in buildings and



actors and actresses go through their parts.

Scenes have been painted on sheets of plate glass through which the actors were photographed, which gave the same effect as a miniature top, but these glass shots have been largely superseded in favor of the miniature tops which allow more flexibility in lighting and treatment. Due to improvements in the quality and "speed" of film many trick camera effects can be produced which were not possible with the former slower speed films. Studio camera technicians have devised a method known as the "projection background" process, by which it is possible to obtain, with a minimum of expense and without leaving the studio, the same result as though an active company were to be sent to a far dis-



Top, Submarine Set on Movie Lot; Below, Special Process Camera Mounted in Soundproof Blimp, and Film Editor, or Cutter, at Work

mountains that never existed except in the diminutive state. Such a stunt calls for a different kind of miniature. The bottom of the model is constructed to life-size scale while the top is made at a greatly reduced scale. This top is suspended in the proper position within a few feet of the camera so that to the single eye of the lens, seeing things without depth, the miniature tops of a building are resting exactly on the lifesize bottoms, where the

tant location. Suppose the principal scenes in a story are on the Sahara desert. Every



studio has thousands of feet of film which have been photographed in all parts of the world by traveling cameramen or news-reel photographers. The film showing various views of the pyramids and the desert will be used to obtain the background for the desert scenes. A large screen is set up on a sound stage and a movie projector is placed some distance from it. The stock film to be used for the background is then projected upon this screen, while the actors go through their scenes in front of it, a camera photographing the entire ensemble to obtain a finished effect about the same as though the entire production crew had been sent to the desert, with the resultant great expense for traveling and living in a foreign country while the pic-



Top, Running Two Strips of Film through Printing Machine for Background Effect; Center, Shooting a "Flying" Plane; Left, a Double Exposure

ture is being made. Another method involves preparing a special film showing

the necessary background and incidental action. A print from this is placed in the camera in contact with the unexposed negative. The rest of the action is then photographed in the regular manner against a blank or specially colored background which photographs on the new negative. While the new action is being recorded on the film the action of the background light prints the primary film onto the new negative too, so that the re-

sult is a composite of the two separate scenes blended into one picture. This system allows magnification of either element by shooting it in a close-up and then recording the other in a normal scale. Thus a giant can be made to act with ordinary lifesize mortals or a small reptile can be made to appear huge.

Whenever a film is run through a camera its susceptibility to light is not used up, so it can be used again to photograph further action if it is rewound and put through the camera again before development. Thus two scenes can be accurately matched and photographed on the same film. In the studios this same process makes it simple to show any number of semi-transparent ghosts floating through a scene in which real people are casually enacting their roles. This requires careful matching of the action and, to facilitate this, the studios have worked out various special colored paints which appear very different to the eye, yet are reduced to the same shade of grey upon the screen.

Another use of multiple exposure is in the production of twins. A mask is placed

in front of the camera, allowing only half of the scene to be photographed. Suppose you stand on the half of the scene being photographed and simulate a handshake. The cameraman then re-photographs the scene, this time with the mask over the other half of the scene. On the screen you would be shown standing face to face with yourself with your hands joined.

If the cameramen are stumped, there is always the possibility of drawing the picture. Let us suppose we are driving a nail through someone's hand. The preliminary action is covered in medium shots and the idea portrayed in general, then it is necessary to show the detail of the action. If you are to see twenty seconds of action the artist prepares about five hundred drawings showing minute changes of position of each moving portion of the picture. All stationary background to the action is meticulously reproduced in each individual picture, while the moving parts gradually change from the primary position to the final one. The cameraman photographs each picture in rotation and the

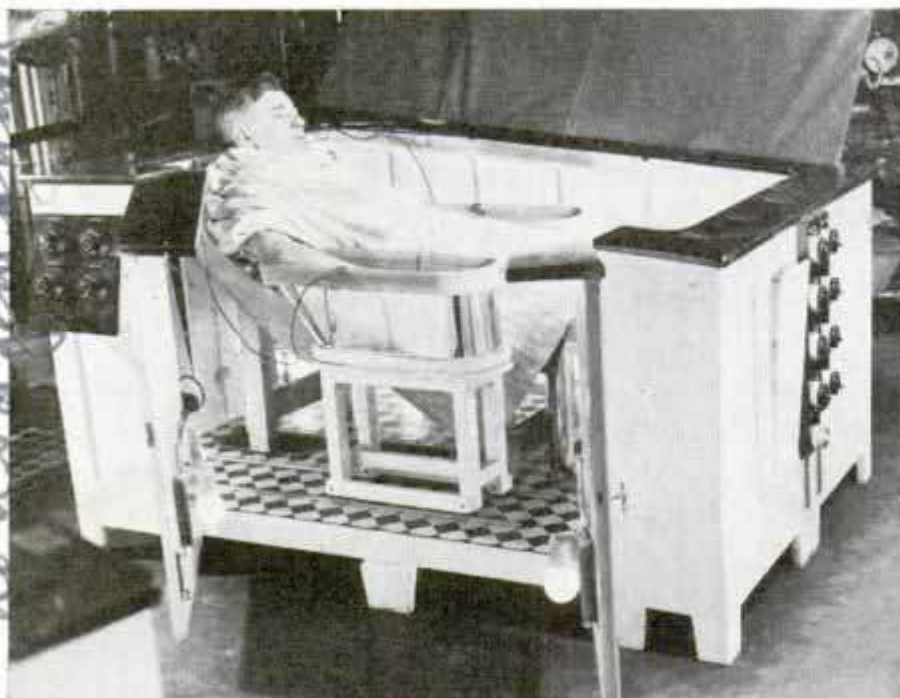
(Continued to page 126A)

C/826
**ELECTRIC BATH FOR PATIENTS
 INDUCES ARTIFICIAL FEVER**

Certain diseases are being combated successfully by inducing in the patient an ar-

tificial fever such as might result from other diseases. One way of doing this in the past has been to inoculate a patient with malaria fever, the resulting rise in temperature accomplishing the desired result.

However, it is no longer necessary to introduce one disease in order to cure another for an artificial temperature can be produced and controlled by an electrotherapeutic apparatus which is like an electric bath. The patient is placed in a cabinet and the fever is at the control of the operator. The treatment has been used in dealing with rheumatism and cardiac and nervous disorders.



Patient Taking an Electric Bath Which Induces Artificial Fever

© Fox Photos

☛ Trees planted so as to shelter a house may save as much as fifteen per cent in fuel bills.

*London England. (W.C.I.)
 no U.S. Patent known*

Medical Supply Assn.

*Science News
 11/25/27*

CAJON PASS MAKES MILD CLIMATE IN CALIFORNIA

Cajon pass, a great gash in the San Bernardino mountains, forms a twelve-mile long natural hot-air furnace which manufactures southern California's mild winter weather. This theory has been advanced by Irving P. Krick, meteorologist. He believes that this pass, which has a 4,000-foot elevation, is the only exit for masses of relatively cold air, high above the desert, which are prevented from flowing down on the Los Angeles territory by the mountains. Due to being crowded by the walls of the pass, this air rushes down with increasing velocity and as it descends it is pressed down by a heavier and heavier blanket of the earth's atmosphere. When air is compressed, it becomes heated, and the heated air makes the mild climate. If Cajon pass were filled by some giant hand, the meteorologist says, the climate of southern California would become like that of San Francisco.



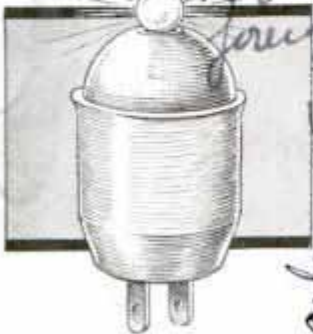
Stand Equipped to Place the Camera in Any Position for Photographing Commercial Scenes; Note Unusual Angle in This View

CAMERA STAND SPEEDS WORK IN COMMERCIAL STUDIO

Arranged so that the camera may be handled from every angle and position, a camera stand for commercial use permits horizontal, vertical, forty-five degree shots, as well as from any angle between. It moves sideways, forward and backward, all with the movement of the hand from the operator's platform. Raising the camera to any height or lowering it to the floor is possible.

NIGHT LIGHT WITHOUT A CORD PLUGS IN ANY OUTLET

For use in bedroom, bath, hall or on the porch for illuminating house numbers, a night light without a cord plugs into any alternating-current outlet. It consists of a shell accommodating a flashlight bulb and gives a soft glow which makes all objects in a room visible. It is finished in ivory, blue or green and, at ordinary rates for current, burns 100 hours for one cent.



PLATINUM SHOES FOR WOMEN

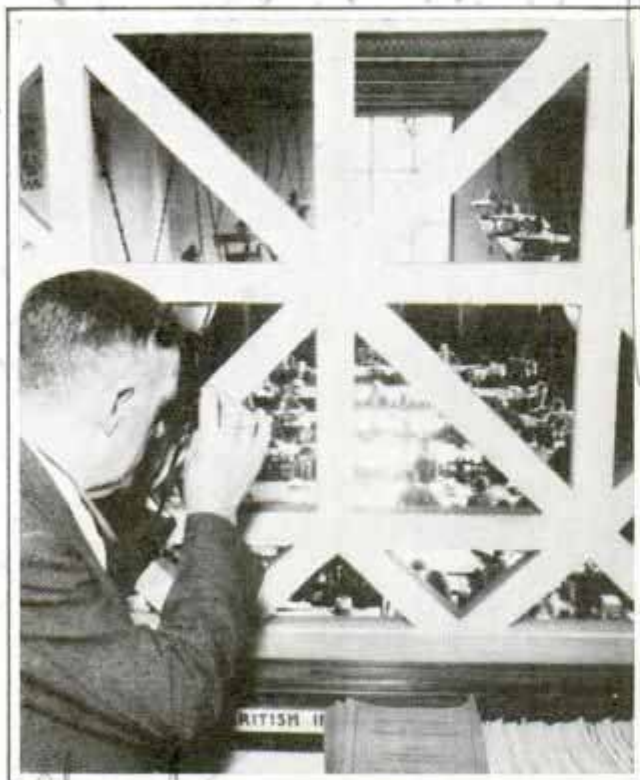
Recently it has been found possible to "beat" platinum into the extremely thin "leaf" hitherto reserved for gold, and this leaf is being used to cover women's shoes. It is applied to a shoe much as gold leaf is applied to a sign and has the advantage that it does not tarnish like silver. Thus women are offered platinum slippers—although the metal covering is almost infinitesimal in thickness.

*Permanence
Suggenheim Laboratory of Life
California Institute of Technology*

*11/27/33 C186
\$300.00 job Dallas*

*1003
Higginbotham Photo Engraving
Advertising Co 1003 Camp St.
New York*

Hamilton Beach International



"Library Detective" Watches Readers in Room Below with Powerful Glasses to Save Books

HIDDEN EYES WATCH READERS TO SAVE LIBRARY BOOKS

Hidden eyes keep watch over books in a Los Angeles library, saving a vast amount by preventing theft and mutilation of property. At a screened vantage point above the main reading room sits the "library sleuth" with a pair of powerful glasses. Any person in the room can be brought "close up" in the glasses by the watchman.

PLUG-IN ELECTRIC FIRE ALARM PROTECTS THE HOME

Protection for the home is provided by a new fire-alarm device which simply plugs into the nearest electric outlet. The principal advantage is that the alarm detects fire instantaneously regardless of existing temperatures. It functions rapidly whether the temperature is ten degrees below zero or 100 degrees above. An increase in temperature of ten degrees a min-



ute, such as would be caused by an actual fire, causes the alarm to sound. The apparatus is installed on the ceiling and near the center of the room or compartment to be protected. It operates on alternating current. A small neon type lamp, costing less than three cents per month to operate, glows constantly, marking the location of the signal.

ANTI-RUST COATING FOR METAL IS EASY TO APPLY

New or rusted metal surfaces can be saved from further deterioration by applying a liquid which acts by welding the inert mass of rust to the base metal and prevents further rusting. The liquid can be applied with a brush or spray and forms a non-porous, moisture-proof and airtight covering for the metal. The original treatment can also be used as a finish coat and aluminum powder, powdered graphite or dry red lead can be mixed with the liquid and applied for the double purpose of preventing rust and giving a decorative finish in color to the metal. Being transparent, all markings and identification signs remain visible through the coating.

TWO-COLOR AUTO LAMP BULB MAKES DRIVING SAFER

Two hues from one auto lamp, a white light for high-speed driving and an amber light for penetrating fog, are offered by using a two-color bulb which provides either light when a switch is pressed. The twin bulb is of standard size and will fit any headlamp where a standard two-filament bulb is used without any alterations of the wiring system. The mellow, diffused amber light is particularly suited to bad-weather driving where fog, rain and dust are encountered and the white light is said to illuminate the road for a greater distance than ordinary bulbs, without glare.



C1823
C1833
C1795
C1832
The Isaacmewell Co.
Hector, Ind.
Totalarm
115 N. 60 cycle
The Isaacmewell Co.
Matchless Electric Co.

401 N. Broad
Phila
Free to be ordered
See also order
75¢ and up
Circuit breaker
Matchless Electric Co.

**SOLDER FOR THE CAR RADIATOR
MAKES PERMANENT SEAL**

Automobile radiator leaks are stopped and a permanent seal is formed by a liquid solder which is poured into the radiator with the water or anti-freeze solution. The seal is a permanent one, it is claimed, and circulation is not affected. Leaks are stopped when the solder solution is poured into the radiator and the seal is formed when heat and ventilation are applied, as in running the motor. The circulation of the water carries the solder and seal to the outside, the seal forming on the outer surface of the radiator, instead of inside, allowing an open channel for circulation. The solder is also useful for stopping leaks in cracked cylinder blocks, acting in the same manner as in the radiator.

**CLAY IDOLS ON MOUNTAIN MARK
SITE OF INDIAN TEMPLE**

On the top of a mountain in Mexico, 14,000 feet above sea level, two explorers a few months ago found several idols, bits of pottery and other clay pieces, lending credence to the legend that this lofty eminence was once the site of an ancient Indian temple. This is believed to be the highest point in North America where Indians once worshiped. At one time, it is believed, there was a shrine on top of the mountain to which Indians came to offer gifts to the "God of the Mountain" when desiring rain and good crops. The Indians



Some of Clay Idols Found on Mountain Peak in Mexico, Once the Site of an Indian Temple

today, however, believe the top of this mountain is inhabited by an evil spirit which drops rocks on daring climbers.



Two Views of Miniature Racing Cars with Real Engines; They Are Used in New Sport

**BICYCLE-MOTOR MIDGET AUTOS
USED FOR RACING**

New thrills are being provided for youngsters and adults by midget racing cars used on a Pacific coast track. The patrons drive the baby autos themselves around the graveled track, which boasts banked turns, guard rails and a lighting system for night operations. Powered by a one-half horsepower bicycle motor, the tiny racers attain speeds of twelve to eighteen miles per hour. The motor is concealed under the turtle back to allow plenty of leg room beneath the hood. A hand lever for starting is located on the right side, power being transmitted to one rear wheel by means of an automobile fan belt and pulleys. A hand throttle on the dash is the other control. Driving is simple so that children may operate the cars, while the welded steel frame, springs and pneumatic tires and aluminum disk wheels furnish strength for adult drivers.

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

*Spencer
Clava
C1944*

Rodgers. 232 S Palm

*Calif
Beverly Hills*

*Flower. 1560 Venice St
Hollywood Calif.*

Dr. J. J. ...

operated by ...

of the majority

C/6 34 Mr. Alex. ...
55 W. 86th St.
New York



RADIO broadcasting has just passed its thirteenth birthday and many people wonder whether there will be any future changes comparable to its early triumphs. The last few years have witnessed a steady refinement of radio devices and methods. The radio voice has been heard by the remotest listeners on earth and sea, but nothing compared to the sensations of the early twenties has thus far been noted in the thirties.

What of the future? Has radio reached its high-water mark? Will the rocket shoot any higher?

Radio's real history is made behind the scenes. When mysteries are solved behind laboratory doors, the results usually break upon the public like thunder. A survey of what is really going on indicates that the reverberations of radio's new thunder will reach into the highways of the universe.

With the aid of Dr. Karl G. Jansky's supersensitive receiver, men have a means of exploring the depths of space by cap-



Top, Air Pilot Using Radio Telephone; Below, Playing Theremin by Waving Hands

turing the sounds radiating from them. Doctor Jansky has already heard sounds he believes may emanate from the Milky Way and it would not surprise him to find that some stars send out waves corresponding to the commonly known radio frequencies. Our sun is a gigantic broad-

1634

It's PEAK?



Above, Installing Lightning Arrester on Empire State Building to Protect Antennae of Experimental Television Apparatus

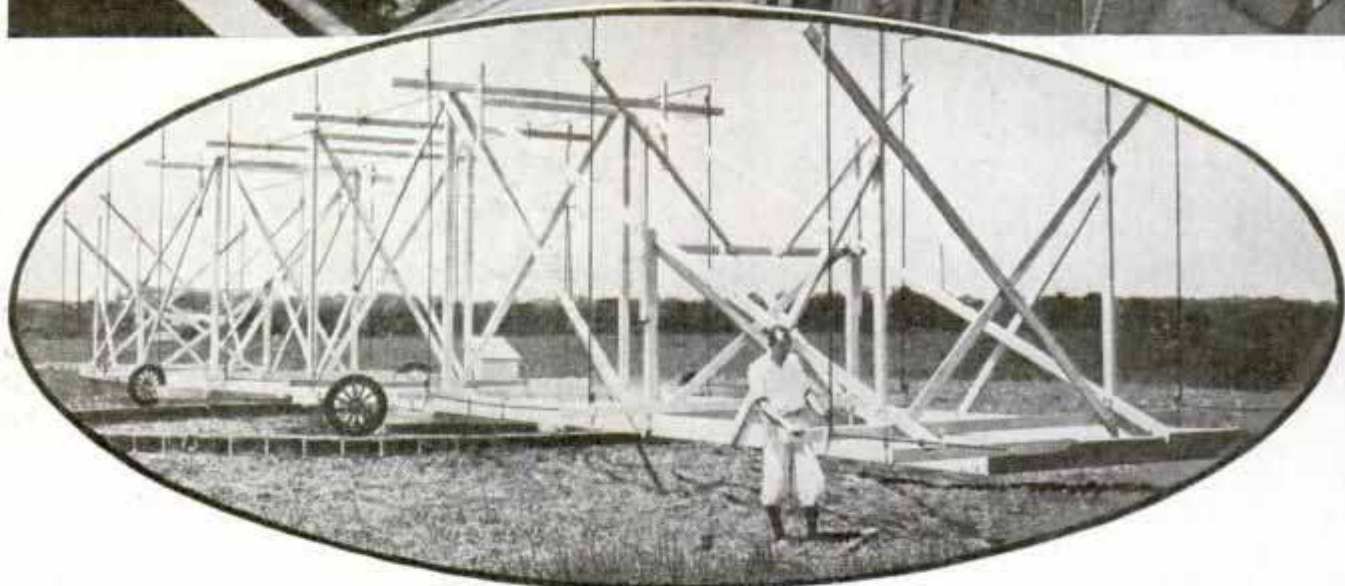
casting station, but none of its radiations can compare with the waves used in ordinary broadcasting. If the sun did broadcast on the same wavelengths, every station on earth would be drowned out by its superpower waves. But there are other stars which Doctor Jansky classes as real radio transmitters.

The radio contact with outer space also is now definitely assured in another direction. All agencies now exploiting the possibilities of the stratosphere agree that short-wave transmitters are the best means of maintaining

Top, Left, Using Talking Neon Light Which Makes Sound Visible; Below, Radio Receiver Which Fits Purse

Radio International

*Stan Gylbar
Mick*



Top, Microphones Enable German Courts to Record Testimony of Witnesses on Phonograph Disks; Bottom, Directional Antenna for Picking Up Radio Signals from the Cosmos

contact with the earth. Still another series of discoveries is likewise affecting the fortunes of radio. Marconi, who first pounded out the dots and dashes of radio telegraphy, now is bent on learning how to transmit micro waves over long distances and has succeeded in picking up signals at a distance of 168 miles. Thus the curvature of the earth is no longer an insurmountable obstacle in sending these micro waves, because Marconi has bent them around the curvature. The new nut-size radio tubes developed by the R.C.A. research laboratories have greatly simplified

the problem of receiving micro waves. In Marconi's hands, they will become effective tools, and bring nearer the time when micro-wave broadcasting will be a reality. For success is inevitable.

What will such broadcasting mean?

First, an enormous increase in the number of radio channels. This increase has no limitations, for, as you halve the wavelength, you double the number of channels! There are as many channels available between five and ten meters as in all the wavelengths above and, by continually splitting up the wavelengths, you add more

[Handwritten scribbles and illegible text at the bottom of the page.]

Below, Apparatus Used for Performing Operation with High-Frequency Current Instead of the Knife

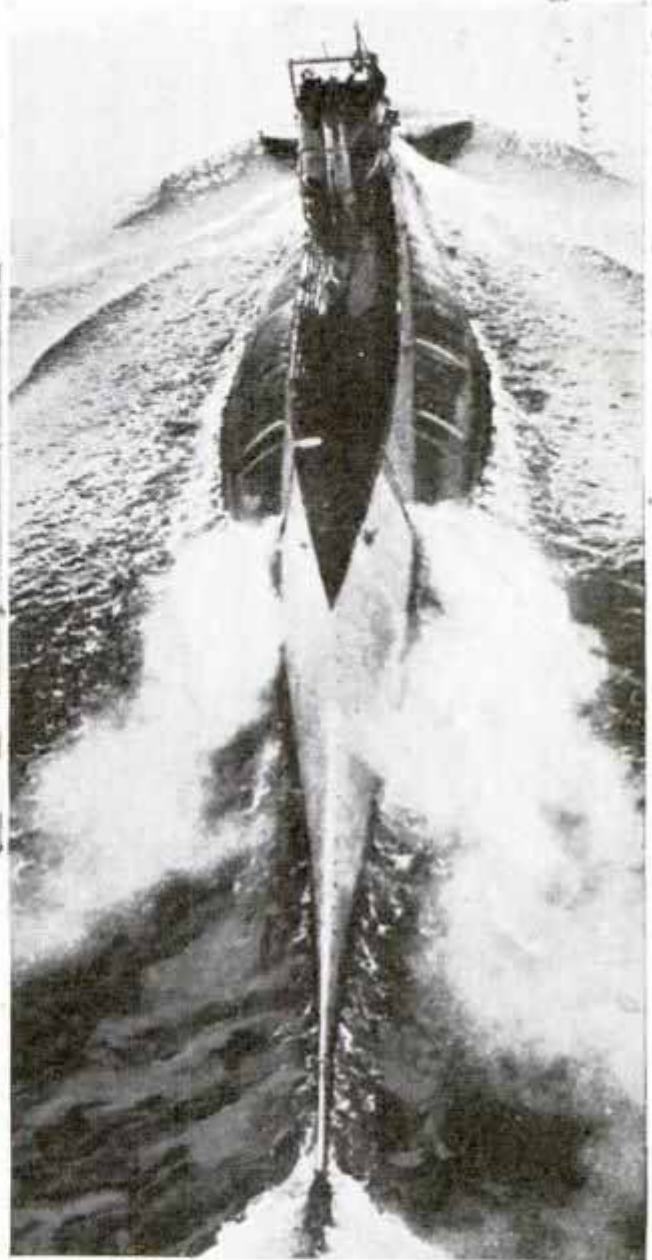


channels. As one expert remarks, in a city of 10,000,000 people the federal radio commission might assign a wavelength to each without fear of interference.

This same expert holds that it will be possible for every citizen to equip himself with a wireless telephone set, to be carried in purse or pocket. A purse-size receiver is already on the market, but with the advent of miniature tubes for micro waves, a receiver need be no larger than the capacity of your vest pocket. In fact, there is already a vest-pocket micro-wave receiver, and it works. With such developments it is easy to vision the day of radio telephone conversations between private individuals, each person being assigned a wavelength and a "telephone number." Marconi says that in the micro-wave field, there is no static. This presages a static-free era in radio communication.

"If we can solve the problem of making ultra-short waves bend sufficiently to compete with long waves, we shall have reached the eve of an era of wireless communication of hitherto undreamed of cheapness," he adds.

The transmission of power over radio beams is a field still wide open to investigation, and television is a sphinx which has the public, as well as experimenters,



Submarine Preparing to Descend with Radio Announcers for the First Underseas Broadcast

puzzled. Here again, we must wait for more knowledge about short waves. While apparatus has been devised to receive television images quite clearly, the development of this art is greatly hampered by the limited range of the transmitters.

The National Broadcasting company has been conducting experiments in a television laboratory on top of New York's Empire State building. From that eminence, engineers are attempting to widen their radius of broadcasting. Marconi has already shown that he can send micro waves beyond the horizon. An adaptation of such knowledge to television may be expected to thaw television out of frozen seclusion. No nation or private concern

(Continued to page 124A)

11/22/33

C1846

International Business Machines Corp 270 Broadway



Operating the Radiotype, an Electric Typewriter with a Radio Transmitter Attached to It

TYPED MESSAGE SENT BY RADIO AS FAST AS IT IS WRITTEN

Instantaneous written communications between business departments by "microwave" radio can now be sent with the aid of an instrument known as a radiotype which transmits graphic messages as fast as they are typed. The sending can be done by radio or wire and the equipment consists of an electric typewriter with a transmitter attached, this being synchronized with a similar installation at the receiving point. When the transmitting machine is operated, impulses are conveyed to the receiving apparatus and the writing is reproduced. Even such operations as back-spacing, tabulating and shifting for capitals are duplicated. The only antenna needed is an eight-foot aluminum rod mounted on the roof of the building from which transmitting is done and a similar rod on the roof of the receiving building. Messages sent on the radiotype are secret as a synchronized machine is needed to translate the clicks. It is expected the device will be used for inter-office communications in large industrial plants and it has also been tested in connection with the transmission of police messages.

CHEMICAL MAY OFFER RELIEF TO HIGH BLOOD PRESSURE

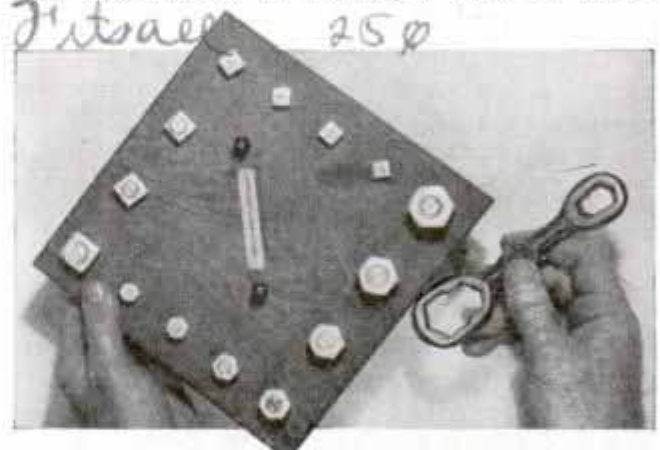
Relief to high blood pressure may be offered by a complicated new chemical, and another one has been used successfully in stopping the growth of natural cancers in mice. Both substances were described at a recent meeting of the National Academy of Sciences. The blood-pressure chemical is obtained directly from the blood of animals but disintegrates so rapidly that it has been obtained only by drawing it from the blood directly into an ice-cold solution. In animals it appears to be a depressor of pressure and it is considered possible that lack of it may cause high blood pressure in humans, but it has not been tested on humans as yet. According to Dr. Cyrus H. Fiske, of Harvard medical school, a modification of this chemical, taking place naturally in blood corpuscles, might be partly the cause of dilation producing the skin flush of fever, inflammation and over-heating. The chemical tested in cancer treatments of mice is extracted from rapidly growing body tissues and it is associated with, but different from, the chemical substance which causes growth. When mice were operated on for cancer, the chemical usually stopped recurrence, and also prevented grafts of cancer from "taking" in a large percentage of cases.

Cambridge Mass

C1753

WRENCH FOR MANY NUT SIZES NEEDS NO ADJUSTMENT

Requiring no adjustment, a new wrench fits eight sizes of hexagon nuts or bolts.



"All-in-One" Wrench Tightens or Loosens the Different Sizes of Nuts Shown on Board

It may be utilized to tighten or loosen many other sizes of hexagon and square nuts by approximate fit.

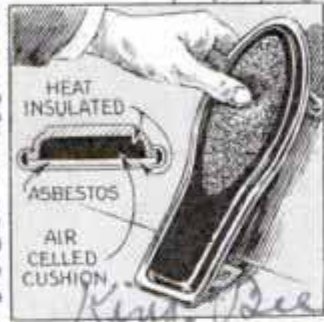
Rust Products Corp

C/8 45
**AIR LINE CARRIES
DUCK FEATHERS
AND OYSTERS**

Flying fish are now a reality and so are flying oysters, not to mention flying duck feathers. These three items and many others almost as unusual are listed among the strange and varied items carried by air mail and express over United Air Lines. A duck farm regularly ships feathers to pillow manufacturers by plane, rainbow trout go by air from Denver to New York and oysters and lobsters fly from the Atlantic coast to Chicago and are served for dinner the same day. Cut flowers go frequently on the transports as do strawberry cuttings, valuable tree seedlings and other nursery stock. A baby alligator also winged its way from Florida to Chicago a few months ago.

C/1697
**AIR-CELL ACCELERATOR PEDAL
MAKES DRIVING EASIER**

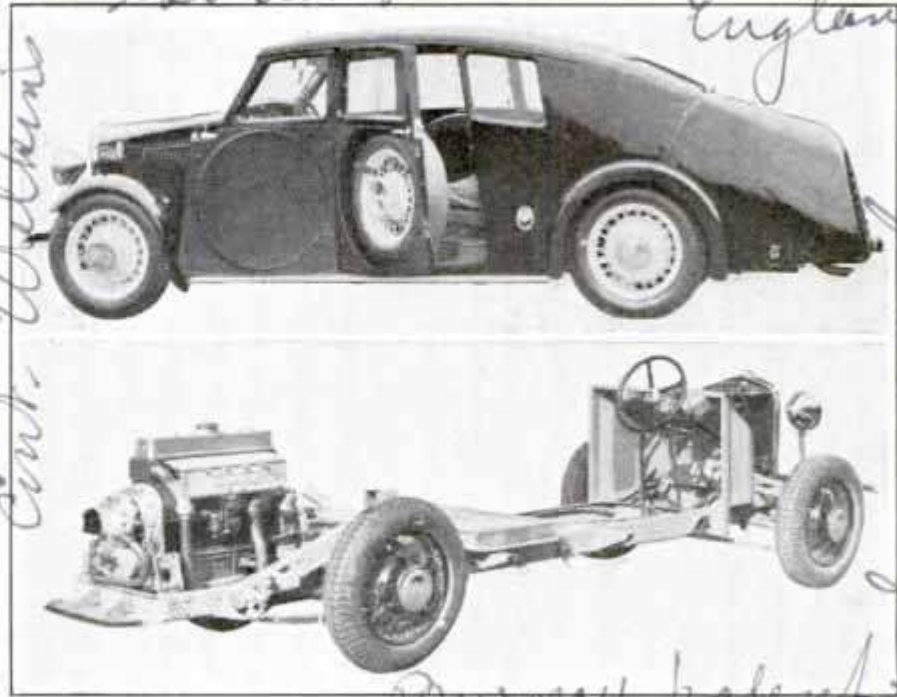
Insulated against heat so that the motorist's foot remains comfortable on the warmest day, an air-cell accelerator pedal makes driving easier. The pedal has a pneumatic cushion with an asbestos shield beneath. An automatic downward pressure spring assures highly sensitive control and eliminates rattling against the accelerator button when the foot is removed. The pedal is perfectly flat and has no heel drop hazard.



41675
Kings Bee

C/1728
**SPARE WHEEL HIDDEN IN DOOR
OF STREAMLINED AUTO**

One type of streamlined car recently exhibited in England carries a spare wheel and tire in a hollow rear door. The spare is reached by means of a special circular

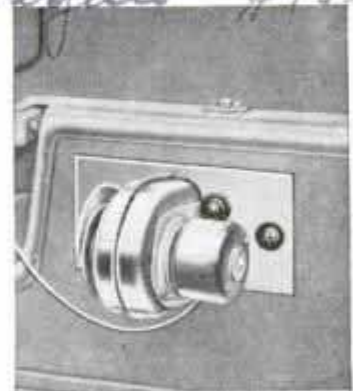


Streamlined Car with Compartment in Door for Spare Wheel; Note Sharply Sloped Windshield and Engine Mounted at the Rear

door on the outside of the regular rear door. The engine is mounted at the rear, hence it was impracticable to place the spare there, and if it had been placed on the side, it would have defeated the purpose of streamlining to reduce air resistance. The windshield of this car is set at an angle of thirty-five degrees and all wheels are independently sprung. The battery is mounted at the rear of the radiator, and baggage is carried in a compartment behind the rear seat.

C/1810
**AUTOMATIC DRAFT SAVES FUEL
FOR COAL FURNACE**

Fuel bills may be reduced considerably by use of an automatically controlled coal burner for furnaces or boilers. One feature of the burner is the automatic "forced draft," which regulates the fire to give uniform heat. Blower and motor are balanced to insure low operating costs. Current consumption is equivalent to that of a thirty-watt house lamp. Buckwheat anthracite coal may be used in furnaces equipped with the burner.



American Automatic Devices Co. 530 Schroeder Chicago

Crossley Motors

H.A. Smith, 187 N. ...

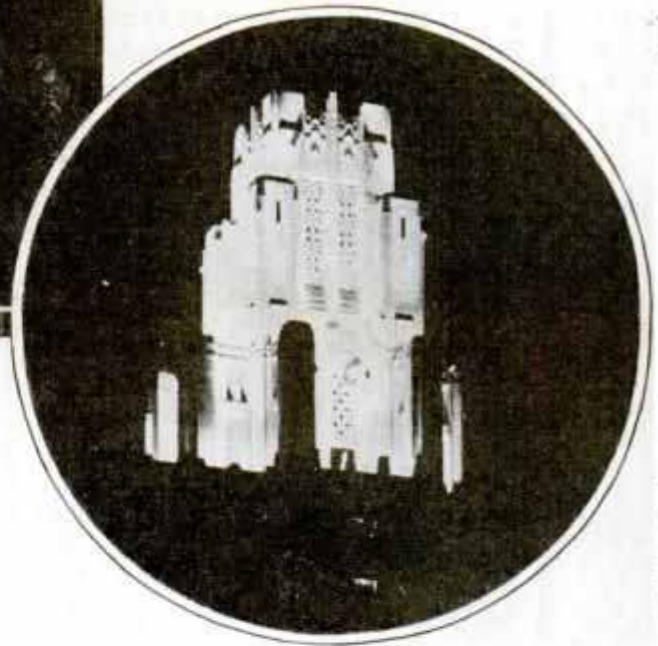
How to Make Night View of Lighted Tower



Above, Picture of Lighted Tower Made by Day-Night Photography; at Right, Same View Made by Ordinary Means; Note Lack of Shaded Detail

Buildings with floodlighted towers or other form of night illumination can be photographed exactly as they appear to the eye at night by combining day and night photography—making part of the picture in the daylight and the rest at night. Frequently the unlighted portions of illuminated buildings appear in the picture as black spaces although the eye can see such parts of the real structure. The amateur can catch the softer, darker tones without overexposing the lighter sections by combining day and night exposures. If the tower lights are turned on while there is still some daylight, the task is easy. Place the camera on a steady tripod and work out the correct exposure for the lighted tower, according to the strength of the floodlighting. Start the first expo-

sure well after sundown, but while there is still some dim daylight on the building. By making repeated exposures each time with the dark portions a trifle darker but with the tower the same, one of the several prints may be expected to give the proper balance, showing the building as it appears to the eye. When the lights are not turned on until after dark, the procedure consists in making two exposures on the same film, taking care not to move the camera. The first is made while there is good daylight, but is shorter than for a daylight shot of the structure. After dark an exposure is made for the lighted tower. Several attempts may be necessary before a picture is obtained which



combines just enough daylight exposure to show the dark portions with just enough night exposure to show the tower correctly. Day-night photography also opens an interesting world of sunsets, moonlight scenes, and artificially illuminated gardens.

FIRST ELECTRIC REFRIGERATOR GETS PLACE IN MUSEUM

Writing a new chapter in the history of inventions, the first practical electric refrigerator has been placed in the Smith-

sonian Institution, the United States national museum. The machine is quaint looking, compared to the latest automatic refrigerators. It was produced by Edmund J. Copeland, of Detroit, after four years of experimentation, during which he constructed fifteen models. The refrigerator was removed from active service in 1932 after fourteen years of use. The invention marked the culmination of almost 100 years of effort to achieve automatic control of refrigeration, following the first mechanical ice-producing machine which was invented by Jacob Perkins, of England. His machine was patented in 1834.

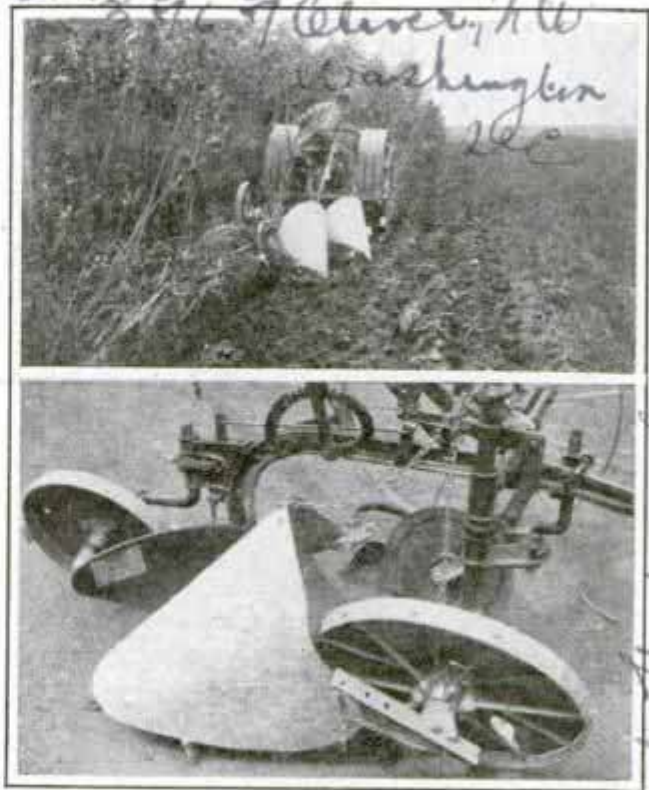
METAL IS HEATED AND FROZEN IN BUILDING AIRPLANES

Some of the metal which goes into an airplane has been frozen and other parts have been subjected to tremendous heat. The thousands of aluminum alloy rivets going into one of the Boeing transports, for instance, are rushed from a 950-degree heat-treating bath to the sub-freezing temperature of dry-ice containers to retard the aging of the rivets until they are used. An anodic process protects duralumin and aluminum parts from corrosion, and heat treating is employed to increase the tensile strength of metal parts, such a process virtually doubling the strength of metals subjected to it.

WOOD BOXES TAGGED QUICKLY WITH AUTOMATIC STAPLER

Attaching tags to boxes, barrels and other wooden shipping cases is made quick and easy by using a lightweight automatic stapler which is so compact that it can be carried in the pocket when not in use. It is operated by striking a plunger with the hand and accommodates a strip of staples which are fed one

by one into the tag tacker. The plunger slide is lubricated by oil wicks, fed from a single oil cup, and all working parts are inclosed to keep dirt from reaching them.



Plow Fitted with Trash Guide Which Turns under and Completely Covers Tall Plants

TRASH GUIDE FOR PLOW USED TO FIGHT CORN BORER

Any ordinary plow can be fitted quickly with a trash guide devised recently by government engineers for the particular use of farmers who must plow under corn fields and cover every stalk as a control measure against the corn borer. In practice, the funnel-shaped guide can cover virtually anything from a heavy stand of sweet clover to hemp ten feet tall. The sides are pivoted to brackets clamped to the plow with which it is used.

ABRASIVE STONES IN OIL BATH MAKE HANDY SHARPENER

For putting an edge on a knife or other small implement, a compact sharpener offers three oil stones of varying roughness. It consists of a small case containing the three abrasive stones which revolve through a bath of oil that enlivens and cleans them. The stones are so situated that each may be brought into use quickly, according to the type of implement to be sharpened.



N.W. Highway Mr. Proffert

C1884

Boeing Airplane Co

330 W. Front Seattle C17 B

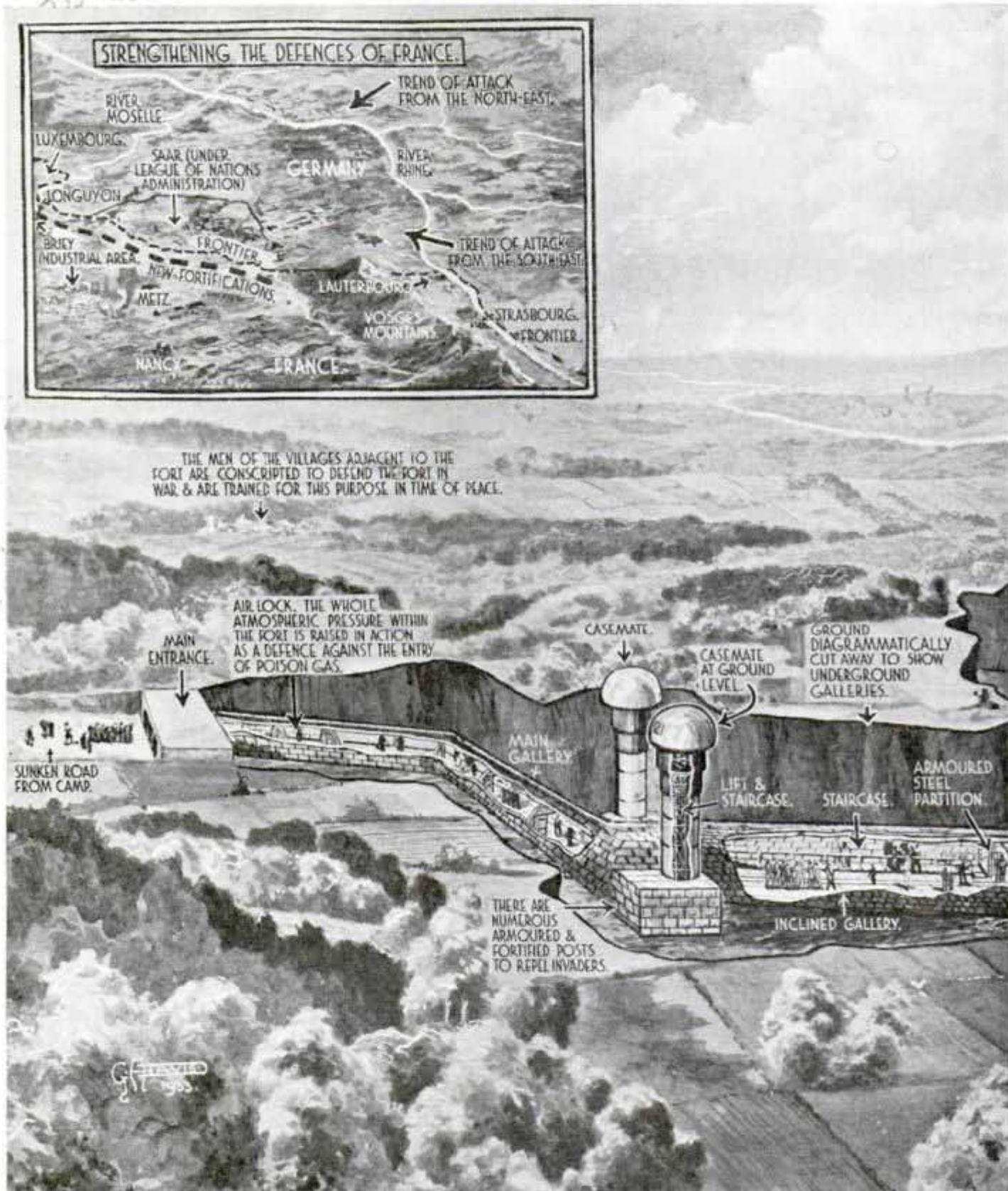
Mr. E. S. Moore, 716 1/2 7th Ave., N.W. Washington D.C.

mention of Federal Engineers who obtained patent to be put on... Theba Kans... U.S. Food... Sharpening... C176

J.B. Crook Co. Paris, Miss.

Mr. R. H. Curtis 2118 E. 5th St.

Gigantic Underground Forts Guard France

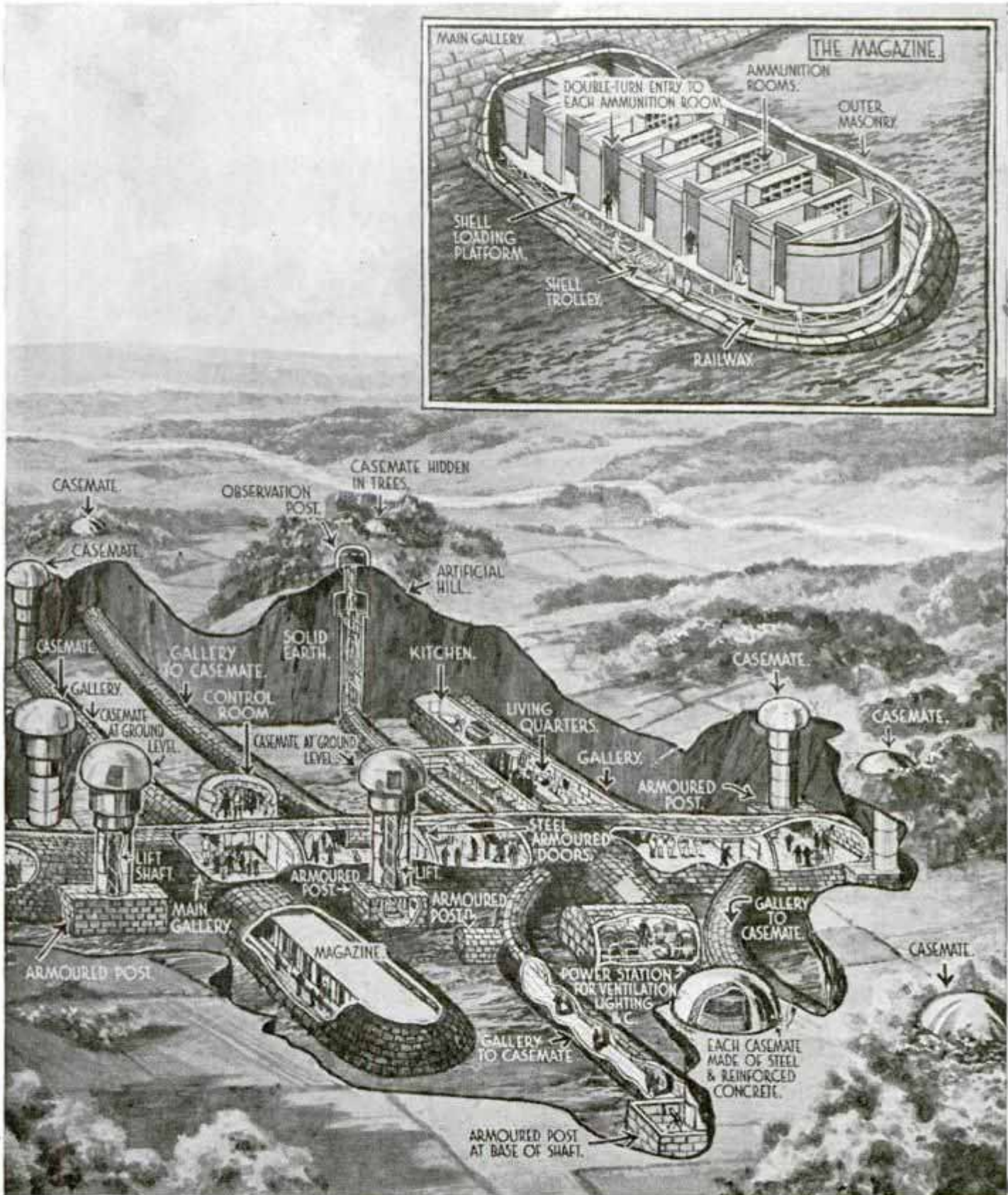


This Diagram Shows the Workings of Underground Fortifications Nearing Completion on Eastern Frontier of France; This Defensive System, One of the Strongest Ever Built, Consists of Fortified Casemates Giving Each Other Protection by Cross-Fire, and Inter-Connected by Underground Galleries Safe from Bombardment; Living Quarters, Magazines, Stores, Power Stations and Control Posts Are Buried, Only the Casemates Above Ground, in Camouflaged Positions; Dotted Line in Map at Upper Left Shows Where France Is Placing These Armed Caverns; One Feature Is the Air Lock Arrangement for Excluding Poison Gas from the Fortifications in Case of Attack; Diagram Shows How the Defenders Enter at Secret Gates After Passing along a Sunken Road; Steel Partitions within the Fort Enable the Garrison to Defend Themselves Even After an Enemy Has Penetrated to the Underground Chambers; More than \$100,000,000 Is Being Spent on These Defensive Works by the French Government, a Fact Regarded as Proof of That Nation's Pacific Attitude.

Bomb and Gas-Proof Caverns Dot Frontier

London

The Illustrated London News



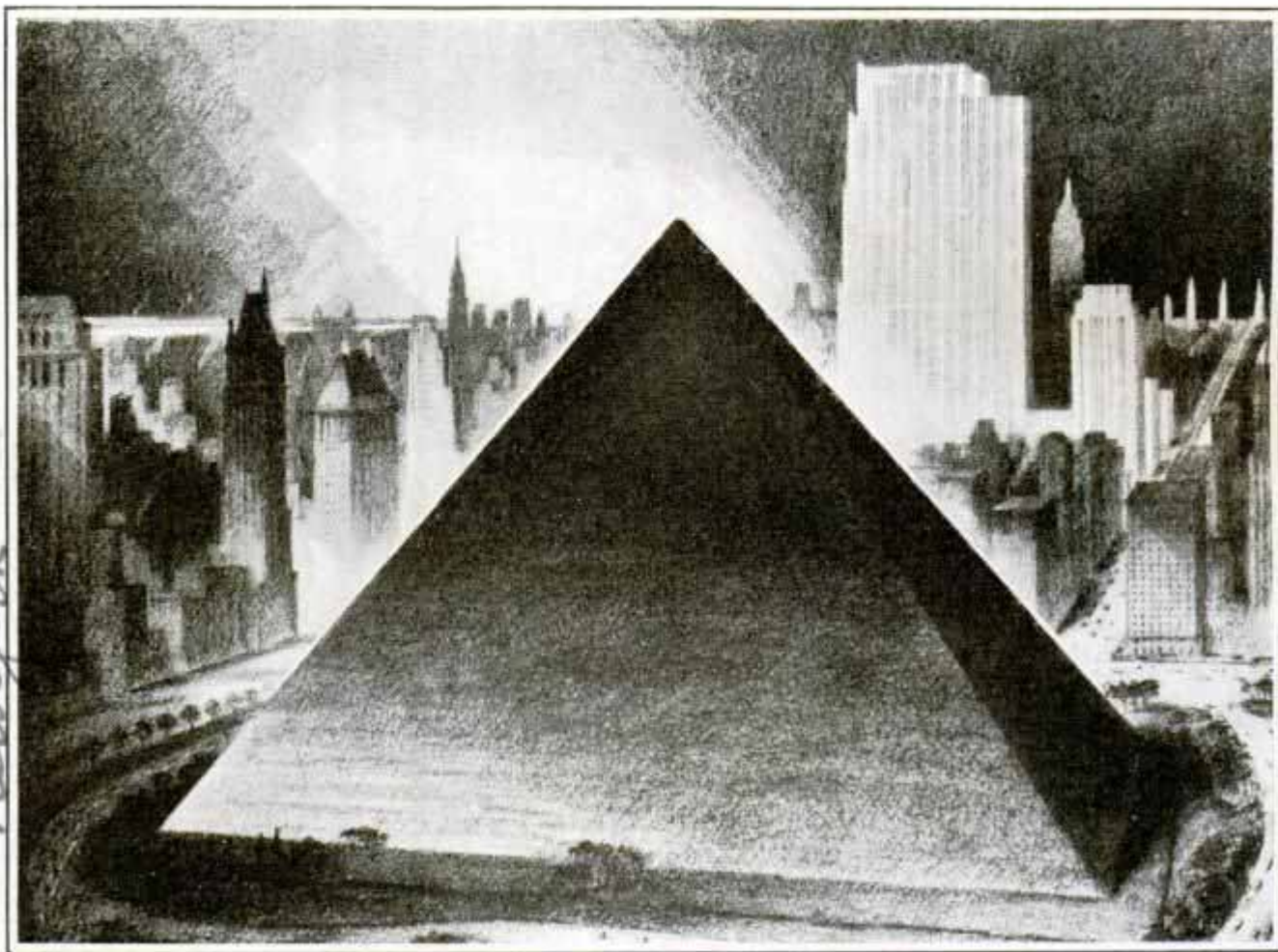
Drawing Gives Cutaway View of Vast Underground Fortifications Built in the Saar District by the French Government; Galleries Far beneath the Surface Are Shown Leading to Strongly Armed Casemates; These Galleries Form a Veritable Labyrinth, with Here and There Movable Armored Doors and Interior Firing Chambers for Defending the Various Sections After Penetration by a Foe; All Casemates Are Armed with the Most Modern Weapons; Upper Right, View of Magazine, Giving an Idea of How Carefully the Explosives Are Guarded against Bombardment; Protection against Shell Fire Is Provided by a Great Depth of Reinforced Concrete and Armor-Plate Turrets; Near Each Fort Camps Have Been Constructed for Officers and Men of the Regular Army Who Would Occupy Them in Time of War; Reserve Troops, Consisting of Inhabitants of Villages Near By, Are Trained with the Regulars for Manning the Giant Fortresses; So Well Have These Measures Been Worked Out That Only a Few Hours Would Be Sufficient to Close the Frontier

London Electric Agency, Ltd

204

Architectural artist

Pyramid Rivals Skyscraper as World Wonder



Hamilton Wright
 Drawing Showing How the Great Pyramid Would Appear if Reproduced in Central Park in New York in Front of a Background of Skyscrapers, the Pride of Modern Architects

How do the pyramids of Egypt compare with the greatest structures of stone and steel erected by modern man? This question was asked recently of builders and architects who constructed Rockefeller Center in New York and they decided that the Egyptian pyramid is a worthy rival of the most magnificent modern structure, particularly when it is considered that the Egyptians may have employed rudimentary methods in constructing the pyramids. In order to compare the labor involved in ancient and modern construction, it is necessary to reduce both to terms of man-days. Herodotus, the Greek historian, stated that the work of 100,000 men was required for three months of each year for twenty years to build the Great Pyramid. Assuming that each man worked daily for three months, this represents 180,000,000 man-days of work. While once a trifle larger, this pyramid today is 451 feet high, each base line is 775 feet, the sloping sides

are each 586 feet high and the cubical contents are estimated at 85,000,000 cubic feet, one authority estimating about 2,300,000 separate blocks of stone were required for its construction. However, some stones were of huge size. The area occupied by the Rockefeller Center group approximates that of the Great Pyramid. This group is 920 feet long, about 720 feet wide and the top of the pyramid would have extended above the forty-first story of the R.C.A. building in this group. The time to complete the Rockefeller Center was estimated at 10,000,000 man-days, compared with 180,000,000 man-days for the Great Pyramid. A solid stone reproduction of the pyramid constructed in Central Park in New York would cost an estimated \$156,000,000, the architects decided, and would take 2,250,000 man-days, but a pyramid of the same size could be built by modern methods of steel and concrete for about \$15,000,000 and would re-

How do the pyramids of Egypt compare with the greatest structures of stone and steel erected by modern man? This question was asked recently of builders and architects who constructed Rockefeller Center in New York and they decided that the Egyptian pyramid is a worthy rival of the most magnificent modern structure, particularly when it is considered that the Egyptians may have employed rudimentary methods in constructing the pyramids. In order to compare the labor involved in ancient and modern construction, it is necessary to reduce both to terms of man-days. Herodotus, the Greek historian, stated that the work of 100,000 men was required for three months of each year for twenty years to build the Great Pyramid. Assuming that each man worked daily for three months, this represents 180,000,000 man-days of work. While once a trifle larger, this pyramid today is 451 feet high, each base line is 775 feet, the sloping sides

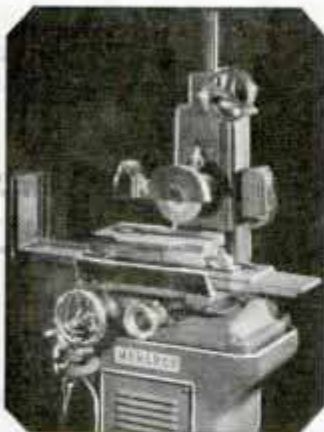
quire about 750,000 man-days. Because the Rockefeller Center group is of more complicated construction than the pyramid, it was estimated that its construction required four times the man-days needed to build a modern pyramid of solid stone, but the modern reproduction could be produced in about one-eightieth of the time used by the Egyptians, according to the figures of Herodotus.

**STEEL CURTAINS IN THEATER
BEST FIRE PROTECTION**

Proscenium curtains made wholly of steel will provide the maximum protection from fire for the theater audience. In tests by the United States bureau of standards, steel curtains were found to insure safety for thirty minutes, while steel-framed asbestos curtains lasted half that time. Since most auditoriums are designed so that the audience may leave within five minutes, both types of curtains are regarded as offering a sufficient margin of safety.

**MAGNET HOLDS CASTING TIGHT
IN GRINDING MACHINE**

Castings are held in place without bolts in a surface grinding machine which has a magnetic bed on which the work is placed. An electric current magnetizes the bed and holds the casting like a nail in a horseshoe magnet. The bed is about two feet long, a foot wide and six inches thick, and within it are a series of electromagnets which draw in a downward direction from the surface. On the surface a gridlike arrangement of grooves is filled with a soft iron which extends to the magnets and magnetizes more quickly than steel. When the casting is in position, a switch is turned and it is held in place until grinding is completed. When the switch is turned off, the bed demagnetizes at once and the casting can be lifted off.



When the casting is in position, a switch is turned and it is held in place until grinding is completed. When the switch is turned off, the bed demagnetizes at once and the casting can be lifted off.



Here's a New Watercraft; Motorcycle Mounted in This Manner Attains Rapid Pace

**MOTORCYCLE FOR USE AS BOAT
IS MOUNTED ON PONTOONS**

Conversion of the motorcycle to uses on the water is accomplished by mounting it on pontoons. The strange craft has been introduced in Europe. The motorcycle engine drives a small propeller, developing considerable speed.

**CLEANER FOR CONVEYOR BELTS
WIPES AWAY THE DIRT**

To wipe the carrying surface of conveyor belts clean and dry, a simple multiple-blade cleaner is being used, particularly when wet or sticky materials are being handled. The cleaner, which requires no power, consists of a series of self-aligning, spring-steel wiper blades set diagonal to the belt travel. Each blade is pivoted on an individual spring which presses it firmly against the surface. The overlapping blades remove all material clinging to the belt and tension screws allow pressure to be regulated according to the material being moved. Blades are reversible and can be replaced without tools.



Monarch Machine

Press memo 12/2/33

C/603

C1797

C1765

*Engineer.
Herbert K. Kane*

Washington, D.C.

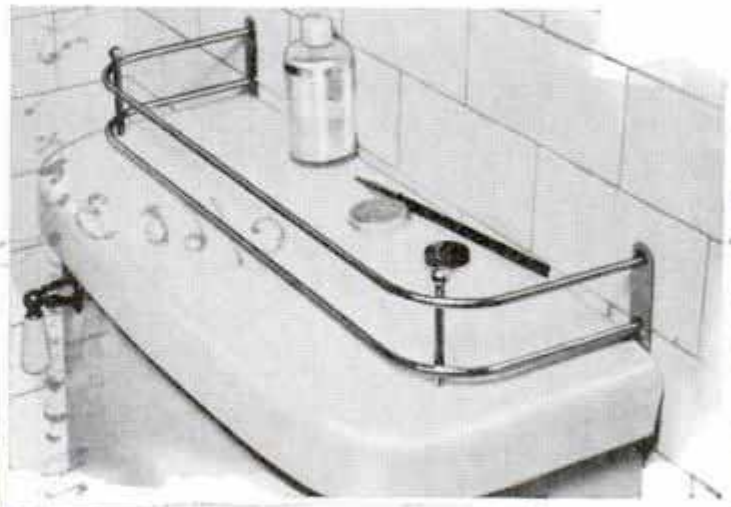
*am Bodensee
Bregenz Austria*

*Stephens-Lidgans
mfr. Co. 220 Bridge St.
Wm. Mass.*

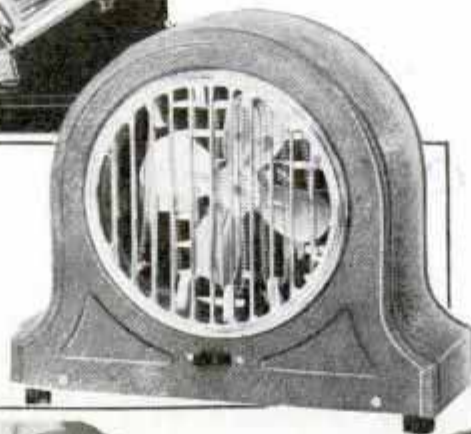
EASIER WAYS



Above, Electric Toaster with a Hinged Top Which Lifts Up When Lever Is Pressed, Making It as Easy to Clean as Brushing off the Top of a Table



Above, Guard Rail for the Bathroom Shelf Which Keeps Glasses and Bottles from Being Broken; Left, Electric Fan Heater with a Fan Mounted behind the Heating Element; It Operates on Alternating Current and Forces Warm Air into a Room at a Rate of 235 Cubic Feet per Minute; the Circular Housing Assures Maximum Output of Forced Heated Air; It Can Be Obtained in Two Colors and Weighs Only a Little over Five Pounds, Hence Is Easily Portable; Below, Table Tray Which Saves Time and Labor for the Busy Hostess; the Tray Is Filled in the Kitchen and Carried to the Dining Room Where the Legs Automatically Drop When It Is Lowered, Transforming It into a Table Convenient for Easy Service



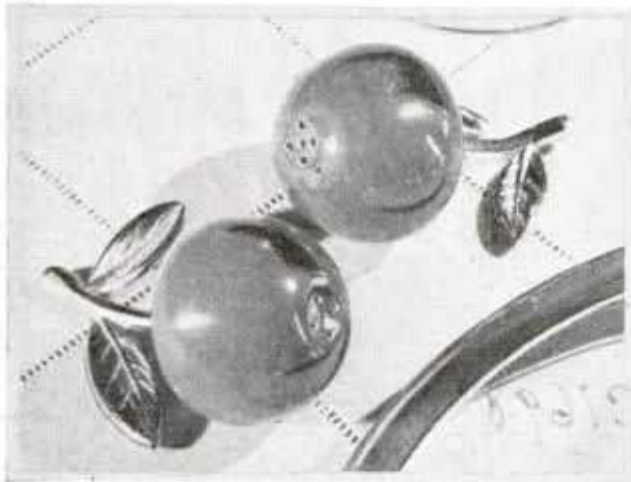
Above, Kitchenware Made of Heavy Rubber in Pastel Shades; Such Articles Are Stiff and Firm, Yet Bend without Breaking and Do Not Mar Sinks or Dishes; They Are Resistant to Acid, Alkali, Fire and Most Stains; Shown Is a Sink Rack, Dust Pan, Sink Scraper, Soap Dish, Sink Strainer and Drainboard Mat



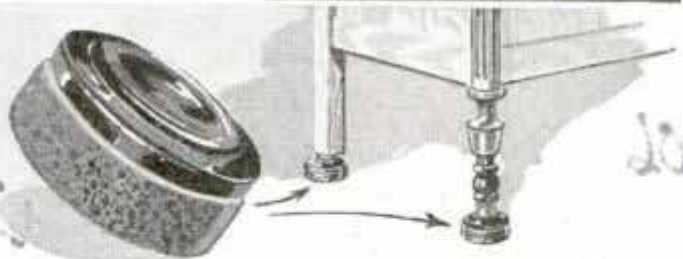
of *DOING IT*



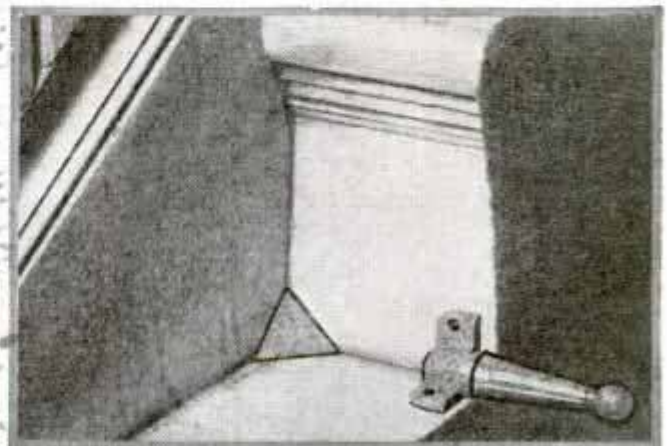
Above, Automatic Serving Fork with Sliding Ejector Operated by Finger to Push Food from Prongs; Right, Vacuum Cleaner Steered by Twisting Handle; the Pistol Grip Operates on a Swivel and Turns the Head of the Cleaner; It Can Also Be Locked to Form a Rigid Handle



Above, Salt and Pepper Shakers Shaped Like Cherries; Below, Wringer with Aluminum Casting Which Serves as Mechanical Hand to Feed Clothes into Rollers



Above, Balloon Casters Made of Sponge Rubber Protect Floors and Stop Vibration in Radio Sets and Other Furniture; Below, Stair-Carpet Grip and Molded Corner Stop



C1784

1214-16th St

Washington DC

PHOTO ALBUM LIKE CARD INDEX
KEEPS PICTURES IN ORDER



Portfolio Picture Album Like a Card Index, Which Holds Many Photographs in Perfect Order

Designed like a portfolio in which the picture are placed like cards in an index poster, a photograph album offers not only compactness but space for many pictures so arranged that they are always in order. By numbering or classifying photographs in this album, it is always a simple matter to select any desired print without a search through several pictures.

FLOWERS PRESERVED IN SAND
RETAIN COLOR AND SHAPE

Fresh flowers can be preserved for months, retaining all their natural beauty of color and form by treating them with sand, experimenters at the Missouri botanical gardens have found. White silica sand produces best results, but any dry, clean sand which is not too coarse can be used. It should be sifted through a forty-mesh grading screen or through about three layers of ordinary window screen. Then heat the sand in the oven and allow it to cool, thus removing the moisture. Flowers to be placed in the sand should be freshly cut and both blooms and foliage should be free of moisture. Large clay pots make good containers but any can or galvanized bucket can be used. Pour a little sand into the container and place the flowers in the sand, stems downward, and not too close together, because too many

flowers in one pot will tend to make the sand damp and defeat the purpose of the experiment. The container should be tall enough so that the blooms do not reach the rim and can be covered completely with sand. Continue adding sand until the flowers are buried, and be sure the sand enters the bloom well but does not injure its natural shape. Label the pot with the names of the flowers and the date, place it in a dry room and leave it undisturbed for a month at least, some flowers requiring five or six weeks for drying. To make sure it is time for unveiling, dig the sand carefully away from one or two specimens. If the flowers are dry, invert the container and carefully pour out the sand, being sure to remove grains adhering to the dried blooms, which are very fragile after drying. Your reward will be flowers which retain their freshness, coloring and shape for months if protected from dampness, sun, wind and dust. Flowers which drop their petals easily do not produce good results. Delicate tints should also be avoided. Among flowers which respond to sand drying are dahlias of the smaller type, zinnias, marigolds, transvaal daisies and even the lowly sunflower.

C1698

SHAVING MIRROR WITH LIGHT
HAS VACUUM CUP BRACKET

Adequate illumination for shaving is provided by a combined mirror and light which is attached to the wall by means of a bracket with a vacuum cup. A center sack in the vacuum cup contains a sealing fluid for perfect adhesion to glass or wall materials. The light concentrates its illumination on the features and helps to make shaving easier.



Handy Mirror Has Small Electric Lamp to Provide Illumination for Shaving

mination on the features and helps to make shaving easier.

C1806

St Louis

Cml Richard P. Berry

American Automata

with hand cups 12.25

RICE IS GRADED BY ELECTRIC EYE

One of the latest applications of the electric eye, or photo-electric cell, is in the grading of rice. With the aid of this eye, the chalkiness of kernels can be determined and it has been found possible to classify brown rice into fifty different opacity groups. This makes it possible to standardize grading at different inspection points without relying on the human factor and the possibility of different interpretations.

HAND-TURNED ICE-MAKER HAS THERMOS USES

Operated by turning a handle, an ice-making machine for the home has been produced in England. The device also may be used in the manner of a thermos container, keeping its contents hot or cold for many hours. No electric current or other power is required to produce pure ice in blocks or cubes. The ice is made by adding a freezing mixture of white and brown crystals, supplied with the machine, to the water in a removable aluminum container. This mixture is then placed in the ice-maker, the handle is turned for about three minutes and the ice is ready. The thermos arrangement preserves the ice two or three days.



TWO-WAY SPEAKER'S SYSTEM USED WITH TELEPHONE

Audiences may talk back to a speaker thousands of miles away by means of a two-way address system designed for use with the telephone. The speaker simply talks into his telephone, a pick-up carrying his words to a loud speaker. When the audience asks or answers questions, the speaker hears each voice in the telephone receiver. No equipment is carried by the person making the address and no



Diagram Shows Arrangement for Two-Way Conversation on Public-Address Scale by Means of Telephone Pick-Up

connections are made to his telephone. Several groups in the same city or in many cities may be addressed at the same time. The unit is small, simply operated and portable, using alternating or direct current. The system enables an executive to broadcast personal messages to his field staff, branch offices, dealers or agents any time to any place where a telephone is found, at the cost of a long-distance call, plus the cost of operating the private broadcasting system, which is small.

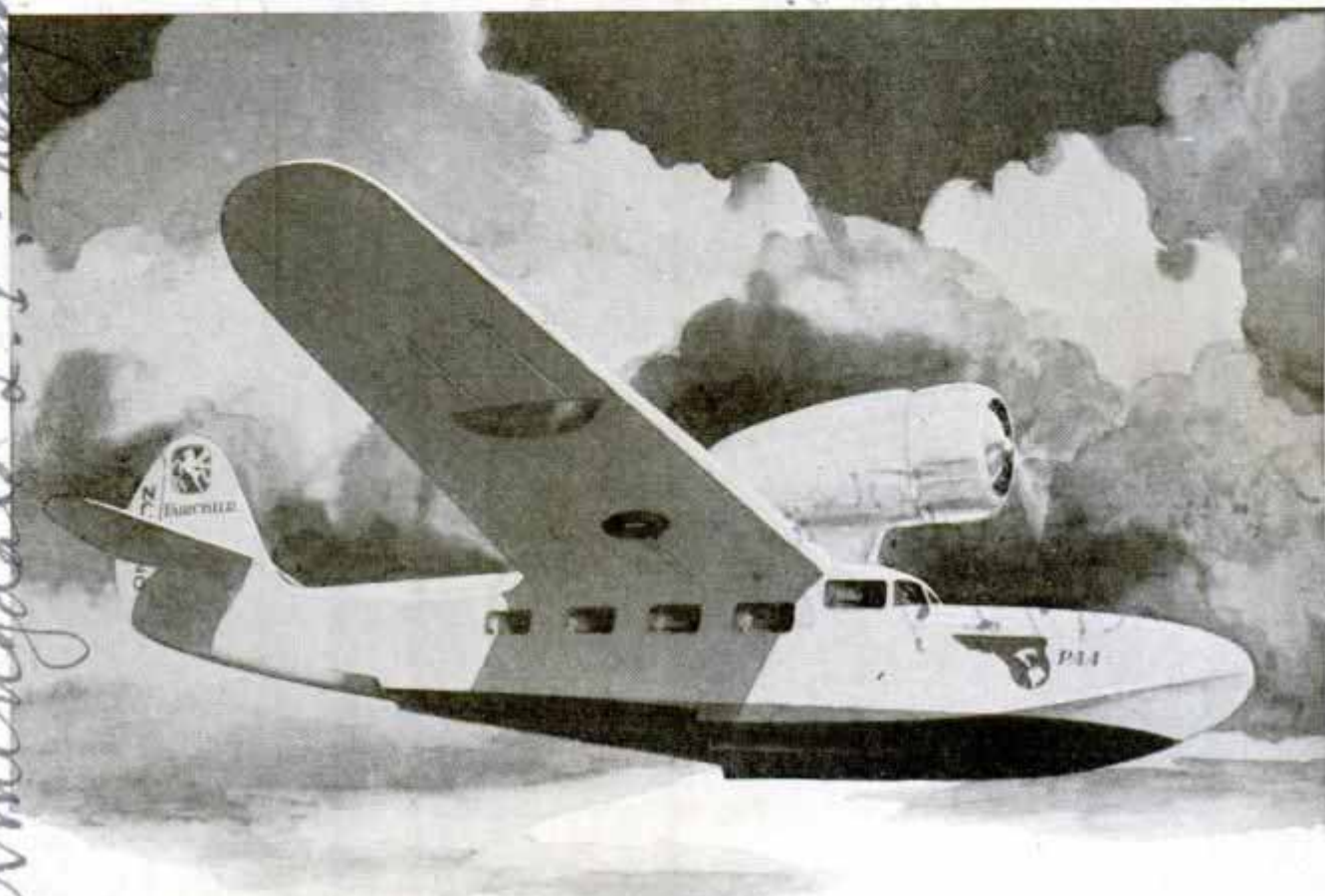
GAUGE SHOWS WATER LEVEL IN AUTO BATTERY

Installed in a few minutes on the instrument panel of any automobile or truck, a water gauge for the car battery shows when the battery solution gets low and thus indicates the proper time for adding water. After the dial is mounted on the dash, it is only necessary to attach one wire to the gauge and the other to the middle battery cell.



C1736

Plane Lands without Wheels or Pontoons



Amphibian Air Liner Which Can Make Emergency Landing without Wheels or Pontoons; the Under Side Acts as a Runner When the Surface Touches the Ground or Water

Neither wheels nor pontoons are needed for emergency landings by an amphibian air liner designed for Pan-American Airways. The under side of the craft is so shaped that it will act as a runner when the liner touches the ground or water. It is intended to carry eight passengers and two pilots at a speed of 180 miles per hour.

mail because many trained elephants never become really indifferent to the noise of gasoline engines.

135 & 42nd Ave. N.Y.C.
 7990
NOISE OF AIRPLANES FRIGHTENS AFRICAN ELEPHANTS

Wild elephants in Africa have been annoyed so much by the noise of mail planes passing overhead that they have changed their habits completely, and have sought new feeding grounds to the north and south of their former ranges. This in turn has brought some of them into contact with cultivated areas where they have done damage. In recent years the herds have become more restless and investigators attribute this to the noise of the planes which frightens the beasts. It is believed unlikely that the wild elephants ever will become accustomed to the air

e1699
REFLECTOR ON BUMPER GUARD IS SET IN RUBBER PAD



Bumper guards, which prevent over and under contact between bumpers of different automobiles, are being produced with reflectors set in rubber. The reflectors are supplied in two colors, red and green, to warn

night drivers. They are mounted in a rubber pad which serves as a shock absorber to prevent breakage as well as to protect the bumper guard. The shock absorber is black, while the guard is finished in chromium. The entire device is easily mounted.

Vertical handwritten notes on the left margin:
 March 1936
 Harold A. A. Aviation Corp.
 Harmingdale P. 7
 135 & 42nd Ave. N.Y.C.
 7990
 Reproduced by Confeli
 P.O. Box 11, Belmont
 1936

Vertical handwritten notes on the right margin:
 630 Throop St. Cambridge, Mass.

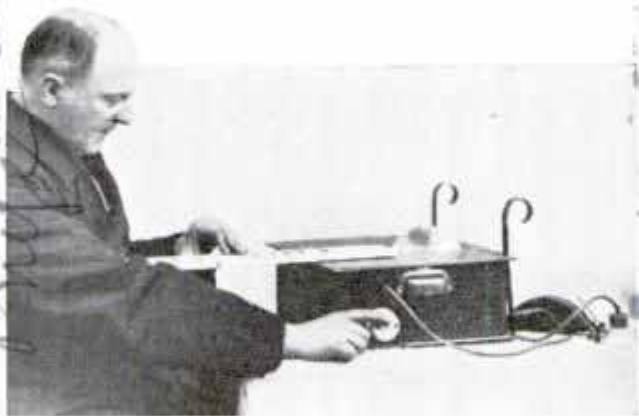
Horizontal handwritten notes at the bottom:
 Science News
 American Automobile

CITRIC ACID TAKEN DIRECTLY FROM LEMON JUICE

Direct extraction of citric acid from lemon juice promises to revolutionize the industry which has been obtaining the acid through the intermediary of citrate of lime. Development of the new process is designed to meet the growing competition of citric acid produced as a result of a special process of fermentation. The direct extraction method was evolved in Italy, which enjoyed a monopoly on the acid before the fermentation process was introduced.

ELECTRICAL SAW PLUGS IN WALL OUTLET

Adaptable to many purposes in the home or shop, a small electric saw has been produced in France. The saw may be plugged into any socket. It consists of a metal frame or box, sixteen inches long by ten inches wide and six inches high, weighing about seventeen pounds. From the top of the frame protrudes the small circular saw, which is



Handy Saw Plugs into Socket Like Any Electrical Appliance; Its Speed Is Adjustable

driven by a belt and pulley with proper reduction for the right cutting speed.



Oxygen Breathing Apparatus for Rescuing Drowning Persons; Visibility and Ease of Movement Are Not Hampered by Its Use

OXYGEN MASK HELPS RESCUER SAVE DROWNING PERSON

Successful tests have been conducted recently with an oxygen breathing apparatus which can be used under water to recover the bodies of drowning persons. In appearance, it resembles a gas mask and with its aid the diver can remain under twenty or thirty feet of water for a much longer time. Visibility and ease of movement are not hampered by the mask and this fact makes it efficient for rescue work where even seconds count.

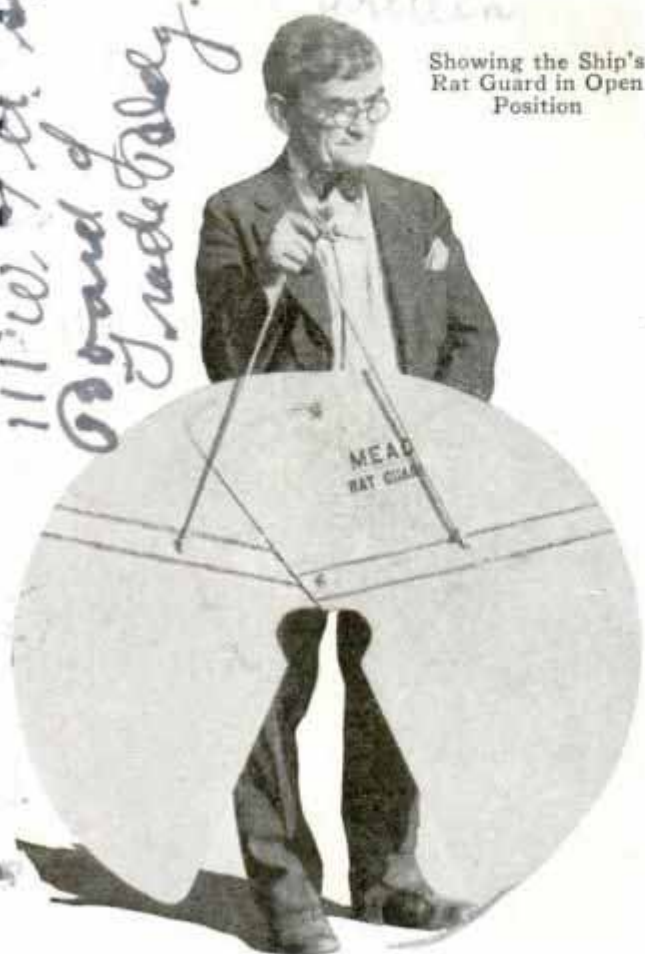
Mr. ~~None~~ Safety
[Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request accompanied by postage.]

According to *Commerciales & Handels*
Rome, Italy
11/17/33
Belega Commerce
183
1734
And. Sophie Wilder, 69 Morton St.

Tested by Capt. Charles D. S. ...
Life of Langley Childer
American Red Cross
Traddock
250

Mr. Globe Comproux *Appliances*

RAT GUARD FOR SHIP HAWSERS IS EASY TO INSTALL



Showing the Ship's Rat Guard in Open Position

Easy to place in position or remove, a rat guard has been produced for installation on ship hawsers while the vessel is in port. This device does not endanger the lives of seamen while it is being secured to the mooring lines, since it is dropped from the ship's side and locked into place at the end of a rope lanyard. A pull on the same line removes the guard. Protecting ships against rats is regarded as one of the best means of preventing the spread of disease from one country to another.

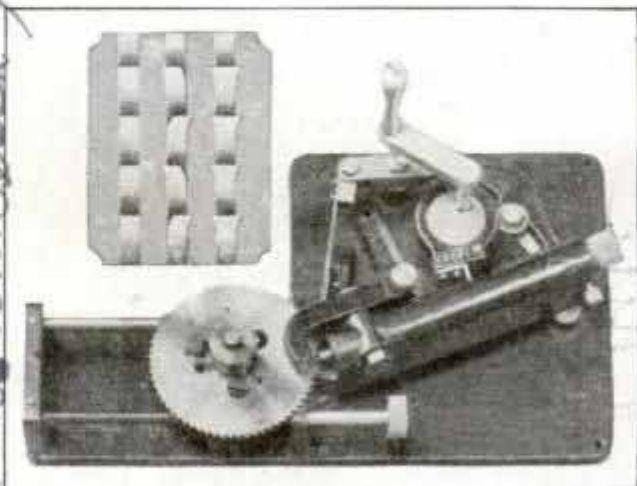
PLAN FOR LOW-PRICED PLANES TO AID PRIVATE FLYING

As a means of developing private flying in the United States, Eugene L. Vidal, director of aeronautics of the department of commerce, has launched a plan for the minimum production of 10,000 small airplanes. The cost of each plane to its purchaser would be \$700 or less. The department has sent out inquiries to nearly 34,000 persons identified with aviation, stating the specifications of a volume pro-

duction plane and asking whether they would purchase such a ship if it is made available in the near future. The result of this survey will be given to the American aircraft industry. According to Director Vidal, the proposed plane would be a small, low-wing monoplane, carrying two passengers, constructed of a new steel alloy, fitted with an eight-cylinder, small-bore engine of about 4,000 revolutions per minute and equipped with a geared propeller. An outstanding feature would be the landing speed of about twenty-five miles per hour, accomplished by means of "air brakes" in the form of flaps. The cost of operating and maintaining a plane of this type would be less than that of an average-priced automobile and "superman" qualifications would not be necessary to fly the ship. Its top speed would be less than 100 miles per hour.

CIRCULAR-SAW TOOTH SWAGER MAKES BLADE CUT BETTER

Circular saws cut better if there is enough clearance in the cut to avoid friction and heating of the blades. This can be accomplished quickly with an automatic saw swager which eliminates setting the teeth. In the swaging process, each tooth is given a uniform shape, with the edges extending beyond the plane of the saw itself. Since the outside edges of each tooth do the cutting, this eliminates binding and wobbling. The swaging is produced by compression, and a hammer



Automatic Saw Swager and, in Insert, Swaged Teeth, at Right, as Compared with Set Teeth

spring can be adjusted to deliver a light or heavy uniform blow to each tooth.

111 W. 7th St. Los Angeles, Calif. Board of Trade Bldg.

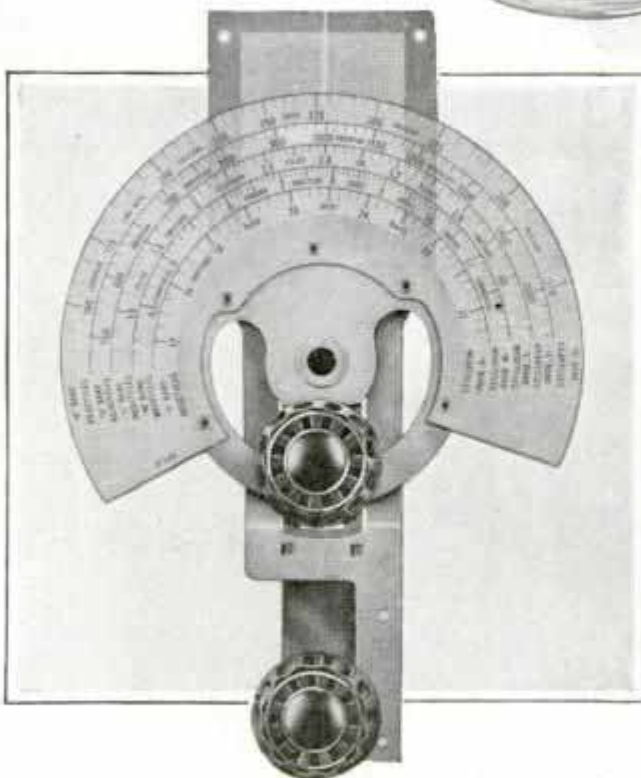
W.C. Beach

Technical Supply Co.



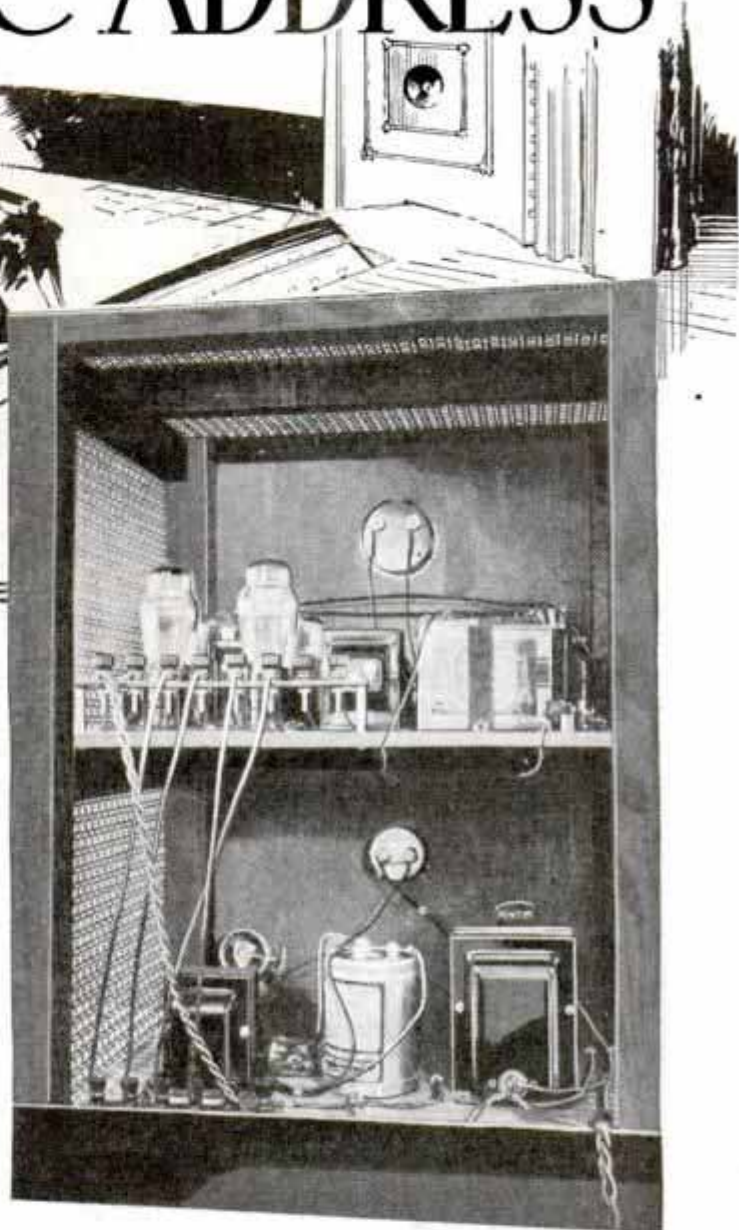
SIXTEEN-TUBE *Receiver* Covers *Five Wave Bands*

TUNING from 9 to 2,000 meters, this all-wave receiver covers practically every type of broadcast now on the air. The complete self-contained chassis and dynamic speaker are available and can be easily installed in your own console cabinet, if you happen to have one of standard size. It employs 29 tuned circuits, ten of which are in cascade. This means that the signal has to flow consecutively through ten tuned circuits before it is admitted to the audio amplifier. New tubes, good tone, high sensitivity and an adjustable background-noise suppressor are features of this set. The Midwest com-



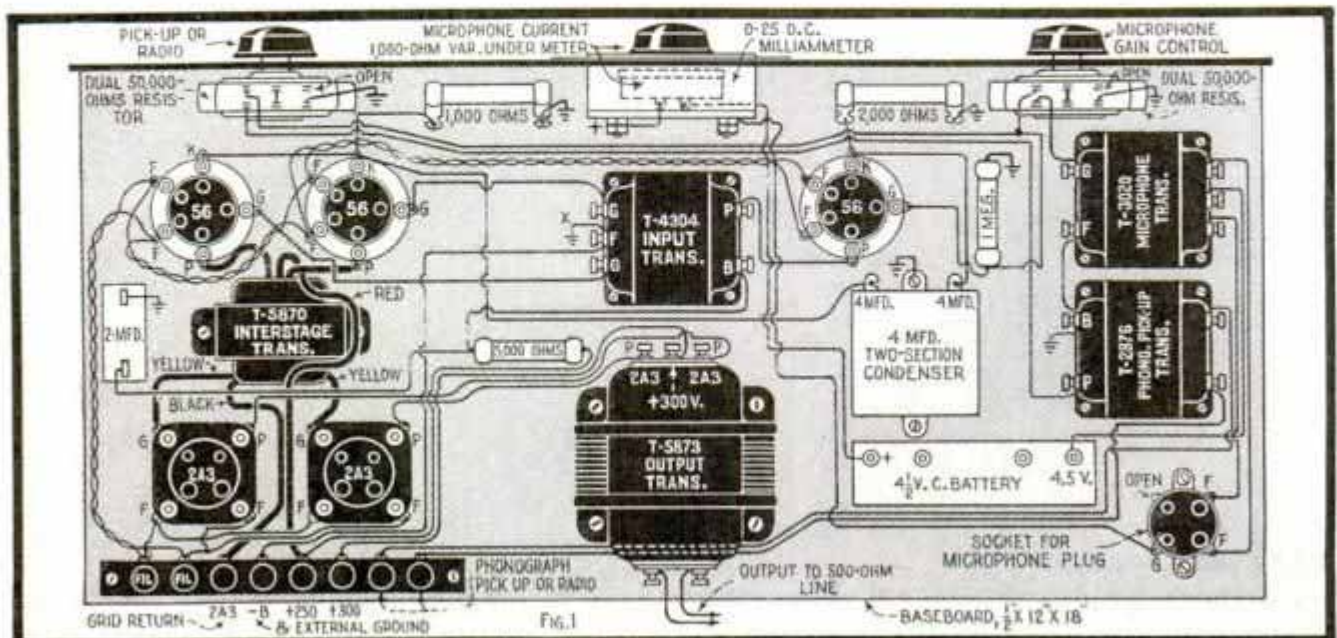
ination dial and automatic band selector, shown at left, greatly simplifies tuning. A spot of light indicates the band being tuned; this moves over the different bands as the lower knob is rotated. The five scale divisions are indicated by the letters E, A, L, M, and H. The E band tunes from 850 to 2,000 meters for the long waves commonly used in Europe. Band A covers American broadcasts from 200 to 565 meters; L tunes from 75 to 200 meters for police, amateur, television and commercial airplanes. The fourth band, indicated by the letter M, covers the range from 25 to 75 meters; this band is reserved for amateurs, commercial airplanes and worldwide short-wave stations. H is used for amateur and commercial phones.

A Modern PUBLIC ADDRESS



RECENT tube developments have made possible the construction of this practical low-cost amplifier. Built and tested in Popular Mechanics radio laboratory, it is entirely self-contained and operates directly from the ordinary 110-volt a.c. supply line. Although simple in design, it is highly efficient and has ample power for use in school auditoriums, public address work and community dances. All parts are standard and no special knowledge of radio is necessary to assemble it.

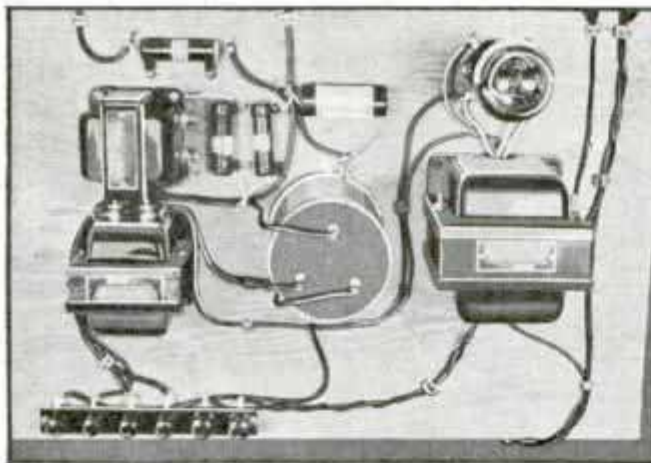
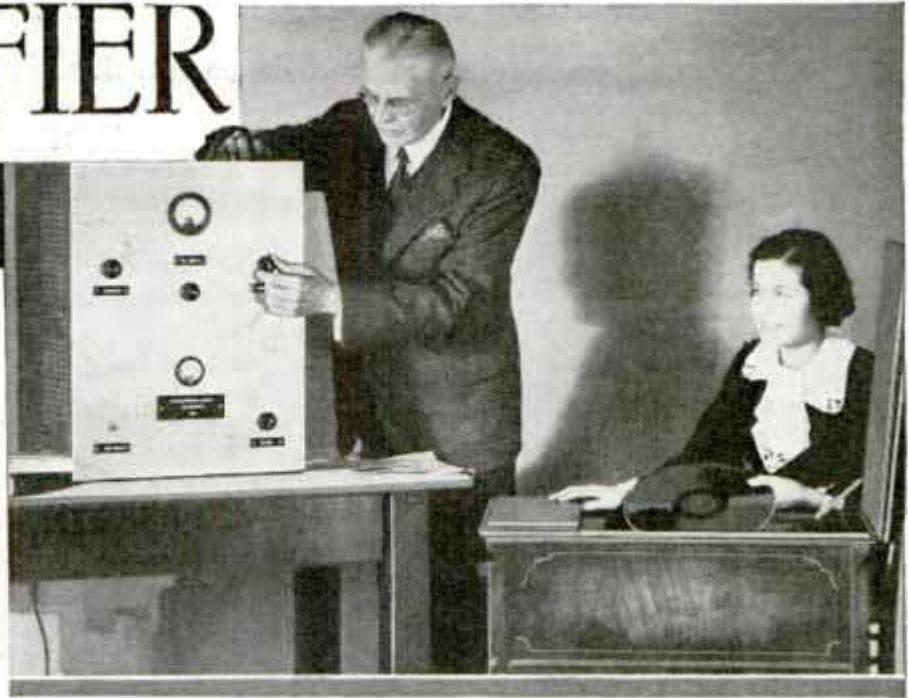
The input is arranged so that a double-button microphone and either a phonograph pick-up or radio may be used at the same time, each having a separate volume-level control, so that a musical back-



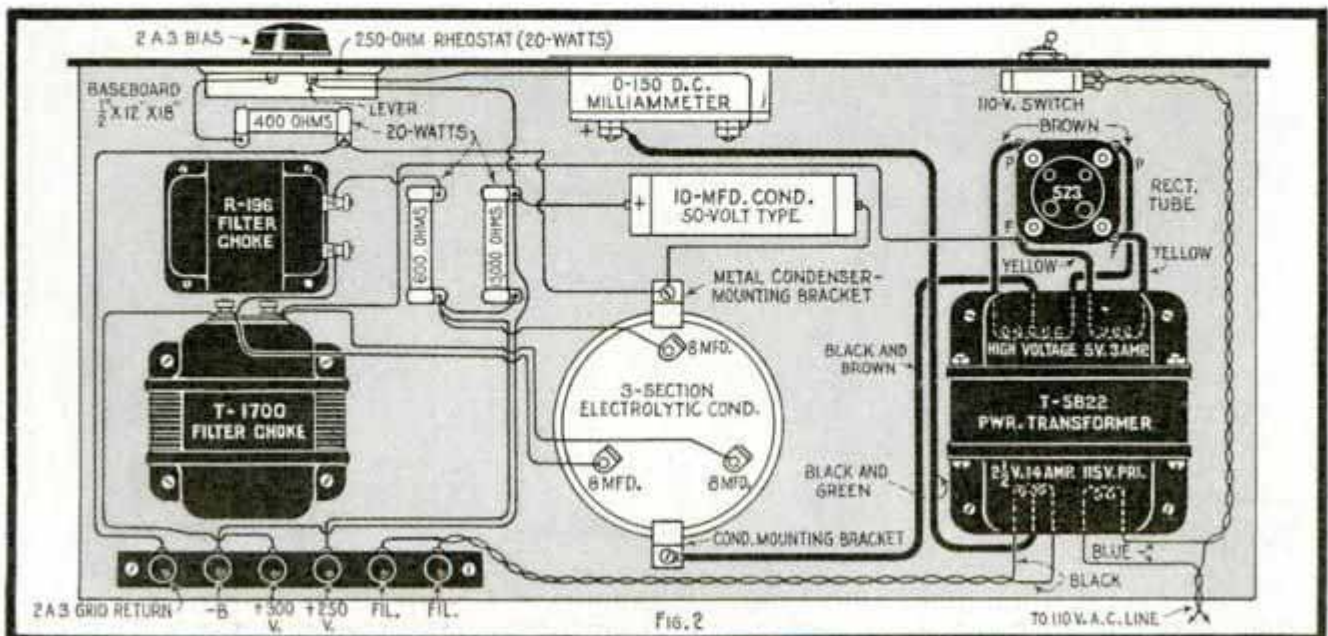
AMPLIFIER

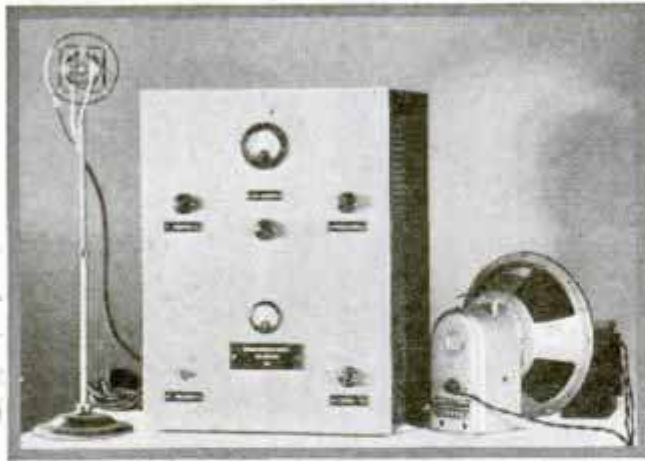
at
Low Cost

ground may be used for announcements if desired. This is done by means of two dual variable-resistor units, used as faders and so arranged that the adjusting of one does not change the volume level of the other. About 15 watts of audio power, with only 2½% distortion, is developed and the tone range is as good as that obtained from the amplifiers that are used in most of the modern broadcasting stations.



Two plywood baseboards, ½ by 12 by 18 in., are used to mount the various parts of the amplifier and power unit. These layouts are given in simplified form in Figs. 1 and 2. All wiring is clearly shown in these breadboard layouts and the instruments, mounted on the metal front panel, are also shown connected in the circuit. In the original model, shown in the photos, the front panel consists of a sheet of satin-finished craydo metal, ¼ by 18 by 24 in. Aluminum or plywood may be used for this panel if desired. Although the panel appears against both of the instrument boards, these boards are actually mounted in the rack about 2 in. back from the panel to facilitate bringing up the leads to the





instruments at the front. The binding posts are arranged on strips of bakelite, supported $1\frac{1}{2}$ in. above the bases by means of metal bushings at each end. A photo of the completed power unit is shown above Fig. 2 and the amplifier, detailed in Fig. 1, appears above the schematic diagram. A complete material list may be obtained, without charge, upon application.

The interstage transformer in Fig. 1, and power transformer in Fig. 2, are provided with colored leads for easy identification. All other wiring is done with No. 16 rubber-covered flexible stranded wire. It will be noted that all of the filament leads are twisted. The grounded post, marked

X on the input transformer, is connected directly to negative B, which is the externally grounded post on the terminal strip. All other leads indicated as grounded are brought to the transformer post marked X, which is used as a common ground, or connected to leads running to this common ground when it is not convenient to run a separate lead.

The instrument rack is made of wood and covered with perforated steel sheet which is available in a cane pattern. The rack is 18 in. wide, 24 in. high and 18 in. deep. Four corner posts, $1\frac{1}{2}$ in. square and 24 in. long, are required. The base is 1 by 18 by 18 in. with $1\frac{1}{2}$ -in. cutouts at each corner to take the upright posts. The top rails and the side braces, upon which the baseboards rest, are 1 by $1\frac{1}{2}$ in. These details are all clearly shown in the rear-view photo on page 262. A large blueprint of all diagrams, including a detailed sketch

of the rack, is available. Those who wish it should specify blueprint No. 194.

The power-supply unit employs the new 5Z3 rectifier tube. Bias for the 2A3 power tubes, that are largely responsible for the efficiency of this amplifier, is obtained by

(Continued to page 120A)



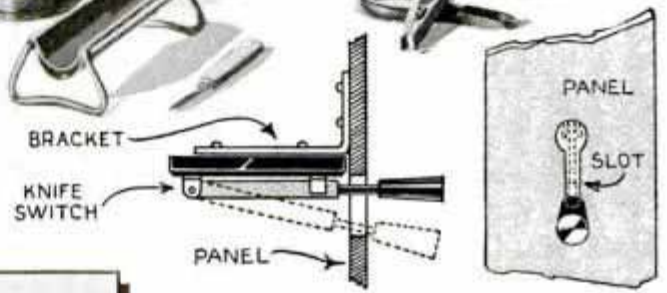
*National Radio Co
Malden, Mass*

*National Company, Inc
Malden, Mass*

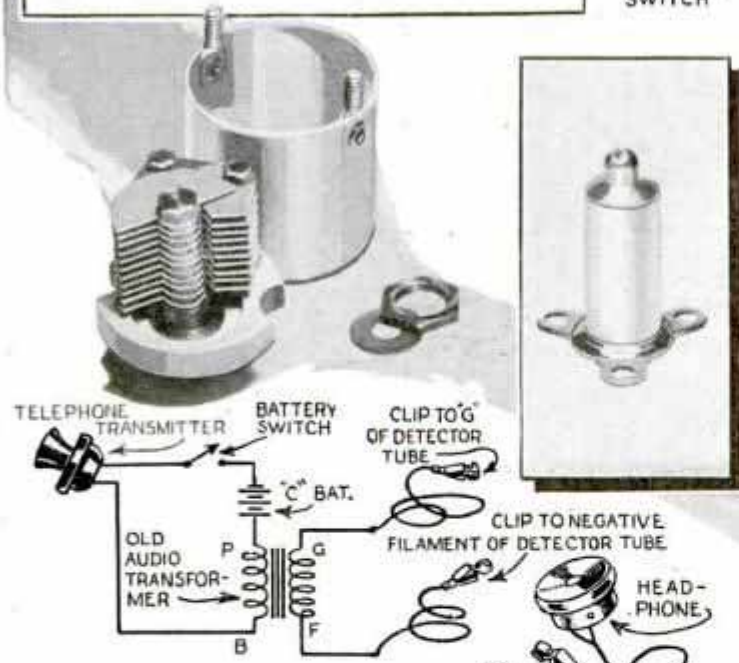
Easy Solutions for COMMON RADIO PROBLEMS



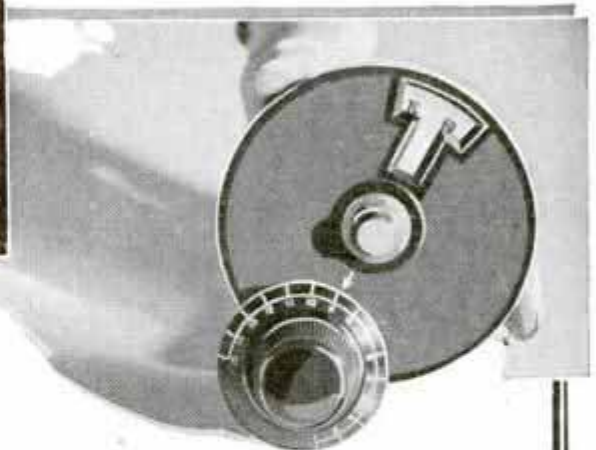
Above, Spring Clothespin Holds Flexible Hook-Up Wire in Handy Position for Tinning and Soldering; Below, 100-MMPD. Air-Type Padding Condenser for Super Circuits Has Dust Shield; Right, Isolantite Stand-Off Insulator; Metal Feet Prevent Cracking Ceramic When Mounting



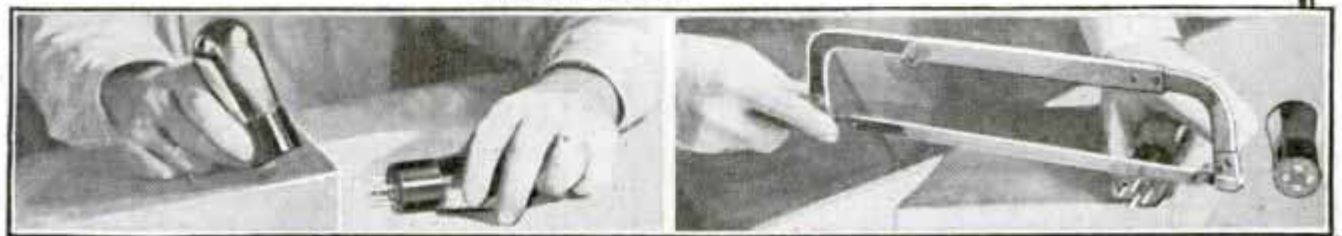
Above, an Ordinary Knife Switch Mounted as a Substitute for an Expensive Heavy-Duty Panel Switch; Below, Small Dial Used Instead of Knob on Vernier Dial Aids in Close Tuning Short-Wave Receivers



Above, Home Broadcaster Hook-Ups; Keep Volume Control on Receiver Low and Extend Phone Leads to Adjoining Room



Lower Photos Show How Receiver Designer Makes Old Tubes Stand Up When Laying Out Bases for Tube Height and Location



*General Radio Co
Cambridge
Mass*

*R.C.A. Radiotron Co
Harrison, N.J.*



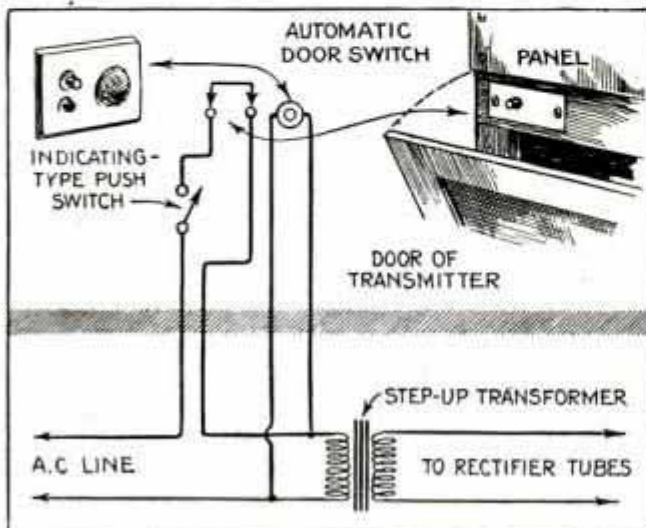
Triple-Grid Tube Showing the Seven-Prong Arrangement to Provide External Connections for Each Grid

Receiver Tube Has Seven Prongs

A triple-grid power amplifier tube, known as the type 59, has been recently introduced for use in the output stage of a.c. operated receivers. A 7-contact socket is required. It is a heater-type with a very low hum level and has twice the gain of a type-245 tube, which greatly increases the audio output of the new receivers.

Automatic Door Switch for Power Compartments

This simple safety-first device, commonly used in commercial stations, may be easily adapted to any amateur apparatus or public-address system where high voltages are employed. It will be noted that



Power Compartment Door Operates Safety Switch

the primary circuit of the power transformer is controlled by an indicating-type push switch on the front panel, or operator's desk. The red jeweled light in this switch is on when the button is pushed to energize the primary. A standard H and H automatic door switch is mounted on the instrument frame at the rear in such a manner that when the door to the power compartment is opened, the automatic switch opens the primary of the transformer regardless of whether the starting switch is on or not.

04503

Transformer Is Continuously Variable

To compensate for line-voltage changes, the usual method is to use rheostats or tapped transformers. These both have disadvantages; a rheostat regulates voltage downward only and introduces power loss, while the tapped transformer does not give smooth adjustable voltage control. This transformer solves the problem by means of a special core wound with a single layer of wire over which a brush contact slides as the dial is rotated. A.C. voltage control with the smoothness of a rheostat, from 0 to 130 volts, is thus made practical. The dial is calibrated in 5-volt steps.



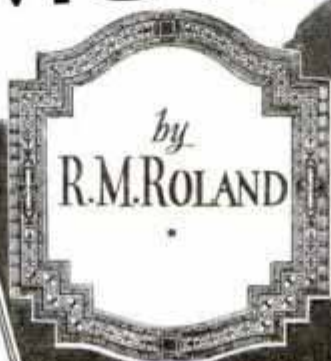
Auto-Receiver Installation Troubles

Roof antenna should be kept at least 3 in. from all metal body parts. This also applies to the dome light and its wiring, which should be shielded and the shielding well grounded. Suppressors usually eliminate most of the ignition noises; however, in some cases it is necessary to shift the lead-in wire, speaker and battery cables. Also try grounding the hood by winding bare wire around the woven-braid lacing which is used to prevent the hood from contacting the metal under the braid.

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.



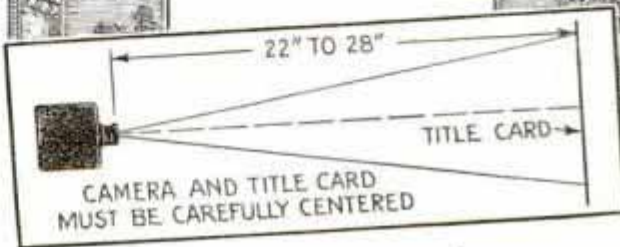
Make your own HOME MOVIE TITLES



LETTERS that come floating into the title page and seemingly arrange themselves into words, is one of the novel effects that you can produce when making home-movie titles. Other unusual treatments are the use of small-figured wallpaper backgrounds, the arrangement of pictures and decorative borders cut from magazine pages and the illusion of a real stage with the movable curtain bearing the title. Using positive film for titles makes the cost comparatively small. With positive film the image comes reverse, that is, the film is not processed and reversed, but you get a negative, the same as with any film,—a white background becomes black and vice versa.

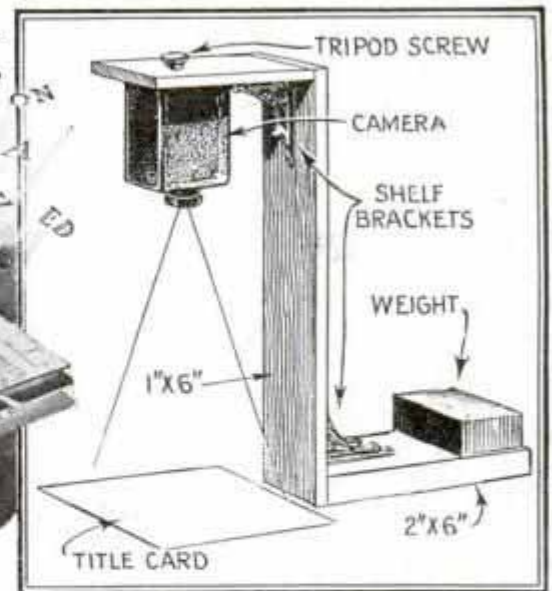
Using printed letters cut from magazines is much easier and quicker than lettering the titles, especially for those not accustomed to this work. The same applies to the use of decorative borders

Letters that Form the Title Words Come Floating Into the Picture

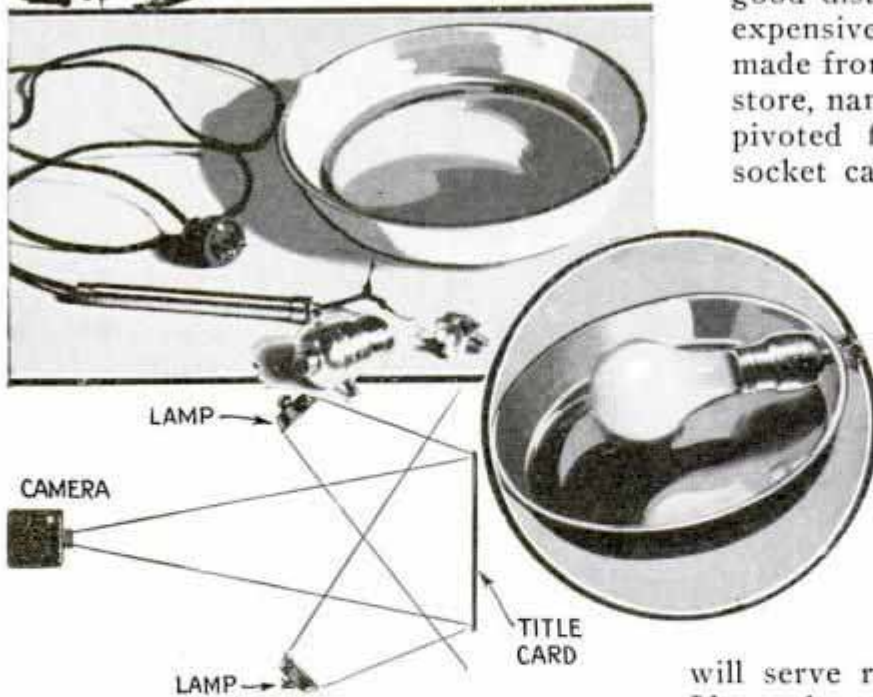




**Gently Blowing
Away the Letters
While the Title Is
Being Shot**



**Simple Setup for
Lowering the
Title Behind a
Miniature Stage**

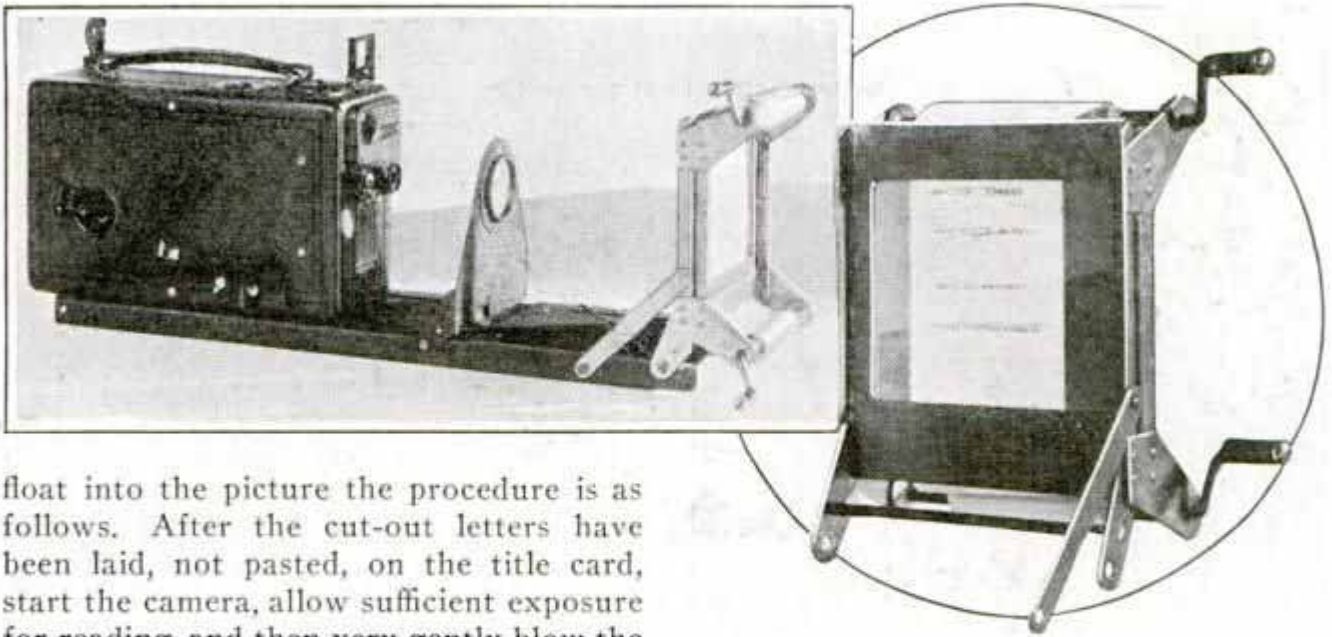


and pictures. For the white background, a dull-finished paper is preferable to glossy paper, as the light reflection will be more even. Also, it has been the experience of the writer to keep the white background rather small, say about 5 by 7 in. in size.

This is pasted on a 12 by 14-in. piece of gray paper and a 7 by 9-in. border is then drawn around the white title piece. The distance the average camera should be placed from the title card is from 22 to 28 in. A good method of taking title shots is to mount the camera on a suitable holder, pointing the camera directly down toward the title card, which is laid on the table below, as shown in one of the illustrations. Another detail shows how two lamps are arranged for good distribution of light. Simple, inexpensive lights for this purpose can be made from parts obtainable at the dime store, namely, a flat tin pan, a socket, a pivoted fitting that screws onto the socket cap, a brass sleeve that screws onto the fitting, a length of lampcord and a plug. The assembled lights are then mounted on suitable holders. The 64-volt photo-flood lamps will furnish plenty of illumination.

When the title card is laid in a horizontal position, there is no need for pasting the letters down. This has the advantage in that the same title page will serve repeatedly for different titles. If you do paste the letters down, use rubber cement, which makes it easy to remove the letters any time. When exposing, make sure that there will be sufficient time to permit reading the title,—about three minutes per word is about right.

For the trick of making the title words



float into the picture the procedure is as follows. After the cut-out letters have been laid, not pasted, on the title card, start the camera, allow sufficient exposure for reading, and then very gently blow the letters away. With a little practice and with the help of a soda straw to direct the air current on small spots you will soon become adept at removing the title letter by letter, which is, of course, preferable to blowing them all off the card simultaneously. Start with the letter at the upper left and go over the first line toward the right and then continue with the second line the same way. After the words have all disappeared, stop the camera. The developed film is cut out and reversed, from top to bottom, after which it is cemented back in place. When projected on the screen, the letters will come into the card one by one until the complete title is formed. Another stunt is to paint a miniature stage on a piece of cardboard, cutting out the center portion to expose the title card, which in this case is a small curtain behind the cut-out section of the stage piece. For this type of title card, the stage piece is set up vertically and the camera placed in front of it. An easy method of raising and lowering the curtain is shown in one of the drawings. Falling snow or rain can also be shown on title cards by placing a perforated reservoir above and just in front of the title card held vertically. Besides these suggestions there are numerous other ideas that will produce unusual effects, depending on your own resourcefulness. One of the simplest title cards having a mottled background is made by pasting suitable wallpaper on cardboard and then placing the letters on this background.

Where it is necessary to get the film

out in as little time as possible, and fancy titles are not desired, typewrite the titles on a long strip of paper, allowing sufficient space between each one, and mount the strip on rollers, which are then attached to a small frame. After each title has been shot the rollers are turned to bring the next one in position.

Tool Slices Soap and Vegetables

Here is a homemade tool with which you can quickly slice soap or vegetables. A small rod is pointed at one end and is threaded almost its entire length. A strip of sheet metal is then folded over at one end and is drilled to screw onto the rod. A more permanent job will be had by soldering a nut on the end of the metal strip to screw on the rod. After sharpening one edge of the strip, fasten a handle to the



Soap and Vegetables Sliced with Tool Improvised from Iron Rod and a Strip of Sheet Metal

other end and the tool is ready for use. Insert it through the cake of soap and turn the metal strip as shown.—G. E. Hendrickson, Argyle, Wis.



Striking Side of Barrel with Wood Mallet Quickly Removes Bung without Getting Splinters Inside

Barrel Bung Removed by Pounding on Side Staves

To easily remove the bung from a barrel, simply strike the staves around the bung several sharp blows with a wooden mallet. The bung is usually tapered slightly and this action will cause it to loosen instantly. This method is much better than using a chisel or auger, which usually results in shavings or splinters falling inside the barrel.—G. D. Nelson, Argyle, Wis.

Vermin-Proof Poultry Feeder

One of the most essential requirements of poultry feeders is that they be vermin proof and be so arranged that the fowls cannot climb into them. A Wisconsin poultryman made his own feeders from cake pans and funnels, which he mounted on wood stakes as shown. The pans were of the type having a hollow spout projecting upward from the center. When the pans and funnels were mounted, the stakes were driven



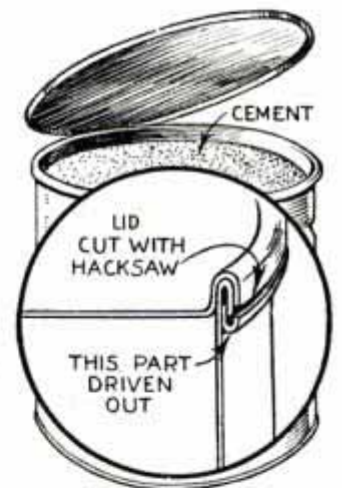
into the ground to elevate the pans a few inches in order to prevent mice from getting at the contents. The funnels prevent fowls from getting into the pans, and also shield the feed from chaff and litter.

Transparent Lacquer on Wrist-Watch Band Prevents Stains

Stains on the arm caused by a metal wrist-watch band or strap can be eliminated by applying a coat of clear lacquer or finger-nail polish to the inner surface of the band. The surface to be lacquered should, of course, be clean and dry. Also, as the coating will wear off, it should be applied at intervals.

Moisture-Proof Containers for Cement

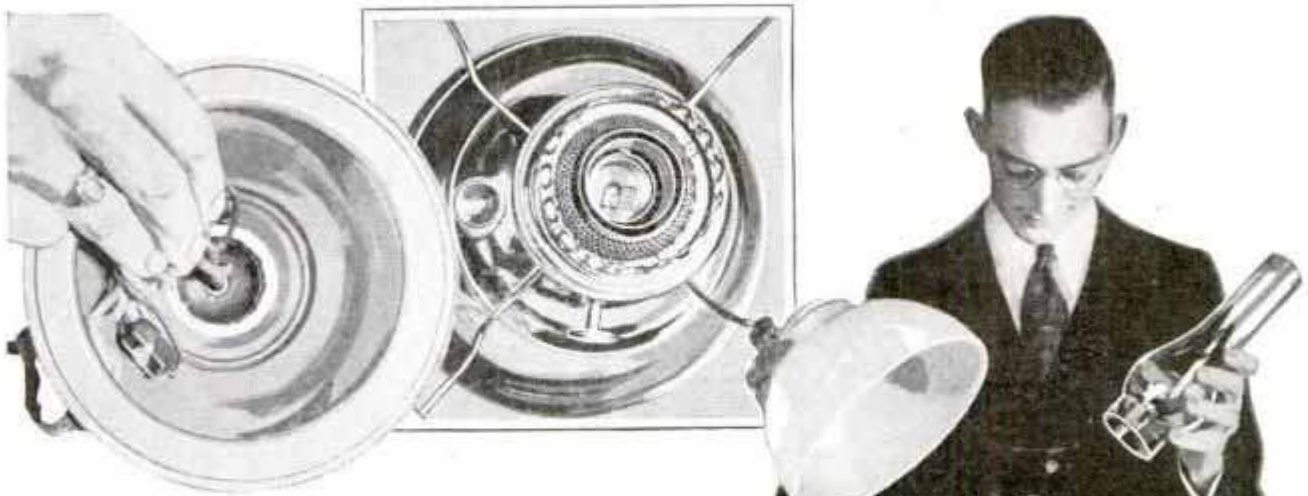
Moisture-proof containers in which to keep cement so that it will not harden can be had by slightly altering the heads of steel oil drums. With a sharp hacksaw, cut the crimped edge as shown in the circular detail and then drive out the lower piece which has been sawed loose. The head can now be lifted, and, when replaced, will effectively protect the contents of the drum. A weight placed on the drum will prevent any tendency of the head to raise up.—G. P. Milde, Brownsville, Ore.



Grease Spots Removed from Clothing without Leaving Rings

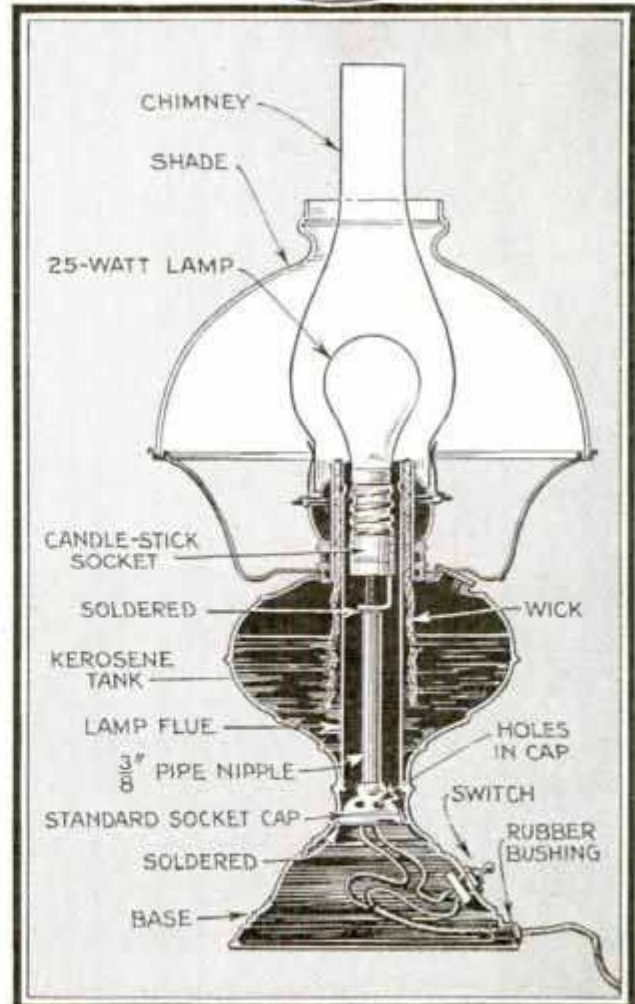
Grease spots on paper or cloth may be removed with a mixture made by rubbing calcined magnesia into a paste with benzine. The benzine dissolves the grease and the magnesia absorbs it. If the spots are old, it may be necessary to apply the preparation several times. The paste is rubbed into the spot with the fingers, away from fire, as benzine is highly inflammable. The mixture can be preserved in a wide-mouthed bottle, kept tightly corked.

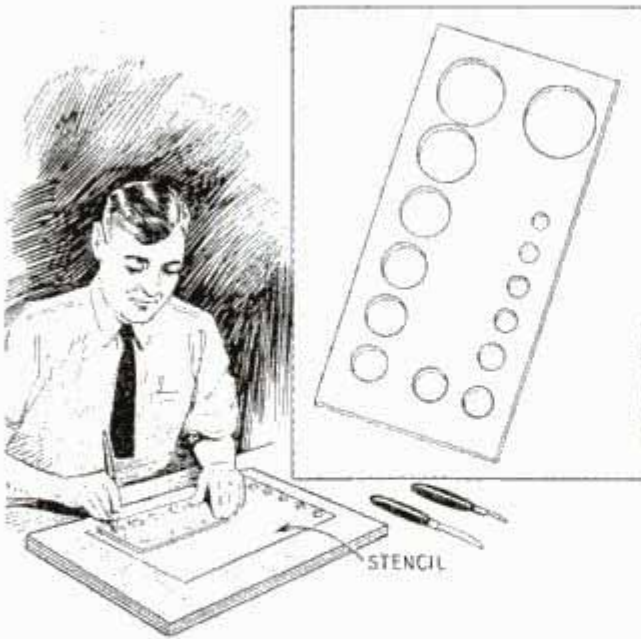
How to Electrify Your Old Oil-Burning Lamp



Converted into a combination oil and electric lamp, so that it can be used in either capacity at any time, this lamp is of special convenience in communities where the electric-lighting supply is not always dependable. To change from electric to oil, merely unscrew the lamp and light the wick. The type of lamp needed is one that has a hollow center extending from the base to the top, and uses a cylindrical wick. In order to make the conversion to an electric lamp, get a $\frac{3}{8}$ -in. standard socket cap, a $\frac{3}{8}$ -in. pipe nipple, and a candlestick-type socket, a toggle switch, a lampcord and plug. Ventilating holes are first drilled in the cap after which it is screwed to the tube, and this in turn is soldered securely to the socket as indicated. The lampcord is then run through the cap and tube, and connection is made to the socket, after which the assembly is slipped inside the hollow center of the lamp, and the cap is soldered in the neck of the base. Next, drill a hole for the switch and install it. One of the lampcord wires is cut in two, inside of the base, and the ends thus formed are connected to the switch. A hole is also drilled in the base and reamed out to take a socket-cap bushing and the lampcord is run through this outlet. Attaching a plug at the other end of the lampcord completes the job. Soldering iron—the pipe nipple—necessitates first cleaning the surface and then applying a flux consisting of muriatic acid cut with zinc.

☛ When cleaning the dust bag of a vacuum cleaner, it is a good idea to empty it above dampened newspapers on the floor to keep the dust from spreading in the room.





Compass-Point Holes in Mimeograph Stencil Avoided by Using Finger-Ring Gauge to Make Circles

Finger-Ring Gauge Used to Make Circles on Stencils

An ordinary finger-ring gauge card, obtainable at jewelry stores, is handy for making circles on stencil paper. The card will be found better for this purpose than a compass, the point of which leaves a hole in the stencil. The ring gauge has sixteen circles of different sizes, which is sufficient range for average stencil work.

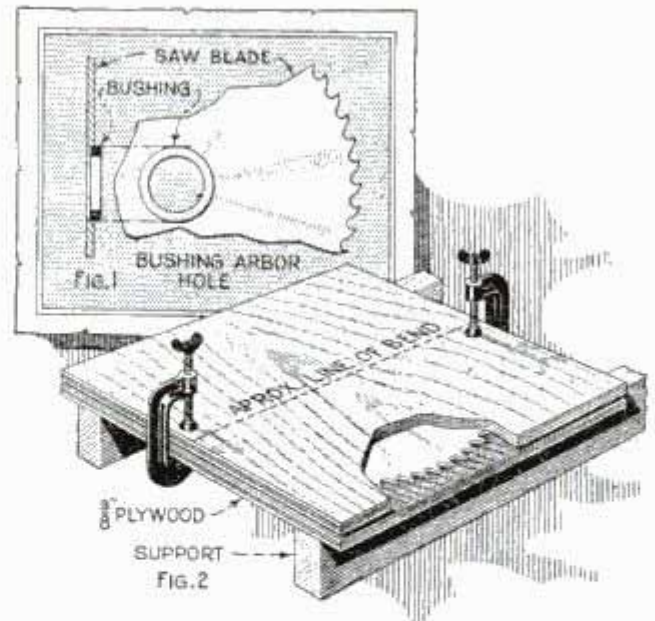
Making Your Crosscut Saw Run Easily

Have you ever gone to the timber with a newly filed crosscut saw to cut down trees, and found that it pulled just as hard as it did before it was filed? If so, the difficulty was probably due to the kind of wood you were cutting. In most cases, a few drops of oil or gum solvent spread over the saw will remedy the trouble. If the timber being cut is of the coniferous species, such as pine, balsam, spruce or hemlock, a few drops of gasoline or naphtha on the saw will usually do the trick. This dissolves the gum and resin that accumulate on the saw blade. Frequent applications may be necessary to keep the saw running smoothly. However, if the timber is of a hardwood variety, such as oak, poplar, ash, elm, maple or the soft woods such as willow, basswood and aspen, a lubricant should be used instead of the solvent. In this case, use a few drops of good oil, such as sweet oil, gun oil or even light machine oil. In sawing some of the harder

woods such as maple and pear wood, it may be necessary to use a solvent in connection with the oil.—Ben C. Robinson, Newcomerstown, Ohio.

Circular Saw Bushed to Fit Small Arbor

It often happens that the home-workshop owner has a dado head or a circular-saw blade in which the hole is too large to fit his saw arbor. This can be remedied by bushing the hole with a thin ring cut from a bronze sleeve bushing, as shown in Fig. 1. First try the bushing in the hole. If it fits tightly, cut off a ring of exactly the same thickness as the saw and force it in place, being sure that it is at right angles to the blade. If the bushing fits the hole loosely, cut the ring a little wider than the thickness of the blade. Lay it on a flat surface and strike it lightly with a hammer to expand the metal. Another kink that is often useful is that of truing a saw blade that has been slightly sprung. First determine the location of the bend. Then clamp the saw between two pieces of $\frac{3}{8}$ -in. plywood with the clamps on the line of the bend. Lay the assembly in such a position that the ends are solidly supported, as shown in Fig. 2. Then strike a

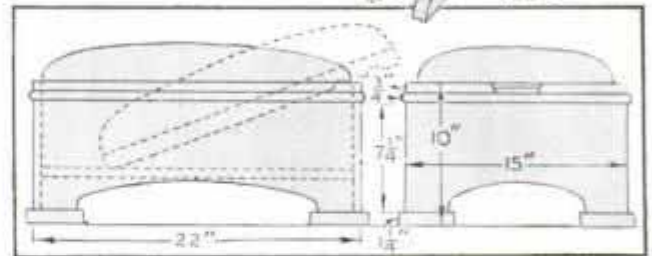
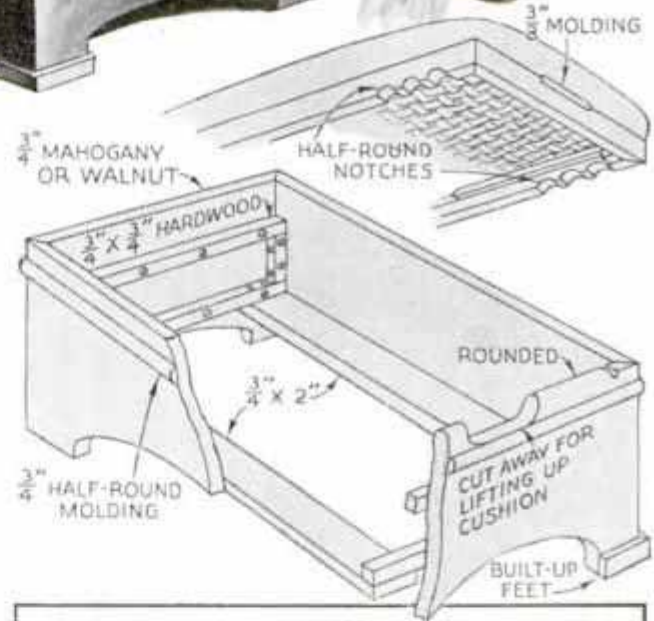
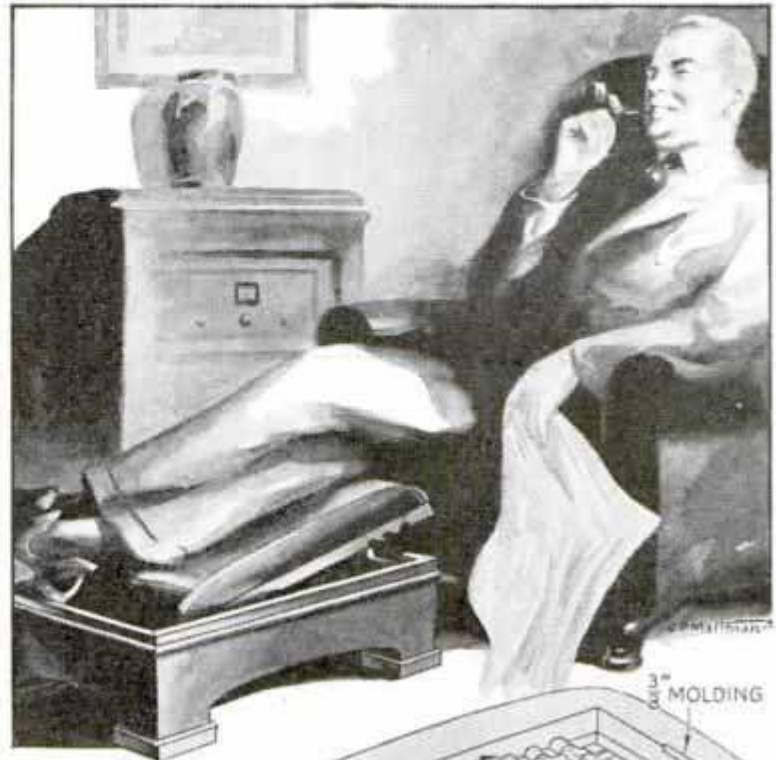


Simple Methods of Straightening Bent Circular Saw or Bushing One Too Large for Saw Arbor

sharp blow with a hammer at three evenly divided points just below the line of bend. If the bend is not entirely removed, repeat the procedure with very light blows until the blade is true.

English Footstool Has Adjustable Cushion

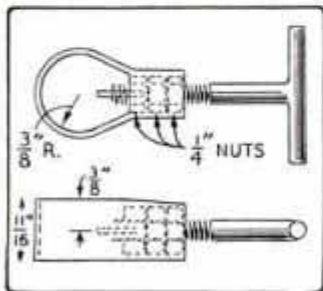
This new design in a stool from England not only rests the feet but can be adjusted to form an extension to a chair. The cushion is made on a separate frame which can be used in a horizontal position, or one end may be lifted up and kept in a tilted position. Construction is merely a matter of simple cabinet work. For wood, use $\frac{3}{4}$ -in. mahogany, walnut, oak or other wood having a fine grain, which can be stained to match the chair it is to serve. Ordinary pine can be used if the stool is to be painted. Corners are mitered and glued, and fastened with cleats on the inside, as shown. The top edge of one end is rounded to fit in the half-round adjustment notches of the cushion frame. A section is also cut away to permit the hand to lift the cushion. This type of stool lends itself to considerable decoration in the way of molding or wood-carving. Upholstering, of course, should match the accompanying chair.



Eliminating Odor of Cleaning Fluids

If you like to clean your garments with naphtha or benzine, but object to the odor left in the clothes, add 2 or 3 drops of oil of lavender to each quart of cleaning fluid used. This does not interfere with the cleaning action and imparts a pleasing odor to the material being cleaned.—L. H. Georger, Buffalo, N. Y.

Gap Adjuster for Airplane Spark-Plug Points



Of the many tools used by mechanics in adjusting the spark-plug points of airplanes, the one shown here is probably one of the easiest to

make. Three $\frac{1}{4}$ -in. nuts are welded between the ends of a U-shaped piece of sheet steel as shown. A length of $\frac{1}{4}$ -in.

iron rod, having a short crosspiece welded to one end to serve as a handle, is threaded and is drilled lengthwise in the end to take a short piece of No. 23 piano wire. This should be a drive fit in the rod. Note that one side of the loop is farther from the center of the pin than the other. This is to take care of plugs that have the gasket on, as well as those without one.



Straw Retained by Old Tire Casing Makes Excellent Bed for the Dog

Dog Bed Made from Old Tire Casing

Filled with clean straw, hay or similar material as shown in the photo, an old tire casing makes an excellent bed for your dog. The casing retains the bedding material and keeps it from being scattered about. Frequent changing of the material is necessary for the health of your pet. By placing some tobacco leaves in the bed the animal will not be troubled with lice.

Rubber Band Protects Skate Runners



When carrying ice skates it is a good idea to protect the steel runners from nicks and dents that may occur when the skates strike together. A rubber band about 1½ in. wide cut from an old inner tube and stretched lengthwise over the skate runner, as shown, will be found useful for this purpose.

Glue Made Waterproof

Cabinetmakers' glue may be made practically waterproof by either of the following methods: The simplest one consists of adding to each pint of thick, hot glue, potassium bichromate, 1 to 1½ drams, dissolved in the smallest possible quantity of hot water. The bichromate should be added immediately before the glue is to be used and should not be mixed in strong sunlight. After the joint has set and has been exposed to the light for some time,

the hardened glue becomes almost waterproof. The second method is to allow a good grade of glue, 1 part, to swell in an equal quantity of water, then, after the glue has absorbed as much water as possible without the pieces losing their semi-solid form, add linseed oil, 1 part, and melt the mixture over a low fire, stirring it to an even consistency without burning it. The third method consists of melting glue, 12 parts, in water, 15 parts. After the glue has been melted and is of an even consistency, stir in rosin, 2 parts, heating until the rosin has been evenly mixed with the glue. Four parts of turpentine are then stirred into the mixture. All three preparations are, of course, applied hot.

Split Sleeve Holds Broken Drill in Drillpress

By using a split pipe sleeve as shown, broken drills can be utilized. This method can be applied to drills up to ½ in. in diameter. The sleeve is merely slipped over the broken end of the drill and the assembly is then chucked in the drillpress.



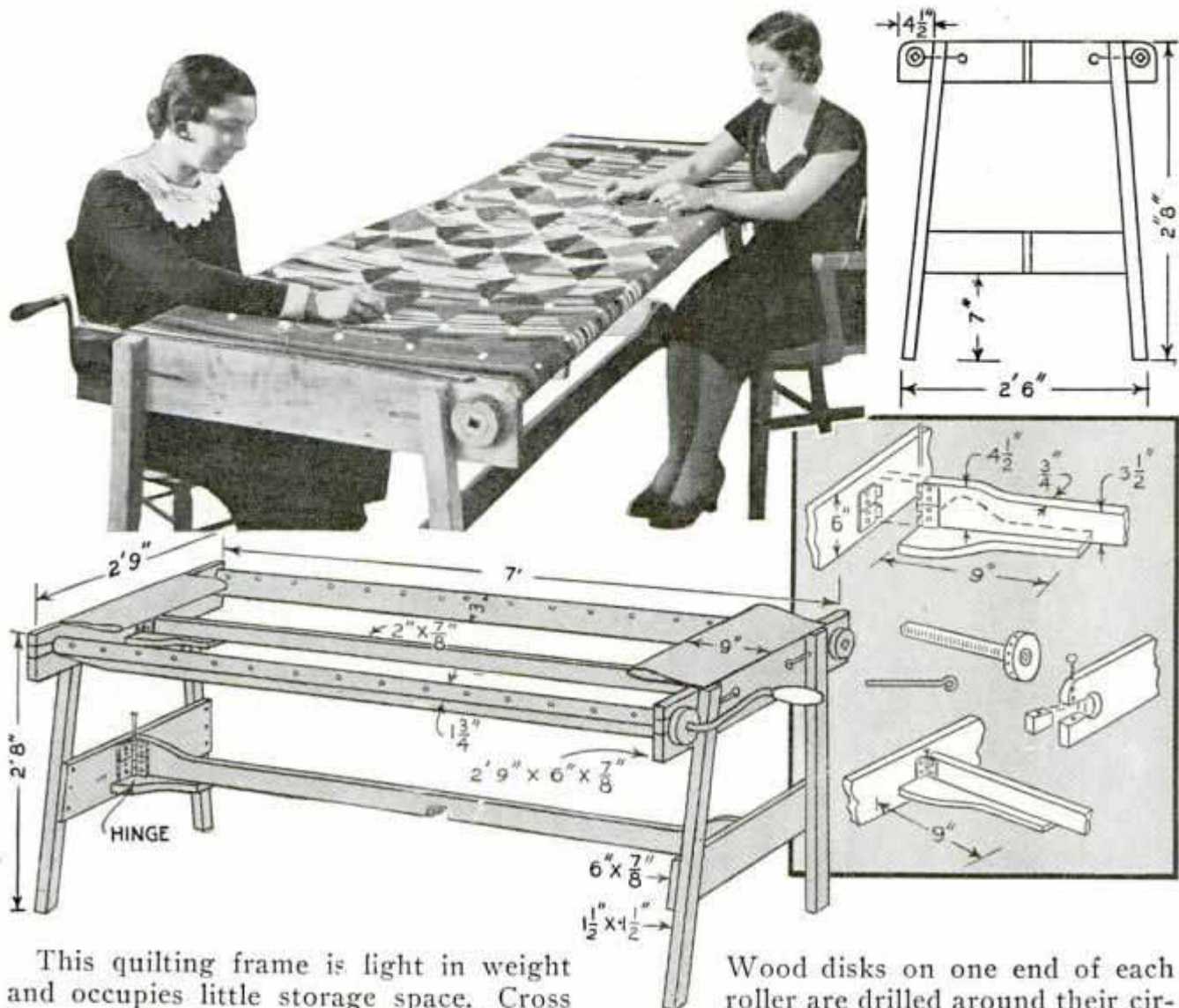
For small drills, a thin strip of tin, copper or brass may be rolled to form a tube for this purpose. —Thomas Moore, Detroit, Mich.

Miter Box Hinged to Workbench

This arrangement keeps the miter box out of the way and assures it being at hand when needed. It also provides a rigid mounting when the box is in use. The box is held to the end of the workbench by means of a hinge improvised from three pieces of flat iron, one of which is screwed to the bench top flush with the surface and the other pieces screwed to the miter box flush with the bottom surface as shown.



A Quilting Frame with New Conveniences



This quilting frame is light in weight and occupies little storage space. Cross braces at the top and bottom provide the necessary rigidity, and they are attached to the ends of the frame by means of hinges, the pins of which are removed to dismantle the frame. Additional strength is obtained by wood blocks screwed to the underside of each brace to bear against the ends of the frame. The rollers work in slots cut lengthwise in the ends of the frame. They are held in place by means of blocks, which are fastened with small pins.

Wood disks on one end of each roller are drilled around their circumferences to receive steel pins inserted through holes in the vertical frame members, which prevent the disks from turning when the quilt has been stretched on the frame. Each roller has a strip of canvas tacked to it to permit easy attachment of the quilts with pins. The ends of the frame are also fitted with strips of canvas for the same purpose. Fitting a crank to the end of one roller completes the job.

Tool Quickly Rules Music Staff on Mimeograph Stencil

The five lines of a music staff are made on a mimeograph stencil in one operation by using this tool, which utilizes five



old safety razor blades. They are bolted together using cardboard spacers about $\frac{1}{16}$ in. in thickness. In using the tool, pull the rounded ends over the stencil, otherwise it will be cut.

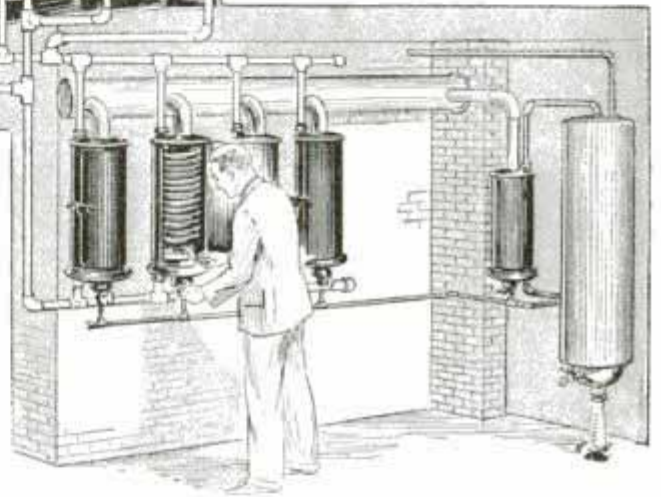
☐ A small tobacco sack rubbed briskly on glass has been found helpful to keep it from frosting.

Hot-Water System Operated on Gas Burners



for the addition of more units should they be needed. Both the pipe and the heaters should be covered with asbestos insulation to avoid excessive loss of heat. The basement will be kept warm by the flue that conducts the burned gas to the chimney and it is a good idea to have the flue quite long in order to get as much heat as pos-

Replacing a furnace in a hot-water heating system, a number of gas-fired water heaters, connected to the system in parallel, have been found practical, and, according to the owner, also economical, as only one or two burners are used during mild weather and extra burners can be lighted as the weather becomes colder. The number of burners needed depends, of course, on the number of radiators, their size, the amount of space to be heated, the type of building and also the severity of the weather. Roughly, it has been found that one heater is needed for each radiator of average size. When installing the heaters, it is well to leave space



sible. Expansion and contraction of the water is taken care of by an expansion tank at the highest point of the system, this tank being equipped with an overflow pipe that lets excess water out on the roof or leads it to a drain.

How to Dress a Grinding Wheel

In facing an abrasive wheel with a dressing tool, there are certain things that should be taken into consideration. First, if the dresser is of the metal spur-wheel type, it should be held against the wheel in the position that causes the least sparking. A heavy shower of sparks does not indicate efficient dressing action, but simply means that metal is being removed from the tool and that the parts are being worn out. It should be so held that the dressing spurs turn with the least friction and resistance. Another mistake often made is to bear firmly against the wheel

with the tool, whereas the proper method is to approach the wheel very slowly and carefully. The reason for this is that the dressing of a grinding wheel is not for the purpose of removing the dulled grains only, or even for shaping the wheel, but also to correct any out-of-roundness that may be present. When the approach is slow and careful, the high spots are knocked off first, and the wheel is gradually worn down true. When this condition is obtained, it will run without vibrating the work that is held against it.

☞ A heated iron held over white spots on a shellacked surface will restore the color.

Polishing Badly Tarnished Brass

Tarnished brass is easily polished with a cleaner consisting of rouge, 3 oz., turpentine, 12 oz., oleic acid, 1 oz., strong ammonia, $\frac{1}{2}$ oz., and denatured alcohol, 1 oz. If preferred, the mixture may be perfumed by adding oil of sassafras, 10 minims. The preparation is mixed by shaking and it should be applied with a cloth. It should also be shaken each time it is used. After the tarnish and dirt have been removed from the brass, precipitated chalk may be used to finish the polishing and remove excess cleaner.

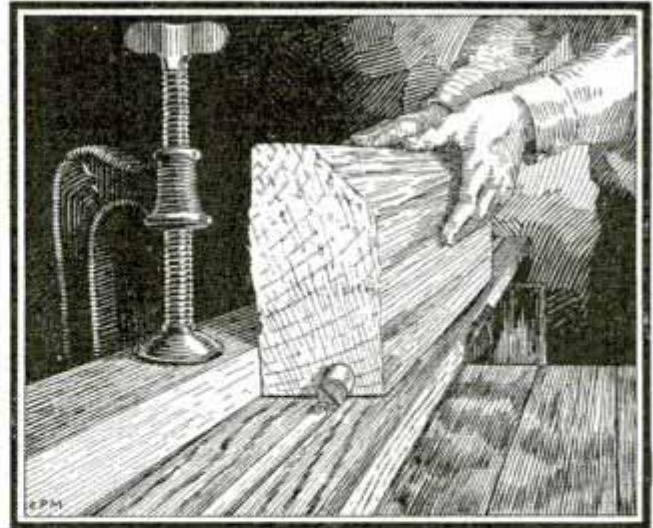
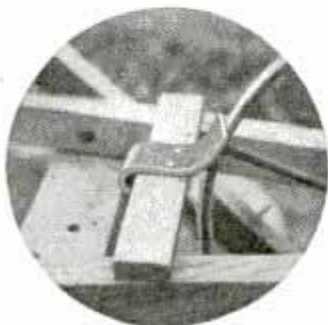
An Everlasting Scratch Pad

Here is a scratch pad that lasts indefinitely as the writing is erased by merely lifting up the top sheet. First get a piece of sheet metal, paint it a dull black, and, after this has dried, give it a light coat of floor wax. Now, over this surface place a sheet of tracing paper and then a sheet of thin celluloid. Fasten the assembly together at the top with small rivets, and sew or rivet the paper and celluloid together at the bottom. To write on the pad, use a pointed hardwood stick.—A. H. Waychoff, Phoenix, Ariz.



Improvised Scraper Keeps Barrow Wheel Clean

To keep moist soil from packing on the wheel of your wheelbarrow, nail a strip of old auto casing around a wood block so that the ends project 2 or 3 in. from one edge. Then nail the block across the frame so that the ends of the casing scrape the wheel both above and below the block. As the casing is flexible, it will not lock the wheel.



Accurate Job of Grooving Skis Done with Tool Improved from Block and Steel Bushing

Tool for Grooving Skis

Grooving skis accurately is easily done with a tool made from a wooden block and a hardened-steel bushing. One end of a block is sawed off at a slight angle, and a woodscrew is put through the bushing and driven into the block, the lower end of the bushing projecting below the lower edge of the block, which distance determines the depth of cut. In use, a straight-edge is clamped to the ski to guide the tool as it is pushed along, assuring a straight groove.—A. H. Vance, Harshaw, Wisconsin.

To Remove Rust Stains from Cloth

Rust stains can be removed from white cloth by soaking the spot in a solution of tin chloride, and then rinsing it thoroughly in large quantities of water. If the tin chloride is not available, it can be prepared by dissolving in hydrochloric acid some tin foil such as is used for wrapping candy and cigarettes. Of course, all metal foil on packages is not real tin foil. Lead and aluminum foil will not serve for this purpose.—M. J. Guerre, Camaguey, Cuba.

Silk Trim for Tennis Rackets

When restringing tennis rackets, ordinary fishline makes an excellent substitute for the silk cord that is commonly used to trim the racket. It is desirable to select a line with as large a diameter as possible. The fishline can be obtained anywhere, while the regular silk cord is much more difficult to get.—C. G. Grover, Nephi, Utah.

B.P. 46, 1.8

Famous MASTERPIECES



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



Governor Winthrop's Desk

"GOVERNOR WINTHROP, I am honored by thy visit to mine humble cabinet shop! In what manner, pray, may I serve thee?"

"Having heard in what high esteem thy craftsmanship is held hereabouts, we have come to commission thee to make a fine desk of rare foreign woods, suitable to our use."

"Excellency, I will make thee the finest desk skill and artistry can produce, and it will be finished for thee, the Lord willing, three months hence."

"So be it, and thou shalt name thine own price and we will pay it. But remember that only thy finest will suffice!"

A conversation of this nature no doubt was the inspiration for one of the most renowned pieces of furniture ever built. The original desk, which was used by Governor Winthrop of Massachusetts during the early seventeenth century, has been preserved and is on display in a mu-

seum in Salem today, though little is known of its maker.

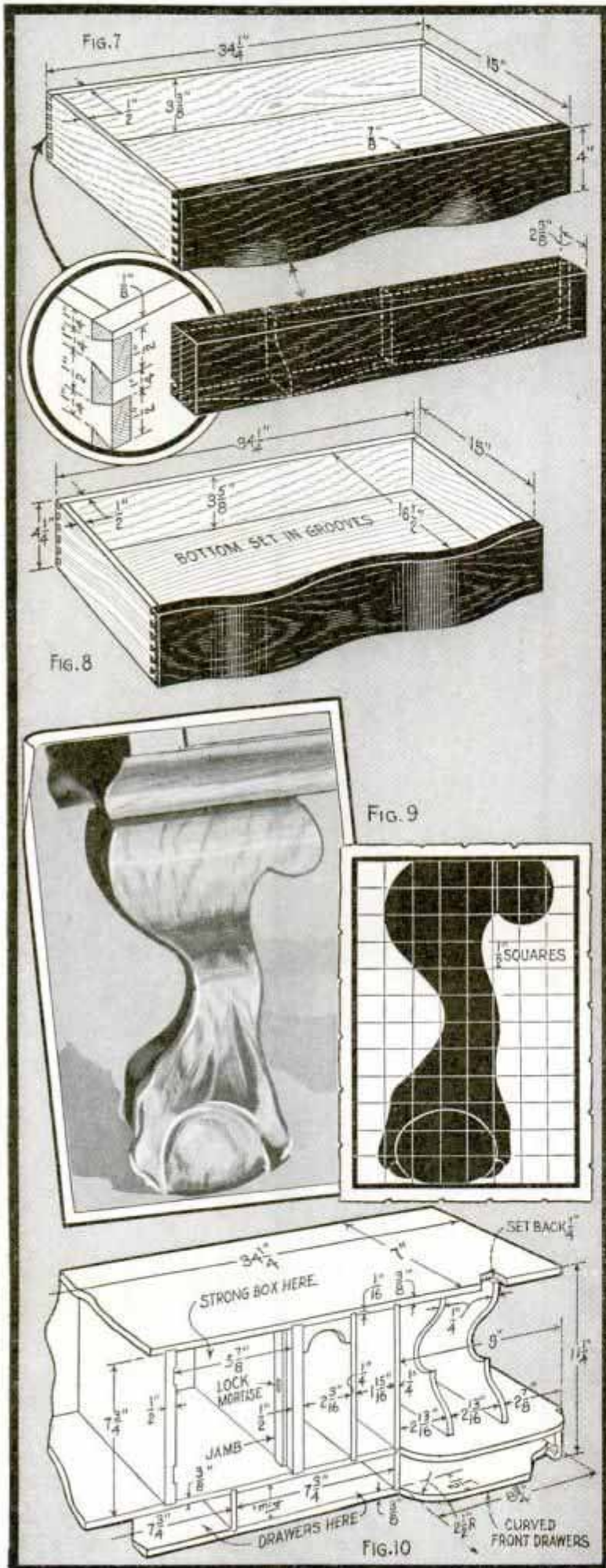
To build a Winthrop desk in the home workshop is not as difficult a feat as may appear, as one admires the fine lines and satiny finish of one of these pieces in a store window. With a few of the motor-driven machines with which so many workshops are equipped nowadays, many of the obstacles have been surmounted. Then, too, it should be remembered that our forefathers did their cabinet work with much poorer hand tools than are available now. Many of the so-called replicas of this desk offered for sale today have been modified from the original design to meet the requirements of quantity production. The desk described herewith is authentic in both line and proportion. Although cheaper woods, such as birch or gum, may be used and stained to resemble mahogany, a better job from every standpoint will result if fine Central American

of AMERICAN FURNITURE

This is the first of a series of articles describing the construction of some outstanding pieces of fine furniture, enabling the home craftsman to build true reproductions. Because of its splendid design, the desk of the first governor of Massachusetts, 1629, has been copied extensively so that the name and type is familiar to people all over the world. This masterpiece of fine-quality furniture can be duplicated in your own workshop and will be a lasting token of your craftsmanship in woodworking.

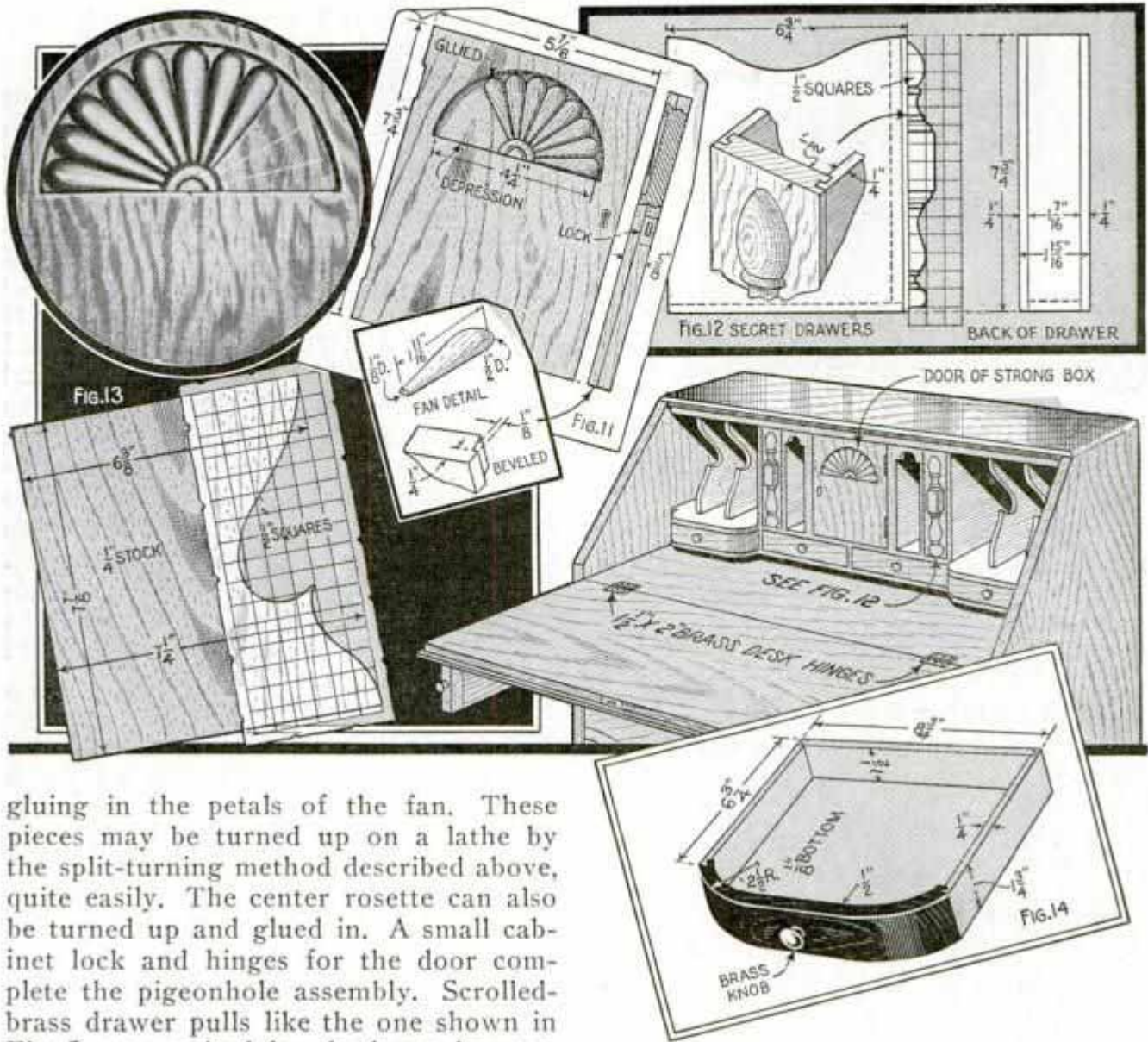
mahogany is used. Gluing up stock for the two side panels is the first step. These pieces should be doweled or splined, and the grain carefully matched to give the appearance of a single piece. The dimensions can be obtained from Fig. 1. While the glue is drying on these pieces you can make the base. This consists of a frame with molded edges and a serpentine front, as shown in Fig. 2. A tongued-and-grooved joint was used on the original miters, but this can be simplified by the use of dowels or splines without detracting from the strength. The base is to be screwed to the bottom of the side pieces as indicated, so these holes should be bored and countersunk. After the side panels have been carefully surfaced on both sides, they should be cut to the exact dimensions indicated on the drawing. When cutting the dado to house the writing bed care must be taken to see that the writing bed comes exactly $\frac{7}{8}$ in. below the corners, or the lid will not swing clear. Mortises for the drawer rails and a rabbet for the back should also be made before starting the assembly. A bevel should be planed on the top piece, to be used as a jamb for the lid, as shown in the detail of Fig. 6. Joints should also be cut on the ends of this piece to house the sides. The rounding of the corners above these joints should be left until after the





which is simply slid into place when finished. Fig. 10 gives the construction details and dimensions of this part. The three horizontal members should be made together so that they will be identical in size and shape. The curved portions at the ends are laid off with a 2½-in. radius at each side. The dados for the partitions must be laid out and cut very carefully, as inaccurate work here would ruin the piece. The scrolled pieces do not reach to the front edge at the top, so these dados must be stopped ¼ in. back. Fig. 13 is a pattern for these pieces. The construction of the carved front drawer is shown clearly in Fig. 14. The front pieces are cut from a piece of 2-in. stock on the band-saw. The other small drawers are made in a similar manner except for the fronts, which are only ½ in. thick. Careful work to insure accurate fitting of the drawers is essential.

At a time when banks were unknown, every man required a strongbox and secret receptacles where money, jewelry and valuable papers could be placed for safekeeping. The desk supplied this need. The secret drawers shown in Fig. 12 look like ornamental panels when closed, but are quite roomy. A split turning is used to ornament the front. This is made by screwing two 7/8 by 1 3/4 by 10-in. pieces of wood together and turning them up to the design indicated, on the lathe, thus producing duplicate turnings at one operation. They should be stained and polished on the lathe. The turnings are fastened to the drawer fronts with screws from the back, and glue. The door of the strong box, Fig. 11, provides the center of interest in the pigeonhole assembly, so should be carefully selected for fine grain. The fan type of carving shown, may be worked out with tools or by the simpler method of recessing the semicircular portion and



gluing in the petals of the fan. These pieces may be turned up on a lathe by the split-turning method described above, quite easily. The center rosette can also be turned up and glued in. A small cabinet lock and hinges for the door complete the pigeonhole assembly. Scrolled-brass drawer pulls like the one shown in Fig. 5 are required for the large drawers. The pulls can be purchased if you do not wish to work them out in brass.

It is in the finishing that many good pieces of cabinet work are spoiled. Use a mixture of equal parts of brown and dark-red mahogany penetrating stain, as this color approaches the color of the original most nearly. The primer, which should be

applied strictly according to directions, should be of the type recommended by the stain manufacturer. Allow plenty of time between coats of stain, primer and varnish. After applying two coats of rubbing varnish and sanding with No. 000 sandpaper, rub to a satiny gloss with curled horse hair and boiled linseed oil.

Small Swivel Aids in Attaching Screw Cap to Oilcan

The usual method of fastening a screw cap on an oil or kerosene can by soldering a piece of light chain to it, is greatly improved by soldering a fishline swiv-



el to one end of the chain and to the cap. This permits it to be screwed off and on without kinking the chain. A cotter key, having the two parts bent in opposite directions and at right angles to the head, as shown, is convenient for attaching the swivel to the lid.

☛ To keep casters from dropping out of furniture legs, fill the hole in the bottom of the leg with melted paraffin and immediately insert the caster.



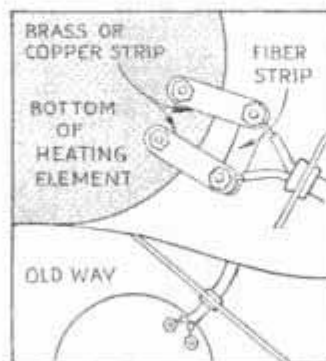
Nails, Screws and Other Small Parts Carried in Bait Box When Making Repairs around the Home

Fisherman's Bait Box Utilized as Small-Parts Container

When working from a ladder in making repairs around your home, a fisherman's bait box of the kind attached to the belt, will be found convenient to carry tape, screws, nails and other small parts.

Simple Method to Prevent Wires Burning Off Electric Stove

Lead-in wires on small electric stoves sometimes burn off at the terminals where they connect to the heating element, because the insulation burns off the wires and allows them to short-circuit. A piece of short fiber and two brass or copper strips will prevent the trouble. Drill a hole at each end of the three strips, connect the copper strips to the element terminals and use the fiber as a spacer at the other end, as shown. Connecting the lead-in wires to the copper strips completes the job. This hookup holds the wires away from the heating element.—T. Trail, Baltimore, Md.



Wax applied to the bottom of cleats on temporary walks over newly finished floors, will prevent the cleats from sticking.

Interesting and Useful Experiments with a Doorbell Transformer

With a bell transformer and a coarse file connected to dry cells and hand grips as shown in Fig. 1, an effective shocking outfit, which is harmless, may be assembled. Scraping the wire across the file produces the shocks to the person holding the grips. The dry cells are connected to the 6-volt side of the transformer. Almost any kind of electrical meter may be used to measure alternating-current volts and amperes by connecting the bell ringer to the meters. Fig. 2 shows how to connect a 110 or 150-volt voltmeter to a transformer so that the instrument may be used to measure low voltage a.c., with results close enough for most practical purposes. With a 6-volt transformer, divide the reading of the high-range instrument by 18 to get the approximate volts; with 8, 10, 12 and 14-volt transformers divide by 13, 11, 9 and 7.8 respectively. Fig. 3 shows how to connect a 150-volt d.c. voltmeter through a copper-oxide rectifier to a transformer for measuring amperes in a.c. circuits. To calibrate the meter to know how many amperes are flowing, insert lamps of the sizes shown in the table under Fig. 8, and mark the scale of the instrument accordingly. The rheostat may be used to adjust the meter so that the pointer will move all the way across the scale with the largest lamp in the socket. After once adjusting the rheostat, it should be locked in position and not changed unless the meter is to be used for other purposes. Figs. 4 and 5 show methods of using low-reading a.c. and d.c. voltmeters, such as 10 or 12-volt instruments, with transformers in order to measure 110-volt a.c. circuits. By multiplying the reading of the instrument by the values shown in the tables, approximately correct line voltages may be determined. In Fig. 6, the small lamp may be turned on and off with the switch connected as shown. A toy transformer can be used to light a 110-volt, 10-watt lamp by making the connections shown in Fig. 7. The rheostat in Fig. 8 is adjusted exactly as explained above in order to use an a.c. voltmeter to measure a.c. amperes. In Fig. 9 the rheostat is used to dim the small lamp connected to the low-voltage side of the transformer.



You Can Have Lots of Fun with This Cheap but Effective Electric Shocking Outfit, Which Is Easily Assembled and Wired; It Consists of Three Dry Cells, a Bell Transformer, an Old, Coarse File and Some Bell Wire

TO LOW-VOLTAGE A.C. VOLTMETER

TRANS. BELL SIDE LINE SIDE

② MEASURING LOW-VOLTAGE A.C. WITH 110-V. VOLTMETER

2,000-OHM WIRE-WOUND RHEOSTAT D.C. VOLTMETER

ADJUSTED AS IN FIG. 8

5 WATT 110-V LAMP TAKES .045 AMP
10- " " " .090 "
25- " " " .225 "
60- " " " .545 "

LINE SIDE BELL SIDE LAMP

③ D.C. VOLTMETER MEASURES AMPERAGE IN A.C. CIRCUIT

TO FIND APPROX. VOLTS, MULTIPLY READING OF METER BY 18 WITH 6-V. TRANS

13 " 8- " "
11 " 10- " "
9 " 12- " "
7.8 " 14- " "

TO 110-V. A.C. LINE TO BE MEASURED

④

TO FIND VOLTS MULTIPLY READING BY 18 WITH 6-V. TRANSFORMER

13 " 8 " "
11 " 10 " "
9 " 12 " "
7.8 " 14 " "

BELL SIDE 0 TO 10 OR 12-V. A.C. VOLTMETER

LINE SIDE

⑤

5 OR 10-WATT LAMP

BELL SIDE

TRANS. TURNING LIGHTS ON & OFF WITH BELL TRANS.

LINE SIDE

SWITCH

⑥

TO TRANS. LIGHTING A 110-V. LAMP FROM A LOW-VOLTAGE TOY TRANSFORMER

BELL SIDE

LINE SIDE

10-WATT 110-V. LAMP

⑦

2,000-OHM WIRE-WOUND RHEOSTAT. ADJUST SO THAT POINTER MOVES GREATEST DISTANCE WITH LARGE LAMP IN SOCKET; THEN LOCK.

5-WATT, 110-V. LAMP TAKES .045 AMP
10- " " " .090 "
25- " " " .225 "
60- " " " .545 "

A.C. VOLTMETER

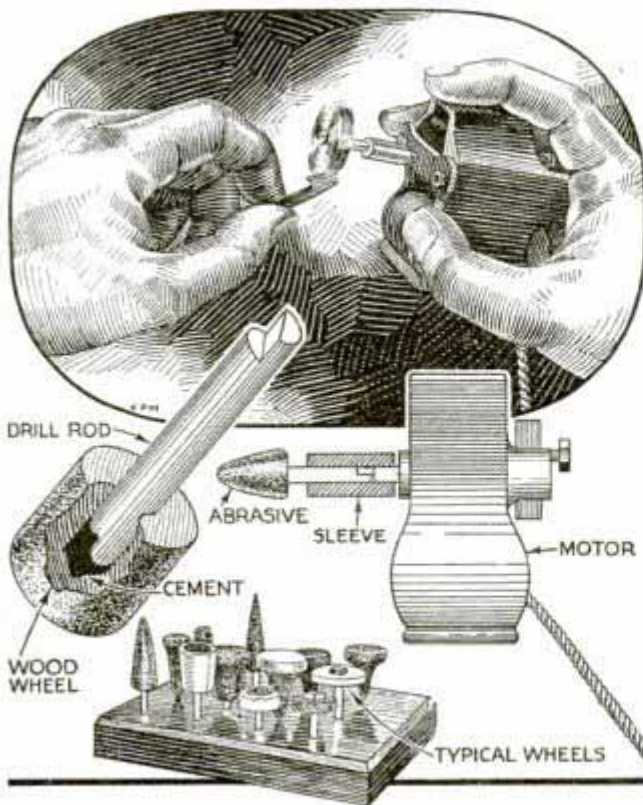
LINE SIDE TRANS. BELL SIDE LAMP

⑧ MEASURING A.C. AMPERES WITH A.C. VOLTMETER

BELL SIDE 35-OHM RHEO. TRANS. LINE SIDE

SMALL LIGHT

⑨ CONVERTING BELL TRANSFORMER INTO LIGHT DIMMER OR SPEED CONTROLLER FOR TOY MOTOR



This Modelmakers' Polishing Unit Is a Small Electric Motor, Which Uses Homemade Polishing Wheels

Small Polishing Unit Helps in Fine Model Work

This polishing unit will be found handy by modelmakers for shaping, grinding and polishing. Any electric motor small enough to be comfortably held in the hand may be used. A small 110-volt a.c. motor is preferable, although a 6-volt toy motor operated by a toy-train transformer will be satisfactory, a foot-operated rheostat being cut in the circuit to control the speed. It is a good idea to wrap the motor with friction tape to avoid shocks when holding it. The polishing and shaping wheels are disks or cylinders of hardwood over which various grades of abrasive papers are glued. They are fitted with shafts of drill rod cut away at the ends to engage the motor shaft, which is similarly cut, and are held in place by means of a sleeve that fits snugly. If a small chuck can be fitted to the end of the motor shaft, small drills, end mills and dentists' drills may be utilized to increase the usefulness of the unit in your model work.—Albert E. Eidman, Cleveland, Ohio.

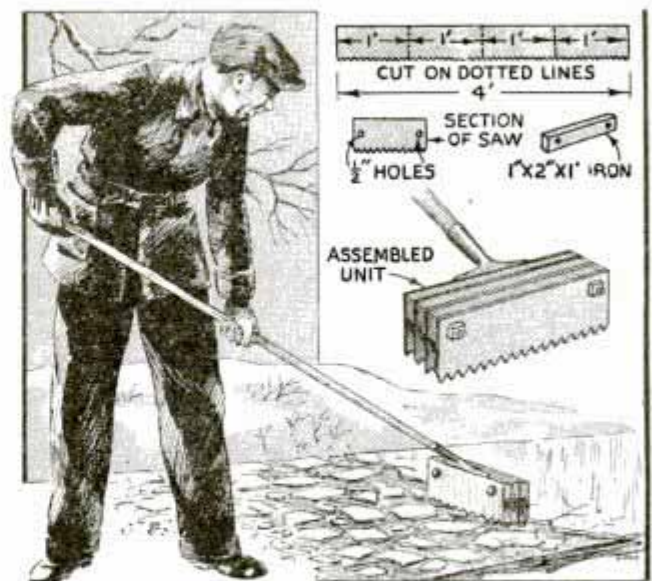
☐ Brooms may be kept in good condition by boiling them in soapsuds, which makes the straws much stronger, but not stiff enough to cut the carpets.

Bleaching Discolored Sponges

Sponges that have been discolored from long use can usually be bleached to their original color, after thoroughly washing them with soap and water and rinsing in several changes of clean water, by soaking them for a few hours in a mild bleaching solution made by dissolving chloride of lime, 1 oz., and tartaric acid, $\frac{1}{2}$ oz., in water, 1 gal. If this treatment does not produce the desired bleach, allow the sponges to soak in warm water for two or three days, changing the water several times during the period. After this treatment, and without allowing the sponges to dry, soak them for a few hours in a solution made by adding hydrochloric acid, 1 part, to water, 20 parts. The sponges can be freed of the acid solution by boiling them in water and thoroughly rinsing them.

Ice on Sidewalk Loosened with Tool Made from Crosscut Saw

For removing ice and sleet from sidewalks, an effective tool can be made from an old crosscut-saw blade about 4 ft. long. The blade is cut in four equal sections, which are then bolted together with the teeth on one side, using pieces of flat iron as spacers. It may be necessary to anneal the ends of each section by heating them to a cherry red and allowing them to cool

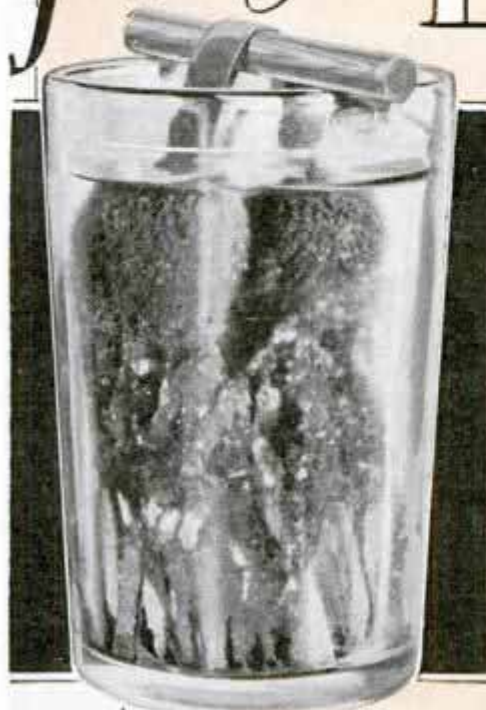


Tool Made from Four Pieces of Saw Blade Quickly Loosens Ice on Sidewalks

before drilling the bolt holes. In use, the tool is moved back and forth over the walk until the teeth cut through the ice.

playing with LEAD

By
C. A. Crowley



"Lead Tree" that Grows Overnight in a Glass Jar or Tumbler, Made by Hanging Piece of Zinc in Lead-Acetate Solution



Finely Divided Lead (Pyrophoric Lead) Bursts into Fire When the Particles are Dropped in the Air



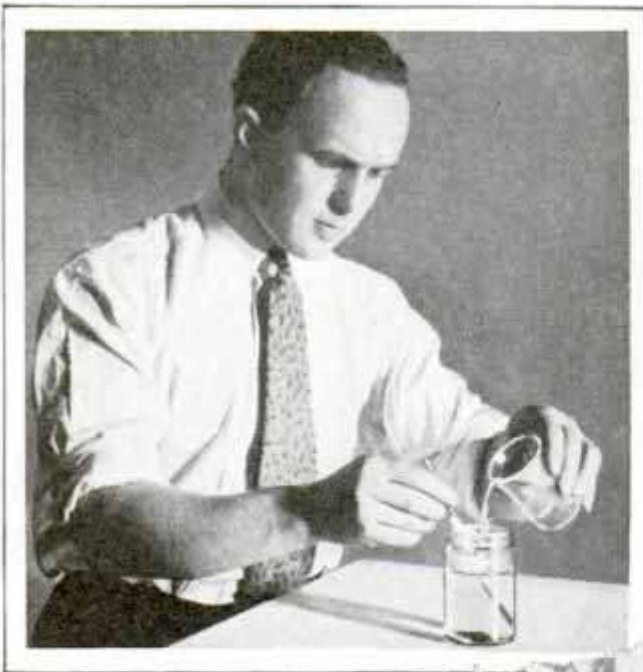
Mercury in the Bottle Goes Right Through a Solid Lead Wire and Drops Off into the Dish



IN addition to hundreds of practical everyday uses, chemists find that lead is a very active chemical. When finely powdered, it takes fire spontaneously upon coming in contact with the air.

This pyrophoric lead, as it is called, is made by heating lead tartrate in a test tube. To make the lead tartrate, dissolve two tablespoonfuls of tartaric acid, or ordinary cream of tartar, in a 250 cc. beaker or a jelly glass three-quarters full of water. To a 1-liter beaker, or a quart jar about half full of water, add two tablespoonfuls of lead acetate (poison). Use an old spoon for measuring the chemicals. When both chemicals have dissolved, pour

the cream-of-tartar solution from the jelly glass into the quart jar and stir the mixture with a glass rod or stick. The solution will turn milky white. The white lead tartrate may be separated from the solution by filtering the mixture through a piece of filter paper held in a funnel. The clear liquid which passes through may be poured into the sink and washed away with water. Carefully scoop the lead tar-



Above, the First Step in Making Pyrophoric Lead Is to Precipitate Lead Tartrate; Center, the Lead Tartrate Is Slowly Poured through a Filter

trate out of the funnel with a knife blade, being careful not to tear the paper, and place it in a crucible or tin lid. The lead tartrate is next dried by very slowly heating it over a Bunsen burner or alcohol lamp turned low, while stirring with a glass rod or a small spoon. Just enough heat should be used to drive off the water. The mixture will spatter if it is heated too strongly. When the water has all been evaporated, the lead tartrate will remain as fine white powder. The heating and stirring should be continued very cautiously until the color of the powder is just slightly brown. This very slight color change indicates that all of the water has been driven off. The dried tartrate may now be poured into a large hard-glass test tube which can be heated without breaking. A cork to fit the test tube should be at hand but it should not be inserted until later. Slowly heat the brownish lead tartrate in the test tube while stirring with a glass rod. Heat very slowly and stir continuously. The color will gradually change to black as the heat changes the lead tartrate to pyrophoric lead. If the heating is too strong the lead will melt and run together and ruin the experiment. When no more fumes come from the tube, discontinue



the heating and insert the cork. After the tube has cooled, shake gently and pour a very few particles of the fine powder onto a sheet of metal from a height of about 3 feet. The particles will take fire as they come in contact with the air. If the lead should not take fire at the first trial, carefully reheat the tube with its contents for a few minutes to complete the reaction.

If a small amount of lead is melted in a pipe cap and the surplus lead poured off after the mass has partly solidified, beautiful crystals of lead will remain in the cap. Lead crystals in a more ornamental form may be made by growing a "lead tree." Get a battery jar, a fish bowl, a large fruit jar, or even a tumbler, and fill it with a solution made by dissolving $3\frac{1}{2}$ oz. of lead acetate (poison) in a quart of



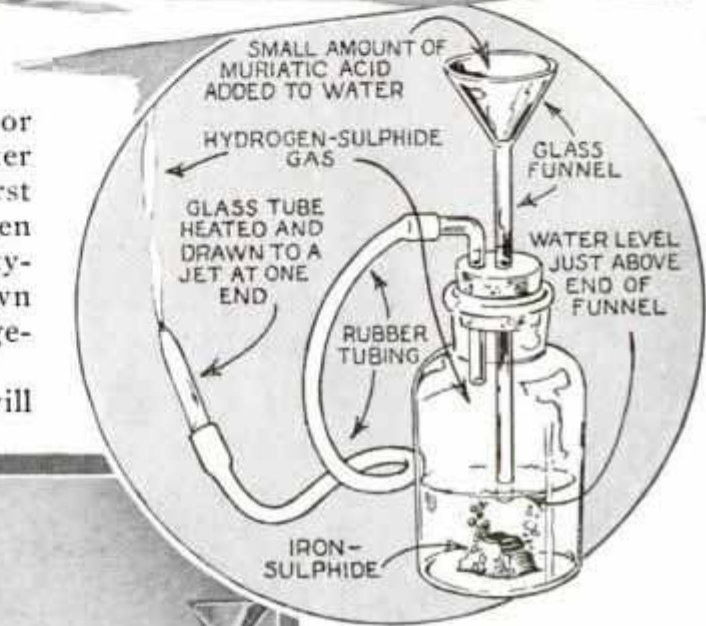
Drying and Dehydrating the Lead Tartrate in a Porcelain Dish Set over a Bunsen Burner

water. Into this solution suspend a piece of zinc which has been completely covered with asbestos paper. The zinc should be suspended with strong cord from a piece of wood resting on top of the jar. Set the jar out of the way and in a location where it can be watched without being disturbed. In a few days a beautiful growth will emanate from the encased zinc rod.

Lead in chemical combination with oxy-

gen forms several compounds called oxides. Common litherage is one of these. You may mix it with glycerine to the consistency of paste and make a hard heat and water proof cement, which can be used for cementing together metal parts, and for repairing broken castings or stopping leaks in plumbing. Red lead mixed with oil is used by steam fitters to make pipe joints steam and water tight. Another of these lead compounds known as lead peroxide, a reddish-brown powder, gives off oxygen when it is heated. Pour a small quantity of lead peroxide in a crucible or can lid and heat it. If a glowing splinter is held over the lid, the splinter will burst into flame, due to the action of the oxygen given off. In addition to giving off oxygen, you will note that the dark-brown powder changes to a beautiful orange-yellow color.

A small particle of lead peroxide will

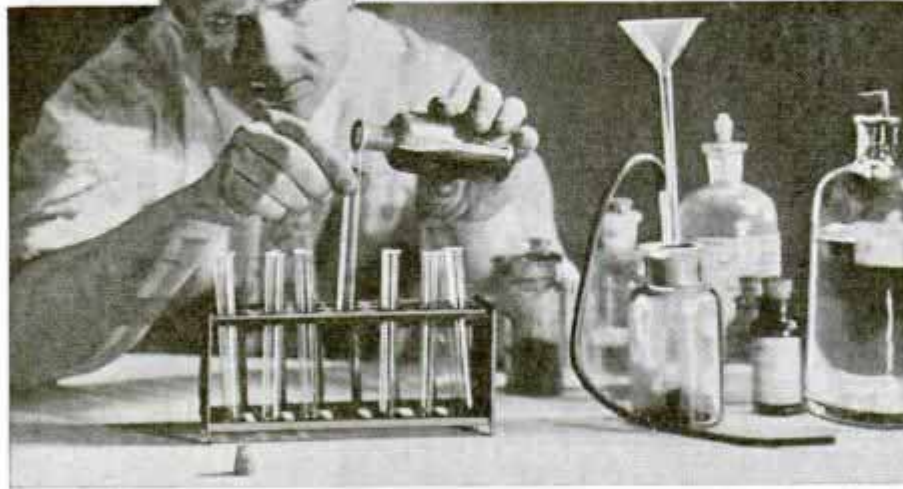


Above, Construction of a Homemade Hydrogen-Sulphide Generator; Left, When Directed against a Small Particle of Lead Peroxide, the Hydrogen-Sulphide Gas Will Take Fire and Give Off Odor of Burning Sulphur

ignite hydrogen-sulphide gas without the use of matches or a flame. Set up a hydrogen-sulphide generator by inserting a long-stemmed funnel and a short length of glass tubing into a cork to fit a bottle as shown. Wet the glass to make it slide easily through the cork. Into the bottle place a small lump of iron sulphide. With rubber tubing connect the tube from the generator to another short length of glass tubing which has been heated and drawn to a jet at the open end. To generate hy-

drogen sulphide, pour enough water into the funnel to bring its level above the bottom end of the funnel and then pour in a small quantity of ordinary muriatic acid. If the end of the tube carrying the hydrogen-sulphide gas is brought close to a particle of lead peroxide, the gas will ignite and give the odor of burning sulphur (sulphur dioxide). This gas, as well as hydrogen sulphide, which smells like rotten eggs, is irritating and should not be breathed; however, if the experiment is

Interesting Demonstration That Shows
Danger of Poison from Using Lead
Pipes for Drinking Water



performed in a well-ventilated room the odors will not be objectionable.

An interesting experiment, which will show the danger from using lead pipes for water and the hazards to health when cooking utensils are plated with tin containing even a small amount of lead, may be performed by placing a small shaving of lead in each of eight test tubes. Half fill the first tube with distilled water. Place a similar quantity of hydrant or well water in the second, and rain water in the third tube. In the remaining tubes place orange juice, lemon juice, tomato juice, vegetable broth, soup, or other liquid foods. After allowing the tubes to stand for an hour, insert the tube from the hydrogen-sulphide generator into the first tube and allow the gas to pass through the solution for several minutes, and repeat this with each of the other tubes. All of the liquids that have dissolved a small amount of the lead will be turned slightly gray or black by this treatment. If the amount of lead dissolved was small, the black precipitate will be hard to detect but the change can be observed by watching closely while the gas is passing into the solution. Lead is a poison which acts slowly. Cistern water collected from lead downspouts frequently contains appreciable quantities of lead compounds. Another test for lead may be made by setting the test tubes as before but by adding a few drops of a solution of potassium dichromate instead of the hydrogen sulphide. With lead this chemical forms

chrome yellow which may be easily seen. To demonstrate the color of chrome yellow pour a few drops of potassium-dichromate solution into a test tube containing lead-acetate solution. The yellow precipitate of lead chromate or chrome yellow as it is called is used as a pigment for coloring paint yellow.

Galena crystals such as are used as detectors in radio are lead sulphide. A super-sensitive galena crystal may be made by mixing sulphur flowers, 1

part, with finely powdered lead filings, 7 parts. Thoroughly mix and place in an iron or clay crucible or a small pipe cap. Set the crucible over a burner and heat it until the mixture just begins to glow red. The fire should then be turned out. Next quickly pick up the crucible with a pair of long pliers and set it in a shallow pan of cold water to cool quickly. Do not allow the water to get inside the crucible as this will ruin the crystal. When the crystal has cooled, it will be found to be much more sensitive than ordinary radio crystals. Should the crystal be crumbly when cool, it was overheated. Too much lead or not enough heat will cause the crystal to be irregular in texture over its entire surface. By experimenting it is possible to make perfect synthetic radio crystals which are far more sensitive than natural galena.

Alloys which melt at a temperature lower than boiling water contain lead. You can make these alloys and have considerable entertainment by casting spoons from them. They will give a great surprise when used to stir hot coffee. An alloy which will melt at about 150° F. is made by melting lead, 27 parts, and adding in succession cadmium, 10 parts, bismuth, 50 parts, and tin, 13 parts. Another easily melted alloy is made by melting lead, 27.1 parts, and adding bismuth, 50 parts, and tin, 22.9 parts.

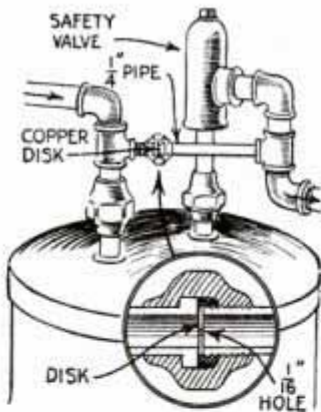
☞ The gummed portions of unsealed envelopes are often useful when a gummed strip is desired.

Solution to Color Electric Lamps

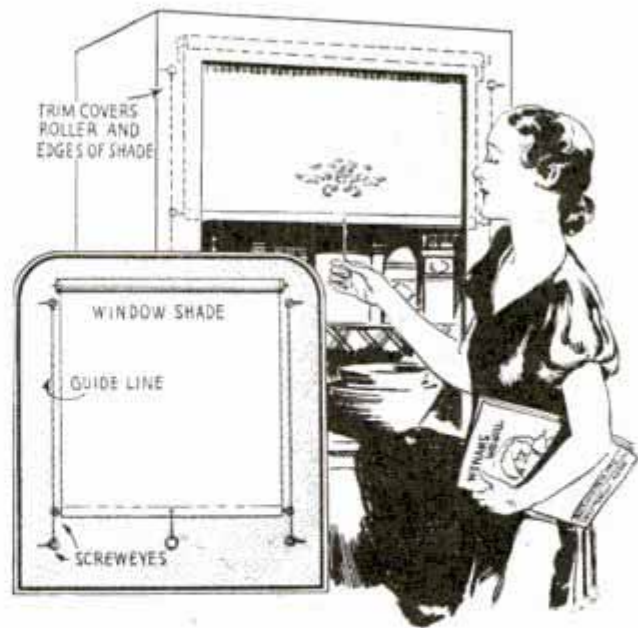
Electric lamps and other glass objects may be evenly stained to any desired color by either dipping or painting them with one of the following preparations: First dissolve bleached shellac, 3 oz., powdered rosin, 1 oz., and gum benzoin, 1 dr., in denatured alcohol, 10 oz. Then add an alcohol-soluble aniline dye of the color desired. These coloring solutions dry rapidly and are as permanent as the dyes used. In selecting the dyes, request those that are fast to light.

Preventing Waste of Hot Water in Storage Tank

There is often a great loss of hot water from a storage tank that is unsuspected by the average person. If the outlet pipe rises from the tank and extends in a horizontal position for several feet, a test will show the presence of a steady double-flow of water outward along the upper half of the pipe then back along the lower half. The pipe then acts as a radiator and dissipates as much heat as a poorly insulated tank. Dripping faucets, although delivering perfectly cold water, also cause the loss of an equal amount of hot water from the tank. The connections shown effectively do away with both these losses. A safety valve, set to open at a pressure of 5



lb., is installed in the hot-water outlet pipe above the tank, after which both the inlet and outlet pipes are connected together by means of a 1/4-in. pipe and union. Before the union is closed, a thin copper disk, having a 1/16-in. hole in its center, is inserted and the union is then closed over it. With this hookup, the hot water is kept in the tank until a faucet is opened, which causes a drop greater than 5 lb. across the connecting line between the inlet and outlet pipes so that the safety valve opens and delivers hot water. If a faucet is left trickling, cold water is drawn through the hole in the union.



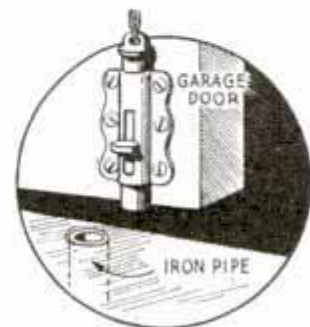
Open Cupboard Closed by Window Shade Mounted behind Front Trim and Held in Place with Cord Slides

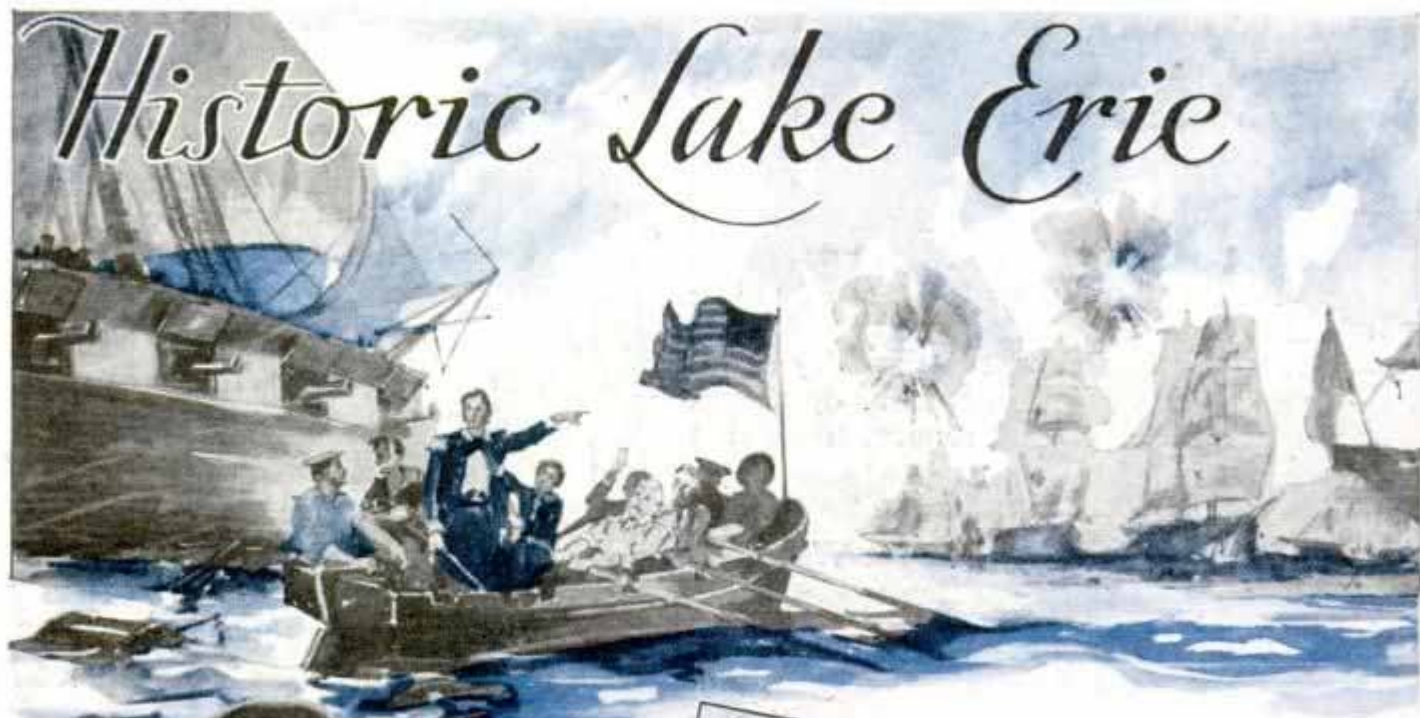
Window Shade Closes Open Front of Cupboard

If you have an open cupboard in your kitchen, it can be neatly covered by using a window shade. Most cupboards of this kind have a trim around the front that will hide the roller and slides, which are indicated by dotted lines in the drawing. Screweyes in each end of the curtain slat slide on lengths of strong cord fastened to screweyes driven into the inner sides of the cupboard near the top and bottom. This arrangement makes the curtain roll straight and holds it neatly against the inside surface of cupboard trim. A stenciled design on the curtain will add greatly to its appearance.

Pipes Set in Garage Floor Engage Door Bolts

When laying garage floors, holes are often formed for the door bolts, but after some use, the cement has a tendency to chip away, leaving too much play to hold the bolt snugly. It is much better to set lengths of pipe in the floor when it is laid, to take the bolts, which will prevent chipping of the floor. This makes a neat job that will last indefinitely.





Popular Mechanics Magazine again introduces a new kind of project for model ship builders—the reproduction of an entire fleet of miniature ships, a fad that has become increasingly popular among European model makers. This one depicts the battle formation of British and American squadrons of the famous battle of Lake Erie, including Commodore Perry's flagship "Niagara."

By
Harold T. Bodkin

AT sunrise on the tenth day of September, 1813, in the placid waters of Lake Erie just off the shores of the now popular summer resort, Put-in-Bay, Ohio, two squadrons of ships warily set white sails and cautiously approached one another. The westward group flew the proud ensign of the British navy; the squadron to the eastward displayed the stars and stripes of the United States of America. Warships all—yet, judged by salt-water standards, perhaps the most unusual col-

lection of vessels ever to fight a decisive major naval battle. They were odd as to size, odd in rig and odd as to the disposition of guns the various ships carried aboard.

In reproducing a miniature model of the battle of Lake Erie, it should be remembered that the ships are placed more closely together than the exact scale area, because the board on which they are mounted is intended for mantel or table display. However, the positions of the ships are relatively accurate and represent the stage of the battle during which Commodore Perry, in an open boat, transferred his staff and flag from the shattered "Lawrence" to the fresher "Niagara" which was just then coming up into close action.

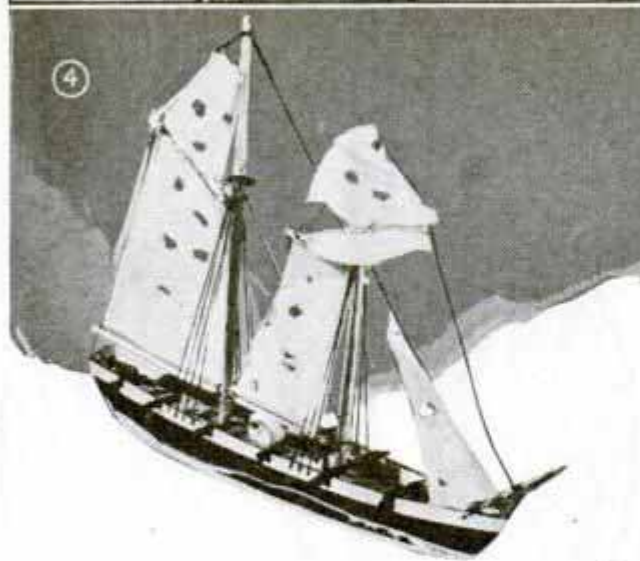
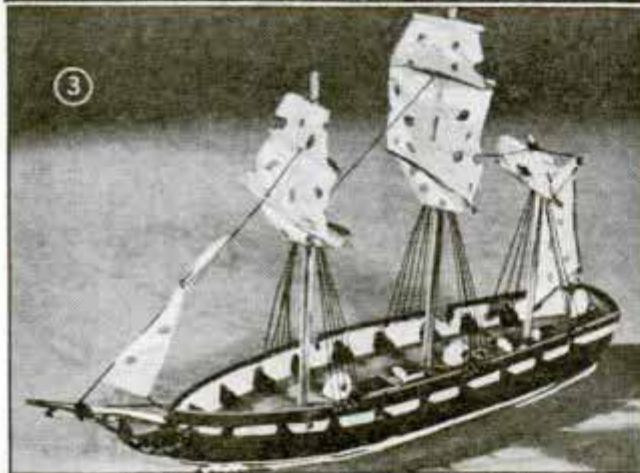
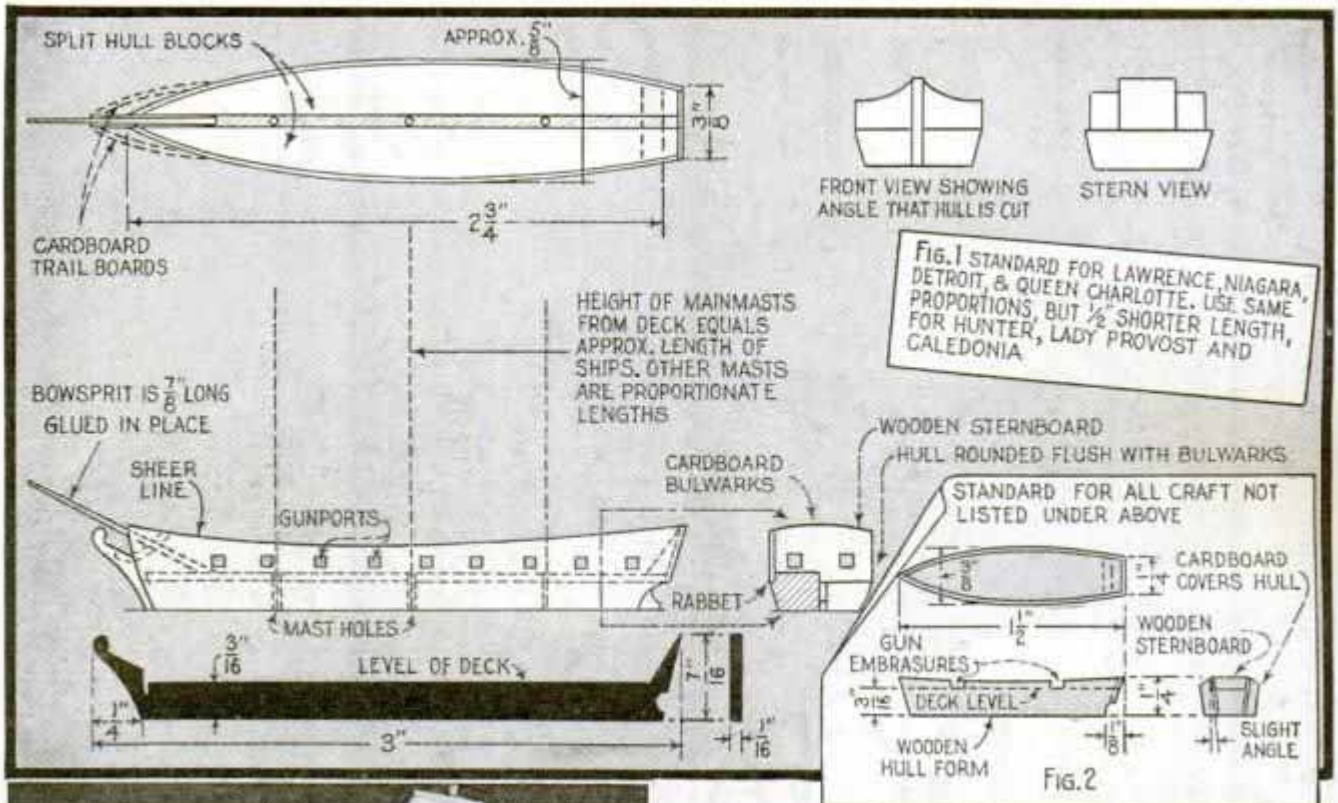
Although the making of fifteen tiny

BATTLE *Shown*

on a BOARD

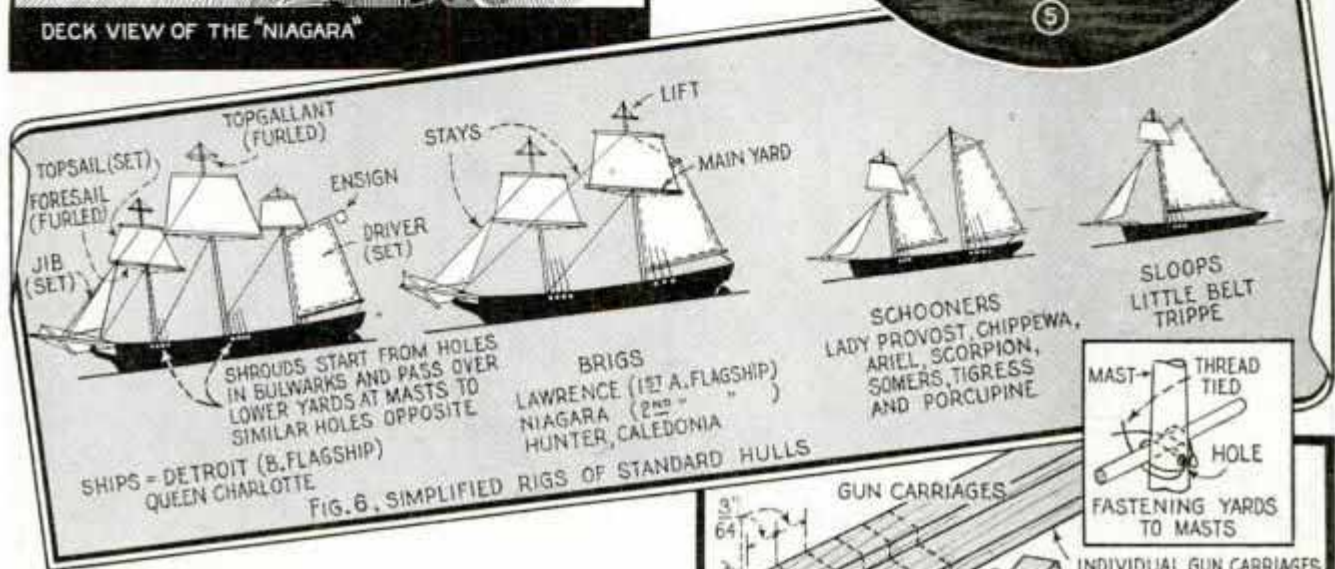
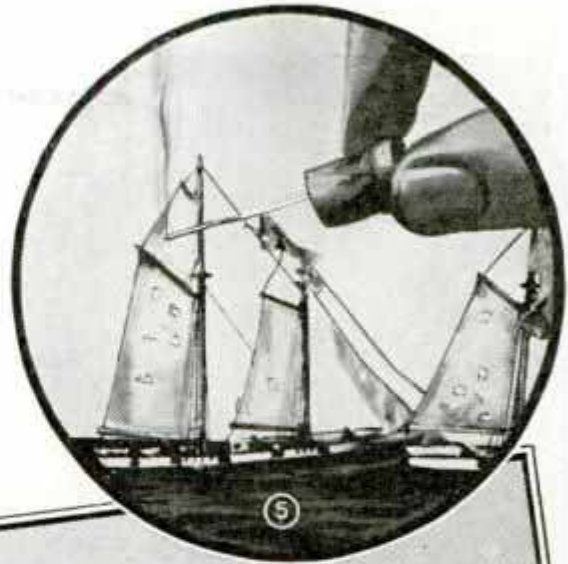
ships might appear as an extended job, they are so simplified in construction that the work can be completed in a short time, much less than would be devoted to a single larger scale ship model. As shown in Figs. 1 and 2, all vessels have been divided into three standardized sizes. The largest ones are made first. Fig. 1 shows the form and size of the white-pine block which is sawed to shape and notched or rabbeted along the upper edges of both sides to receive cardboard bulwarks later. The section of the stern view shows these rabbets. This done, the block is sawed fore and aft into two halves, called split-hull blocks. Next, a centerboard is made, as in the lower view, and the split blocks glued on opposite sides to produce a solid hull again, with the projecting beakhead and rudder properly centered. The side view shows this assembly. The sternboard can be made from a piece of wood about the thickness of a berry box and, after a bevel is cut in the stern of the two split blocks to conform with that of the stern end of the centerboard, the sternboard is glued into place. In all cases, waterproof casein glue has been found best to use for these small parts. Bulwarks are now cut from light cardboard. A pattern is first cut to a V-shape, allowing sufficient width





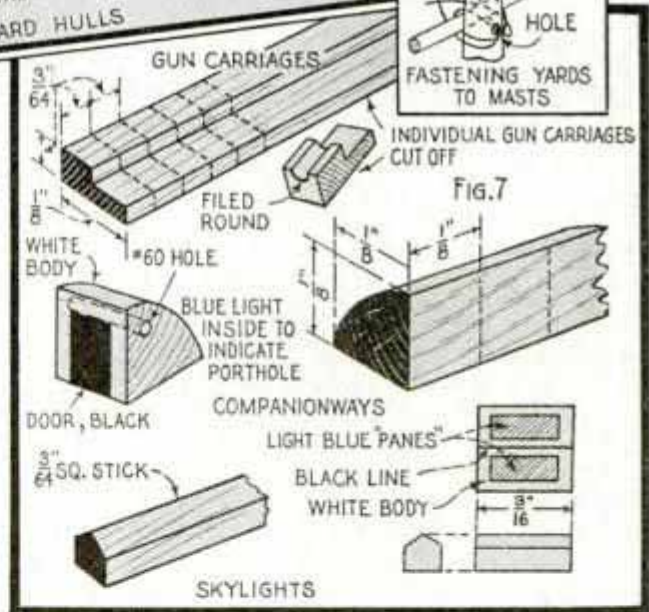
of the two sides to correspond with the full height of the bulwarks at bow and stern. The pattern is then folded at the apex, bringing the two sides flat together. This should leave a fold slanted upward

and forward to represent the bow end of the bulwarks. The bulwarks are then glued into the rabbets of the lower blocks and to the sternboard. When dry, the cardboard is trimmed flush all around and the lower wooden blocks sandpapered flush with the cardboard sides as shown in the stern view. The top edges of the bulwarks are trimmed to a flat curve representing the sheer line. Note that this line is lowest at midships and sweeps upward forward and aft. Trailboards of cardboard are now made and glued into place as shown by the curved dotted lines at the bow. A bowsprit, made from a round toothpick sanded to about half of its original diameter, is now glued to the deck and the beakhead. With a safety-razor blade, cut square gunports through the bulwarks. The number of guns carried on the ships are as follows: American ships, "Lawrence" and "Niagara," 20 each, "Caledonia" 4, "Somers" 2, "Ariel" 3, "Scorpion" 2, "Tigress" 1, "Trippe" 1, "Porcupine" 1; British ships, "Detroit" 19, "Lady Provost" 13, "Queen Charlotte" 17, "Hunter" 10, "Chippewa" 1, "Little Belt" 3. The "Lawrence" and "Niagara" had nine guns on a side and two at the stern. Space out gunports on the other ships likewise and, where the number is odd, place the odd gun through the stern. The "Hunter," "Lady Provost" and "Caledonia" hulls



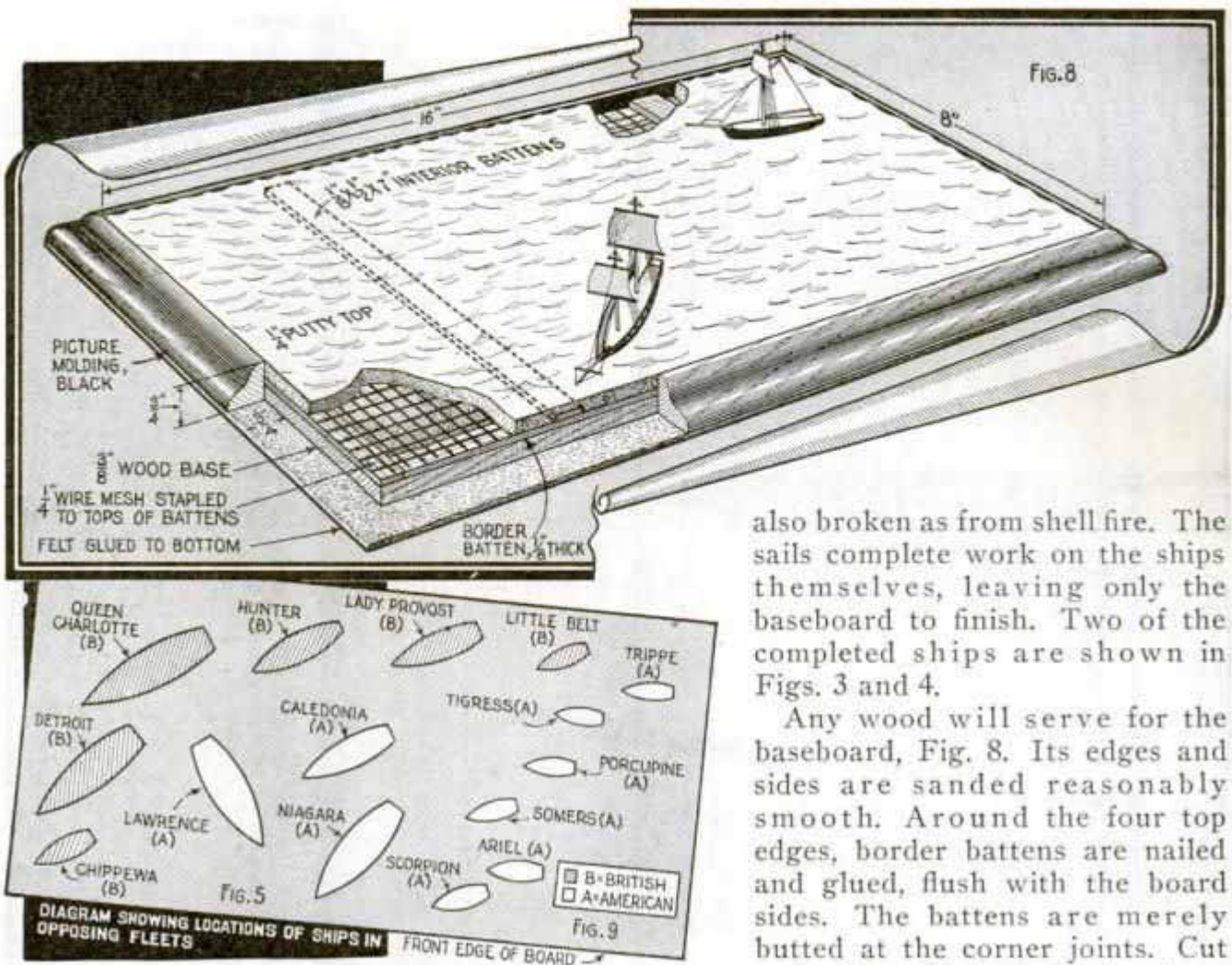
are made the same as the four larger ships just described, except, that they are 1/2 in. shorter and proportionately narrower. Fig. 2 shows how the rest of the smaller ships are made. These consist merely of single wooden hull forms sawed to shape, fitted with a sternboard as already described, and covered with cardboard sides extending from the waterline to the tops of the bulwarks. The bulwark tops are also trimmed to a sheer curve to give form to the ships. Print the names of the ships on the bottoms for handy identification.

When all hulls are completed, the deck fittings are made. These are standardized as five different units—gun carriages, companionways, skylights, hatches and guns. The method of making the first three units is shown in Fig. 7. The hatches are merely dark gray paper, or thin cardboard, ruled into squares with India ink and bordered on four sides with a narrow white line. The guns are 3/16-in. lengths of No. 20-gauge wire, cemented or glued into the rounded notch in the top of the carriages. The guns are painted dull black. The in-



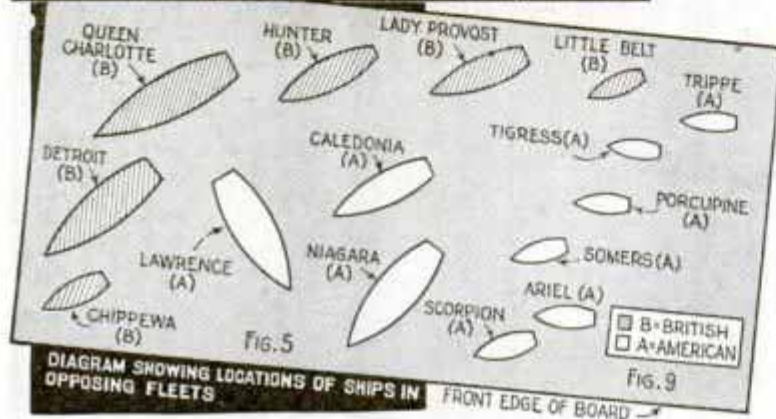
sides of the bulwarks are now painted dull white, the hulls outside are dull black except for a band of white the depth of the gunports running full length, as can be seen. To better distinguish the two squadrons, a narrow white waterline is also painted on ships of the British fleet. The trailboards are black with touches of gilt brushed on to represent gilded carvings. After painting, the fittings are glued into place.

Fig. 6 shows how the rigging and masts



also broken as from shell fire. The sails complete work on the ships themselves, leaving only the baseboard to finish. Two of the completed ships are shown in Figs. 3 and 4.

Any wood will serve for the baseboard, Fig. 8. Its edges and sides are sanded reasonably smooth. Around the four top edges, border battens are nailed and glued, flush with the board sides. The battens are merely butted at the corner joints. Cut to fit about $\frac{1}{16}$ in. from the edges,

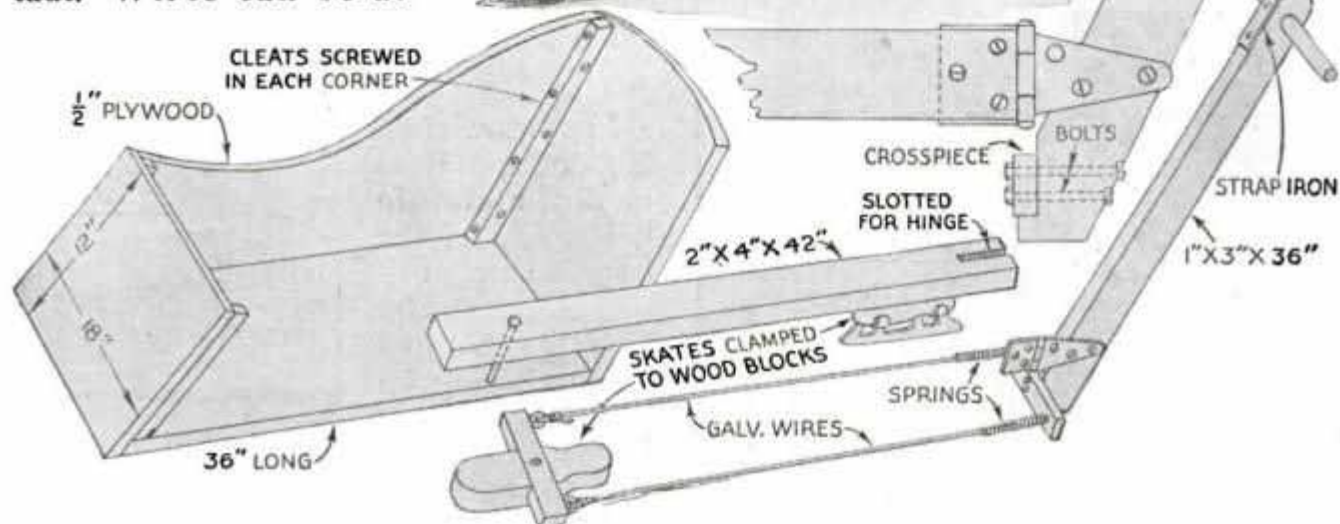


are used to typify the different classes of ships. Reference to this will enable you to locate the mast holes for individual vessels. The lengths of masts are based on the mainmast of each ship, this mast being about the length of the deck or very slightly longer, allowing a little extra length at the foot to glue into the mast holes. The mainyard is the standard for yards, being slightly longer than the beam of the ship. Other masts and yards are shorter lengths as illustrated. On schooners and sloops, consider the mainmast boom (lower) as the yard standard. No. 50 or 60 black cotton thread is used for all rigging. The sails are dotted in on the rigging plans. Make these from thin white China silk. First, cut roughly to shape and glue directly onto the rigging lines and yards. When dry, a red-hot wire is drawn rapidly around the sail-rigging outlines. This trims the silk quite neatly, but should not affect the less inflammable cotton thread. The hot wire is poked through the sails irregularly to represent shell holes as in Fig. 5. The topmasts of a few ships are

$\frac{1}{4}$ -in. wire mesh is stapled in place on the battens. Black picture molding is then glued around the baseboard. This should extend about $\frac{3}{16}$ in. above the top of the wire mesh to hold the putty, which is now molded smoothly over the mesh. About 3 lb. of ordinary window putty should be enough. While the putty is still plastic, the ships are set firmly in position, as shown in Fig. 9. When dry, a mixture of azure blue, with just a trace of ultramarine blue, is brushed over the putty, around the ships. Japan colors are used for quick drying. "Whitecaps" are applied, as illustrated, with a camel's-hair brush dipped into white paint and squeezed out until nearly dry. The paint should be left stand overnight. Then one or two coats of clear quick-drying varnish are brushed over the putty, being left glossy to simulate the transparency of the water. Last, a piece of soft felt is glued on the bottom of the baseboard. If desired, a glass inclosure, 8 or 10 in. high, may be fitted above the board to better protect the tiny models against dust and accidental breakage.

This Two-Runner Ice Sled Steers from Rear

This speedy little ice sled is propelled with almost no effort because it is mounted on only two skate runners which are directly in line. The runners are clamped to wood blocks under the frame, the front one turning on a pivot bolt. The handle bar is a length of broomstick through a 1-in. steering column which is hinged to the rear end of the 2 by 4-in. main frame. Note in the detail drawing how this is hinged. The crosspiece at the bottom of the steering column has a pair of coil springs attached, as shown, to keep the steering wires taut. Wires can be at-



tached to stout screweyes, or through holes drilled in the crosspieces. The forward crosspiece is mortised into the skate block for a first-class job. The passenger body may be as elaborate as you care to make it, using $\frac{1}{2}$ -in. plywood for a light and strong job. Cleats are used at each corner to assure rigidity. For color, Chi-

nese red with black chassis and trimming, makes an effective combination. Note that the length of the push bar is given as 36 in., but it should be suited to the height of the user. Skates of the double-clamp variety are used on this job, and they can be removed when they are required for foot skating.

Lead-Pencil Eraser Makes Switch Easily Operated with Gloves

To make the small knobs on toggle switches easy to operate when heavy mittens or gloves are worn, place a lead-pencil eraser, of the type shown, over the knob. This lengthens it



slightly, and the friction between the glove and the rubber helps to keep the fingers from slipping off. This is also a good idea when the hands are greasy.

Electric Lamp Warms Dinner Plates

Warming dinner plates is easily done by placing an extension light underneath an inverted pan, under which are stacked the plates. This method is also useful for keeping food warm without removing it from the table.



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BLUEPRINTS

for Home . . .
Craftsmen

Just out with this issue—a set of three blueprints on Governor Winthrop's Desk, described in this issue. Order Nos. 846 to 848, 75c. Also a print of Battle on a Board, No. 837. (See page 292.)

Other recent and popular blueprints are "Roamer," a 16-ft. outboard cruiser, Nos. 765 to 770, \$1.00; "Hi-Ho," a 14-ft. family outboard runabout, Nos. 840 to 845, \$1.00; "Sovereign of the Seas," an outstanding historic ship model, Nos. 828 to 835, \$1.50; Four-Room \$700 House, Nos. 850 to 855, \$1.00.

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(Other blueprints listed in advertising section)

Coating for Motion-Picture Screens

Motion-picture screens of the proper color to show the finest picture detail may be had by coating canvas or other suitable cloth with a paint consisting of stick glue, $\frac{1}{2}$ lb., melted in a gallon of water. The glue should be soaked in cold water overnight before heating. After the glue has melted and is still hot, stir in glycerine, $\frac{1}{2}$ lb., and zinc oxide, 1 lb. The mixture should be stirred until it is of a perfectly even consistency and free of lumps. It is applied hot to the stretched cloth with a large brush. The fabric should be left stretched tightly until it is dry. Screens made by this process may be rolled without cracking or breaking. One gallon of the paint will cover 10 sq. ft. of canvas.

Improvement on Your Bench Brush

In cases where a bench brush cannot be laid down, as it may then pick up moisture or dirt, a simple holder to keep the brush in a position so that the bristles will not touch the bench top, can be made from a piece of tin, or a tobacco-can lid. This is pivoted to the back of the brush so that it can be turned crosswise when the holder is used, and can be turned flat against the handle when it might be in one's way while using the brush.



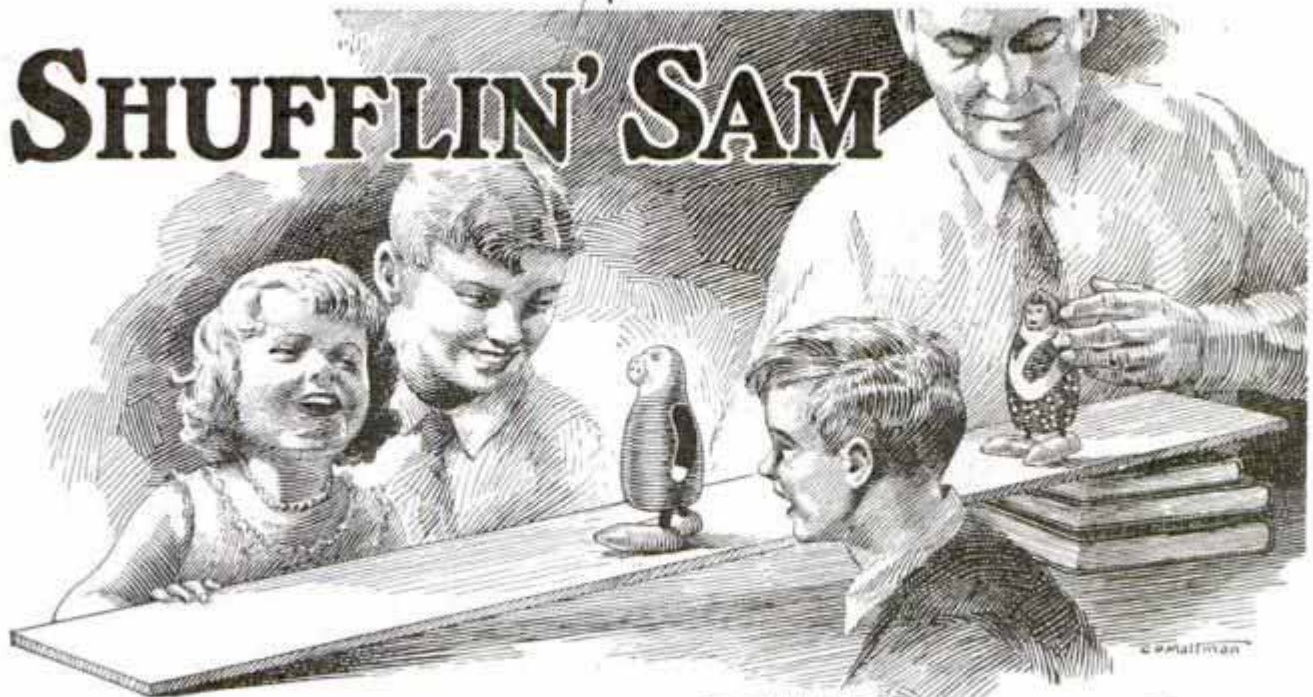
Distilled Water Obtained from Your Electric Refrigerator

The next time you defrost the cooling unit in your electric refrigerator, save the water that drips into the tray underneath the unit. Laboratory tests show that this water is just as pure as distilled water and it may be used for the same purposes. Before defrosting the unit, be sure that the tray, which should be glass, is thoroughly cleaned.—Daniel Egan, Paterson, N. J.

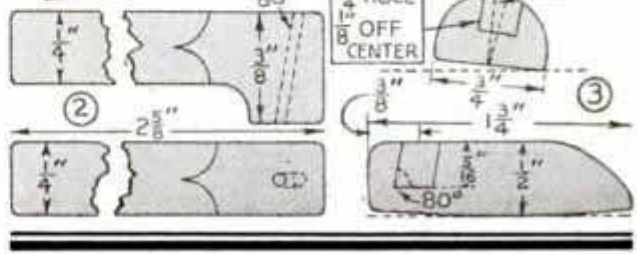
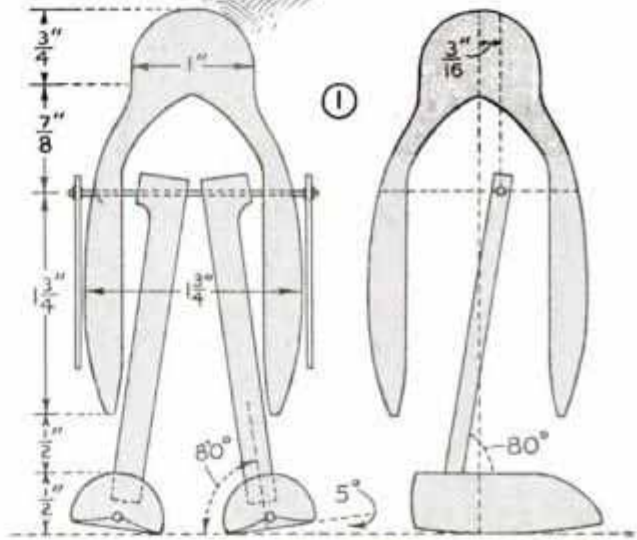
☞ When hanging up Turkish towels to dry, use three clothespins instead of the usual two; they will dry straight and need not be ironed.

substitute the penguin

SHUFFLIN' SAM



PAINTED to resemble almost anything from a wooden soldier to a gorilla, this wooden toy shuffles down an inclined board in a most amusing way. For motion, it depends on gravity and, owing to the balance of the body and the angle that the legs and feet are set, one leg is free to swing forward while the body is supported by the other leg. Then, as soon as the moving leg hits the lower edge of the body, it stops and rests on the board while the body swerves over just a trifle so that the other leg is cleared and starts swinging down. In this way the walking motion is maintained. The body, preferably maple, is turned down to the dimensions given in Fig. 1, and it is painted and drilled at the point indicated for a wire shaft on which the legs pivot. These are cut down from 1/2-in. stock to the sizes given in Fig. 2. The angles at which the legs and feet are set must be accurate to assure movement. A pivot hole is drilled through the upper end of each leg at an 80° angle. The 1/4-in. holes in the feet, in which the lower ends of the legs are glued, are drilled 1/8 in. off center toward the inside, and the center line of these holes is off 5° from the vertical center line of the feet. See Fig. 3. When assembled, the bottom of each foot is 5° from horizontal. Also, the legs incline toward the toe as shown and the bottom of each foot is slightly rounded at the ends. Arms may be of light cardboard or tin, pivoted to swing, or they may be simply painted on the side of the body.





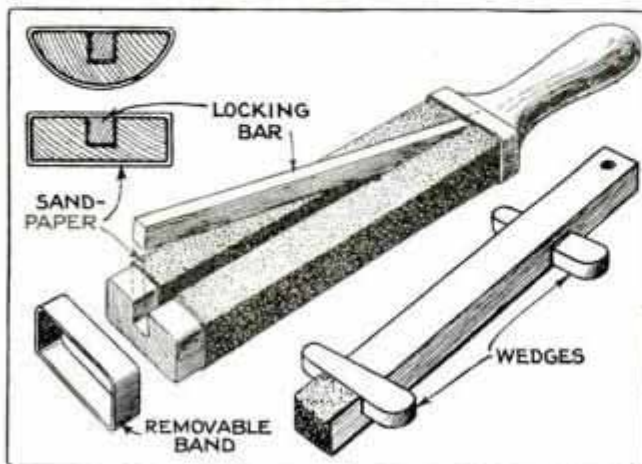
Lengths of Telescoping Curtain Rods Provide Easily Operated Slides for Drawers underneath Workbench

Telescoping Curtain Rods Used as Drawer Slides

Small drawers may be easily fitted to the underside of the workbench top by using lengths of telescoping curtain rods for slides. The rods are cut to length, after which one half is screwed to each top side of the drawer. The other half is then screwed to the underside of the bench top.

Two Abrasive Sticks That Are Easily Made

Here are two methods of making small abrasive or polishing sticks. The upper one may be made almost any width desired, and it may have either a flat or oval sanding surface. The tool is merely a block having a hand grip at one end and a groove lengthwise of the center in which the ends of the abrasive paper are held by means of a locking bar, which, in turn, is



These Abrasive Sticks Are Handy in Your Workshop and Cover a Wide Range of Work

held securely by removable brass bands at each end. The stick shown in the lower detail is for more delicate work, and consists of a small, narrow block on which a strip of abrasive paper or emery cloth is held by tapered wedges.

Simple Method of Imitating Sunken Panels on Models

In any work on models that requires sunken panels such as a stern board, as on the "Sovereign of the Seas," I use 3-ply veneer of the required thickness. It is very simple to cut through one ply and pick out the wood, leaving clean edges and a smooth surface. The wood can also be cut from the back for windows, giving the model a hollow effect.—B. MacIntyre, Toronto, Can.

Tobacco-Can Lid Serves as Warning on Bottles of Poison

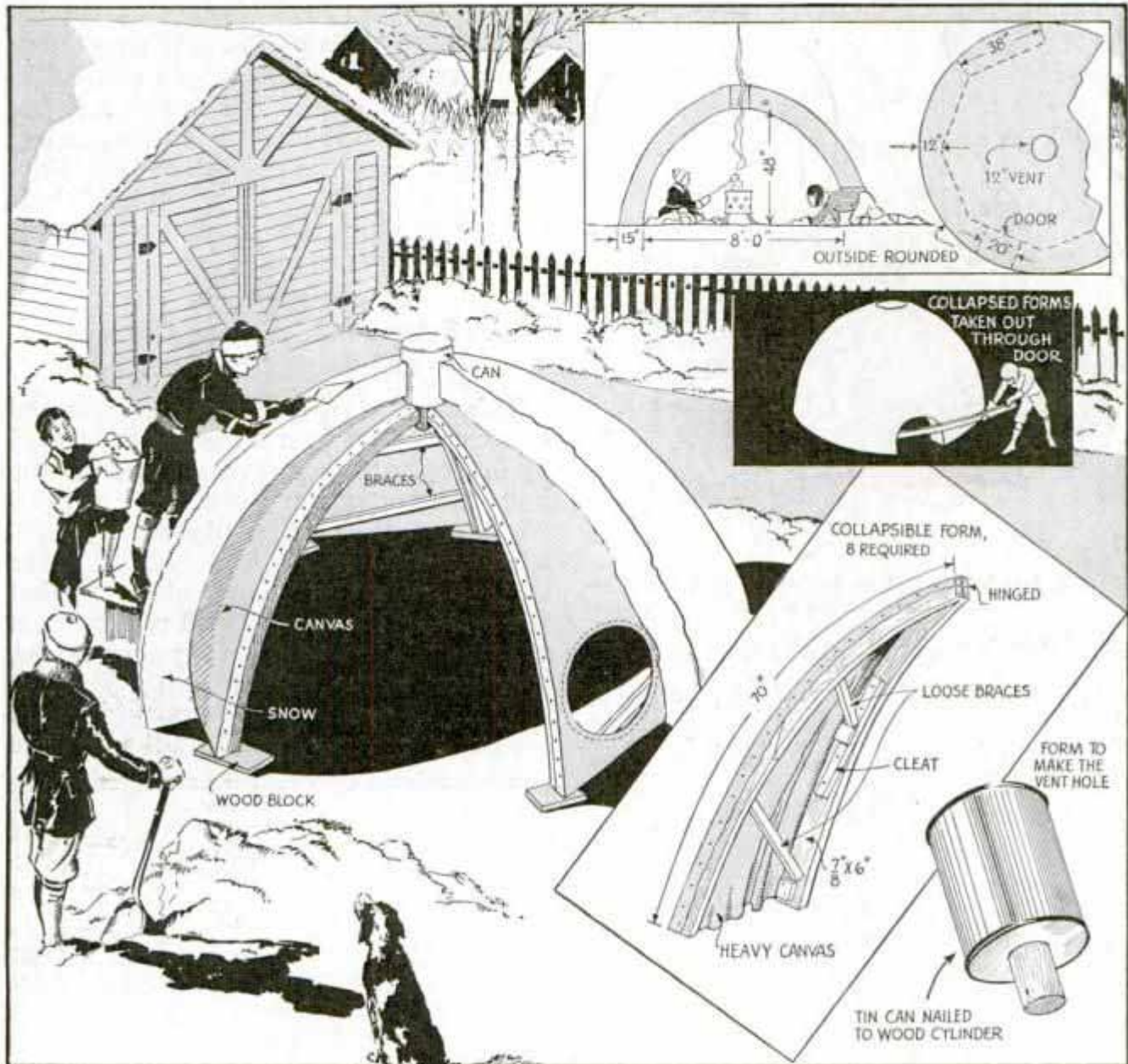
Bottles containing poison or highly inflammable liquids are easily marked with the lid from a tobacco can. Bend the center prong of the lid hinge downward and the outside ones upward. Then fasten the lid to the bottle neck with a rubber band. This provides a red sign that is readily seen in daylight or felt when running the hand over the bottles in the dark.



How to Make Metallic Paints

A good bronzing fluid that can be mixed with aluminum powder to produce a high-grade aluminum paint is made by dissolving scrap celluloid, such as that from old motion-picture film, 1 oz., in a solvent consisting of 1 pt. each of amyl acetate, acetone and benzine, or a good grade of lacquer solvent may be used instead. In this case, dissolve the celluloid in 3 pints of the solvent. For other colors, copper, brass or other metallic bronze powders may be used. Dry artists' pigments may also be mixed with this fluid to produce a variety of colored lacquers.

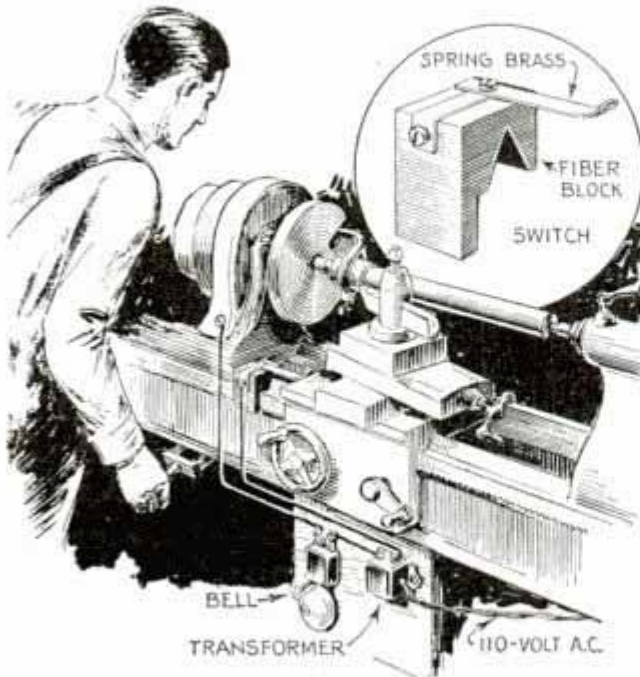
Building Snow Houses with Portable Forms



Turning out the arctic igloo in mass production is a comparatively simple job with these folding forms. The eight which are used each consist simply of two curved side members hinged at the peak and covered with canvas, and held open by two braces inside. The braces are separate from the form, and slightly longer than the distance between the side members. Hence, when tapped into position they hold the frame open and keep the canvas covering taut. By knocking the braces loose, the form can be folded. The side members carry cleats on the inside and are hinged together at the top. Tack the canvas on the sides so that when open, the form will be 38 in. wide at the bottom. Use 2 by 2-in. material for the com-

pression struts, or braces. In one of the forms, cut an opening in the canvas near the base large enough for a worker to pass through in order to get inside to collapse the forms after the snow covering has set. A cylindrical form sets at the peak of the structure. The tips of the curved forms rest against the small end while the larger cylinder leaves an opening in the roof for a vent. With the forms assembled, put snow around the base to a thickness of about 15 in., and work toward the peak. In removing forms, first take out the top piece then crawl inside and knock out the struts from the curved forms, one at a time, folding them and passing them out through the small door to a helper on the outside.

Practical Ideas That Simplify Lathe Work



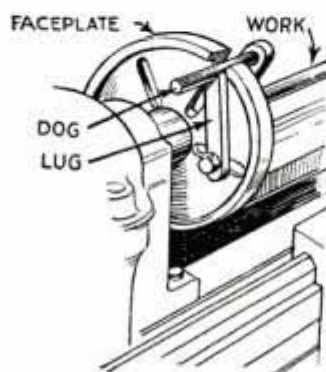
Electric Doorbell Wired to Lathe, Rings When Carriage Reaches End of Cut

Warning Signal on the Carriage

When taking a long, slow cut on a lathe, time is often wasted because the operator does not wish to do other work and run the risk of spoiling the turning job. A warning signal can be provided by wiring up an electric bell to ring when the lathe carriage reaches a predetermined point. A fiber block is cut to fit snugly over one of the ways and a spring-brass contact is screwed to it. The contact is adjustable so that the lathe carriage will touch it at the end of the desired travel. An ordinary doorbell and a bell-ringing transformer, or a couple of dry cells, are wired in the circuit as shown. If a transformer is used, it can be connected to the motor leads so that the current is on only when the lathe is in use.—Jack Beater, Fort Myers, Fla.

Lug Prevents Vibration of Dog

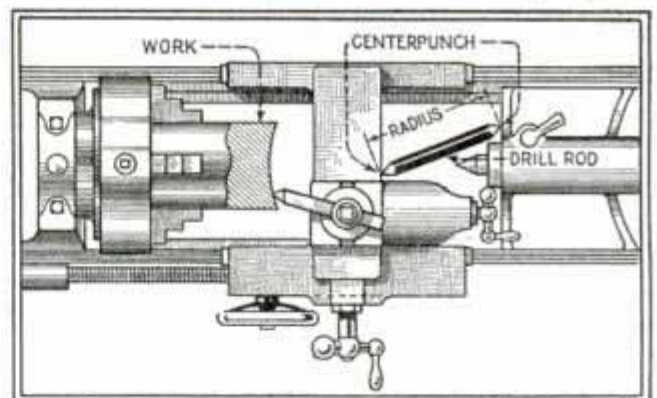
When driving small-diameter work between centers in a lathe, or when taking a very light finishing cut, it often happens that the dog vibrates due to the play in the faceplate slot, which is



almost certain to cause chatter marks on the work. This is particularly true of the clamp type of dog. A simple method of preventing this trouble is to bolt a lug of thin flat iron to the faceplate with one end bearing against the tail of the dog. Friction caused by tightening the bolt will hold the lug in place and prevent any movement of the driving dog.

A Setup for Machining Concave and Convex Surfaces

This method of machining concave and convex surfaces in a lathe has been used by one operator for several years. If the lathe has a compound rest, set it parallel with the ways. Then, with a centerpunch, make indentations in the tailstock and the cross slide opposite each other so that when a short length of drill rod, pointed at both ends, is placed in the punch marks, it will set at the angle shown. With the rod and the turning tool in position, start the power crossfeed and hold the carriage



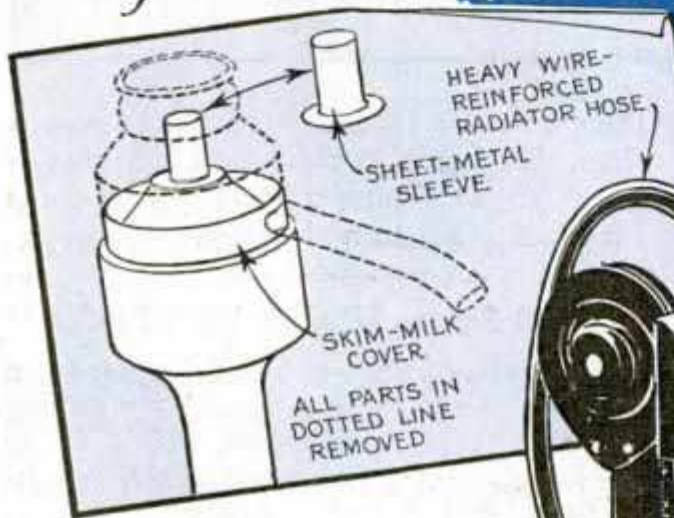
Accurate Job of Machining Concave and Convex Surfaces Assured with This Setup

toward the tailstock by hand or with a weight. Sometimes a spring is used for this purpose. When the tool reaches the center of the work, throw out the crossfeed and return the tool to the starting point. Depth of the cut is obtained by turning the handle on the compound rest. If there is no compound rest, the cut is adjusted by lightly tapping the rear end of the cutting tool with a hammer. In the illustration, the setup is for a concave job. For convex work, the principle is the same, except the rod is placed against the headstock and the carriage, which is forced toward the headstock.



A Small SHOP FORGE

made from Old Cream Separator

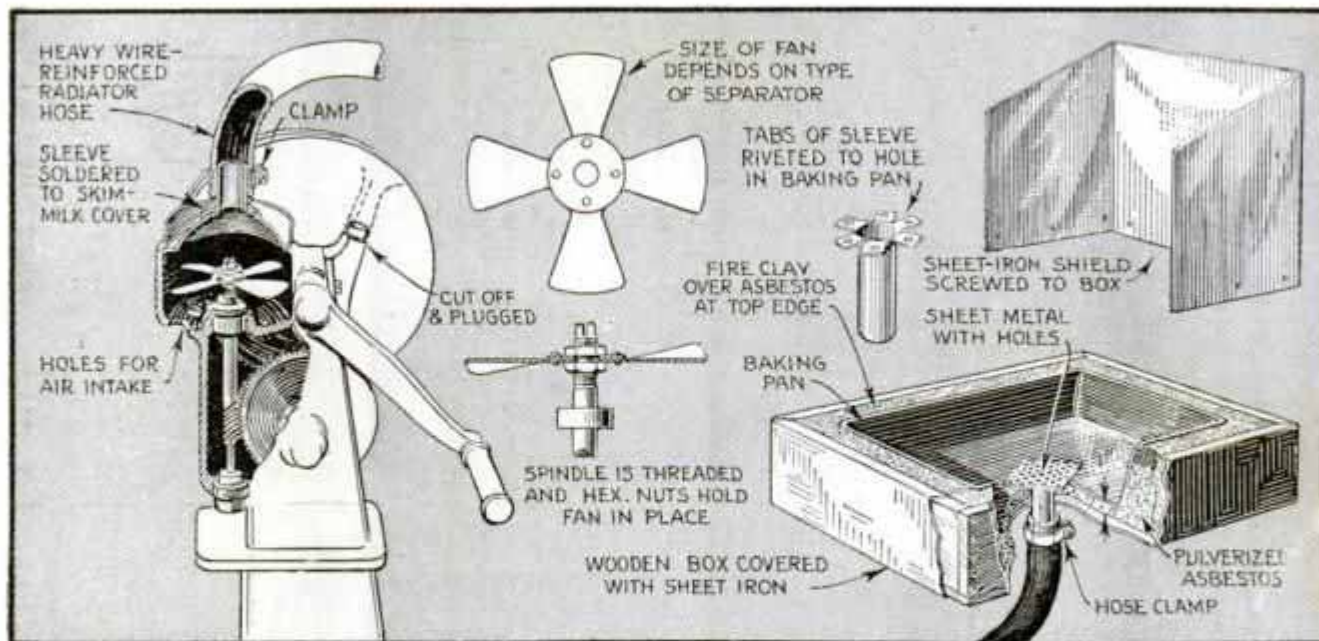


By FLOYD M. MIX

WITH a few alterations, an old hand-driven cream separator, that is no longer suitable for its original purpose, can be transformed into a good workshop forge. Begin by removing the separator bowl and the supply can. As the supply-can bracket will not be needed, it can be sawed off and plugged. The worm-screw spindle, which will drive the fan, is next removed and threaded on the upper end. This is done by removing the dust cap and drip shield and then loosening the stop screw, which is located on the side of the frame. Lift the spindle straight up as the top bearing and spring will come out, leaving the lower ball-bearing in position in the frame. The top bearing should not be removed from the spindle. Replace it as soon as the threading job is completed, and tight-



en the stop screw. The fan is cut from a piece of heavy sheet metal to the shape indicated, if a ready made fan of the right size cannot be adapted. Dimensions are not given as these depend on the style of separator used. An extra piece of sheet metal is riveted to one side of the fan to make it sufficiently rigid, after which the fan is placed between two hexagon nuts on the spindle, so the fan will direct the air current upward as it enters through



the bowl casing drain. Extra holes may also be drilled in the casing to assure sufficient air intake. The spout is removed from the milk cover, it is placed over the fan, and a piece of 2-in. sheet-metal tubing is soldered to the opening in the middle.

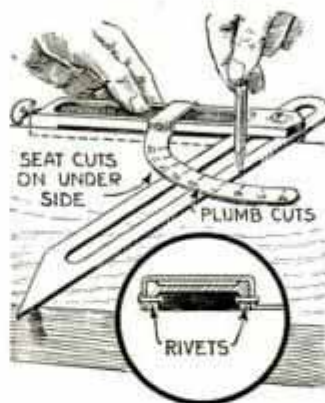
The firebox is made of $\frac{3}{4}$ -in. white pine, lined on both sides with No. 22-gauge sheet iron. Pulverized asbestos is packed between the firebox frame and the inner box, which may be a heavy sheet-iron baking pan. The space between the pan and the outer box is then sealed with a layer of fire clay. The nozzle through which air is delivered to the fire consists of a 2-in. tube, which is connected with a length of wire-reinforced radiator hose to the sleeve on the milk cover, the hose being securely held in place with hose clamps. A piece of sheet iron, perforated, is laid over the air intake of the firebox. When necessary to clean out the holes of cinders that will accumulate, merely loosen the clamp and slip the hose off. A still better arrangement is to use a tee instead of a sleeve, leading the hose to the side opening and fitting a plug in the bottom opening to be used for cleaning.

In mounting the firebox to the separator a couple of angle-iron braces are needed, these being flattened and drilled at the ends for attachment to the firebox and to the separator base. The most convenient height is about 30 in. The back of the firebox is also rigidly attached to the upper portion of the separator, the exact method of attachment depending, of course, on

the particular type of separator used. A sheet-metal shield at the back is also added or, if you desire, a hood can be made for connection to a chimney.

Bevel Square Used as Pitch Finder

Equipped as shown, a bevel square is a time saver on such jobs as determining the correct pitch of a cut, fitting frieze boards, sheathing gable ends, cutting rafter butts and applying cornice moldings. The arc is made of sheet steel and is fastened to the beam of the square by riveting through the sides as shown in the circular detail. To do this, it is necessary to



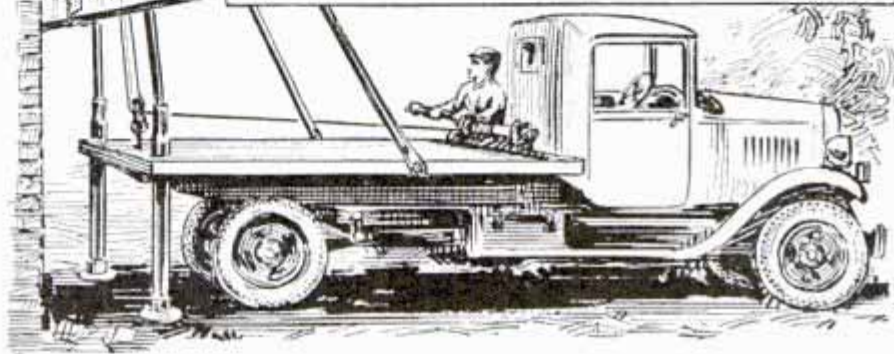
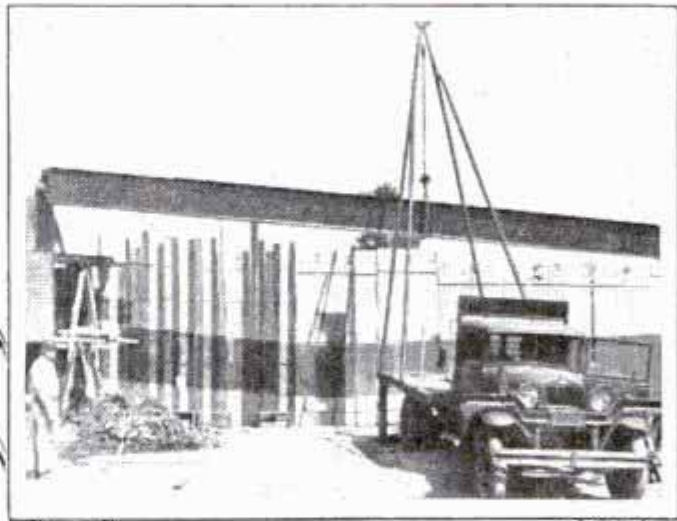
separate the two parts of the handle by loosening the rivets and the pivot pin that hold the two members together. The size of the arc will vary with the size of the square used, and the distance the arc is placed from the pivot pin. Cal-

ibrate the arc by laying out the various pitches on a board by means of a steel square and set the bevel square to each pitch, marking the corresponding pitch on the arc. Lay out the plumb cuts on one side and the seat cuts on the other side. The figures on the arc show the rise in inches for each 12 in. of run.

Truck Hoists Help to Simplify Erection Work

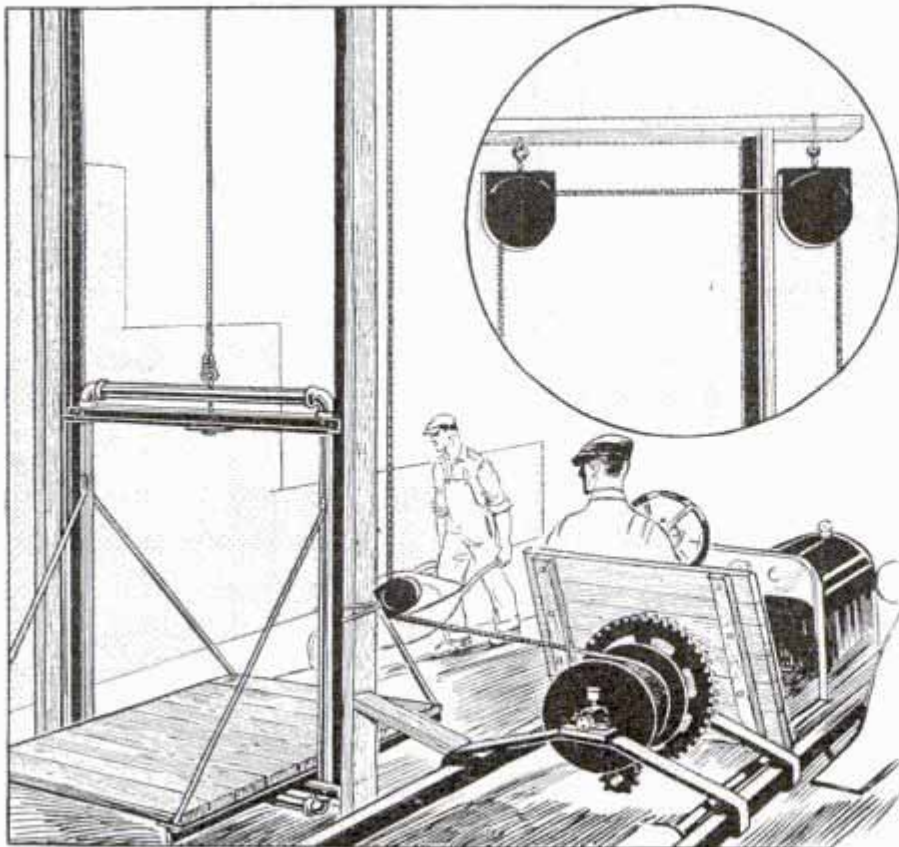
Contractors engaged in small construction jobs will often find these two hoists helpful in their work. The upper drawing shows a small truck, equipped with a pipe frame and a winch, which is used to raise heavy iron beams or other loads. Each rear corner of the truck bed has a 6-in. reinforced hole through which is fitted a section of pipe, plugged below the level of the truck bed and provided with flanges to rest on the ground. Vertical members of 4-in. pipe are slipped inside of them, taking the load off the truck bed. Braces, attached to the truck and to the vertical members, serve to support the latter rigidly.

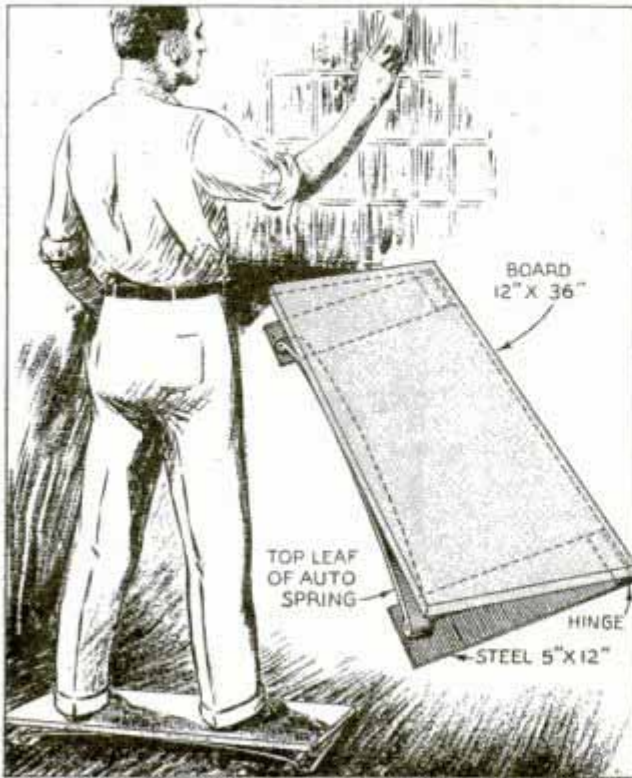
In the lower drawing, the motor and chassis of an old model-T Ford are utilized as a power unit to operate a small skip



hoist. The driveshaft is disconnected at the rear end and is shortened materially after the housing has been removed. A

4-in. pinion is attached to the end of the shaft, which is supported by means of a bearing attached to a length of heavy flat iron, the latter being bolted between the sides of the frame. The pinion meshes with an 18-in. gear on the shaft of a small drum for winding the hoist cable. The bearings at each end of this shaft are bolted to arched pieces of $\frac{1}{2}$ by 2-in. iron, the ends of which are in turn bolted to the chassis frame. From the drum, the hoist cable passes through a pulley attached to the hoist tower and through two pulleys at the top of the skip. The hoist is towed from job to job.



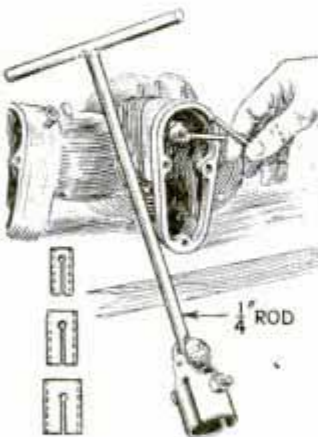


Auto-Spring Leaf Fastened to Board Provides Cushioned Platform for Mail Dispatcher

Spring Platform Prevents Tiring of Mail Dispatcher's Feet

An Oklahoma mail dispatcher who tired of standing on concrete floor to sort sacks of mail and distribute it in pigeon holes, solved the problem by standing on a spring platform. Two steel plates are hinged to one side of a 1-in. board at the corner edges and the main leaf of an old auto spring is bolted near the other edge.

Universal Grinder for Valves of Airplane Motor



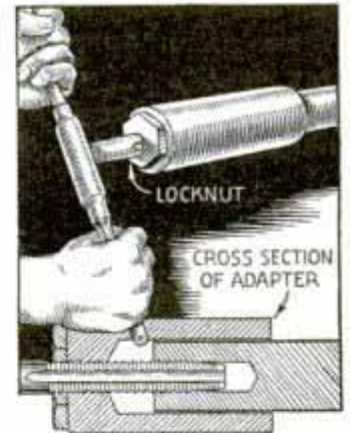
will save space in the toolbox. Weld a crosspiece, for a handle, to a length of $\frac{1}{4}$ -in. drill rod. Flatten the other end and drill it for a pin. A soft steel ball, approx-

imately the size of the largest valve stem you may have to work on, is drilled through at right angles for two pins, and is slotted on one side to take the handle. A short length of thin steel tubing is then shaped to allow the ball to turn on its pin, and is slotted to within $\frac{1}{4}$ in. of one of the sides. When assembled, this gives a universal action so that the tool works freely in the hand and the valve rests securely on its seat. A number of sleeves to fit the various sizes of valve stems can be made from pieces of tubing and clamped in the tool as indicated.—Ivan Kester, Chicago.

imately the size of the largest valve stem you may have to work on, is drilled through at right angles for two pins, and is slotted on one side to take the handle. A short length of thin steel tubing is then shaped to allow the ball to turn on its pin, and is slotted to within $\frac{1}{4}$ in. of one of the sides. When assembled, this gives a universal action so that the tool works freely in the hand and the valve rests securely on its seat. A number of sleeves to fit the various sizes of valve stems can be made from pieces of tubing and clamped in the tool as indicated.—Ivan Kester, Chicago.

Guide Assures Perfect Alinement When Tapping Round Stock

When tapping holes in the ends of round stock, the use of a tap guide, or adapter, will greatly facilitate the job and assure perfect alinement of the tool. The guide is a short length of round stock drilled lengthwise to slide snugly, yet with a running fit, on the end of the work. The closed end of the guide is tapped exactly in the center to take the tap. If a considerable amount of work is to be done, a locknut is necessary to prevent the tap from turning in the guide.—B. L. Matthews, Cleveland, Ohio.



Talcum Powder Cleans Marble Counters in Restaurant

Restaurant tables and counters with tops of marble or enamel often become sticky in damp weather and give a suggestion of unsanitary conditions where every effort may be made to preserve cleanliness. After experimenting with cleaning liquids of various kinds, one restaurant manager solved the problem by using a wad of cotton dusted with cheap talcum powder. The talcum does not remain on the surface in sufficient quantity to soil a customer's clothes, but it does leave the counter and table surfaces clean and sanitary to the touch.

Novel STORE-WINDOW *Attraction*



By
Arthur Lindberg

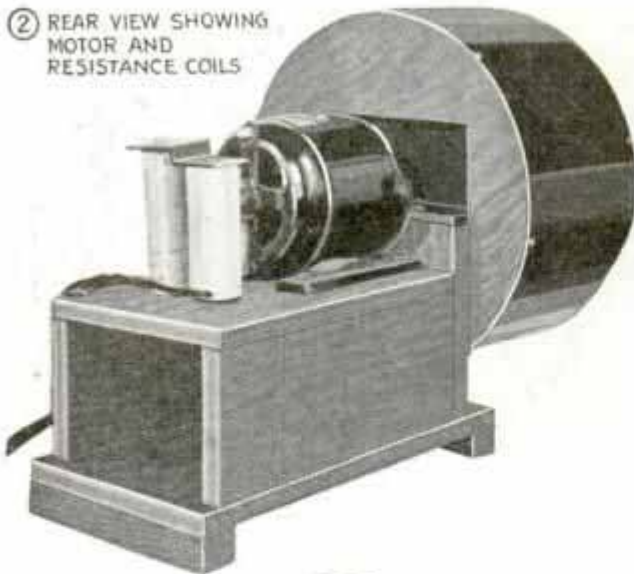
FASCINATING because of its ever-changing design in glowing red, this store-window attention arrester consists mainly of two 2-watt neon lamps and a small electric motor. The current consumption is about the same as that of a 60-watt lamp, and the cost to make it is about three dollars. It may be run on direct current, using a d.c. motor, but it works better on alternating current. The band of red light is produced by rotating the neon lamps at a speed of 300 r.p.m. The changes in the shape of the light band are caused by lighting the lamps separately or at the same time, which is done automatically by a thermostatic switch.

Figs. 2, 3 and 4 show the unit assembled. The motor is screwed to a wooden base, Fig. 8, and its shaft is fitted with an extension that holds a disk on which the neon lamps are mounted. The extension shaft also has insulated slip rings which contact with brushes to convey current to light the lamps. Fig. 5 details the various parts of the extension shaft and the method of assembling them. Take a $\frac{1}{2}$ -in. brass rod, drill it at one end to fit the motor shaft, after which the other end is turned down to the size indicated and threaded. A fiber or bakelite sleeve is now slipped

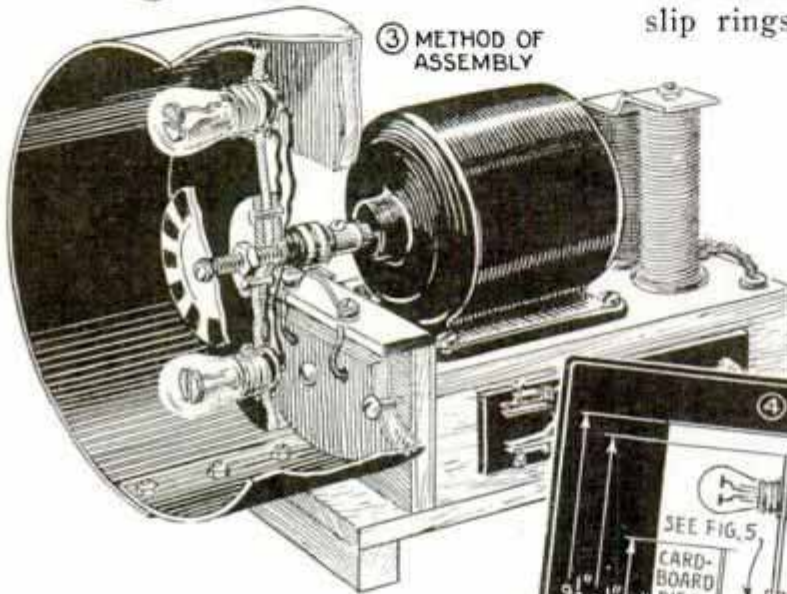


over the spindle. Press one washer over the bushing flush with the end which is to fit the disk, and lay a foot length of No. 30 double-cotton enameled or other well-insulated magnet wire in two file grooves. Slip another insulating washer over them and press it tight against the first. A pair of file grooves in this manner lined up with the grooves in the bushing will serve as a channel through which to lead the wires. One of the wires is now bent up so that when the first slip ring is pressed over the bushing, it will be wedged between it and the insulating washer. The ring should

② REAR VIEW SHOWING MOTOR AND RESISTANCE COILS



③ METHOD OF ASSEMBLY

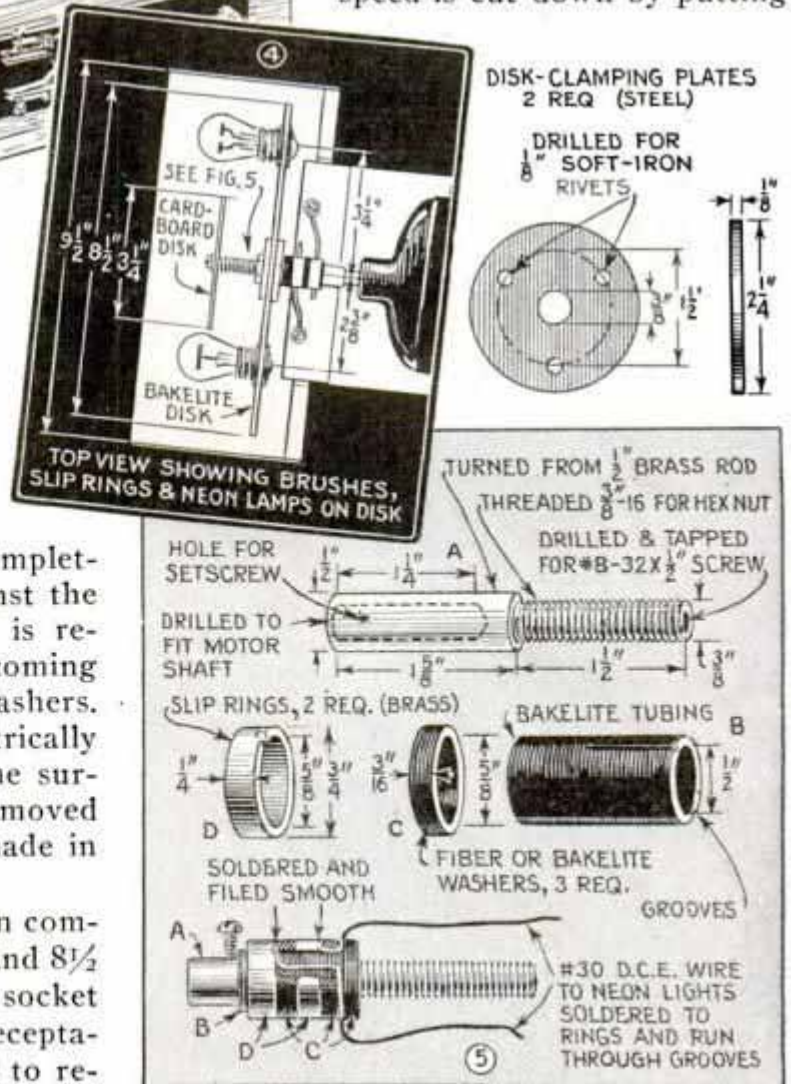


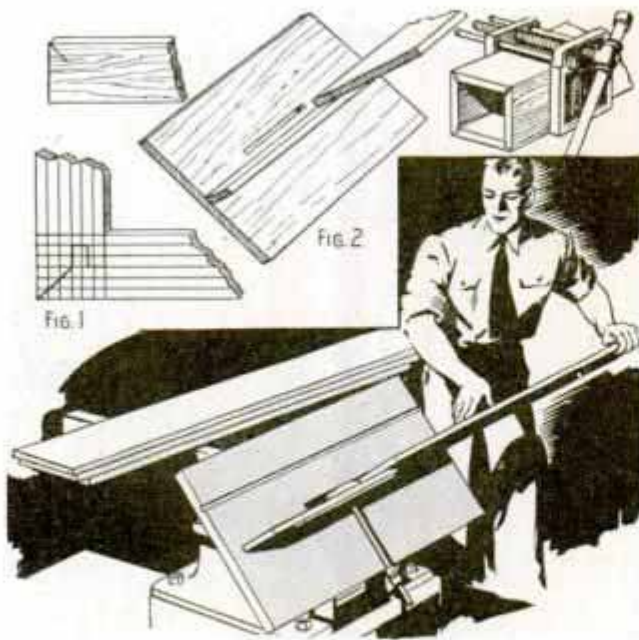
be turned so that the wire will rest in the groove. The other wire should pass under this ring in its groove and must not make contact with the ring, care being taken to avoid damaging the insulation. The third washer is slipped on, and the wire is placed in position, after which the assembly is completed by pressing the other ring against the washer and wire. The insulation is removed from the ends of the wires coming from between the rings and the washers. A drop of solder on each will electrically connect them with their rings. The surplus wire and solder should be removed with a file or a light cut may be made in a lathe.

After the extension shaft has been completed, a bakelite disk, $\frac{1}{8}$ in. thick and $8\frac{1}{2}$ in. in diameter, is fitted with two socket shells taken from old porcelain receptacles. Holes are drilled and reamed to re-

ceive the shells, which are held in place by tightly wrapping heavy copper wire around them on each side of the disk, and soldering the wire so that it will not come loose. The disk is then drilled accurately in the center to fit snugly on the extension shaft, where it is held in place by means of two plates detailed above Fig. 5. The wires from the slip rings are then soldered to the shells.

Next comes the making of the guard, which consists of a strip of thin fiber or bakelite rolled to form a cylinder and screwed to a wood disk which is in turn screwed to the base. (See Figs. 6 and 8.) The brushes that make contact with the slip rings are made of phosphor-bronze wire and are screwed to a strip of bakelite as in Fig. 7. The brushes are insulated from each other and must make a good wiping contact with the slip rings when the disk is being turned. The motor will probably run too fast and its speed is cut down by putting





Lock-Miter Joints Easily Made on Circular Saw Equipped with a Dado Head

Lock-Miter Joints Made on Home Workshop Saw

Many owners of home workshops have considered the lock-miter joint too difficult to make and have been content to use the mitered-and-splined joint instead. However, a lock-miter joint is easily made on a circular saw without special cutters, using only a dado head. Material $\frac{3}{4}$ in. thick may be conveniently plotted out by dividing it into six equal parts as shown. Note in Fig. 1 that the lines of the joint follow the intersecting division lines faithfully except at one point, where the space is evenly divided. All cuts made on like pieces should be the same. Avoid making one kind of cut on one end and the other kind on the other end of the same piece. When correctly made, clamps need be applied only in one direction. The only cut that may cause trouble is the miter at the outer corner, which is made with a smooth-cutting saw. Fig. 2 shows a setup for making this cut. It is necessary to set the fence above the saw. Therefore, be sure it is securely tightened, or it may get into the saw. The table must be set at a height that will make the cut the correct depth according to the layout, and the fence set just close enough to make the cut come to a point on the corner.

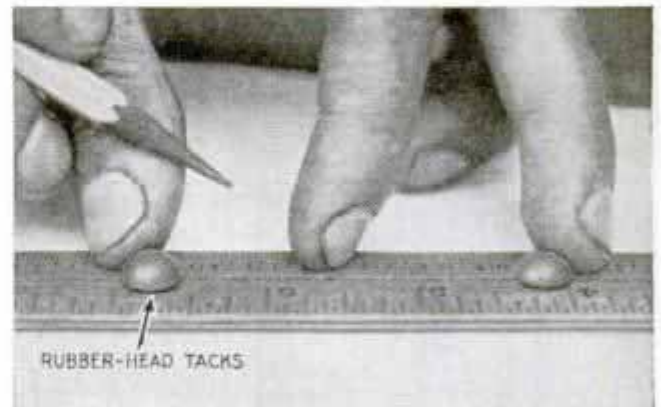
It is good policy to use the smallest milling cutter possible as cost is lower and less power is needed.

Designs and Pictures Transferred to Wood or Cloth

Ornamental designs, sketches on paper and pictures, or even photographs may be transferred to wood, cloth or almost any other material with great accuracy by using the following process: The design is first pricked with a coarse needle around the outline of the details to be transferred. The punctures should be about $\frac{1}{8}$ in. apart. The paper is then fastened to the wood or other material to which it is to be transferred with thumbtacks or weights, taking care to place the pattern in close contact. Transfer powder, made by grinding together in a mortar, ultramarine blue, 2 parts, and powdered rosin, 1 part, is next sprinkled over the pattern. The powder should be ground as fine as flour. After carefully removing the excess powder from the top of the pattern with a camel's-hair brush, a warm flatiron is run over it. The colored rosin melts and runs into the wood, thus fixing the color. Transfer powders in other colors may be made by substituting different colors for the ultramarine. Dry white lead may be used for white, chrome yellow for yellow, chrome green for dark green, and turkey red for a brilliant red.

Rubber-Head Tacks Improve Ruler

To better handle thin flexible rulers, cut off the ends of a couple of rubber-head tacks so that they are slightly shorter than the thickness of the ruler and drive them into it about 1 in. each way from the cen-



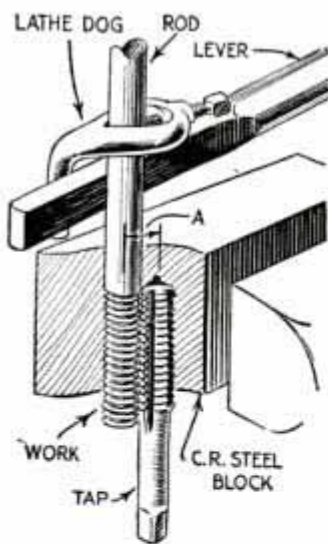
Two Rubber-Head Tacks Cut Off and Driven into Ruler Make It Easy to Handle

ter. In this way, you can slide the ruler around over your work by pressing the finger tips against the tack heads.

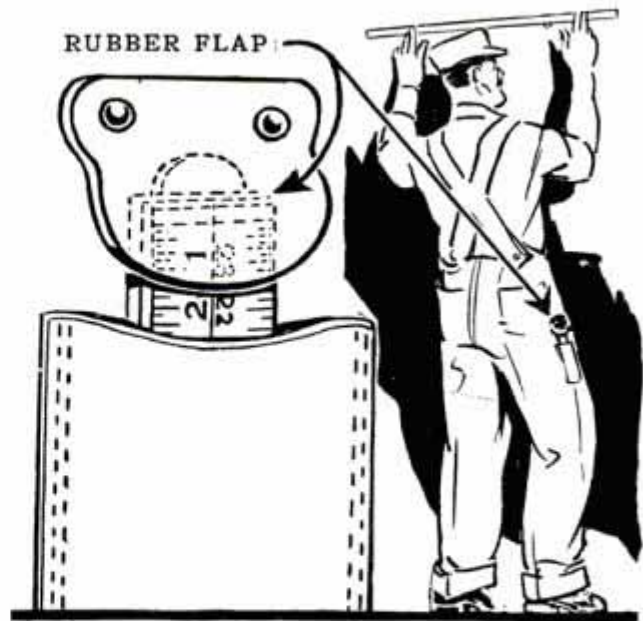
Testing Quality of Quicklime

With the following methods, anyone can test the quality of quicklime, which is an important factor in the value of a completed job in which lime is used. Remember that the best quicklime is always heavier than an inferior grade. It also feels greasy when rubbed between the fingers, while poor lime is gritty and is dry to the touch. When slaked, high-grade lime falls quickly, the water boils furiously, and a great deal of heat is produced. When poor lime is slaked, the water hardly boils and is only slightly warmed. Good quicklime never requires more than half of its bulk of water to slake it and it swells to twice its original bulk. On the other hand, the poorer quality of lime will swell to about two and one-half times its original bulk. The final test is the residue left after the slaking. If running water is used, or if the water is continually changed, good quicklime will leave no residue.—Merry Tanenbaum, New York City.

How to Cut Threads on Iron Rod with a Tap



In a small garage where equipment was rather limited, I saw a mechanic thread a rod with a tap in the manner indicated. A hole was drilled and tapped halfway through a steel block, after which the tap was removed and a $\frac{3}{4}$ -in. hole was drilled entirely through the block to take the rod, the center-to-center distance A being equal to one-half the root diameter of the tap plus one-half the root diameter of the rod. The tap was again run into the hole and the rod was placed in the other hole, and by means of the lever and a lathe dog, the rod was turned against the tap, which cut the thread. With this method, the tap need not be of the same size as the work. In this case, a $\frac{5}{8}$ -in. tap was used to thread a $\frac{3}{4}$ -in. rod.—Charles Kugler, Philadelphia, Pa.



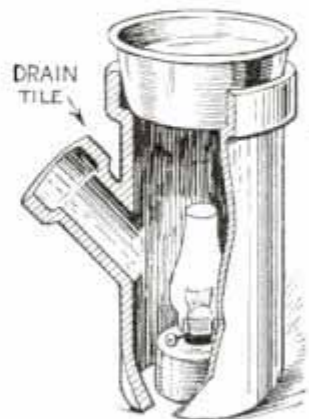
Fastened to Overalls above Leg Pocket, Rubber Flap Holds Carpenter's Rule in Place

Rubber Flap Keeps Rule in Pocket

Although the leg pocket in a pair of overalls is convenient for carrying a rule, it is often lost when climbing about on roofs or scaffolds. To prevent this, one carpenter fastened a rubber flap to the cloth just above the pocket opening. The flap is easily lifted for removal or replacement of the rule, but effectively prevents it from dropping out of the pocket.

Greenhouse Heater Improvised from Drain Tile

In searching for something from which to construct a heater for a small greenhouse, I finally used a length of 8-in. drain tile, which had a connection molded into one side at a 45° angle. A kerosene lamp was placed on the floor and the tile was set over it. Then a pan containing water was fitted in the top of the tile. The result was a little heater that raised the temperature and helped to maintain humidity.—Wm. H. Leach, Cleveland, Ohio.



☛ A piece of abrasive from an old cylinder hone makes a good stone for smoothing burned ignition points.

WORKING

By Raymond Barkuloo



FOR cutting glass, a smooth surface on which to place the piece of glass is needed. A drawing board equipped as shown in Fig. 11 has been found convenient. A hardwood strip is screwed near the bottom and a similar strip is fastened to the adjacent edge at right angles to the first strip, being held by a bolt and spring assembly at each end. The purpose of the second strip is to serve as a straightedge, the piece of glass to be cut being slipped under it and the cutter then run along its outer edge as in

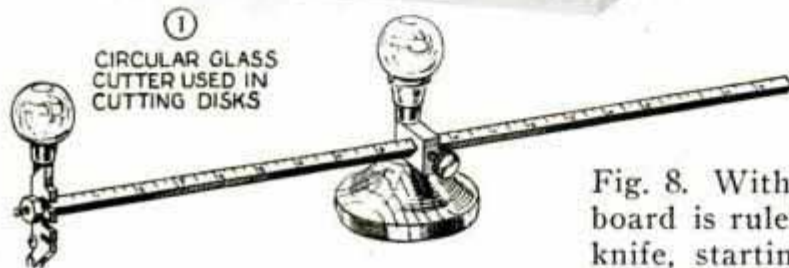
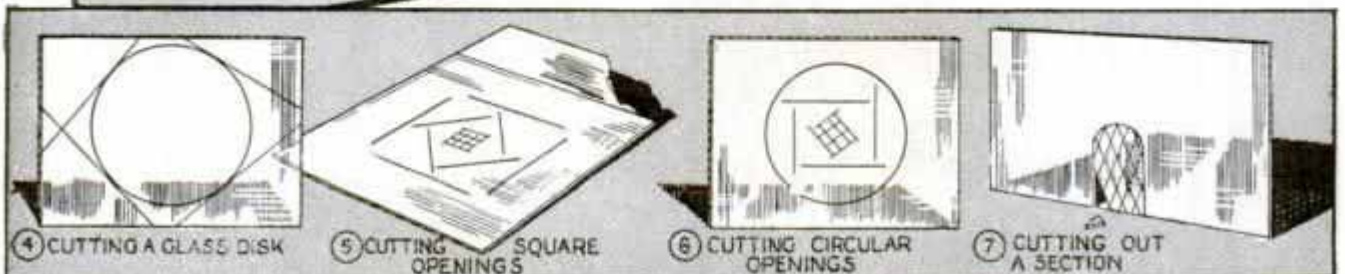
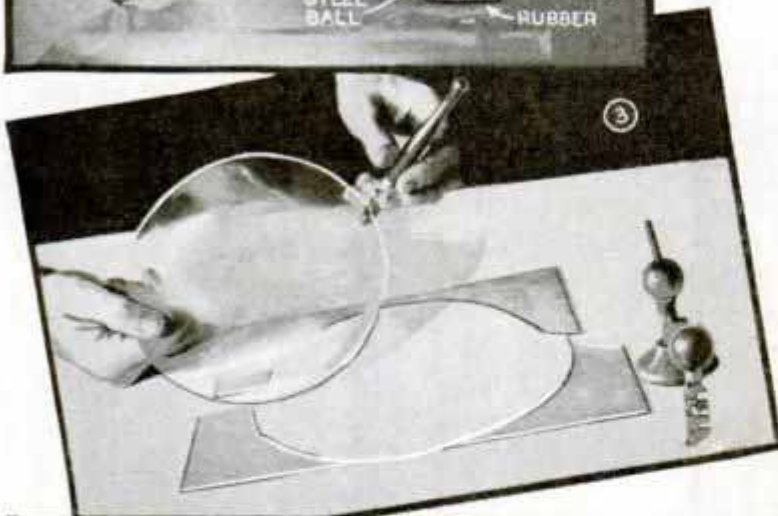
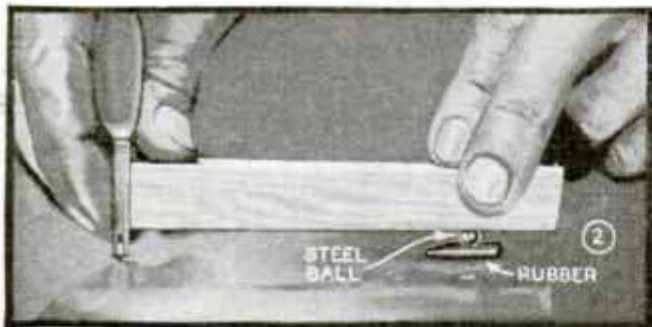
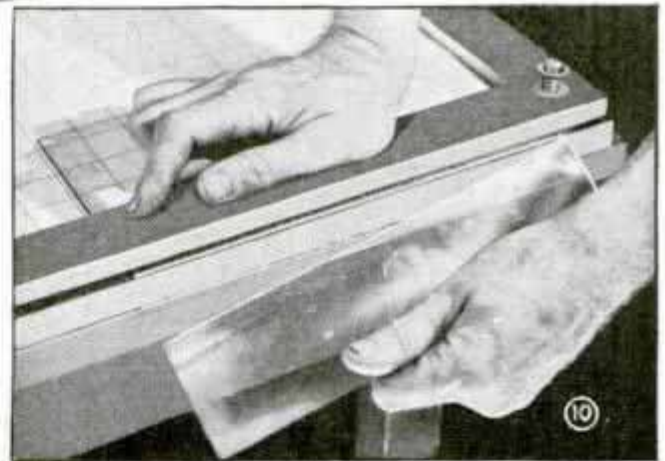
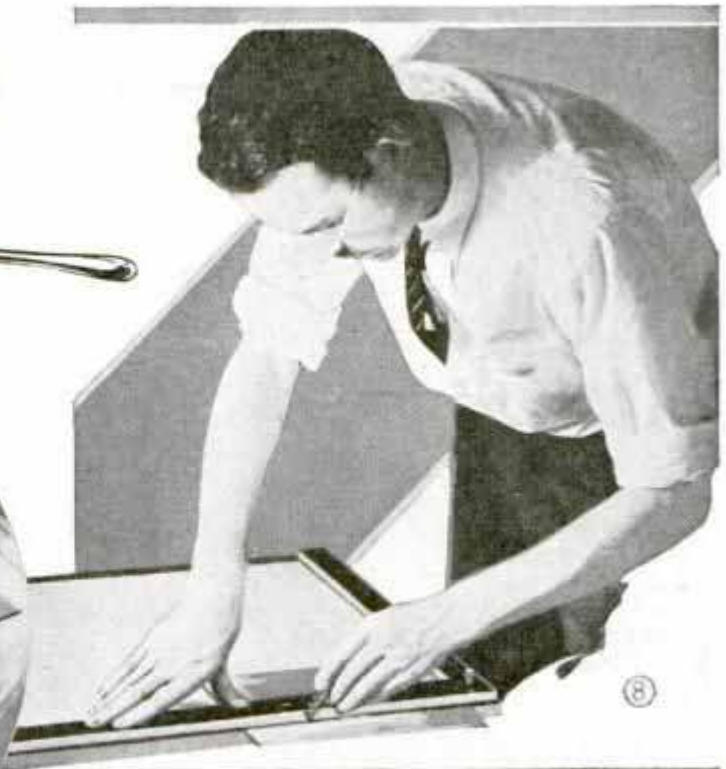
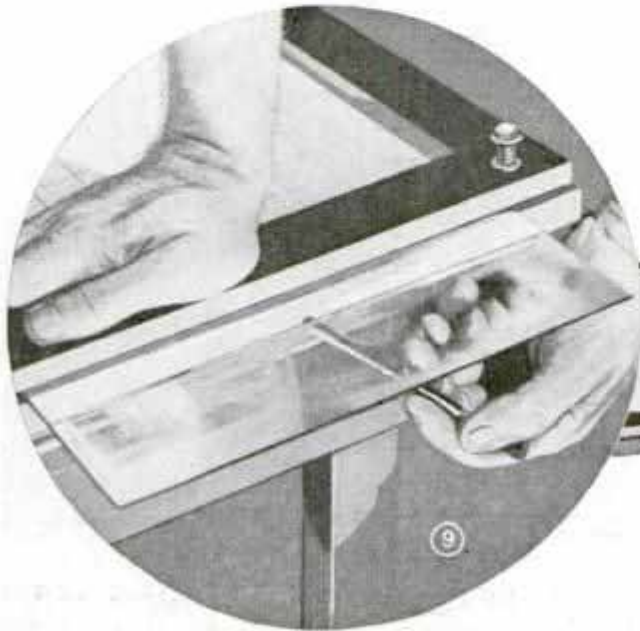


Fig. 8. With the two strips in place, the board is ruled off in 1-in. squares with a knife, starting at the inner edge of the bottom strip and the outer edge of the side strip. Finer divisions of the board may be made if desired.

The cutter should be run over the glass only once. It is not necessary that a deep cut be made. A fine, clean but continuous line is sufficient. If it should skip a few places you may carefully run it over these places again, being careful not to retrace over any part already marked. After the cut has been made the glass should be slid forward and tapped on the underside immediately under the cut, Fig. 9. While tapping the glass you will note that a deep crack forms directly under the cut. When the crack extends the full length of the cut it should be lined up with the edge of the board and broken with a sharp

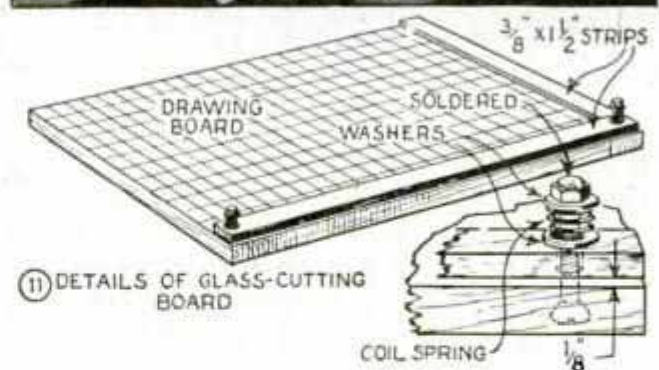


with GLASS

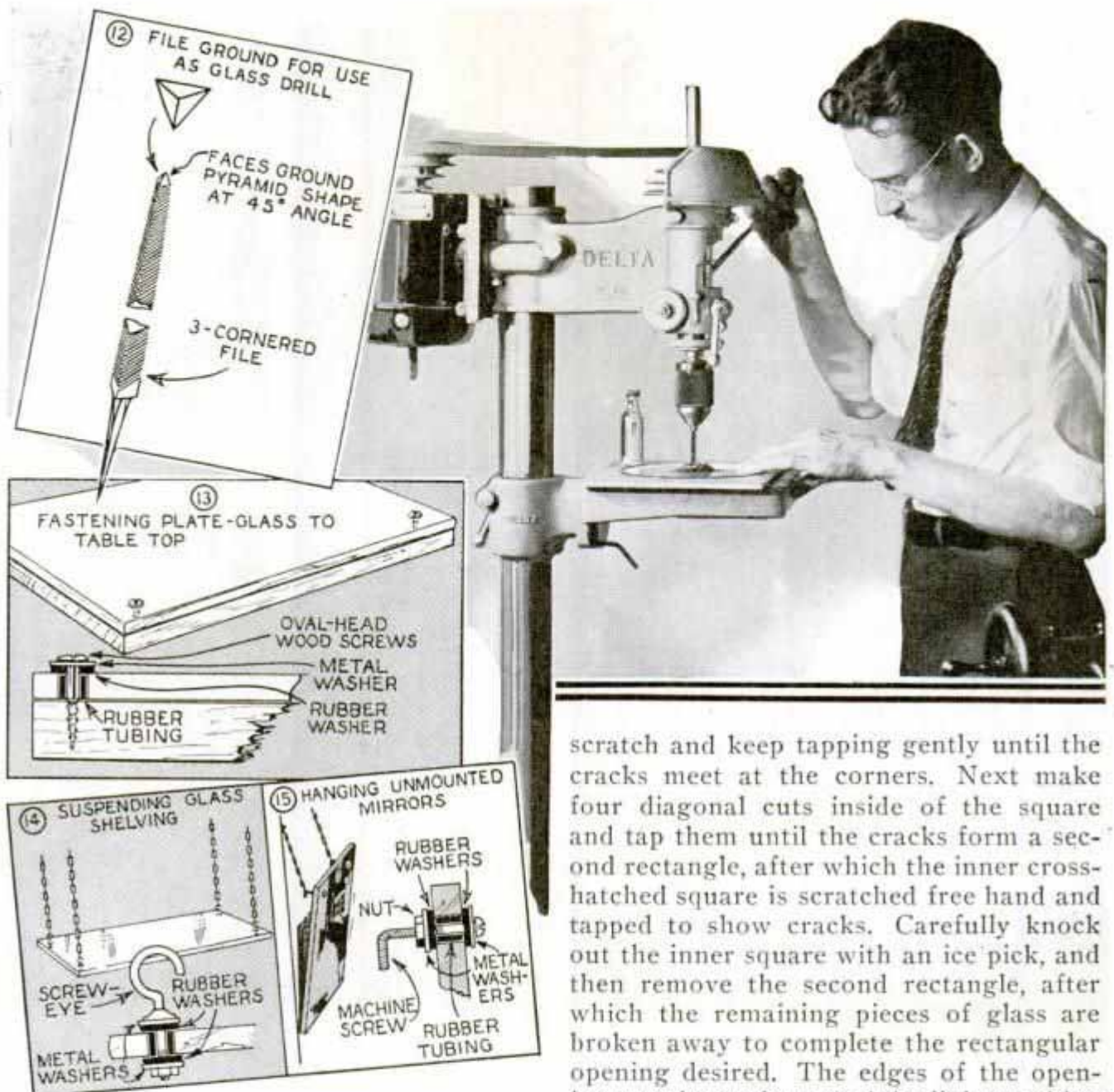


downward movement as shown in Fig. 10. If the cut was perfectly straight and uninterrupted, the glass will usually break straight. However, if a few irregularities result, the surplus may be removed by simply breaking it off with the notches or teeth of the cutter. With a little practice the teeth may be used to great advantage in shaping glass. With them you can remove very small pieces without cracking the piece.

After some experience in straight glass cutting you will get the feel of the cutter and become used to the characteristics of glass. You will then be able to tackle successfully the cutting of round and irregularly shaped pieces. Round pieces of glass are cut with a circle cutter shown in Fig. 1. This cutter is mounted on a rotating arm which pivots in the center of a heavy base. When a cutter of this type is not available, a makeshift arrangement which will do the job can be improvised from a regular cutter, a short square stick, a steel ball and a small piece of rubber or tape as in Fig. 2. The cutter is held to the end of the stick by means of a tack, one of the notches being slipped under the tack head. Mark the desired radius of the



cut on the stick, measuring from the cutter wheel to a point where the stick is placed on the ball. With a hammer sink the ball some distance into the wood and then lay the stick and ball on the piece of rubber, which will prevent the ball from slipping out of position. After the glass is cut it is turned over and tapped under the cut until a crack forms all the way around. Next, straight cuts are made in the glass as in Fig. 4, and the corners are



broken away exactly as in straight cutting, leaving the disk as in Fig. 3. Ovals and irregular shapes are cut out by scratching around a pattern made from $\frac{1}{4}$ -in. plywood. In making irregular cuts, as much surplus glass as possible should be removed by straight cutting after the design has been scratched into the glass and a complete crack produced by tapping.

The cutting of rectangular and circular openings in glass is more difficult and requires more patience than straight cutting. It is important that only very small pieces of glass be removed at a time. Cutting rectangular openings, Fig. 5, is done as follows: First scratch the edges of the opening to be made, not marking all the way to the corners. Then tap the glass to start a crack at the center of each

scratch and keep tapping gently until the cracks meet at the corners. Next make four diagonal cuts inside of the square and tap them until the cracks form a second rectangle, after which the inner cross-hatched square is scratched free hand and tapped to show cracks. Carefully knock out the inner square with an ice pick, and then remove the second rectangle, after which the remaining pieces of glass are broken away to complete the rectangular opening desired. The edges of the opening may be made smooth by light stroking with a coarse file, after which an emery stone is used for finishing. The procedure for cutting circular openings, Fig. 6, is practically the same except that a circular cut is made first. Cutting out a section of glass as in Fig. 7 is done by first scratching the arc and the straight lines, after which the inside part of the section is scratched diagonally. Cracks are then produced by tapping and the small pieces are broken out one by one.

Holes may be drilled in glass with a drill made by grinding the blunt end of a triangular file to a pyramid shape as shown in Fig. 12. The location of the hole to be drilled should be surrounded with a dam of putty. The dam is filled with turpentine to lubricate the drill, which may be rotated either in a drillpress or with an

ordinary bit brace, using only a slight pressure. When the drill starts to break through, the glass should be turned over and the hole completed from the other side, very carefully, of course, to prevent breakage. If a piece of clean white paper is placed under the glass while drilling, it will be spotted by the turpentine as soon as the tip of the drill breaks through, thus warning you of the necessity of turning over the glass. Like other operations with glass, a perfectly smooth wood surface should be used as a support.

Figs. 13, 14 and 15 show methods of mounting glass. If resilient rubber mountings are not used, expansion and contraction of the glass with changes in temperature will cause breakage. These methods of mounting also make the glass less likely to break under shock and vibration.

Glass may be ground smooth on a grindstone or fine emery wheel if the work is done slowly so as to avoid chipping and heating. In all operations on glass, it is important that the glass be kept from getting hot as it will break when unevenly heated. Coarse files may be used for smoothing up rough edges, if light pressure is used in quick sweeping strokes. This treatment is the most rapid method of producing a smooth edge; however, a wet grindstone is the best tool for producing a fine finish. Ground glass may be produced by rubbing the surface of glass with water and coarse emery powder on a rag or piece of leather.

Glass is sold in several thicknesses and qualities. Ordinary window glass comes in single strength (ss) and double strength (ds). Single-strength glass is approximately $\frac{1}{2}$ -in. thick. Double-strength glass is about $\frac{1}{8}$ -in. thick. Both of these varieties are irregular in thickness and come in a number of grades depending on how free they are from flaws. Crystal glass is made in several thicknesses between double strength and plate. Plate glass, which is made in different thicknesses, is the only variety which should be used for mirrors because of its uniform thickness and smooth surface.

Ⓞ Paper wrapped around the pilot of a valve re-seating tool will shim the hole in the motor block and also keep the tool from chattering.



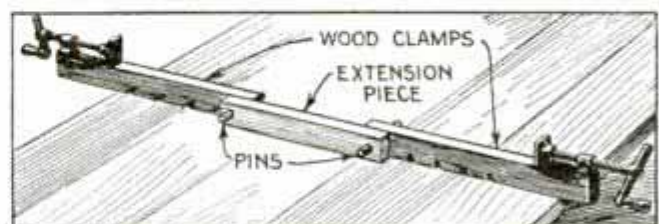
Storekeeper Uses Shelf on Side of Sugar Barrel to Hold Small Sacks While Filling Them

Shelf Attachment on Barrel Speeds Store Service

To facilitate service in selling sugar and vegetables in small quantities from barrels, one merchant made a shelf to hold the sack while it was being filled. The shelf is attached to the barrel by means of flat iron strips, which are screwed onto the underside of the shelf and are bent at right angles to project downward so that they can be inserted between the top hoop and staves of the barrel. A wire bracket on the back of the shelf holds a quantity of paper sacks ready for use.

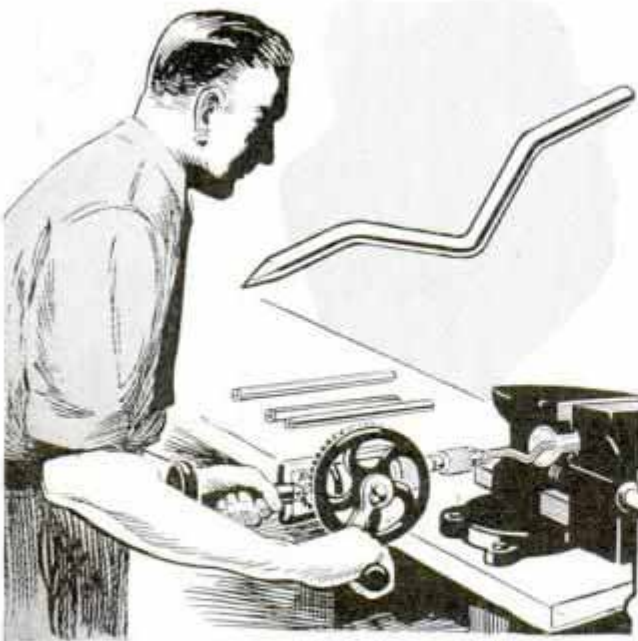
Capacity of Wood Clamps Increased with Extension

Shopmen often have use for extremely long clamps, which can be had by using the extension shown. A hole is drilled in one end of each clamp and the extension piece, of any desired length, is fastened



Extension Pinned to the Ends of Wood Bar Clamp Increases Its Usefulness

between them. Short lengths of dowel rod will serve as pins. Iron as well as wood clamps can be altered in this way.



Bent, Headless Nail Chucked in Hand Drill Helps to Flare the Ends of Tubing

Simple Tool Flares End of Tubing

Flaring the ends of small tubing is easy with this tool, which is merely a headless nail bent to the shape shown and chucked in a hand drill. The pointed end of the nail is inserted into the end of the tubing, which is clamped in a vise, and is turned with the drill, pressure being applied to the nail as it turns.—Masaru Yamauchi, Kealakekua, Knot, Hawaii.

Two Precautions to Remember in Gluing Corestock for a Veneering Job

Have you ever glued up strip or short-block cores for a veneered job, dressed them neatly and laid the veneer, getting what appeared to be a first-class job, only to find later that the joints in the corestock apparently showed right through the veneer? This trouble is caused by the moisture from the joints being absorbed by the surrounding wood, which causes them to shrink and pull the face of the veneer in slightly at these points. Since these points are a trifle low, the light does not strike them at the same angle as the rest of the surface, and they become noticeable. Two precautions are necessary. Use only one kind of wood in a given core because different woods have different shrinkage ratios. The second precaution is to allow the cores to season after gluing them edgewise, and

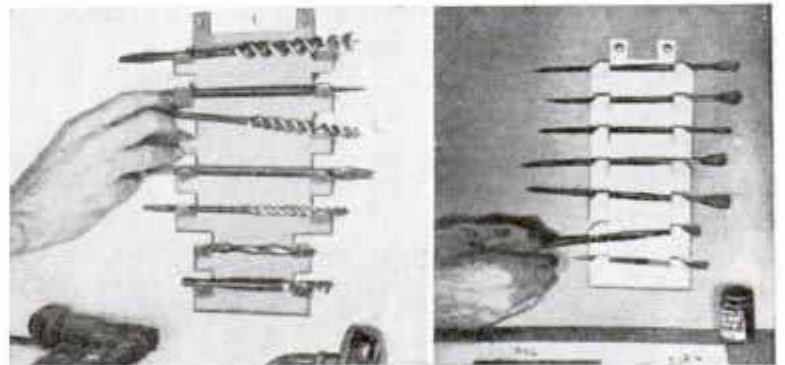
before dressing them to thickness afterward. This allows the shrinkage to take place in the joints first. Then, when they are dressed to a level surface, the veneer can be laid without any danger of the core shrinking and ruining the job.—John E. Hyler, Peoria, Ill.

Refrigerator-Cooling Coils Used as Oil Coolers on Motors

Cooling coils of some types of mechanical refrigerators make excellent oil coolers for auto, marine or airplane motors. Installation varies with the motor, but there is usually an oil-pressure line outside where one end of the coil may be cut in. The return line may be connected to a scavenger pipe or run into the sump or tank. On auto motors that have oil filters, the coils should be installed on the outlet side of the strainer, if this line is to be used, as the uncooled oil passes through the filtering medium more readily than if it were first run through the coil.—Ivan Kester, Clinton, Iowa.

Wall Racks for Holding Small Tools and Show-Card Brushes

For holding small tools such as drill bits, files and chisels, the wall rack shown in the left-hand photo will be found convenient. It is cut from a piece of sheet metal, which has tabs along each side bent outward to provide holding arms for the tools. Two tabs are also made at the top of the rack and are drilled for hanging the rack on a wall or the back of a workbench. The same idea can be carried out to make a holder for show-card brushes as shown



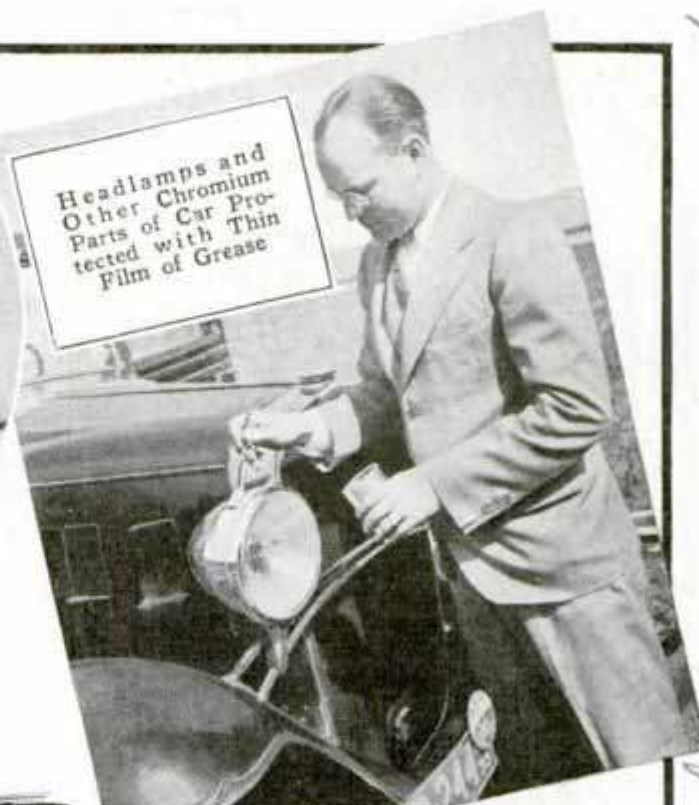
These Racks Will Hold Your Tools or Show-Card Brushes Neatly on a Wall or the Back of the Workbench

in the right-hand photo. In this case, heavy cardboard may be used.—Ray J. Marran, Kansas City, Mo.

Cold-Weather Hints to Solve Auto Troubles



When Using Hot Water to Warm Up Intake Manifold to Make Starting Easier, Heat Can Be Retained by Wrapping Cloth on the Manifold



Headlamps and Other Chromium Parts of Car Protected with Thin Film of Grease



Vaseline in Key Holes before Washing to Avoid Frozen Locks



Hot Air Forced against Windshield through Perforated Hose Prevents Frosting



Cracks at the Molding Filled with Plastic Compound and a Coat of Top Dressing Prevent Leakage and Dry Rot



Rubber Tube on Overflow Projects under Fender and Keeps Alcohol Fumes Out of Car

*Chicago - 18th and Michigan
Car. Tight against cracks. Use
Basumbe, Holphane Paint*

Basumbe, Holphane Paint



Soaking New Cylinder-Head Gaskets in Water Assures Effective Seal between Motor Head and Block

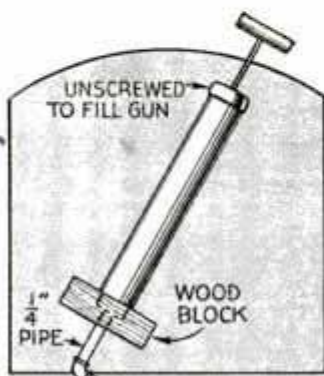
Soaking Cylinder-Head Gaskets in Water

Before installing a new cylinder-head gasket on your car, soak it in water for a few minutes. This treatment softens the asbestos center so that it can be compressed when the head is pulled down tightly on the motor block, thus making an effective seal between the two parts.

Grease Gun Made from Tire Pump

For ordinary use, an efficient grease gun can be made from an old tire pump. Remove the lower end of the pump and substitute a wood block having a hole drilled about halfway through its center to take the end of the pump. This hole should be slightly smaller than the barrel of the pump so that the threads on the end will cut into the sides of the hole. Next drill a smaller hole through the block from the

opposite side to take a $\frac{1}{2}$ -in. pipe nipple. The proper terminal can be screwed onto the free end of the pipe to fit different types of fittings. If more pressure is needed than can be obtained by pushing on the



handle, solder a nut to the underside of the screw cap of the pump and thread the

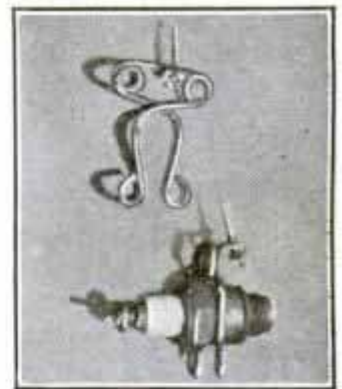
plunger rod its entire length to screw into it. Also, substitute a wood or metal disk for the leather disk on the end of the plunger rod, and, instead of removing the lower end of the pump, drill and tap it for the pipe connection. Then remove the air hose and plug the hole with solder.

Imperfect Spark Timing Causes "Rough" Car Motor

When two sets of timer points are used in a car motor, they must be synchronized or motor performance will be "rough." This is due to unequal firing in the two sets of cylinders, the spark occurring early on one set and late on the other. The same amount of gap on each set of points is not always sufficient. If the motor still lacks smoothness after the points have been equalized in this manner, set them with a commercial point synchronizer by which the timing can be equalized in degrees.

Holder for Spare Spark Plug

Fastened at some convenient place under the hood of a car, a large rubber-stamp clip makes a good holder for a spare spark plug. This is much better than keeping the spark plugs in the tool kit, as



the porcelain is sometimes broken or the points are bent by contact with heavy tools.—C. R. Breckenridge, Jr., Fort Lauderdale, Fla.

A Precaution to Avoid Scored Cylinders

When fitting new pistons and rings in a motor, I have found the following precaution helpful in preventing scored cylinder walls: Before inserting the piston in the cylinder, one end of the pin is plugged with cup grease. The pin is then filled with motor oil and the other end is similarly plugged with grease after which the pin is put in the piston and the piston is slipped into the cylinder. This assures sufficient lubrication until the oil is circulat-

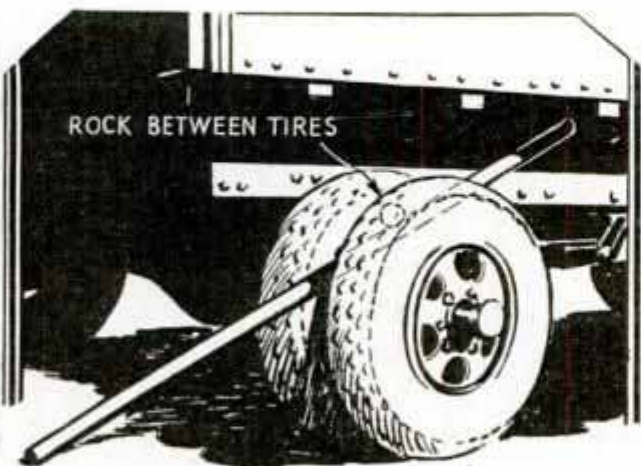
ing freely, as the grease is soon melted and the oil is released at the time when it is most needed.—Earl P. Roberts, Kenton, O.

Improving Luggage Space in Coupe

The luggage compartment under the rear deck of a coupe or roadster is usually dark with the result that many articles are misplaced and it becomes a dirty catch-all. With a little work this can be changed and its usefulness greatly increased. Brush out the compartment with a stiff-wire brush to remove the caked dirt and rust. Wipe all the surfaces with a cloth soaked in gasoline or naphtha, and paint the entire inside with aluminum paint. Sponge-rubber matting or carpet can be placed on the floor of the compartment to prevent metallic articles rattling. A dash light mounted on the deck support will provide plenty of light at night. Boxes bolted in place on the floor will be found handy for storing tools or camping equipment.

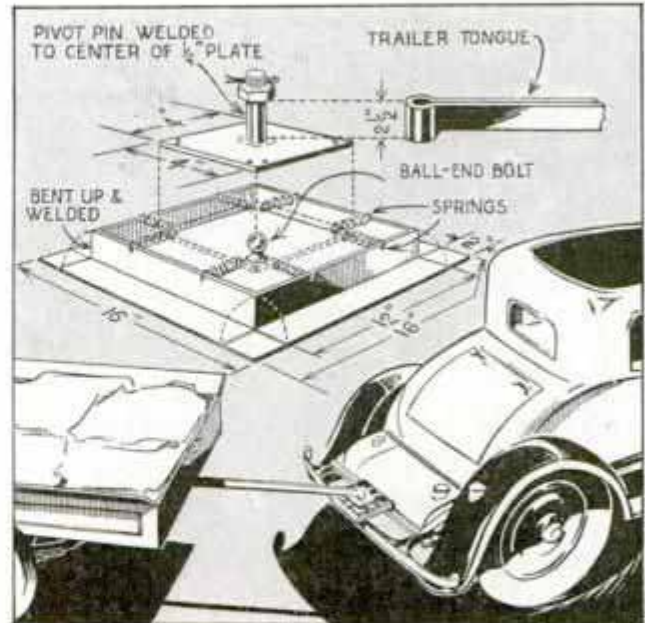
To Remove Rock Wedged between Dual Tires on Truck

Often on road construction or other heavy hauling jobs, pieces of broken concrete or rocks become tightly wedged between the dual tires of a truck. To avoid the necessity of deflating the tires or removing the outer one, the following method can be used: Run the truck forward until the stone is slightly to the rear of a vertical line through the hub. Place a crowbar between the stone and the hub



Rock Removed from between Tires on Dual-Wheeled Truck with Crowbar or Old Driveshaft

as shown, and slowly back the truck until the bar forces the stone out.



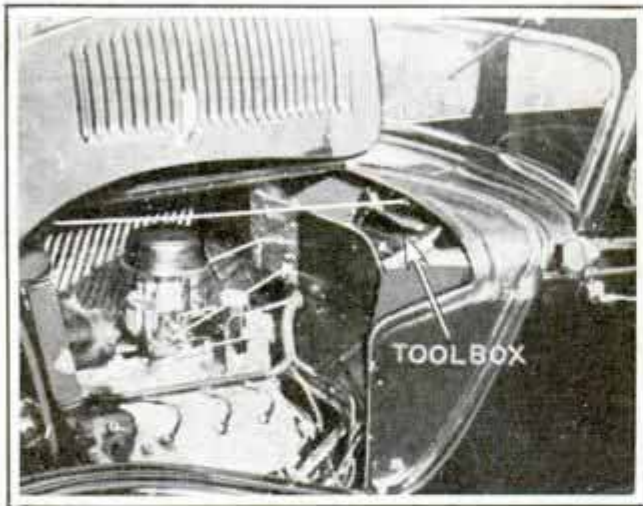
Road Shocks Are Absorbed by Springs in This Trailer Hitch, Which Also Compensates for Side Sway

A Shockless Trailer Hitch

Eight sturdy coil springs in this trailer hitch absorb shocks in starting or stopping and compensate for any tendency of the trailer to sway sideways. The main part of the hitch is made from a piece of $\frac{1}{4}$ -in. plate iron, the corners of which are cut out and the sides bent upward to form a box 2 in. deep. The corners are welded together, after which the sides are drilled as shown to take the hooked ends of the springs. These are 4 in. long and $1\frac{1}{2}$ in. in diameter. A ball-end bolt is next welded into a hole drilled in the center of the hitch and serves as a bearing on which a second piece of plate iron, 4 in. square, rests. If a ball-end bolt is not at hand, a heavy carriage bolt will do. A pivot pin, for attachment of the trailer tongue, is welded into a hole drilled in the center of the smaller plate. Attaching the free ends of the springs in holes drilled near the corners of this plate completes the job. The method of attaching the hitch will depend on your car, but it must be fastened in a flat position.

Loose Fan Belt Causes Knock in Motor

On some of the late-model cars, a loose fan belt causes a noise that sounds somewhat like a loose bearing knock. The next time you hear such a knock and you are reasonably certain that it is not a bearing, check the fan belt to see if it is tight enough.—James W. Clift, Columbus, O.

Toolbox Underneath Car Hood

Top of Cowling Underneath Ford Hood Converted into Toolbox for Storing Large Tools

Owners of 1933-model Fords will find that the space over the cowling underneath the hood can be converted into a toolbox in which to carry large tools. To do this, a piece of sheet metal is bolted to the front of the cowling so that it will extend upward to the radiator brace rods. Smaller pieces of the metal are similarly fastened to the sides. The choke and throttle rods are covered with a sheet-metal hood, which also forms a partition in the compartment. A lining of rubber matting or old inner tubes split lengthwise will keep the tools from rattling.

In Our Next Issue

MASTERPIECES OF AMERICAN FURNITURE

With THOMAS JEFFERSON'S MUSIC STAND, we are running the second of a series of articles on the construction of outstanding pieces of furniture, enabling the home craftsman to build accurate copies of the original pieces now carefully preserved in museums or in private collections. By making this piece, which is as beautiful as all of Jefferson's designs, you will have something of rare value and interesting historic background.

FUN AND PROFIT IN ELECTRIC-PEN ETCHING

Electric pyrographic pens, now available at low cost, enable anyone to make pleasing plaques, boxes, tie racks, bric-a-brac shelves and numerous other items for pleasure or profit.

IDEAS FOR THE MODEL-AIRPLANE BUILDER

Simple and practical hints on model-airplane construction that have been found effective in lightening the weight and increasing the strength and power.

REBUILDING OLD STORAGE BATTERIES

How to make one set of good batteries from two old sets—especially intended for those whose light plant is out of use because new batteries are needed.

WORKING WITH TAPS AND DIES

Successful threading and tapping with hand tools is more dependent on knowing the tricks of handling them than any particular skill.

FAST PEDAL-DRIVE ICE SLED

You can get real speed from this streamlined sled, which has a nail-studded traction wheel and is propelled by foot.

SERVICING YOUR AUTO HEATER

Getting the most out of your heater to make the car more comfortable.



Benny Leonard has the Punch that Wins

— So has the
1934
HARLEY-
DAVIDSON

— the
Motorcycle with the
FIGHTING HEART

RETIRED undefeated Lightweight Champion of the World, Benny Leonard has the punch that wins—the power to smash on through to victory, no matter how tough the going.

The 1934 Harley-Davidson has the winning punch, too. Its marvelous TNT motor gives it power that laughs at hills and mud—36 eager “horses”!

It's a true Fighting Heart—like Leonard's—the

heart of a champion. There's no quit in its make-up — but amazing speed, getaway, and dogged pulling power. Give it a trial and get the thrill of your life! In comfort, ease of handling, classy Air-Flo styling and nifty color schemes, this great 74 Twin lives up to the promise of its wonderful motor.

See the new Twins and Singles at your nearest Harley-Davidson Dealer's. Ask about his Easy Pay Plans.

MAIL THIS COUPON

Harley-Davidson Motor Co., Dept. P., Milwaukee, Wis.
Interested in the "Fighting Heart." Send illustrated literature.
Postage Stamp is enclosed to cover cost of mailing.

Name _____

Address _____

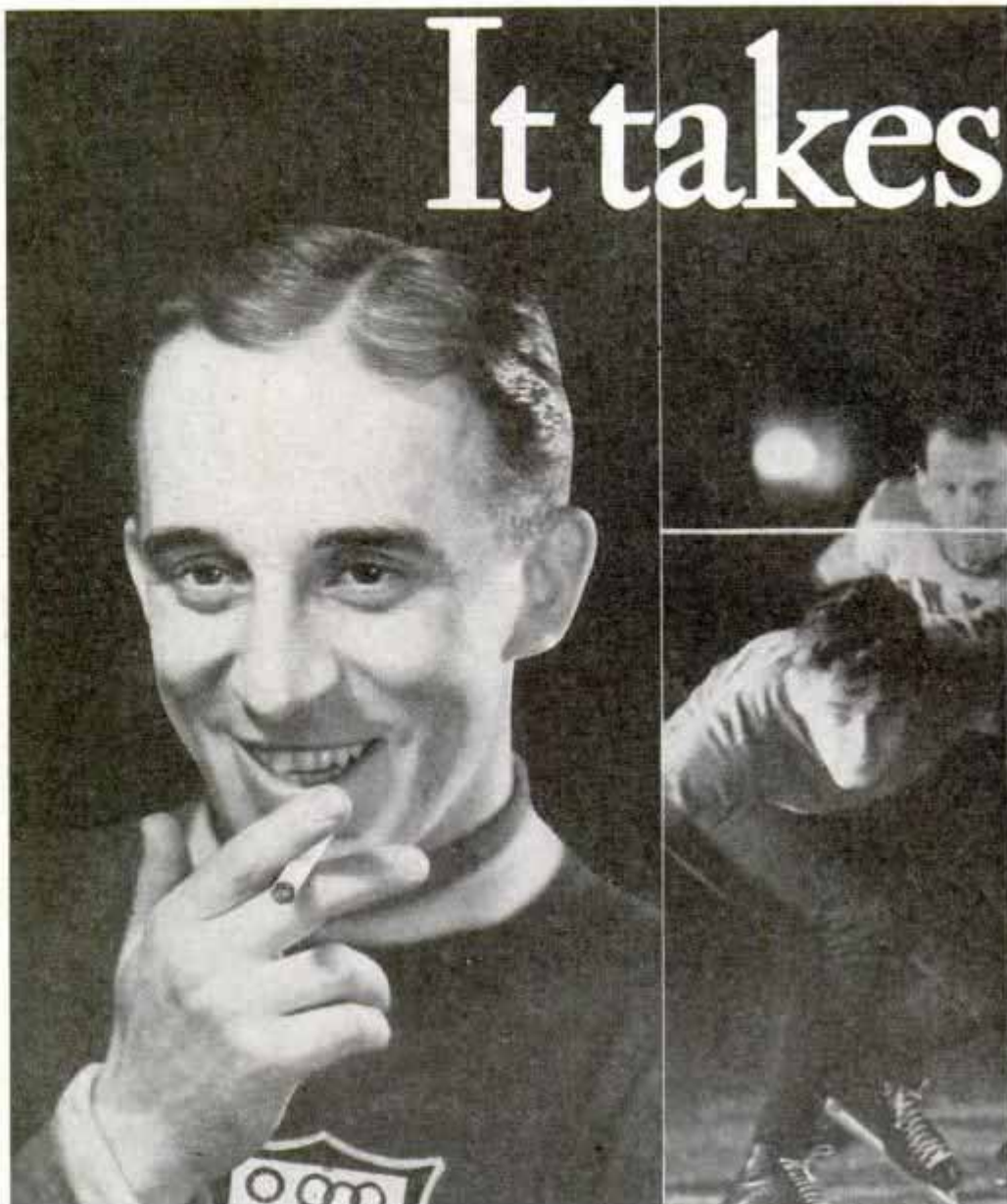
My age is () 16-19 years, () 20-30 years, () 31 years and up
() under 16 years. Check your age group.

It takes

IRVING

JAFFEE

Winner of 1,000 medals and trophies, including 3 Olympic Skating Championships, Jaffee has brought the highest skating honors to the U.S.A. Asked recently if he was a steady smoker, Jaffee said, "Yes, but that goes for Camels only. I have to keep my wind, you know, and healthy nerves."



Copyright, 1933, R. J. Reynolds Tobacco Company

Steady Smokers turn to Camels

You've often seen his name and picture in the papers—Jaffee, the city-bred boy from the U.S.A. who beat the best Olympic skaters that Europe had to offer, and became the skating champion of the world! Speaking of speed skating and cigarettes, Jaffee says: "It takes healthy nerves and plenty of wind to be an Olympic skating champion. I find that Camels, because of their costlier tobaccos, are

mild and likable in taste. And, what is even more important to a champion athlete, they never upset the nerves."

* * *

Change to Camels and note the difference in your nerves...in the pleasure you get from smoking! Camels are milder...have a better taste. They never upset your nerves. Begin today!



IT IS MORE FUN TO KNOW

Camels are made from finer, MORE EXPENSIVE tobaccos than any other popular brand.

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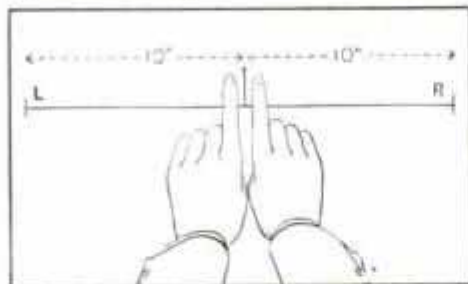
Healthy Nerves

FOR JAFFEE TO BE THE
WORLD'S CHAMPION SKATER



HOW ARE YOUR NERVES?

TRY
THIS
TEST



Draw a line 20 inches long on the edge of a newspaper. Stick a straight pin in the exact center. Place a forefinger on either side of the pin. Close your eyes...try to measure off quickly the distances by moving both hands at the same time. Have a watcher stop you when you reach the edge. See if both your fingers have moved the same distance. Most people have to try this at least six times before both hands come out evenly.

Frank Crilley (Camel smoker), famous deep-sea diver, was successful on his second try.



A
MATCHLESS
BLEND

CAMEL'S COSTLIER TOBACCOS

NEVER GET ON YOUR NERVES..NEVER TIRE YOUR TASTE

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Stop Car Rocking with a CHARTER-STARTER-DRIVE



Charter:

1. DOES NOT STICK!
2. Saves Fly Wheel Starter Gears
3. Saves Time, Trouble and Towing Charges
4. Can be ^{quickly} installed Without Mechanical Alterations

\$7.50 POSTPAID Nationwide SERVICE **10** DAYS TRIAL

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No mechanical alterations necessary to replace the ordinary inertia drive with a Charter. You can do it yourself, or have it done "while you wait" by one of the 4000 Service Stations in the U. S. and Canada.

Send today for the name of the nearest Service Station or for the drive itself. Ten-days Free Trial in any case. Garagemen wishing technical information should check the coupon.

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Send address of nearest Service Station.

Send Charter Drive to fit for 10-day Free Trial. Money cheerfully refunded if not satisfied.

Money Order enclosed Send C.O.D. \$7.50 post-paid.

Name.....

Street.....

City..... State.....

Send technical information on starter installation for Garagemen.

WITH THE RADIO PATROL

(Continued from page 181)

some states, is almost unheard of in Michigan. Only three such cases were recorded in a year.

But these Michigan troopers are not essentially highway police. They do patrol the roads, but actually they have all the police powers conferred by the laws of the state and are vested with as much authority in a city or isolated forest as on a public road. Naturally, however, traffic work takes up much of their time and the wideawake officer often makes important arrests merely by observing the passing cars. For instance, when a couple of troopers sighted a shiny new car with old license plates, they decided to have a look. Instead of an auto license dodger, they caught two bank robbers with \$180,000 worth of stolen bonds.

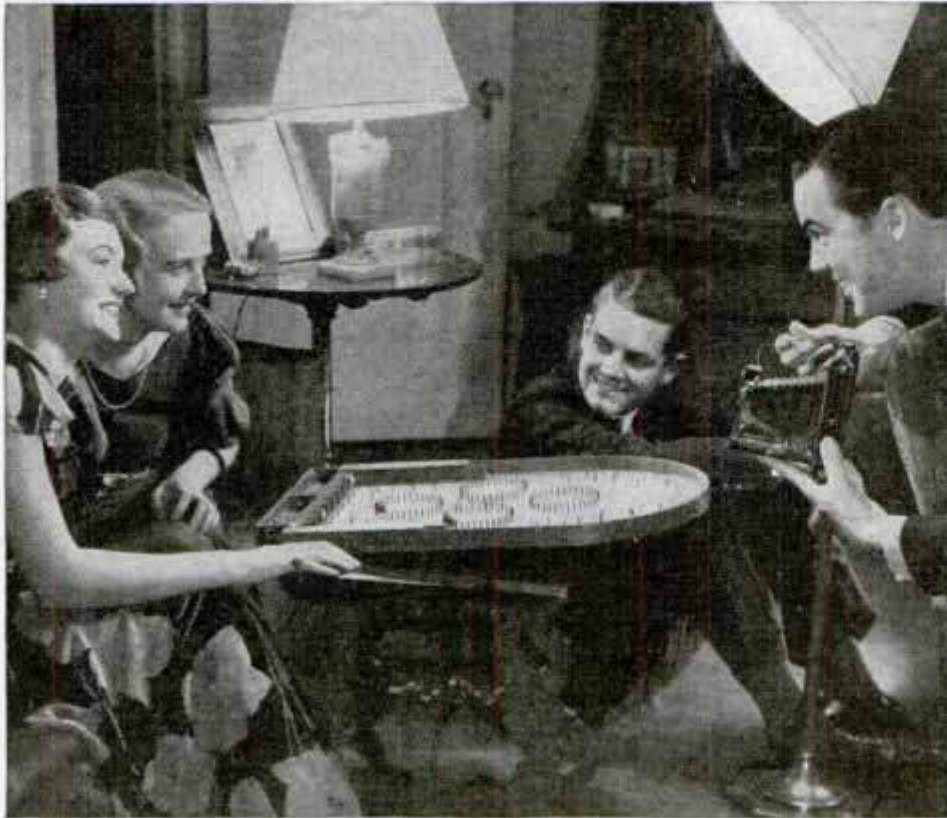
Another reason why a few men, aided by radio, are able to police a large state is that each man is hand-picked. To wear the distinctive blue coat and cap, gray trousers and leather puttees of the Michigan police requires more than an ambition to be a trooper. Applicants for such jobs must be over twenty-three and under thirty years of age, at least five feet and nine inches tall and weigh at least 150 pounds. They must have high-school education, be single and agree to remain unmarried for at least three years after joining the force.

The troopers travel in pairs and do not even go in the "high-powered" cars associated with the crime fighters of fiction. They use light autos of standard make which provide sufficient speed combined with quick pick-up and easy maneuverability. The only distinguishing marks as they roll along the highways are the license plates and the inconspicuous "State Police" signs on doors and rear panel. At night they use a spot light set in reverse position on the right front fender to flash their State Police identification as they overhaul a motorist.

The cars, while inconspicuous, are not as innocent as they appear for each pair of officers goes prepared for trouble. They carry not only side arms but a shotgun, rifle, gas grenade and flares as well as a first-aid kit. A few emergency cars have space for machine guns and there are fifty

(Continued to page 118A)

Snapshots at Night!



How to get this picture



● Arrangement of lights: Two Mazda Photofoods (35¢ each) in lamp "A"; one Photofood in lamp "B." Photofoods (illustrated at left) are good for two hours or more of continuous use . . . good for lots of pictures.

...with Eastman's remarkable new "SS" film

NOW the camera joins the family circle indoors. Old picture-making rules are forgotten. You can take snapshots in the house—at night!

All you need is a camera with an *f.6.3* (or faster) lens, two or three Mazda Photofood Bulbs that screw into any socket, and Kodak Super Sensitive Panchromatic Film—Kodak "SS" for short. It has three

times the speed of ordinary film under artificial light. With this combination you can enter an entirely new field of photography—snapshots without sunlight.

Hold the camera in your hands as you would outdoors. One click of the shutter and you've made a snapshot—at NIGHT!

FREE FOLDER. Indoor pictures are easy with "SS" Film—the only trick is arranging your lights. Ask your dealer (or write direct) for the folder, "Snapshots at Night." Eastman Kodak Co., Rochester, N. Y.

KODAK "SS"—the lightning-fast film, with green lightning flashes on the familiar yellow box.

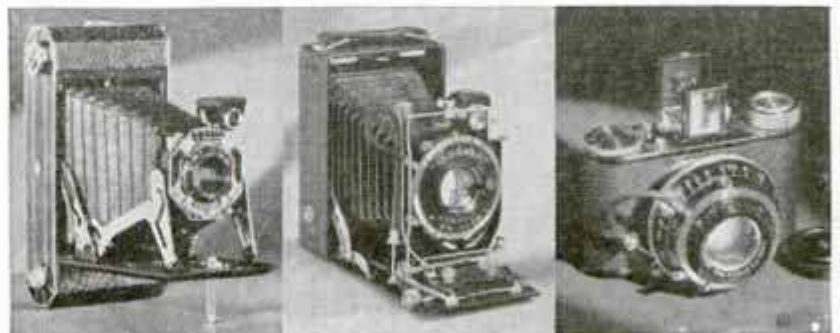
KODAFLECTOR—Inexpensive, efficient . . . makes 2 Photofood bulbs do the work of 9. Complete, with stand, reflectors and cord, \$5.



FINE CAMERAS . . . ideal for Night Snapshots

KODAK SIX-20 (left), *f.6.3* lens, ideal for night snapshots, $2\frac{3}{4} \times 3\frac{3}{4}$ pictures, \$17.50. **Kodak Six-16**, *f.6.3* lens, $2\frac{1}{2} \times 4\frac{1}{4}$ pictures, \$20. **Recomar 18** (center) . . . a versatile camera. Ground glass back, self-timer,

double-extension bellows, $1/250$ Compur shutter, *f.4.5* lens—\$46. **Pupille** (right) . . . miniature camera. Ultra-fast *f.2* lens . . . speeds up to $1/300$, 16 pictures each loading. With case, range finder, two filters—\$90.



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No Money Down

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No. 5
Refinished

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Send Underwood No. 5 (F. O. B., Chicago) at once for 10-days' trial. If I am not perfectly satisfied I can return it express collect. If I keep it I will pay \$2.50 a month until I have paid \$44.90 (term price) in full.

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for less than 4 cents a day
NOW on 30-DAY TRIAL
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New, FREE catalog shows how you can enjoy this new, 1934 Goldentone in your own home for 30 days FREE. Operates anywhere: home, car, boat, camp and

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PATENT APPLIED FOR

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Adds, Subtracts, Multiplies, Divides. Does work of costly machine. Not a toy. Million dollar capacity. Simple and accurate. Guaranteed 5 years.

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Just name and address. We will ship Calculator immediately. On delivery pay postman \$2.50 (plus few cents postage). (If outside U. S. send cash.) 10c additional in Leatherette Case. If not satisfied after 10 days' trial you get your money back. **THOUSANDS OF SATISFIED USERS.** Write for Agents' Proposition. **CALCULATOR MACHINE COMPANY.** (Intrs.) P. O. Box 1118, Dept. 31, CHICAGO, ILLINOIS

WITH THE RADIO PATROL

(Continued from page 116A)

motorcycles to augment the auto details.

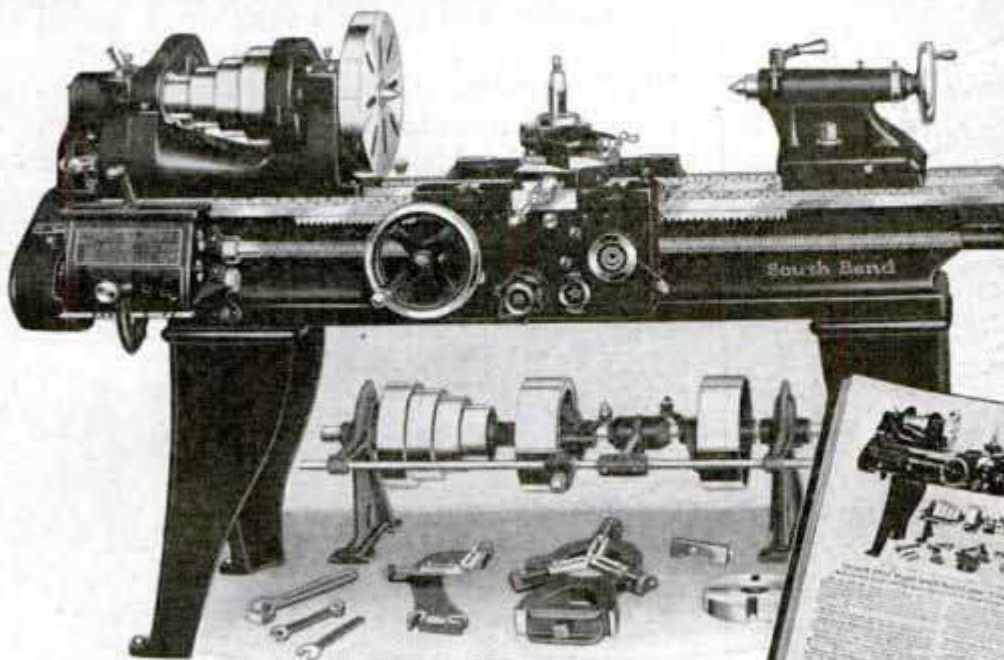
Each year, in school, these young troopers are taught more about the scientific angles of crime detection, not with the idea of making every man a Sherlock Holmes, but to show them how to recognize evidence when they find it and how to preserve it after it has been found. The bureau of identification, also at East Lansing, lends invaluable aid to the troopers. It is a modern laboratory for criminal investigation with every scientific aid. It maintains the largest fingerprint file of any state bureau—more than 1,250,000 prints—and the collection is being increased at the rate of 100,000 a year. It includes a photographic laboratory, microscopes and other apparatus for making ballistic tests, and ultraviolet-light equipment for testing handwriting.

Onfile in this department also is a record of virtually every small firearm in the state. The dealer who sells such a weapon and the purchaser each must report the sale, while the purchaser must submit the weapon for the recording of numbers and for inspection. It is a serious offense in Michigan to possess a firearm that is less than thirty inches long without reporting the fact.

Michigan's experiment with the radio in outwitting the criminal has been so successful that other states are considering similar systems. Massachusetts already has a state-wide radio system for police work and several metropolitan districts have the nucleus for state systems. Michigan police officials even vision the day when there will be a national radio hook-up devoted exclusively to the broadcasting of police information.

"The crook does not respect state boundaries or county lines," says Capt. Laurence Lyon, in charge of the radio division. "As long as he roams the country, the radio seems the quickest and surest method of overtaking him. This can be accomplished by a national police radio system. The crook used to feel fairly safe, once away from the scene of a crime. Today he finds every officer alert the minute the crime is discovered. For not even the boldest criminal in the fastest car—or airplane—can outrun the telltale voice in the police radio room."

Get one of these Valuable Books



16" x 6' Quick Change Gear Overhead Countershaft Driven Lathe. Weight 1875 lbs. \$540.00

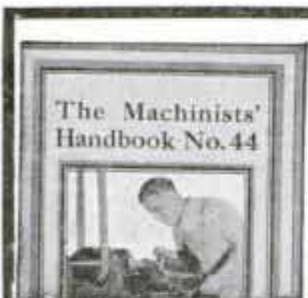
General Catalog No. 94

New 1934 Catalog just out illustrates, describes and prices the entire line of South Bend Lathes and attachments for manufacturing plants, machine shops, repair shops, automotive service shops, home shops, laboratories, etc. A very valuable and instructive book to any one interested in modern methods of metal working. Contains 72 pages, 8" x 10½". Sent free, postpaid to any part of the world, on request. Use coupon below.

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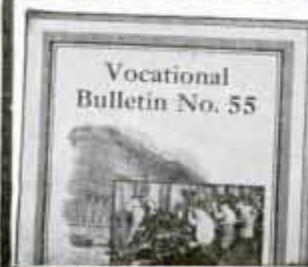
New
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No. 94



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Vocational Bulletin No. 55 is a 32 page illustrated booklet 6" x 9" showing modern shops in Vocational Schools, High Schools, Colleges, Rural Schools including Machine Shops, Auto Shops, Electric Shops, General Shops, Farm Shops. Also contains layouts, courses, tables, equipment lists, etc. Sent postpaid to any part of the world. Use coupon at right.

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of South Bend Lathes from 9-inch swing to 18-inch swing at prices from \$108.00 to \$2000.00 are shown in New 1934 Catalog shown above. Over 56,000 South Bend Lathes are used in U. S. and countries abroad. Listed below are a few popular selling sizes.

Size	Weight	Countershaft Drive	Motor Drive
9"x3' Toolmaker	340 lbs.	\$140.00	\$159.00
9"x3' Junior	416 lbs.	\$180.00	\$199.00
9"x3' Quick Change	595 lbs.	\$275.00	\$396.00
11"x4' Quick Change	965 lbs.	\$340.00	\$498.00
13"x5' Quick Change	1510 lbs.	\$402.00	\$602.00
16"x6' Quick Change	2300 lbs.	\$540.00	\$777.00
18"x8' Quick Change	3290 lbs.	\$705.00	\$997.00

SOUTH BEND LATHE WORKS

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SOUTH BEND LATHE WORKS

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Size of Lathe Interested in.....

Class of work.....

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ACTUALLY COSTS LESS TO USE

Every time you use 3-in-One on tools and equipment you're saving money, for 3-in-One saves replacements and repairs. Special blending makes this oil clean working parts and prevent rust as it lubricates. In handy cans and bottles.

3-IN-ONE OIL



Makes Driving Safer

DETECTALITE attached to your auto headlights promotes safety to yourself and other drivers. "Avoids getting tickets." Warns you instantly when headlights burn out. Easily attached. Chrome finish. Tested and approved. \$1.25 postpaid. Agents and dealers write.

SMAIL'S SALES SERVICE Inc.
Manufacturers of Automobile Safety Devices
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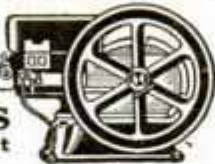
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Operate on Gasoline, Kerosene, Distillate or Natural Gas
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Own an improved Witte, the finest engine built. Enclosed, Self-Oiling, Timken Roller Bearing. Modern as a 1934 Automobile. Cash or Terms. Direct from Factory to You.

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Well, all the working dope on how to do it is in this book. Every step is fully described. And boy! what a kick you'll get when you start "sending".

Don't go another day without this **BOOK**. 96 Pages describing the making of 33 Devices

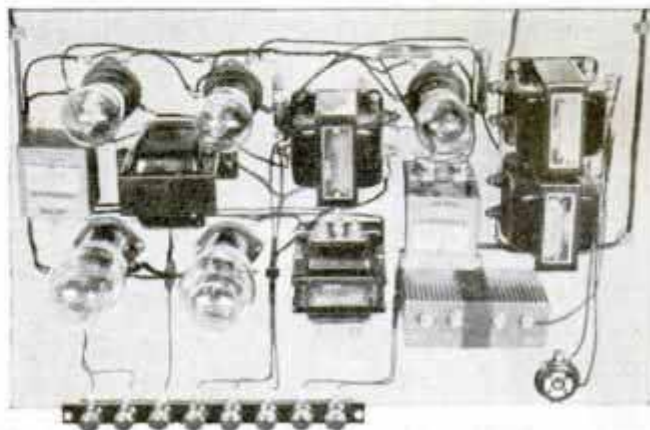
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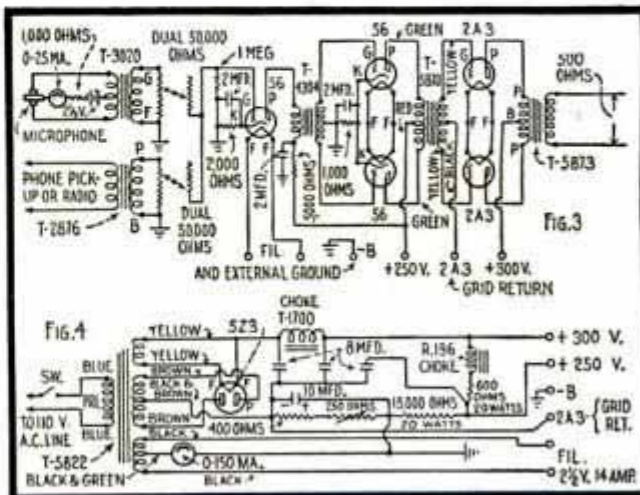
A MODERN PUBLIC ADDRESS AMPLIFIER AT LOW COST

(Continued from page 264)

means of a resistor in the negative lead of the power supply. This resistor is varied until the 0 to 150 d.c. milliammeter shows 80 milliamperes without a signal. The needle will advance to 100 mils, or more, when the signal load is on. The upper meter on the panel is for checking the current on the Universal double-button carbon mi-



crophone; this should read between 15 and 20 mils. The microphone cable should be shielded and extend some distance from the amplifier. The model 305 Wright-DeCoster dynamic speaker, shown in the upper photo on page 270, is provided with a terminal strip for either one or several of these speakers. As the output transformer in Fig. 1 is for a 500-ohm line, the leads from this transformer will be connected directly to the terminals marked 500 ohms on the speaker. If two of these speakers are employed, the 1,000-ohm terminals on both speakers are used and connected in parallel. Three speakers would



be connected to the 1,500-ohm posts in parallel, etc., so as to maintain the match-

(Continued to page 122A)

WINTER brings no thrill like the thrill of skiing.

NORTHLAND SKIS

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Moderate Price

SHAW DU-ALL TRACTOR



Harry! Low prices still in effect but can't be guaranteed! Amazing money-maker for farms, truck gardens, nurseries, etc. Plows, discs, seeds, cultivators, mows, rakes, hoes, runs belt driven machines. Gear shift models, 1 to 5 H.P. Costs \$2. per hour to own. Write for FREE CATALOG and 10 DAY TRIAL OFFER. Also SPECIAL OFFER to AGENTS. Address nearest office.



Does all farm work.

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Galesburg, Kansas Columbus, Ohio

DO YOU

in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and

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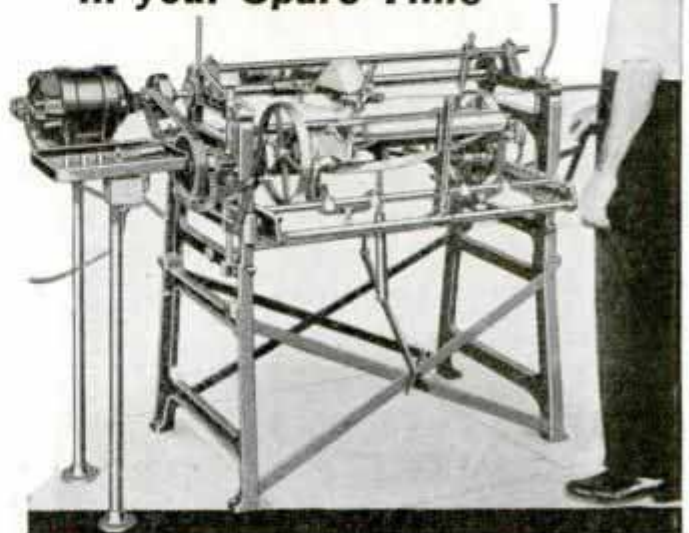
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AND EARN GOOD MONEY

Make \$30 to \$40 a Week in your Spare Time



Build Your Own Profitable, Permanent Business

Anyone who wants to make good money either in his spare time or full time can do so by sharpening lawnmowers on the IDEAL Lawnmower Sharpener. Many men have made as high as \$50 a week in their spare time alone. Most men will average around \$30 to \$40 a week. J. B. VanDien, Ridgewood, N. J., writes: "Some weeks last summer I earned \$40.00 a week with my Ideal Sharpener just as a side line." H. Greenlaw, Fond du Lac, Wis., writes: "During May I sharpened over 200 mowers at not less than \$1.00 each." Niles C. Race, Rochester, N. Y., writes: "I have to date sharpened 785 mowers at \$1.00 each."

The Ideal Lawnmower Sharpener

Makes old, dull lawnmowers cut like new. It uses the correct principle of grinding the blades on a grinding wheel—the FACTORY method—and the method we have used for 30 years. This produces the proper bevel or clearance and is the only way old, dull lawnmowers can be perfectly sharpened. Mowers run easier—stay sharp longer—customers come back year after year.

No Experience Necessary

No experience is required. Start right at home. Attach the Ideal to your lamp socket. Blades are automatically ground to fit the cutter bar without taking lawnmower apart. You can sharpen any make of lawnmower in 15 to 20 minutes—you get \$1.00 to \$1.50, depending on size and condition of mowers. New attachments also grind skates, grass shears, hedge shears, sickles, scythes, axes, gum saws, etc.

Now Is the Time to Start

The time to get started is NOW. Send coupon or post card today for our

free catalog



THE FATE-ROOT-HEATH CO.
342-373 Bell St., Plymouth, Ohio

Send me your free catalog and tell me how I can make Good Money with the Ideal Lawnmower Sharpener.

(Please PRINT your name and address)

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Address

City State

Do you have to APOLOGIZE for your work?

After you have spent hours upon a piece of work do you still have to apologize to your friends for its plain appearance?

If you do, it is probably because you haven't tried the new Stanley Electric Router-Shaper—the "jack-of-all-trades" of the home workshop. Corner beading, fluting, dovetails, inlaying, dado, rabbet and molding cuts are but a few of the many woodworking operations this new inexpensive Router-Shaper will do.

Anyone can operate it and it does beautiful work quickly and easily.

The original multi-purpose machine for the home workshop. Send today for full description.

THE STANLEY ELECTRIC TOOL
COMPANY
105 Elm St. - New Britain, Conn.

A first quality home workshop tool. This catalog describes it in detail. Send for a copy.



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GET PROFESSIONAL MOVING PICTURES

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CAMERA is an engineering triumph. Takes clear, brilliant pictures. Uses 50 ft. roll 16 mm. film.

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Accurate, detailed blue prints of this handsome steel barque. List free. Complete fittings and construction sets for steam trawler and other popular models, including Sovereign of the Seas. Send 15c for illustrated catalog.

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POST YOURSELF! It pays! I paid J. D. Martin, Virginia, \$200 for a single copper cent. Mr. Manning, New York, \$2,500 for one silver dollar. Mrs. G. F. Adams \$740 for a few old coins. I want all kinds of old coins, medals, bills and stamps. I pay big cash premiums.

WILL PAY \$100 FOR DIME

1894 S. Mint; \$50 for 1913 Liberty Head Nickel (not buffalo) and hundreds of other amazing prices for coins. Get in touch with me. Send 4c for Large Illustrated Coin Folder and further particulars. It may mean much profit to you. Write today to

NUMISMATIC COMPANY OF TEXAS
Dept. 324 FORT WORTH, TEXAS

[Largest Rare Coin Establishment in U. S.]

A MODERN PUBLIC ADDRESS AMPLIFIER AT LOW COST

(Continued from page 120A)

ing of the 500-ohm line. This is not nearly as complicated as it sounds; suitable field supply units for these speakers, or the model P-A 20 horn, shown on the truck, are available for use on the regular 110-volt line supply. When the amplifier is used for portable sound truck purposes, the entire installation may be operated by means of a fan-belt generator, several types of which are now available.

The generator is mounted at the head of the motor in such a position that a grooved wheel rotates with the fan belt. This supplies the necessary 110 volts a.c. for the amplifier and speaker-field unit, also for an electric phonograph turntable when used as shown in the lower sketch on page 270. If there are any points not clear to the builder, the radio editor will be glad to explain them in further detail.



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of the party

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POPULARITY Plus! Money to spend! The smiles of those whose smiles you most desire! They're all yours, when you learn to play a Buescher Sax. Easy, too. Many master scales first hour; play tunes first week; join a band in 90 days. See for yourself. Stop at your local Buescher Dealer's for a free test. Or send a postal for beautiful catalog. No obligation. Easy terms. It's great to be popular. Write today.

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BAND INSTRUMENT COMPANY, 210 Buescher Bldg., Elkhart, Indiana B161

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in St. Louis
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New Hotel Jefferson

800 ROOMS
 \$3 to \$5

The ARISTOCRAT of ST. LOUIS

\$1.50 JIG SAW

Plus Adapters and 12 Assorted Saw Blades. NEW FEATURE! Hardened steel grooved roller saw-guide formerly found only on most expensive machines. Saw has V-pulley for treadle or motor. All metal construction. 15" long, 8" high, 6 1/2" table. Sent postpaid on receipt of \$1.50, outside U. S. A., \$1.75. Booklet "Make Your Own Jig Saw Puzzles" given with every saw. Send 2¢ stamp for Folder describing \$2 Latho, \$2.50 Drill Press, \$1 Disc Sander, etc.

J&H METAL PRODUCTS CO. 486 St. Paul Street, Rochester, N. Y.

"The Puzzlemaker" Cuts Wood 2" Thick

BURN YOUR NAME ON TOOLS WITH THE ARKOGRAF

PROTECT YOUR TOOLS FROM THEFT
 Write with electricity any name or design on the hardest and finest tools and instruments, or any metal, like writing on paper with pen or pencil. **Complete Outfit \$3.50**—Prepaid Anywhere. Interesting illustrated circular free. Write today. Agents wanted. **ARKOGRAF PEN CO., 3927 S. E. Stark St., Portland, Ore.**

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ONAN A. C. PLANTS furnish the same current as city service—110 volt, 60 cycle A. C. Operates Radio, Water Systems, Refrigerators, all Household Appliances. **Sizes 300 to 10,000 Watts** Available from stock. No battery used except to start the engine. Ideal for farms, camps and lake homes. Also a complete line of *D. C. Models*. **D. W. ONAN & SONS** 929 Royalston Ave., Minneapolis, Minn.

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Have you ever taken the wrong road and traveled many miles before discovering your mistake? This new **AIRPLANE TYPE COMPASS** constantly tells your direction of travel. Sticks to windshield. Base 1 1/2" diameter. **ONLY \$1.50. POSTPAID. SATISFACTION GUARANTEED** or your money refunded if returned within ten days.

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CHAMPION speed skaters use India *oilstones* for taking the burr off newly ground skates. Exhibition rink performers are able to leap, dance and gyrate because they, too, keep their fine steel blades very sharp and true with an *oilstone*.

A famous mechanical engineer once said: "Reputations for skill are made only by workmen who know the fine points about sharpening the tools they use." All fine craftsmen take special pride in fast, easy-cutting hand tools—kept keen with their bench *oilstones*. Drills, reamers and other metal cutting tools need less regrinding and last much longer when *oilstoned*.

A FREE BOOK

"How to Sharpen" is packed with practical facts. It tells why the "India" (electric furnace abrasive), why the rare Arkansas quarried *oilstones* are used—and how to care for them, too. Thousands of readers of **POPULAR MECHANICS** sent for this book during the last few months.

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I did it. So can you!



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...originator of the world-famous HOLLYWOOD System of SPECTACULAR PUBLICITY LIGHTING... endorsed by Chambers of Commerce of 17 cities!

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"Business always goes to the man with a Big New Idea." I found that out a few years ago. The bottom had dropped out of my own business! I had debts and no money. I was unknown. Then I tried out my New Idea in Spectacular Lighting. It worked like magic. I made money the first month. That new idea has helped to BUILD A CITY and make it WORLD FAMOUS! Chamber of Commerce and business leaders say so. And it has built my company into one of the largest electrical establishments in the West. . . . OTTO K. OLESEN.

Spectacular Publicity Lighting Places Your Business Above Competition!

You can do in your town what Mr. Olesen has done and IS DOING in his own small city of Hollywood, California **WHATEVER YOUR PRESENT OCCUPATION**, you can start with little or no capital, as Mr. Olesen did. His exclusive Idea System is without competition. It furnishes its own publicity. Each job done in its own advertisement and brings other jobs without solicitation. Use Mr. Olesen's Idea System and place your own business above all competition!

GET THE FACTS!

This astounding business secret, this fascinating new way to make money on a high class basis that will place you ahead of all competition and which actually brings customers to you is NOW

AVAILABLE for the FIRST TIME to ambitious men everywhere. No special capital is needed. Be the first in your town to benefit by this opportunity. **GET THE FACTS - AT ONCE!** The whole amazing story is told in Mr. Olesen's Free Book. It explains everything. Send for it TODAY!

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DEPT. A-12, HOLLYWOOD, CALIFORNIA

FREE BOOK TELLS ALL
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MAKE 200 TOYS an Hour... for 1¢ Each!

You can earn handsome profits, making and selling metal soldiers, and it's fascinating fun. Complete casting and coloring outfit only \$2.25. Each casting mould makes 3 different large figures. Extra moulds at 95¢, also make 3 large separate figures. Ask your dealer; if he can't supply, order from us. State choice of U. S. Soldiers, Indians, Machine Gunners, Sailors, Continental Soldiers, Football or Baseball Teams.



FREE ILLUSTRATED BOOK, sent on request.
RAPAPORT BROS., 703 W. Ohio St. CHICAGO

AGENTS... Smash Go Prices!

Santos Coffee 12c lb. 4-oz. Vanilla 8½¢. \$1.00 size Tonic 14c. Razor Blades 5 for 8½¢. 100 sticks Chewing Gum 12c. 150 other bargains. Experience unnecessary. Write

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New Four Speed WOOD LATHE

Be a Master Craftsman. Earn Extra Money in spare hours at home with H & A portable, electric home woodworking equipment. 24 Bench Lathe turns out expert work, clocks, ash stands, candlesticks, BIG MARKET. Perfectly safe for you or your boy. Equipped with special 4 speed pulley. Lightning change of speeds. Plug in nearest light socket. Complete with all necessary attachments. Now at amazing new low prices. Write at once for NEW FREE CATALOG. A complete line of home woodworking equipment.



New high quality, high powered, sturdy No. Use for turning wood or metal items. Lamps. Equipped with special 4 speed pulley. Lightning change of speeds. Plug in nearest light socket. Complete with all necessary attachments. Now at amazing new low prices. Write at once for NEW FREE CATALOG. A complete line of home woodworking equipment.

HESTON & ANDERSON, 602 Grant Ave., Fairfield, Iowa

HAS RADIO REACHED ITS PEAK?

c-1634 (Continued from page 245)

can afford to erect television stations if their broadcasting range is limited to fifteen or twenty miles. Also, to get a fair television image, the federal radio commission would need to allocate about 1,000 kilocycles to the broadcaster. With the present congestion on the air, that is obviously impossible.

At present, it is common practice for a shore station to transmit the contents of a newspaper, word for word, to ships at sea. The ship does not receive merely the words, but an actual picture of the newspaper page, or a facsimile. The extension of such facsimile reproducers into the home is now possible at a very small outlay. What it means is envisioned by O. H. Caldwell, former federal radio commissioner.

"Instead of turning off the radio receiver when you go to bed," he says, "you simply throw over a switch to a position marked 'facsimile.' This brings into operation an attachment printing a small sheet which unrolls beneath the set as fast as printed, so that at breakfast time, you have a complete facsimile of the subject matter."

In medicine, experimenters have already proved the value of a radio fever machine and the sound of your heart beat is heard more distinctly by a physician who listens with the aid of an instrument which greatly amplifies the heart's minute electrical currents. The effect of radio waves on plant and animal life is freighted with possibilities. Plants showered with radio energy have changed many of their salient characteristics. Crops can be accelerated, and many hitherto unknown qualities of plant life can be brought to life. The crossing and development of plants, under the influence of radio waves, also opens a vast field, and the productivity of soil and its fertilization can be influenced by invisible waves. As with plants, so with animals. It may be that man some day will be able thus to determine the forms and characteristics of his domestic animals.

Practically every vehicle of transportation has taken to radio. Even freight train engineers have found radio valuable in switching operations and radio telephone conversations from trains will shortly be common. Radio receivers are

(Continued to page 126A)



FOR EASY TIRE CHANGING

Make tire changing easy. Keep tire bolts and lugs oiled with Esso Handy Oil that can't gum or corrode. Fine long spout puts the oil right where you want it. Leak-proof cap lets you carry it in tool kit. Esso Handy Oil cleans, prevents rust, takes the squeaks out of everything. Get a can today! On sale at dealers everywhere. Esso, Inc., 26 Broadway, N. Y. City.



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 Protect your Tools from Loss, damage, "borrowing." It pays to use a GERSTNER Tool Chest. **FREE CATALOG.**
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GET YOUR PACKET FREE
 "Squaggetti", the New Wonder Vegetable (Spaghetti on a Vine) (Noodle Plant). Easy to grow, 8 to 10 on a vine. **Can be prepared in a dozen tasty ways.** Grow some; surprise your friends and neighbors. Write for your **FREE** planting today. Send 3c toward packing and postage.

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Patented or Unpatented

Our manufacturer-clients now want additional useful and practical inventions. What have you?

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 "World's Largest Organization of Inventors"

ATLAS 9" METAL-WOOD LATHE N.B.A. \$79 Cash—Or 10 Months Easy Terms

A few dollars a month buys this quality-built tool. Enjoy years of new satisfaction in your workshop. Make the things you now buy. *Modern Construction; V-belt drive, built-in countershaft, 45 Zamak parts. Economical: Needs only 1/4 h.p. motor. Tested to .001" accuracy. 10 DAYS TRIAL, satisfaction guaranteed. Compound rest, automatic, reversible feeds, hollow spindle. Takes work up to 18". \$79 as shown, less motor. Send for catalogue of lathes and fixtures.*



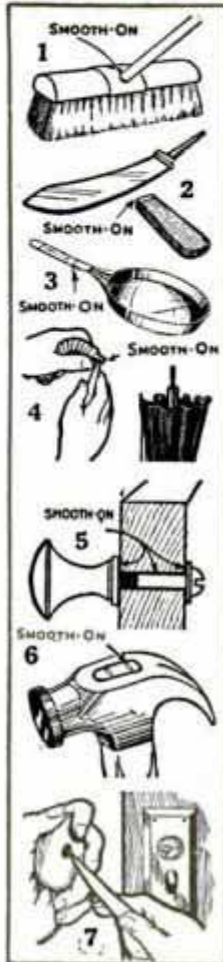
ATLAS PRESS COMPANY
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LOOSE HANDLES QUICKLY MADE TIGHT

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.

HOME and AUTO REPAIRS

WITH SMOOTH-ON

Write for **FREE BOOK**



Do it with SMOOTH-ON

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 574 Communipaw Ave., Jersey City, N. J.

Please send the free Smooth-On Repair Book.

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When writing please mention Popular Mechanics

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AMAZING VALUES!

Popularly Priced!

Any type—Cross-cut, Rip, Combination

- 6" . . . 1/2" hole . . . \$1.15
- 7" . . . 1/2" hole . . . 1.50
- 8" . . . 1/2", 5/8" hole . . . \$1.65
- 10" . . . 5/8", 3/4" hole . . . 2.10

Think of it—a special Disston-made Circular Saw to fit your home workshop machine at these popular prices—saws that you know are big values for the money!

See these Disston-made Keystone Circular Saws at any good hardware store. . . . If your store does not have them, write us, we will see that you are supplied.

Write for free copy of "Disston Saw, Tool and File Manual"; tells how to choose, use and care for saws and other tools.

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NEW

Longer tables and full length fence for straighter jointing.

TILT ARBOR Saw — New
A real saw!

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W. B. & J. E. BOICE

HAS RADIO REACHED ITS PEAK?

C 1634 (Continued from page 124A)

see. June 1932

being built into auto bodies and airplane transportation on a commercial scale would be impossible without radio. The next few years also probably will see a rapid extension of remote control radio devices for it is becoming increasingly easy to control the operation of a distant apparatus, whether it be a loud speaker or a superdreadnaught.

Music cannot only be sent by radio, but also produced by radio. A large number of instruments depending on radio are about to appear. They range from midget organs which can roar with the noise of cannon, to devices like the theremin which produces the soft shading of a violin. To be a musician in the future, you may need only learn how to wave your hands correctly.

DOES THE CAMERA EVER LIE?

(Continued from page 238)

rapid succession of changing stills gives the illusion of motion.

Cartoons are made in this manner but the whole process is reduced to its simplest terms so the amount of drawing can be cut to a minimum. All stationary parts of the picture are drawn on a sheet of paper. The characters are then drawn on thin transparent sheets in gradually changing positions, and these are then placed over the background and photographed. By exactly matching the position of the little characters and drawing them in exactly the proper perspective they appear to wander around in the scene itself instead of only moving on the surface.

The camera once shot "fades" by using a little automatic device that gradually cut out the light by closing the shutter as the scene was being filmed. These effects are now made in the laboratory, and can be changed in length or revised at will with only a very small laboratory expense. As the film runs through the printing machine, the printer light is gradually increased from total darkness to full on to make a fade-in, or from full on to total darkness to make a fade-out.

Lap-dissolves, or the fading and melting of one scene into another, also are now made in the laboratory in much the same manner as they were made in the camera.

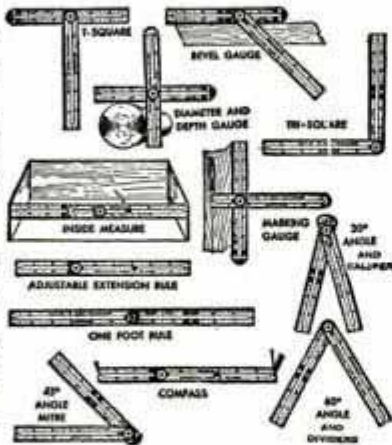
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FOLDED TO FIT THE POCKET

Combining 12 tools. Accurate, economical. Made of German Silver, also Brass. Weighs 3 ounces. Folded 6 3/8 inches long. Fully extended 1 foot.

ARCHITECTS, ENGINEERS, MANUAL TRAINING SCHOOLS, MECHANICS and others need it. Distributors wanted. Sample Tool 50c.



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Thompson BEATS the World on BOATS



Only Boats With Full Length Spray Rails

Keep passengers perfectly dry—even at high speeds. Catalog also shows snipe sail boat complete with sail for \$165. Two big factories. Prompt shipment.

CATALOG FREE
Write for your copy. State kind of boat in which you are interested.

THOMPSON BROS. BOAT MFG. CO. (67)
213 Ann St., PESHIGO, WIS. (Write to either place) 113 Elm St., CORTLAND, N. Y.

Better Built Lower Prices



Canoes \$38 and up

Rowboats \$36 and up

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Ideal TRAILER HITCH BALL JOINT

CAN'T LET GO! MOST PRACTICAL HITCH MADE! **ONLY \$3**

Trailer House Blue Prints 36x24: Ideal or DeLuxe, \$3 for 3 sheets. Over 5,000 words instructions. Free with parts sets or rebate when ordered. Guide to trailer building, 25c. Free literature also. **Order Now!**

HAMMER BLOW TOOL CO., 606 Third St., Wausau, Wis.

REMARKABLE NEW TOOL!

HAND-EE GRINDER

ONLY \$11.50 POSTPAID
● It's a Wonder! Fits the hand—weighs only one pound—plug in any light socket and do a thousand and one jobs quicker and better. No more slow hand filing—grinds where files won't reach. Get a HAND-EE for the shop, home, or your tool kit. Mechanics everywhere are enthusiastic about this great new tool. Operates on A.C. or D.C., 100V., 13,000 r.p.m. Five day trial—Money back if not satisfied. Three wheel shapes free. Order today.



100 SHAPES AVAILABLE



Chicago Wheel & Mfg. Co.
108 S. Aberdeen St., Chicago, Ill. Est. 1895 ● Booklet Sent Free.

Do you know how

- To fix furniture and household articles heretofore unfixable?
- To glue permanently . . . models, boats, and all woodcraft?
- To make and repair sports equipment (skis, fishing rods, toboggans, gliders, etc.)?
- To make your own waterproof crack-filler?

FREE BOOK



TELLS HOW

Send for YOURS . . . today

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G. L. GUGGENHEIM 80., Pub., Dept. 20 B, 112 Sutter Street, SAN FRANCISCO, CALIFORNIA

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AGENTS MAKE UP TO \$20 DAILY

26 million Car owners need Detect-O-Cell. Startling Demonstration creates instant attention anywhere, and Detect-O-Cell is priced so low they can't help buying. Agents are piling up new profit records daily. Write for liberal TEST OFFER and territory proposition. Today!

DETECT-O-CELL, Dept. 124

1654 Farwell Ave.

CHICAGO, ILL.

CAN YOU LIVE YOUR DREAMS?

(Continued from page 199)

following the last course which not only gives them an outlet for their dreams but which, according to Professor Hoopin-garner, if intelligently applied, may ultimately lead them to turn these hobbies or avocations into vocations and thus enable them to live their dreams in their work.

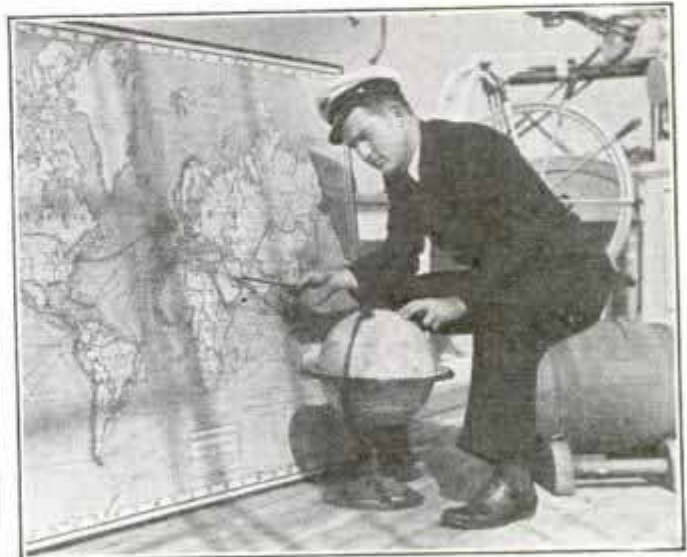
According to a survey made by Dr. Jesse Frederick Steiner, professor of sociology at the University of Washington, America's annual bill for recreation just before the depression set in was, conservatively, \$10,165,857,000. He believes the greatest share of this figure is the result of a new popular interest in recreation that has revolutionized the habits of a people. He also concedes there is a vast range of recreation largely cultural and individual such as reading or amateur photography which his research has not been able to touch but through the medium of which people are also living their dreams.

Secondary in numbers to the "recreational dreamers" are those who are deferring the living of their dreams until they are suitably equipped to enter the field of their desire. This class may have jobs which are boring but that boredom is being overcome by spare-time study with the object of ultimately enabling these workers to do the type of work they wish to do. For this type there is a whole range of extension and home-study courses offered by various institutes and universities.

As for the type of dreamer who feels he must live his dreams through adventure—he must contend with a world that has not as yet caught up with science in discovering the advisability of permitting him to do so. Even nationally known figures who have already contributed notably to science by their discoveries often find it difficult to arrange for the financial support necessary to carry out their plans. The unknown, then, has even less of a chance. Without financial support he must strive to get the type of job which will, as much as possible, permit him to live his dreams. This sometimes means enlistment in one of the various government services.

This is the most difficult of all methods for you to live your dreams. But live your dreams you should, as much as possible, for by so doing, science declares you will be happiest.

DRIVER TOOLS go around the world with SETH PARKER



Phillips Lord, whom you've heard over the radio as Seth Parker or the Country Doctor, is fulfilling a boyhood dream by sailing his own ship around the world. Having been a Driver enthusiast for years, he knows the enjoyment that can be derived from these tools, so he has installed a complete Driver shop in the hold of his beautiful four-masted schooner. In far-off Rangoon, Indo-China, Siam and other places he'll get pleasure aplenty from this Driver shop.



"500" DRILL PRESS

The Driver Series "500" Drill Press shown at the left is but one example of the complete line of Driver power woodworking tools. This sturdy machine is equipped with such features as 1/2 inch Jacob's Chuck, oilless bronze bearings, ball thrust bearings, etc. Has a capacity for drilling to center of 11 inch circle with drills from 1/8 inch to 1/2 inch in diameter. It's so easy to operate you'll do perfect work the first time you try it.

"500"
Drill Press
\$14.95
(less motor)

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SECRETS OF THE "SILK" SAILORS

(Continued from page 229)

Everything becomes blurred and the jumper loses his sight and judgment. Then blood rushes to the head and unconsciousness may result.

The untrained person in a free-fall spin is about like a novice pilot in a blind spin without instruments. However, the jumper can kick out in the opposite direction and stop the spin, whereupon his sight instantly clears and sense of calculation returns. His only danger then is an over-control in the opposite direction which merely causes a reversal of the spin.

The most difficult position to maintain for any considerable distance in a free fall is straight head first, legs together, hands to sides. In this position, speed may exceed 300 miles an hour or, at sea level, it may reach 265 miles an hour. Manning had learned to maintain his position for as much as 5,000 feet, come out gradually and maintain control while slowing up into a swan dive. While coming out of the head-first dive the high velocity causes a considerable horizontal movement, the body acting as a gliding plane against the air. Manning often thus executed a spiral glide coming out of his high-speed, head-first position.

Manning never used a counting system such as that used by Eibe and Kohlstadt. He would spot landmarks on the horizon and calculate his altitude by angular observation. Attempting to judge distance by looking straight down probably accounts for more tragedies of novices coming in and "hitting" during delayed-opening jumps than any other one thing. The counting system cannot be recommended for long delayed jumps. Beyond 2,000 feet free fall, too many other factors enter, causing variation, and the system swiftly loses its accuracy.

Inexperienced persons should never jump without careful instruction and preparation. Their first free falls should be short.

Most people are unable to think accurately about falling through the air. Except for the rush of wind there is nothing terrifying about the experience itself. You remain in approximately constant relation to any other object that is falling. It is the thought of jumping which is terrifying to the one who is inexperienced, not the jump itself.



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TO Mabel, Charley seemed a good catch. To Mabel's mother, Charley was just a good cough. She never *could* see him with that nose-assailing pipe and his halo (?) of gassy smoke.

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You can rely on Chicago's oldest, most reliable rubber company for tire mileage at lowest cost. Increasing thousands of satisfied motorists all over the U. S. A. prove standard brand tires reconstructed by Midland are best. Long, hard service on rough roads guaranteed.

50% TO 60% MORE SERVICE

BALLOON TIRES			REG. CORD TIRES		
Size	Rim	Tires Tubes	Size	Tires	Tubes
29x4.40-21		\$2.15 0.85	30x3	\$2.25	\$0.85
29x4.50-20		2.35 0.95	30x3 1/2	2.35	0.75
30x4.50-21		2.40 0.85	31x4	2.95	0.85
29x4.75-19		2.45 0.95	32x4	2.95	0.85
29x4.75-20		2.50 0.95	32x4 1/2	2.95	0.85
29x5.00-19		2.55 1.05	32x4 1/2	3.35	1.15
30x5.00-20		2.55 1.05	32x4 1/2	3.45	1.15
29x5.25-18		2.90 1.15	34x4 1/2	3.65	1.15
29x5.25-19		2.95 1.15	30x5	3.65	1.35
30x5.25-20		2.95 1.15	34x5	3.75	1.45
31x5.25-21		3.25 1.15			
29x5.50-18		3.35 1.15			
29x5.50-19		3.35 1.15			
30x5.50-18		3.40 1.15			
31x5.50-19		3.40 1.15			
32x5.50-20		3.45 1.25			
33x5.50-21		3.65 1.25			
32x5.50-20		3.75 1.35			

Send \$1.00 Deposit with each tire ordered. Balance C. O. D. If you send cash in full deduct 5%. You are guaranteed a year's service or replacement at 1/2 price. Order today.

MIDLAND TIRE & RUBBER CO., Dept. 2665
1000-10 West Sixty-Third Street, Chicago, Illinois

12 MONTH WRITTEN WARRANTY BOND

FREE SET OF NON-GLARE HEADLIGHT REFLECTORS

FREE WITH EACH ORDER FOR 2 TIRES

50% more headlight power; pieces four; makes night driving safe

New METLMACH
THE MODERN MACH

Made of metal, never burns up, no burnt ends, ashes or stubs to discard. Absolutely waterproof. One mach guaranteed to light 1000 times or more, lights only on itself thus saving the marring of clothing and furniture.

HAVE YOU SEEN IT?

If not, send \$1.00 for 15 mashes and counter display case together with salesman's terms, convince yourself how readily they sell and make 50% profit. Single sample 15c. Every store a prospective customer. Every person a prospective user. Exclusive territory and steady business guaranteed industrious salesmen.

METALMACH CORPORATION, 115 Water St., Warsaw, Ill.

NEEDED in EVERY HOME-USED by EVERYBODY EVERYWHERE!

MAGIC FLUID

COL-GRA'PHOIDS MOTORS

MORE POWER

QUICKER STARTING

SAVING ON GASOLINE

SAVING ON OIL

SMOOTHER RUNNING

FEWER REPAIRS

LESS CARBON

LONGER LIFE

BETTER PISTON SEAL

LESS WEAR

PERFECTED LUBRICATION

LESS DILUTION

PLATED LUBRICATION

saves on Gasoline, Oil & Motor Expense

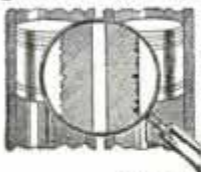
AUTOMOBILE, Airplane, Tractor, Truck and Machinery Owners! Think of it! A revolutionary discovery now "plates" lubrication on all moving parts. Automobile owners, airplane pilots, engineers and other Col-gra users, are amazed at its action. "Like Magic" is the best description of it.

REVOLUTIONARY DISCOVERY

Added to the oil and gasoline, Col-gra seeks all friction parts, where under heat, speed and pressure, it quickly forms an almost frictionless Col-gra'phoid surface. This means smoothness—quicker acceleration—amazing savings on gas, oil and repairs.

PROVEN BY TESTS

On a recent test of a Col-gra'phoided motor, four engineers ran an automobile, without the slightest motor injury, for 29 miles without oil, proving beyond all doubt the ability of this surface to lubricate even in the complete absence of oil. Laboratory tests further show the amazing difference between treated and untreated friction surfaces.



PAYS FOR ITSELF

Because Col-gra reduces friction, gives more power, frees valve action, reduces carbon, heat and wear, and prevents bare metal-to-metal contact, it gives motorists many added miles with less cost. Col-gra quickly pays for itself many times over in savings on repairs, motor fuel, oil, starter and battery.

SALESMEN AND DISTRIBUTORS Good Territory Open

Wonderful opportunity for salesmen and distributors. Earnings up to \$100.00 a week and more. Valuable territory still open. For complete information check and mail the coupon.

THE COL-GRA COMPANY

Dept. 1512 2621 N. 3rd St., Milwaukee, Wis.

SNAPPY WINTER STARTING

In cold weather when the oil is too thick to flow or too thin to lubricate properly, Col-gra'phoid surfaces provide snappy winter starting. Reduces bare metal-to-metal friction—prevents serious damage.

MORE POWER - PEP - SPEED

Col-gra users everywhere are enthusiastic. "I am pleased with results," writes Frank Eastwood. "The motor's smoothness is almost beyond belief. My mechanic says it can't be the same engine." Paul Canalizon: "Col-gra gives the car more power—speed—pep and gas mileage." W. P. Barrows: "My car runs much smoother, uses less oil and has more pep." E. C. Bergman: "Col-gra helps the motor a whole lot—is working more freely and less vibration."

HEAT AND COLD PROOF

Col-gra's patented ingredients manufactured at 7500° assure positive lubrication. No motor heat too great. No temperature too cold—lubricates at 100° below zero. Gasoline cannot wash it off. It stays put!

Why spend money needlessly for gasoline, oil and repairs—why operate your motor just partly efficient? Find out all about this magic fluid "Col-gra" now and let it start saving money for you.

FREE OFFER COUPON!

THE COL-GRA COMPANY,

Dept. 1512, 2621 N. Third St., Milwaukee, Wis.



Gentlemen: Please send me full particulars together with your free 32 Page Illustrated Booklet. This does not obligate me in any way.

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CITY..... STATE.....

Check here if interested for your own car only.

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Mortising, Routing, Drilling, Carving, Sanding, Shaping and Surface Grinding

This remarkable new "Delta" Bench Type Drill Press is really seven tools in one! These are the major operations you can perform efficiently on this amazing 7-in-one motor-driven tool which is built to stand up under heavy production work—yet is priced so low as to be within the reach of every home workshop owner. A brand new "Delta" model, a quality tool throughout—with numerous interesting features. For full details mail the convenient coupon TODAY!



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A Complete Line of Motor-Driven Woodworking Tools!

"Delta" Woodworking Units are convenient, portable and compact. All are available in a large variety of combinations and at prices to fit all needs. The "Delta" line includes: Jointers, Band Saws, Scroll Saws, Circular Saws, Woodturning Lathes, Drill Presses, Boring, Routing, Sanding, and Mortising Attachments—and a full line of accessories.

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Because "Delta" Woodworking Tools are efficient and practical under actual working conditions, they are always available for a 10-Day Trial without the slightest risk. Satisfaction is guaranteed. For full details of this liberal offer and also of the "Delta" Easy Payment Plans, fill in and mail the convenient coupon below today!

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Describes the latest development in motor-driven wood-working equipment at the astonishingly low "Delta" price levels. Fill in and mail coupon now!

DELTA MFG. CO.
3775 North Holton Street
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Milwaukee, Wisconsin



You'll be astonished at the remarkably low price of this fine quality tool—one-third of the price at which machines of this calibre were offered.

Special Features

Include:

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- Self-Sealed Ball-Bearings
- Husky Tilting Table
- Sturdy Steel Column
- Heavy Graduated Quill
- Adjustable Depth Pointer
- Micrometer Depth Stop
- Interchangeable Spindles



DELTA MFG. CO., 3775 N. Holton St. Dept. A233, Milwaukee, Wisconsin

Please place me, without obligation, on mailing list to receive the Free 1934 "Delta" Catalog of Quality Woodworking Tools. Also send full details of your 10-Day Trial Offer and Easy Payment Plans.

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**BUSINESS IN THE PIONEER STAGE, AS
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PROFITS COMPARABLE TO PROFITS MADE IN
EARLY DAYS OF RADIO AND AUTOMOBILES
INSTALLATIONS FROM \$7.50 TO \$150.00
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decade. To such men we say, "This is no
one of the most revolutionary money
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new gadget?" we say, emphatically, "NO!
It is no knick-knack, no trick filing idea—no
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the smallest business man as well as the largest
corporation and it has already saved countless
thousands for the business firms which have
used it. AND, in so doing, IT HAS PAID
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TO SEE OUR NEWSPAPER HELP WANTED
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now we are out to cover the entire country.
It is wanted everywhere. Any man, young or
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achievement is reported and verified
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stallation. L. S. Warner Merc. Co., Texas, saves
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**Installed on Free Trial—Sells It-
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actually enable you to make installations at our
let the customer sell himself after the installation
and working. This does away with the need for
pressure selling—it eliminates the handicap of
not getting money before customer is really con-
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it in every line of business and every section of
the country. Then install our invention without a
down. It starts working at once. In a few short
days the installation has actually produced cash
that is there and available to pay for the deal,
profits above the investment coming in at the
same time! You then call back, collect your money.
It's all yours! Out of every \$75 business you do, nearly
\$50 is your own profit! The very smallest you make is
on a \$7.50 installation! Nothing is so convincing
as to offer to let results speak for themselves without
the customer!



RECORD SALES
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tions in America. Examples shown in this
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Middle West Public Utility Corporation.
2. A famous sporting goods manufacturing
house. 3. A world-famous department store,
steel corporation. 4. A renowned mercantile
house organization. 5. An important ware-
house. 6. A hotel, historically famous hos-
pital. 7. A celebrated newspaper.

Each Installation Leads to Your Customer Takes No Risk

Automatic Repeat Sales
No need to go elsewhere, once you have sold
every good prospect in town. You may stay
where you are and build up a permanent sub-
stantial business. Every pleased customer needs
"refill" supplies constantly. You make exactly
the same commission on these big repeat orders
as you do on the original sale. Washington
Sanitarium and Hospital writes, "We have
already used more than ten installations of the
large size so far." H. C. Heath writes, "We
have only 13,000 population and I have already
sold 76 installations, many of which repeated,
and the above order makes 128 units for yours
truly." Practically every time you establish a
new customer, you increase your permanent
income from repeat business. This enables you,
on exclusive contract, to build an established,
permanent route of customers which can be
sold anytime like any other established business.

Customer gets signed certificate guaranteeing cash
profit on his investment. Very few business men
are so foolish as to turn down a proposition guar-
anteed to pay a profit, with proof from leading concerns
that it does pay. Protected by surety bonded national
organization.

No Canvassing No Supersalesmanship Communicate with Us at Once

If you have not already heard of this
invention being sold in your territory,
lose no time but get in touch
with us immediately. This specialty
is as important a business oppor-
tunity today as the typewriter, adding
machine, and the dictaphone
were in their early days. Men who
can take the measure of an oppor-
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can show us you are the right man
for exclusive franchise in your ter-
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or wire at once. If writing, use the
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gation. Full information will be sent
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SALESMEN NEEDED EVERY WHERE YOU RISK NO MONEY

in trying out this business. Complete
Training furnished. Every man
with us today started at
scratch, without previous ex-
perience, many coming out of
clerking jobs, many out of small
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Service Oil Co., Great Lakes Fisheries, Inc., National
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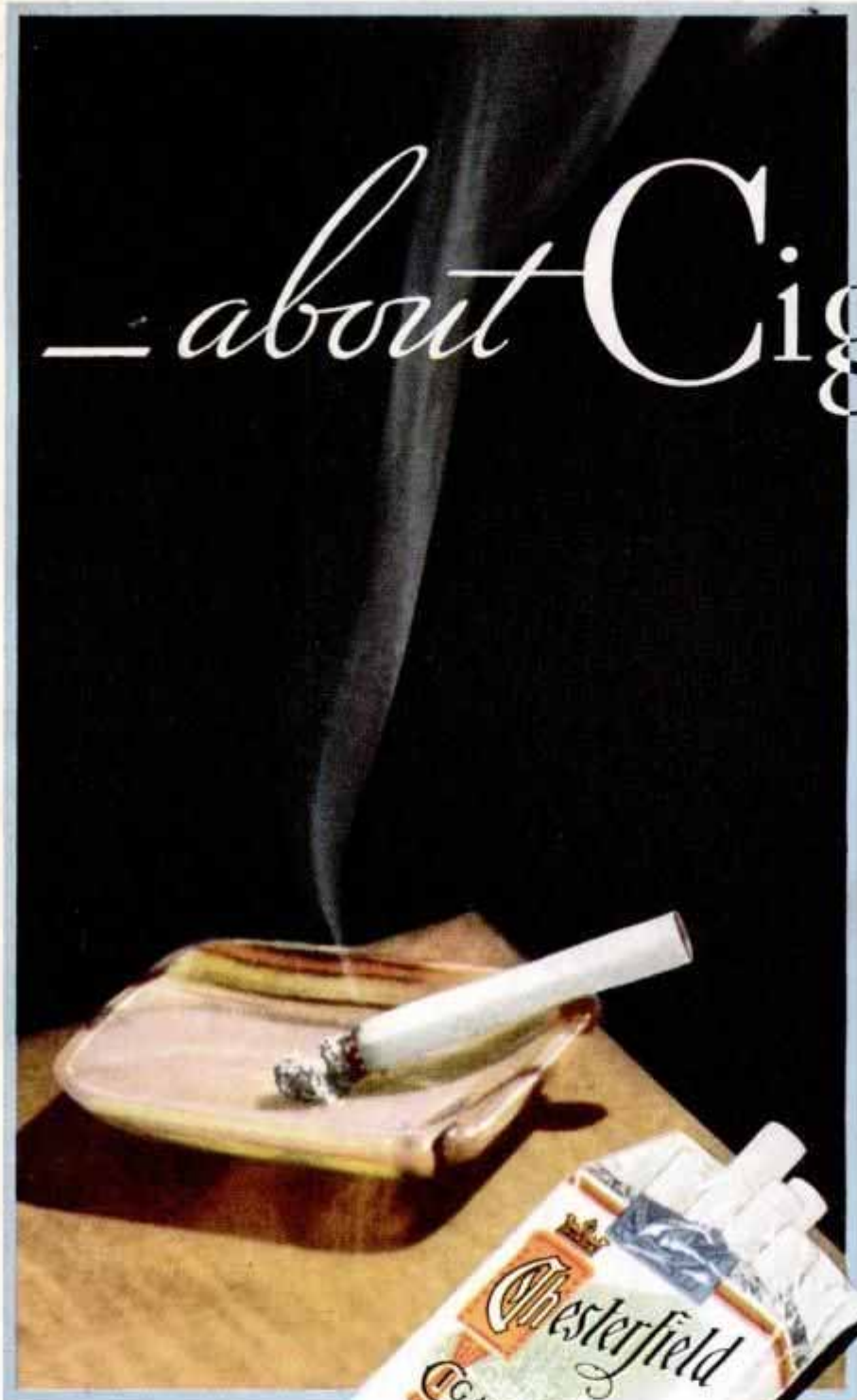
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Without obligation to me, send me full in-
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— about Cigarettes



Of all the ways in which tobacco is used the cigarette is the mildest form

YOU know, ever since the Indians found out the pleasure of smoking tobacco, there have been many ways of enjoying it.

But of all the ways in which tobacco is used, the cigarette is the mildest form.

Another thing — cigarettes are about the most convenient smoke. All you have to do is strike a match.

Everything that money can buy and everything that Science knows about is used to make Chesterfields. The tobaccos are blended and cross-blended the right way—the cigarettes are made right—the paper is right.

There are other good cigarettes, of course, but Chesterfield is

*the cigarette that's
MILDER*

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They Satisfy