

August

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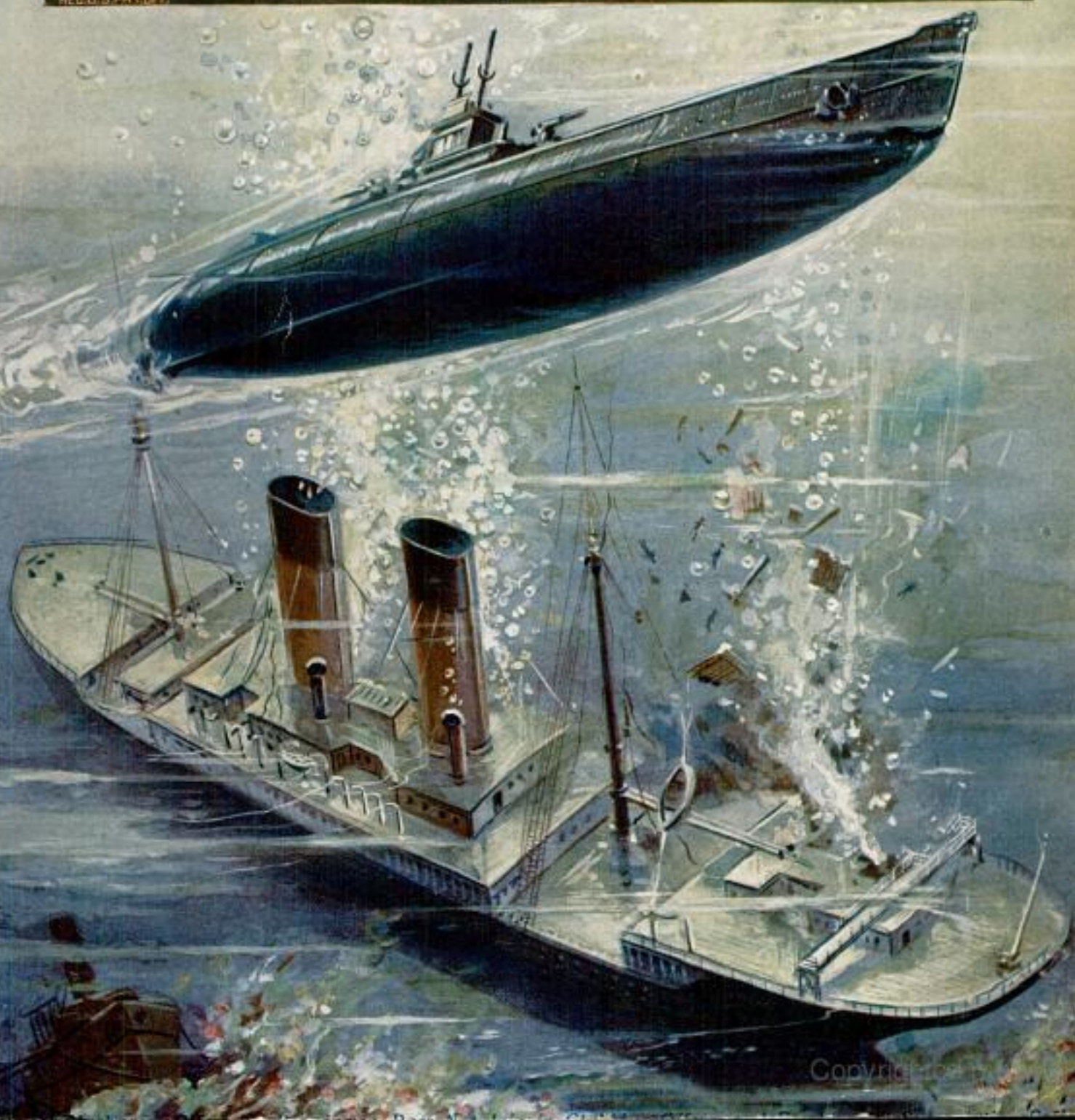
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POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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HARRIS HOMES



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Protecting Those Who Trust Us

A little "inside story" (clipped from a leading lumber trade journal) about the reasons for — and some deductions as to the results of —

Trade-marked Cypress

"THE WOOD ETERNAL"

The following editorial item is from the May 10th, 1917, issue of the LUMBER WORLD REVIEW. (It is worth reading because it is true—and worth reproducing here because you probably don't read lumber trade papers.) We submit it without further comment.

"Tide-water" Cypress

Note the Emphasis it puts on the

Relative Value of Genuine

Please do not be diverted by the small type—
it's A STORY WORTH READING.

(From the "Lumber World Review," May 10th, 1917.)

"CYPRESS TRADE-MARK WINNING BIG.—THEIR SLOGAN, 'SAFE BUYING MEANS EASY SELLING,' PROVES GREAT MARKET AID TO RETAILERS.

"Cypress, 'The Wood Eternal,' was the first lumber to be exploited through a really large general advertising campaign, and now cypress has 'gone and done it again'—and is winning big by helping its retailers to an 'automatic' market by sponsoring to the ultimate user every piece of cypress made by an Association mill.

"When the Southern Cypress Manufacturers' Association began a campaign of advertising a few years ago, which was to exploit the virtues of cypress, little was known of this venerable wood by present day lumber users.

"But as the stories of its remarkable rot-resisting properties were told time after time, the interest of the lumber buying public in this new-old lumber was aroused.

"It was not long thereafter until the mills of the Southern Cypress Manufacturers' Association were working to capacity to fill the orders for cypress which after more or less neglect had again come into its own.

"And then followed what usually follows any marked success in merchandising in these days of intensive buying and selling. Inferior, or upland, cypress (and some carelessly manufactured cypress) began to share unduly in the results of public faith, and it became necessary to protect the lay consumer and at the same time protect the conscientious manufacturer and the honorable and up-to-date preponderance of retailers.

"The general public was not aware that there was a considerable difference between 'tide-water' cypress and the cypress that grew too far inland—but experience began to teach them that while one was 'eternal' the other was more or less temporal and 'fleeting.' One was truly rot-resisting

while the other failed to justify the confidence of the user in its rot-defying character.

"So the already famous cypress arrow trade-mark was devised as an insurance policy for both seller and user. The value of a trade-mark need not be dwelt upon. The manufacturer who won't sign his product will never get very far with it, in these days. The quality must be maintained if the product is to survive the fierce battle of business.

"And so now genuine 'tide-water' cypress (the most eternal of the Wood Eternal) is no longer bought by name alone or on faith—but by a brand back of which is a group of manufacturers including most of the larger and more responsible producers of cypress. As a further testimony of 'pride in their product,' the output of each mill is being identified by the serial number of that mill incorporated in the trade-mark as applied to each mill. The move is one in the right direction, the most important one ever taken by any lumber manufacturers, and is more than justifying, even this early, the well-known cypress slogan which recites that 'the only permanent safety for the seller is perpetual safety for the buyer.' This is the keynote.

"RETAILERS ARE ALREADY EXTENSIVELY REFUSING TO BUY 'ANONYMOUS CYPRESS,' AND ARE SHOWING THEIR UP-TO-THE-MINUTE ACUMEN BY SPECIFYING THE TRADE-MARK ON ALL THEIR CYPRESS ORDERS. THIS IS THE MARK WHICH IS NOW STAMPED ON THE TIDE-WATER CYPRESS—(THE 'WOOD ETERNAL')—MANUFACTURED BY THE ASSOCIATION MILLS.

"IT MARKS A NEW EPOCH IN LUMBER MERCHANDISING."



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Our entire resources are at your service with Reliable Counsel.

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1219 HIBERNIA BANK BLDG., NEW ORLEANS, LA., or 1219 HEARD NAT'L BANK BLDG., JACKSONVILLE, FLA.

INSIST ON TRADE-MARKED CYPRESS AT YOUR LOCAL LUMBER DEALER'S.

IF HE HASN'T IT, LET US KNOW.

Popular Mechanics Magazine

6 N. Michigan Avenue, Chicago, U. S. A.

EDITED BY H. H. WINDSOR

England: The International News Co.
5 Beams Bldg., Chancery Lane, London, E. C.

Australia:
The Australasian News Co.

ISSUED MONTHLY

SUBSCRIPTION:

SINGLE COPY, 15 CENTS

In United States, and its possessions, Cuba and Mexico, per year, postpaid - - - \$1.50
To Canada - - - - - 1.75
To all other countries in the Postal Union - - - - - 2.50

All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

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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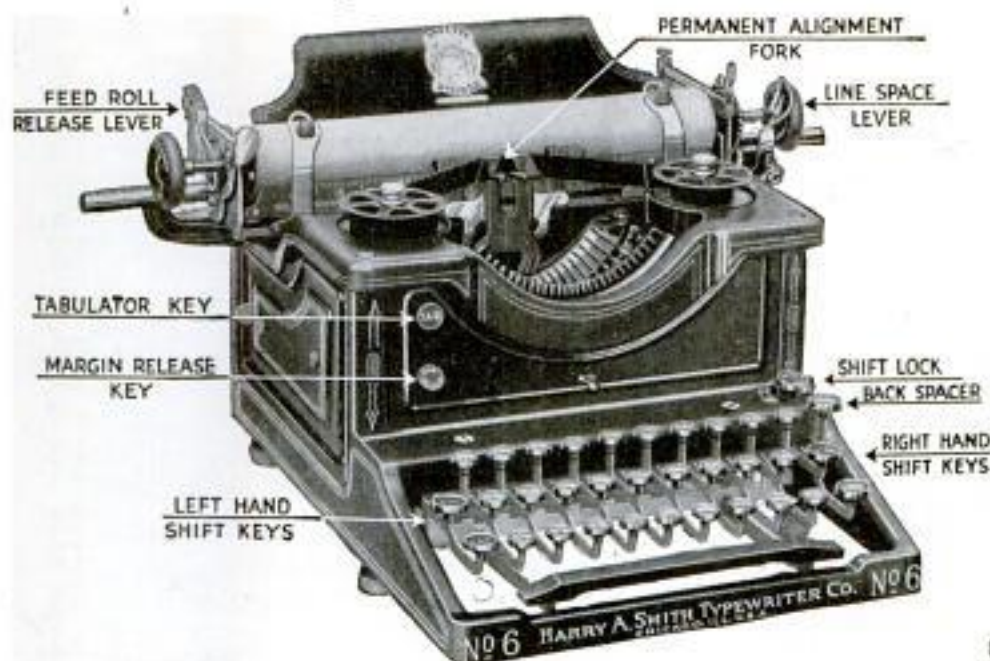
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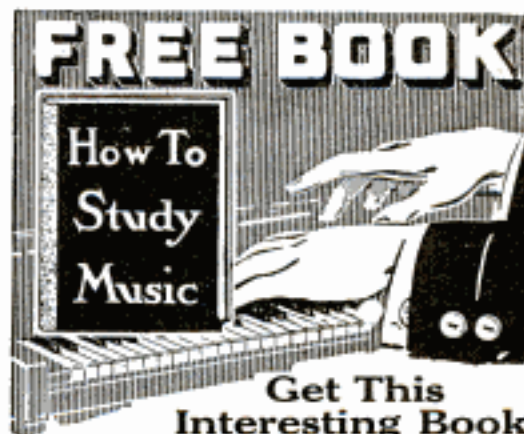
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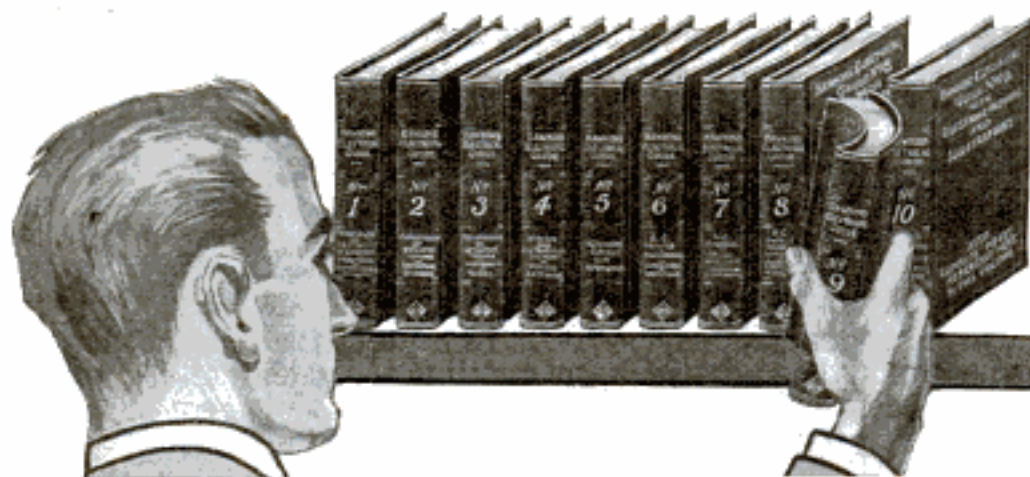
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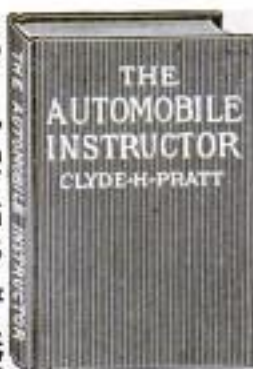
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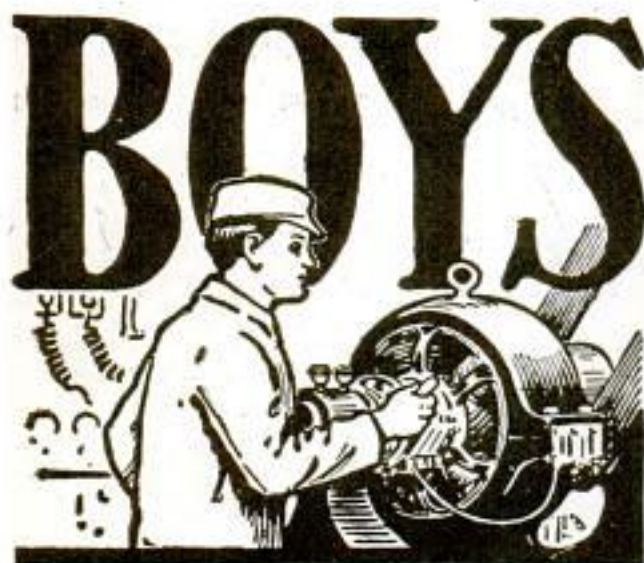
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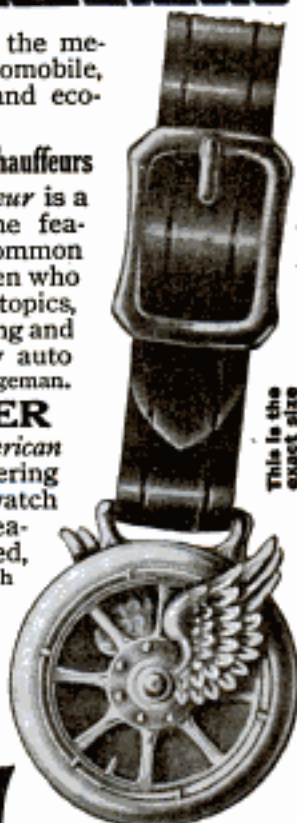
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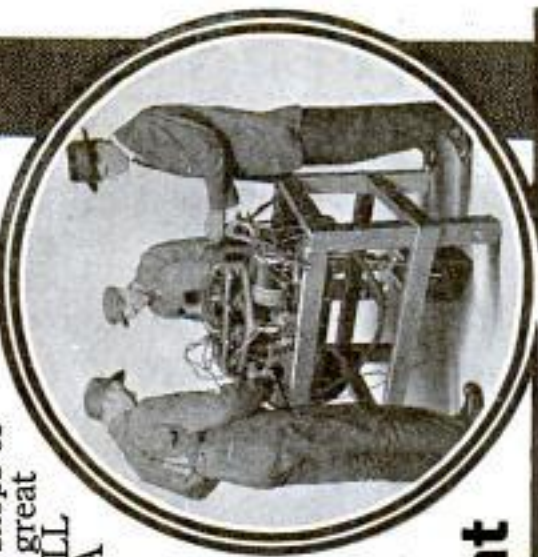
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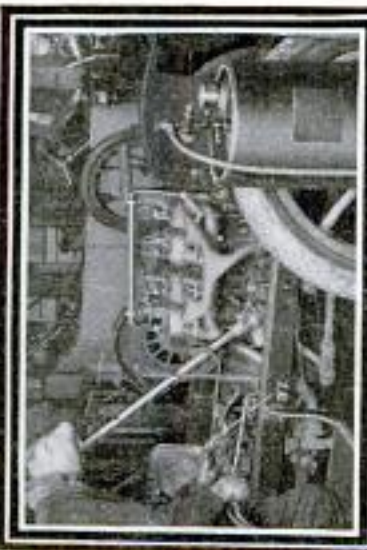
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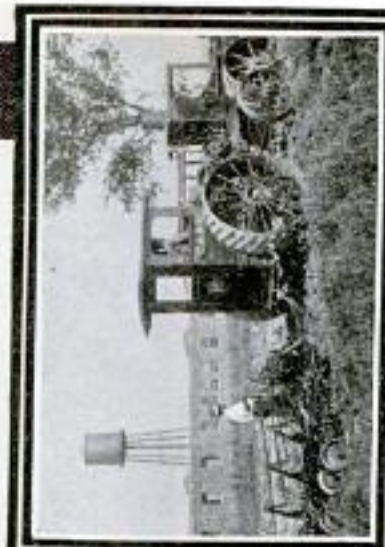
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ARE You a Movie Type? Many of the greatest stars were discovered by accident. You want to know if you have the natural qualifications that bring \$53,000 salaries. The book Motion Picture Acting tells you this, also 191 screen favorites show you how they register 499 human emotions. Use of cosmetics, costume requirements and color schemes also treated. Price cloth 75 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers League, 239 Wainwright, St. Louis.

BIG Profit Nightly—Moving Picture Business—small capital starts you, easily accomplished. Teach you—furnish everything. Ralph J. Goben, 5123 Kenmore Ave., Chicago, Dept. M.

BUSINESS OPPORTUNITIES

PATENTS and Inventions for sale or on royalty. My clients have valuable inventions for market. No better investment for manufacturers or individuals. Full information without charge. Mention line of invention interesting you and data will be sent. Richard B. Owen, Patent Lawyer, Owen Building, Washington, D. C.

PARTY in Brazil will act as buyer agent for dealer or user of Mica; want full instructions; sample on application. Gargasso-Caixa Postal, 1401 Rio de Janeiro, Brazil.

INVENT Something. Your ideas may bring wealth. Free book tells what to invent and how to obtain a patent through our credit system. Talbert & Parker, 4691 Talbert Bldg., Washington, D. C.

I MADE Good income last year as Business Broker. You can too, with small capital. Particulars free. Miss Jack Eydman, Chemical, St. Louis, Mo.

MAIL Order Business is your opportunity. Start as side line, the Brenner way, gradually earn good income. Business-like dealings, common sense, honest help, exclusive plan to every client; proved successes. Send 25c for information worth \$1; no free circulars. Brenner, 302 A Walnut, Philadelphia. \$1 brings all the above, also big collection of Mail Order handbooks.

ADVERTISERS—Mail Order Dealers—Increase your business and profits. Write for advice and book Successful Advertising, free. Warder Advertising Agency, 127 Warder Building, Washington, D. C.

RELIABLE Home Employment. Particulars for stamp. Delana Walton, Prairie City, Ill.

DON'T pay commissions. Get our plan of selling property, any kind, anywhere, without paying commissions. Co-operative Sales Agency, Minneapolis.

PRACTICAL Manufacturing Formulas—All Kinds. Claus, 1864 Harman St., Brooklyn.

BIG Profits Manufacturing Gas Tonic—Carbon Remover—Puncture Plugger—Automobile Polish—Mechanics Hand Soap—Non-Inflammable Clothes Cleaner—Rust Remover—Polishing cloths—Non-alcoholic tube flavors.—Formulas 25c each. 10 Luminous Paint formulas (different colors) 25c. Complete collection above \$1. Satisfaction Guaranteed. Bestvall Formula Service, Irving Park Station, Chicago.

GOOD monthly income easy in spare time manufacturing letters for signs. Free particulars. J. F. McPherson, 677 Brown Avenue, Butler, Pa.

ADVERTISE! 20 words in 120 monthlies \$1.00. Southwestern Agency, 1413-1 Berendo, Los Angeles.

INCREASED Income. No matter what your present employment may be, we can show you how to get more money for your services. Postal will do. National Efficiency League, 44 Boylston St., Boston, Dept. 11.

BE Your Own Boss. Easiest thing—right in your town. Small investment—sure profit with a Kingery Peanut and Popcorn Machine. Prices \$40 to \$400. Liberal terms. Ask for particulars and Catalog No. 61. Kingery Mfg. Co., 411 Pearl St., East, Cincinnati, Ohio.

500 FORMULAS, including Bestilvering Mirrors—Renewing Dry Batteries, Luminous Paint, Luminous Ink, 25c. Ideal Book Shop, 3315-C8, Belleplaine Ave., Chicago.

WANTED—In every town and city—men anxious to get into paying automobile accessory business. Protected territory; close co-operation; new plan; great demand; quick sales; large profits. Small capital. Write now for territory. Orolo Manufacturing Company, Dept. A, Louisville, Ky.

MEN aspiring to better positions. "I tell you how!" Write me, J. G. Weatherly, Troy, Ohio.

25 WORD advertisement in 100 monthly magazines, 3 months, \$1. Bennett, 426 East 149th St., N. Y.

THOUSANDS of Dollars will be made out of Fibro-Vac Guaranteed Puncture Plugger for Automobile Tires—I supply exclusive Formula for preparing this and Carbo-Cide, the only recognized Gasoline Intensifier-Decarbonizer—25 other Automobile Specialties—exclusive territory—particulars for stamp. Muller, Chemist, Tampa, Florida.

ERECT chain six-foot Advertising Thermometers in public places. Each nets you \$129 first year; \$170 succeeding years. Valuable "Opportunity" booklet telling how sent for dime. Winslow Cabot Company, 32 Congress Bldg., Boston, Mass.

CONDUCT a profitable Candy Kitchen; very small capital required; booklet free. Kennon School, 509 Wells St., Dept. A, Chicago.

INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing processes and Trade Secrets in all lines. Sold under positive guarantee; 18 years' practical experience. Revision and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 127 Standard St., Syracuse, N. Y.

PATENTABLE Ideas Wanted—Send for 4 free books. R. B. Owen, 30 Owen Bldg., Washington, D. C.

MAIL Order Dealers. Let the 4 in 1 coupon plan increase your profits. Sell valuable instruction systems by cut price coupon under money back guarantee. Big margin. Small selling expense. Complete plan, sample coupons and bargain bulletin sent on request. Mail Dealers' Coupon System, 519 So. Dearborn St., Chicago.

MANUFACTURERS, Promoters and Patent Buyers are invited to write us stating the line of invention in which they are interested, as we can supply their wants in any class of patents. Victor J. Evans & Co., 162 Ninth St., Washington, D. C.

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ENTER a new business. Earn \$3,000 to \$6,000 yearly in professional fees making and fitting a foot specialty, openings everywhere, with all the trade you can attend to; easily learned by anyone at home in a few weeks, at small expense; no further capital required, no goods to buy, job hunting, soliciting or agency. Address Stephenson Laboratory, 11 Back Bay, Boston, Mass.

WE start you in business furnishing everything; men and women make handsome income weekly operating our "New System Specialty Candy Factories" home or small room anywhere; no canvassing. Opportunity lifetime; booklet free. W. Ragsdale Co., East Orange, N. J.

INVENTORS: We develop and perfect inventions, make models, dies, tools. Metal stamping and special manufacturing. Gerding Bros., Lion Bldg., Cincinnati, O.

ADVERTISERS, Mail Dealers. Our New Rate Book lists 2,000 Principal Publications, rates, circulation. Includes 30 Mail-Order Plans. Free. Dearborn Advertising Agency, 210 Franklin Bldg., Chicago.

LEARN the real estate business; our enlarged instruction book teaches listing, appraising, management, salesmanship, insurance, brokerage, advertising, renting, agency, estates, titles, rights, forms, etc.; revised edition; 240 indexed subjects; excels \$25 correspondence course; buckers cover, \$1; silk cloth, \$1.25, postpaid. Realty Book Co., Dept. No. 29, Cleveland, Ohio.

MAIL-ORDER SUPPLIES

ARTICLES of genuine utility mean success for the Mail Dealer. Choice of hundreds. Write Merchandising Service Company, 309 Broadway, New York.

PRACTICAL manufacturing formulas, all kinds. Claus, 1864 Harman St., Brooklyn.

INCREASE your sales. Place your proposition before the readers of "Cartoons Magazine," 20,000 copies guaranteed every month. Classified rate 5c per word. Mail in a trial ad today. Cartoons Classified Dept., 78 E. Madison St., Chicago.

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ADVERTISERS—Here's your opportunity. Your proposition placed before the readers of "Cartoons Magazine" for only 5c per word. Circulation 20,000 copies guaranteed. Send a trial ad for our next issue. Cartoons Classified Dept., 6 N. Michigan Ave., Chicago, Ill.

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INCORPORATE. Our lawyers do the work, saving you time, annoyance and money in incorporating under the most liberal laws of Arizona. Laws and forms free. Southwestern Securities & Investment Co., Box D488, Phoenix, Ariz.

COLLECTIONS

DEBTS Collected Anywhere, Quickly! Established 25 years. William H. Dodd, 87 Nassau Street, New York.

AGENTS WANTED

AGENTS. Sell wholesale and retail. New Dimmer switch for automobiles. Just out. Large commissions. Easy sales. Apply immediately. Sills & Amidon, Omaha, N. Y.

AGENTS—Telephone appliance. The only instrument not an attachment. Approved by telephone companies. Big seller. Sensation of last business exposition. Write now for selling rights! Wellaphone, Inc., 1 Madison Avenue, New York City.

INVENT Something. Your ideas may bring wealth. Free book tells what to invent and how to obtain a patent through our credit system. Talbert & Parker, 4663 Talbert Bldg., Washington, D. C.

1917's GREATEST Sensation. 11-piece toilet goods combination selling like blazes at \$1.00 with \$1.00 Carving Set Free. Everybody buys. Eagle's profit first week \$51.00. Great crew proposition. Pierce Co., Dept. P, 906 Lake St., Chicago.

AGENTS financially responsible who understand heating plants to sell Blasco Fuel-Saving Devices on monthly payment plan. Every heating plant a prospect. Guaranteed to save 20%. Evaporation tests at two universities averaged 25% saving. Wolf Fuel Saver Company, 14 East Jackson, Chicago.

\$61.50 WEEKLY. Introducing and selling a new gas light burner for kerosene lamps. Beautiful light. No chimney. No mantle. Samples free. Luther Manufacturing Co., Dept. 314, Cincinnati, Ohio.

GOOD income refinishing chandeliers, brass beds, automobiles by new method, producing amazing results; no capital or experience necessary; particulars free. Gunmetal Co., Ave. H, Decatur, Ill.

PREPAID—2 dozen calling cards for 15 minutes' work. Become our agent. Majestic Printing Co., 3044 Leeward Ave., Los Angeles, Cal.

49 DAILY Easy—New Seller—Agents Wanted—Either Sex—Particulars Free. G. W. Ashton Co., Clinton, Iowa.

\$40 WEEKLY—Our patented cake mixer fits any suitable pan; solves the mixing problem, beats eggs, etc. Every housewife wants it, can afford it. Sells for \$60. Sample and particulars 35c postpaid. Beck & Co., Sullivan, Wis.

START an All-profit Mail-order Business. Add several dollars weekly to your income. Explanatory booklets for dime. No free particulars. Cutler Sons Co., Reading, Pa.

AGENTS. By my plan you get the latest offers of ten leading dealers every month free. Henry Shaw, Dept. 31, 44 Boylston St., Boston.

TRANSFER Initials for monogramming automobiles, motorcycles, trunks, etc., at wholesale prices. Write for samples. Globe Decalcomania Co., Dept. 7, Jersey City, N. J.

LIVE, awake agents for selling novelty Check Protector. Some good territory open; every person who has bank account wants one. Sample sent for \$1.50. Greer, 3339 East Colfax, Denver, Colo.

WORLD'S Fastest Selling Auto Accessory. County distributors wanted. Good profits. Write today. G. L. W. Spring Oiler Co., San Diego, Calif.

TAILORING Agents Wanted—Big complete outfit and case, nearly 200 large cloth samples, 3 piece lists and everything needed for canvassing, or use in store, free to live agents. \$25.00 to \$50.00 a week; may make more. Write us today for free elegant outfit to begin, cloth samples, wholesale prices, special offer on a suit for yourself and full information—see our wonderful values, beautiful fabrics and styles. Established 28 years. Every garment made to measure—everything guaranteed and express prepaid. Just send a postal. American Woolen Mills Co., Dept. 814, Chicago.

FREE sample of Famous product. Guaranteed proposition. Famous Products Co., 262 Citizens Bank Bldg., Decatur, Illinois.

PRACTICAL manufacturing formulas, all kinds. Claus, 1864 Harman St., Brooklyn.

AGENTS Wanted—To advertise our goods by distributing free samples to consumer, 90 cents an hour. Write for full particulars. Thomas Mfg. Co., 562 North St., Dayton, O.

EXCEPTIONALLY Good business proposition for agents—ladies or gentlemen—any color. The Rappe Company, Box 836K, Los Angeles, California.

AGENTS can make \$15.00 daily selling our sifter Wall Flour Bin. Sample prepaid \$2.00. Coffman Mercantile Co., Warsaw, Ohio.

SELL Fritz's Wizard fly and insect destroyer; 100% profit. Particulars and sample 25c. Fritz Chemical Co., Chicago, Ill.

AGENTS, 500% Profit. Sign-Letters for office and store fronts. Samples and particulars Free. Inter-States Letter, 2424 N. Halsted St., Chicago.

GENTLEMEN: Mason sold 18 Sprayers and Auto Washers one Saturday. Profits \$2.00 each. Square Deal. Write Rusler Company, Johnston, Ohio.

KETCH the Kaiser Checkerboard of War. New Game Novelty. Harvest for Agents, both sexes. Act quick. Particulars free. Checkerboard Mfg. Co., Fay Bldg., Los Angeles, Cal.

AGENTS. New \$2.50 Automatic Adder. Sell every business man. Big profits. No competition. Does work of high priced machines. Bassett, 5921-N Indiana Ave., Chicago.

AGENTS—with selling experience—to sell direct to consumer made-to-measure suits and overcoats, \$13.50 and \$17.50. If you want an independent business with Big Money, answer at once before territory is taken. Outfits furnished. Midland Tailors, Dept. 6, 19 So. Fifth Ave., Chicago.

QUICK—Snap this winner; brand new; big profits; sells on sight; unlimited field; free particulars. Sunnyside Co., 614 Sunnyside, Danville, Va.

AGENTS, \$60 a week to travel by automobile and introduce our 300 candle power coal-oil lantern. Write for particulars of our auto offer. Thomas Co., 862 North St., Dayton, Ohio.

SAFETY Paper Cutter, holds any razor blade. 40% Profit. Sample 25c. E. P. Wilson Co., 828 Francisco St., Los Angeles, Calif.

LUMINOUS Paint! Shines in the dark. Big seller to hotels, garages, etc. Any article can be coated with splendid results. Watches, clocks, electric switch plates, crucifixes, match boxes, etc. (Everlasting.) Only 25¢ a bottle. Luminous Paint Co., B-17, Douglas Park Station, Chicago, Ill.

AGENT-Dealers Join Manufacturing Syndicate. Manufacturing list mail for 10c. Manufacturers Syndicate Co., 2123 Madison Ave., New York City.

NACMA repeat order household products are big money makers. Catchy selling plan gets and holds the business. Free selling helps and samples. Exclusive territory. The Nacma Co., Dept. M-7, 20 W. Lake, Chicago.

NEW Knife Sharpener puts razor edge on any knife instantly without grinding. Demonstration creates sensation. 30 sales a day easy. Carry right in pocket. 100 per cent profit. Write for free sample offer now. American Products Co., 8639 Central Ave., Cincinnati, O.

AGENTS: Biggest moneymaker ever put on the market, "Eggette," the original egg substitute. Takes place of eggs in baking and cooking at less than ten cents per dozen. Sells rapidly to homes, stores, bakers, etc. A Guaranteed pure food product. Good opportunity to build permanent business with big income. No competition. Regular size package 10c equal to 12 eggs. Attractive moneymaking proposition free. Write quick. Bestever Products Co., B-4 Douglas Park Station, Chicago, Ill.

AGENTS: You can make big money taking orders for our fine made-to-measure clothes, so write quick for 60 beautiful cloth samples, 32 smart styles in rich colors, wholesale and retail price lists, lowest prices and best offer to agents, \$5.00 to \$10.00 a day easy. Big outfit, over 250 samples free to live wires. No experience needed—no capital. We furnish everything free—pay postage or express charges—back you, boost you, show you how and clearly explain everything. Costs nothing to try. Let us make you a stylish suit to measure to prove our fine quality and style. Send postal or letter today. Paragon Tailoring Co., Dept. 814, Chicago.

THE Ray Adding Machine—Complete for \$15, handsome desk stand free. Adds with speed and accuracy of highest priced machines—also actually subtracts. Saves time, money, labor. Convenient to have on desk or to carry wherever needed. Used by Hershey Chocolate Co., Barrett Manufacturing Co., etc. Order today. Money returned at end of 30 days if not satisfactory. Or write for further information, Ray Company, 1431 Power Bldg., Richmond, Va.

LARGE Manufacturer wants agents to sell guaranteed custom-made raincoats. We deliver to customer. Enormous profits. Defy competition. 1917 Outfit Free. "Aereo," 175 East Broadway, Desk P, New York.

\$1,000 PER Man per county. Strange invention startles world—agents amazed. Ten inexperienced men divide \$40,000. Korstad, a farmer, did \$2,200 in 14 days. Schlichter, a minister, \$195 in first 12 hours. \$1,200 cold cash made, paid, banked by Stoneham in 30 days; \$15,000 to date. A hot or cold running water bath equipment for any home at only \$6.50. Self-heating. No plumbing or waterworks required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Mfg. Co., 311 Allen Bldg., Toledo, Ohio.

WANTED. General Agent to represent us in your locality. Exclusive territory. Big inducements. Chicago Agency Co., 840 Altgeld St., Chicago.

GET into biggest money-making end automobile business—replacing necessary equipment. Live, ambitious men wanted as special factory representatives, exclusive territory, taking orders for tops, top coverings, seat covers, "Stik-Tite" windows. No experience necessary. No capital required. No competition. Copyrighted system protects you. Free catalog, samples, full details. Cincinnati Auto Specialty Company, Dept. MC-87, Cincinnati, Ohio.

AGENTS. We have a good proposition for you. Write for particulars and samples. Chicago Agency Co., 838 Altgeld St., Chicago.

23% PROFIT—\$2.80 on each set sold. Newly invented Jubilee Spark Intensifier. Banishes spark-plug trouble forever. Sells on sight. Huge profits. Exclusive territory. Harry! Jubilee Mfg. Co., Dept. M-9, Omaha, Neb.

EASY, pleasant work for Mechanics. Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

PORTRAIT Agents, new and old, write us. We know what you want and need. Established 17 years. Pioneer, 1252 W. 63rd St., Chicago.

AGENTS Wanted! Sell Polishing Cloths, Rust Remover, Food Flavors, etc. 170 household necessities, guaranteed line, big profits, quick repeater, permanent business. Stuart & Co., 16 Main St., Newark, N. Y.

SAMPLE—5c for 15c water filter; be first; catalogue free. Suvio, 696 East 161st St., New York.

AGENTS sell Reliable Custom-Made Raincoats and Gabardines. Big commission. Complete sample line free. Temple Raincoat Company, Templeton, Mass.

AGENTS: Patriotic Novelty. Send time for 100 American Flag Stickers and Price List. Havitt Sales Agency, Grafton, W. Va.

AGENTS Wanted Everywhere—Best selling household article; large demand for goods; \$25 to \$50 a week; success assured; investigate to-day. Globe Supply Co., Keota, Iowa.

\$1.25 LITTLE Wonder Gas Saver. Agent retails \$2.00 for Ford and Metz. Burns 30 miles on gallon; applied one minute. Vandervoort's, Los Angeles, Calif.

SELL Old Glory stamps; big profits; sample 10c. Queen Novelty Co., Sta. F, Cincinnati, Ohio.

AGENTS Wanted—Tolliver Puncture-Proof Inner Tubes sell easily—our Agents make \$5.00 to \$50.00 a day net profit—no competition. If you wish to establish a business of your own with unlimited possibilities for profit, write us for complete details. Tolliver Tube & Tire Co., 523-C Foster Bldg., Denver, Colo.

BIG Profits selling our goods. Startling! Novel! Mysterious! Useful! Ornamental! Everybody interested. No experience necessary. Steady Work. Write Box 304, Yankton, S. D.

AGENTS—Send for sample "Fretnot"—the wash day wonder. Be convinced you can do a whirlwind business. You can clear at least \$20 to \$100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory granted to agents who can produce. Credit given. Don't call. P. M. Metter & Sons, 3213 Warren Ave., Chicago.

ALL but millionaires buy on sight. Write or send dime for sample. Aero Supply, 37 Liberty St., New York.

500% PROFIT putting initials on automobiles. New transfer method, Particulars free. Auto Monogram Co., 2025 East Monmouth St., Philadelphia, Penna.

RUSH postal for Free Sample "Spik & Span". Wonderful new washing tablet. Washes clothes spotless, without rubbing. Tremendous seller. 200% profit. Free Samples to boost sales. Newberry Co., 212 Peoria, Chicago, Ill.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Photo Plates, Pennants. Rejects credited. Prompt shipments; samples and catalogues free to agents; 30-days' credit. Jas. C. Bally Co., Desk 8, Chicago.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalogue and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

SNAP this quick agents, brand new, big money, large field, sells everywhere; free particulars. Olive Home, Stickney, S. D.

AGENTS—Show our made to order guaranteed \$15.00 suits, real \$25.00 values. No experience necessary. Wonderful selling plan—you furnish prospects—we make the sale. Chicago Woolen Mills, Dept. A, Chicago.

THE Peoria Starter for Ford Cars. Practical, durable and guaranteed. The best mechanical Starter on the market. Some territory still open. Money maker for hustlers. Write for particulars and territory. The United Co., Peoria, Illinois.

AGENTS—Exclusive territory to sell Auto Headlight Glare Removers. Retail 35c per pair. 100% profit. Easily sold. Auto Glare Remover Co., Fisher Bldg., Chicago.

HUNDREDS of Agents are now making goods to sell from Miller's Guaranteed Manufacturers' Formulas. Wizard Washing Tablets—no wax, potash, lye. Costs 5c per pound. Brings 60c. Eggolene, only pure food substitute for eggs at 3c a dozen. Non-Alcoholic Tube Flavors. Ice Saving Cloths, many new sellers including latest Automobile Specialties. Carbo-Cide, the only recognized Gasoline Intensifier-Decarbonizer—80% profit. Enormous sales. Fibro-Vac Guaranteed Puncture Plugger. Exclusive territory. Particulars for stamp. Miller, Manufacturers' Chemist, Tampa, Florida.

SELL New, Martelous, Ballhorne. Sharpens old style or Safety Razors in 20 seconds. Retail \$1.00. Average 30 a day easily. Profit \$15.00. Enormous demand. Outfit to workers. Address, Ballhorne Co., 1403 Conway Bldg., Chicago.

AGENTS—Stamping names on Pocket Key Protectors; sample check with your name and address, 12c. Stamping Outfits, Emblem Checks, Check Pouch, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

SIGN Letter Agents and Painters: 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 404 N. Clark St., Chicago.

HUGE profits selling Nibco Sanitary Brushes, Auto Washers, Brown Beauty Adjustable Floor Mops, Dustless Dusters, and other specialties. Big line. Fast sellers. Write today. Silver-Chamberlain Company, Department M, Clayton, New Jersey.

FREE sample with particulars. No splashing water strainers. Easy seller. Returns big. Experience unnecessary. Union Filters Co., New York.

"MO-BE-CO" Agents make \$10 per day easily selling toilet preparations. Moen-Berg, Fosston, Minn.

MAN Wanted in each country community and every small town, to wear beautiful new tailored-to-order suit of clothes and be Agent in spare time among friends, relatives and neighbors. Confidential wholesale prices given, good profit on each order. No experience required, we teach you all you need to know. Write at once and get gorgeous, illustrated book of cloth samples free, and full instructions. Banner Tailoring Co., Dept. 695, Chicago.

STATE Representatives and Agents—We want men of known ability for best line of Cutlery offered for salesmen. Extremely liberal margins. Dept. P, Aerial Cutlery Manufacturing Company, Marinette, Wisconsin.

LARGE Manufacturer wants representatives to sell shirts, underwear, hosiery, dresses, waists, skirts, direct to homes. Write for free samples. Madison Mills, 503 Broadway, New York City.

AGENTS make 500 per cent profit selling our Auto Monograms and Initials. Window Sign Letters, Changeable Signs, and Show Cards. 1,000 Varieties. Enormous Demand. Sullivan Co., 1123 Van Buren St., Chicago, Ill.

WASHING Compound Agents—Ho-Lol-Hu-Na, Great Hawaiian Washing Secret (Improved)—Washday Wonder of the Age. Become District Sales Agent and make \$2,500 to \$5,000 a year. Cinch exclusive territory now. Get twice the money for your work. Opportunity is knocking. Adam Fisher Mfg. Co., Agency Dept., 2061, Ry. Exch. Bldg., St. Louis, Mo., U. S. A.

NINETY Per Cent of Your Calls Turned into Sales! Wonderful Enthusiasm Follows Every Demonstration! Write at Once for Full Particulars of Our Line of Eradium (Luminous) Articles. Startling! Mysterious! Everlasting! Novel! They Shine in the Dark. Crocifixes, House Numbers, Bulbs, Match Boxes, Pictures, Switch Plates. Sole Manufacturers, The Pioneer Corporation, 1259 W. 63rd, Chicago.

A \$2.50 PREMIUM with every \$1.98 sale and 70 cents profit for you means Big Daily Profits. Free Sample. Box 500, Shreveport, La.

AGENTS for newly invented article, novel, useful. In demand among all classes everywhere. Fast seller, popular price, no competition, big profit. The Geo. W. Clark Co., Clark Building, Jacksonville, Fla.

MAN or Woman to travel for old-established firm. No canvassing; \$1,170 first year, payable weekly, pursuant to Contract. Expenses advanced. G. E. Nichols, Philadelphia, Pa., Pepper Bldg.

YOU can be your own boss with our Key Check outfit. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Pease Die Works, Dept. M., Winchester, N. H.

NEW Patriotic War Atlas Free with my 1917 "Business Guide". Sells everywhere. Beginners clear \$7 daily. 50% commission. Outfit free. Prof. Nichols, Box P. M. 3, Naperville, Ill.

AGENTS Wanted. To Handle Our Hair and Fibre Broom that Takes the Place of the High-Priced Corn Broom. Write for Protected Territory. 100% Profit. Jos. Henssler & Son, 57 E. 43d St., Chicago.

AGENTS, \$50 a week. Will show you how. Genuine Gold Leaf Window Letters. Chicago Agency Co., 812 Alameda St., Chicago.

DECALCOMANIA Transfer Initials and Flags: You apply them on automobile while they wait; cost 2c each; profit \$1.38 on \$1.50 job; free particulars. Auto Monogram Supply Co., Dept. J, Niagara Bldg., Newark, N. J.

INSIDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P, Cincinnati, O.

GET Davis' Latest Proposition, \$15.00 daily a cinch. No matter how many times you have answered my ads in last 20 years, write again. E. M. Davis, Dept. 506, 900 Lake, Chicago.

MEDALLIONS—500% profits. Make up your own goods and be independent. Catalogue free. Resag Co., 1235 Randolph St., Chicago.

AGENTS—Our gold window letter proposition beats 'em all. Staibrite Co., Dept. P, 1115 Second Ave., N. Y. Established 1895.

AGENTS make 500% profit handling Auto Monograms, Patriotic Pictures, Flag Novelties, Window Letters and Changeable Signs. Catalogue free. Hinton Co., 6142 40th Court, Chicago, Ill.

RELIABLE People Wanted—Place Eggine in stores and appoint agents. Takes place of eggs in baking and cooking at 9c doz. Large package and particulars 10c postpaid. Morrissey Company, 4403-5 Madison, Chicago.

AGENTS: Big Hit! Our 5-Piece Aluminum Set is all the rage. Cheaper than Enamel Ware. Sells like wildfire. Guaranteed 20 years. Retail value \$5.00. You sell to housewives for only \$1.98. Biggest seller of the age, 9 sure sales out of every 10 shown. Others cleaning up \$10.00 to \$20.00 a day. Answer this quick to secure your territory. Div. GG5, American Aluminum Mfg. Co., Lemont, Ill.

WHO wants to make more money selling brushes that every household needs? Special method of getting entrance to demonstrate. Fuller Sanitary Brushes are nationally advertised—largest output—best terms and prices—western distributing stations. Your territory is valuable. Write, Fuller Brush Company, Hartford, Conn.; Rock Island, Ill.

AGENTS: \$50 to \$100 a week. Free samples. Gold sign letters for Stores and Office Windows. Anyone can do it. Liberal offer to general agents. Metallic Letter Co., 407 N. Clark, Chicago.

EXCEPTIONAL opportunity selling Sanitary Brushes. Large profits, no permanent capital required. Every home a customer. Special selling help for agents. Proposition free. Sample ten cents. Puritan Sales Company, Dept. M, 1866 Broadway, N. Y.

DISCOVERED! Extraordinary New Proposition. Supreme Opportunity. \$200 per week Easy, demonstrating marvelous Adding Machine. Retail \$7.50. Work equals \$500 machine. Subtracts, Multiplies, Divides, automatically. Whirlwind in speed. Guaranteed Five Years. Used by U. S. Government. Sells everywhere. Amazing profits. Write quick for exclusive territory. Calculator Corp., Dept. PM, Grand Rapids, Mich.

\$50 WEEKLY and up selling Mexican Diamonds. Exactly resemble genuine; Same Rainbow Fire; Stand tests; sell at sight; Repeat orders. Write quick for Sample Case offer free. Mexican Diamond Importing Co., S. W. Las Cruces, New Mexico.

AGENTS. Make Big Money; fast office seller; particulars and samples free. One Dip Pen Co., Dept. 2, Baltimore, Md.

CALIFORNIA Flower Bed Necklaces beat anything for quick sales and profits. Absolutely new. Write for agent's proposition. Mission, 2819 PM, West Pico, Los Angeles, Calif.

"GOLDINE" Sign Letters—1,000% profit. Particulars free. Johnston Co., Quincy, Ill.

MARRIED Salesmen and Agents—Wives to demonstrate in dept. stores, on salary. Easy sales to jobbers, dealers, consumers. All or part time, or side line. Appoint sub-agents. Silveron, the Silver-plating polish—needed in every home, hotel, restaurant, and garage. Guaranteed to Deposit Pure Silver. Write for proposition and sample. Exclusive territories open. Silveron, 157 Cedar St., N. Y.

AGENTS—Ho-Bo-Co Skin Soap and Toilet Goods plan beats everything for agents' profits. "Ho-Bo-Co," 112 Locust St., St. Louis, Mo.

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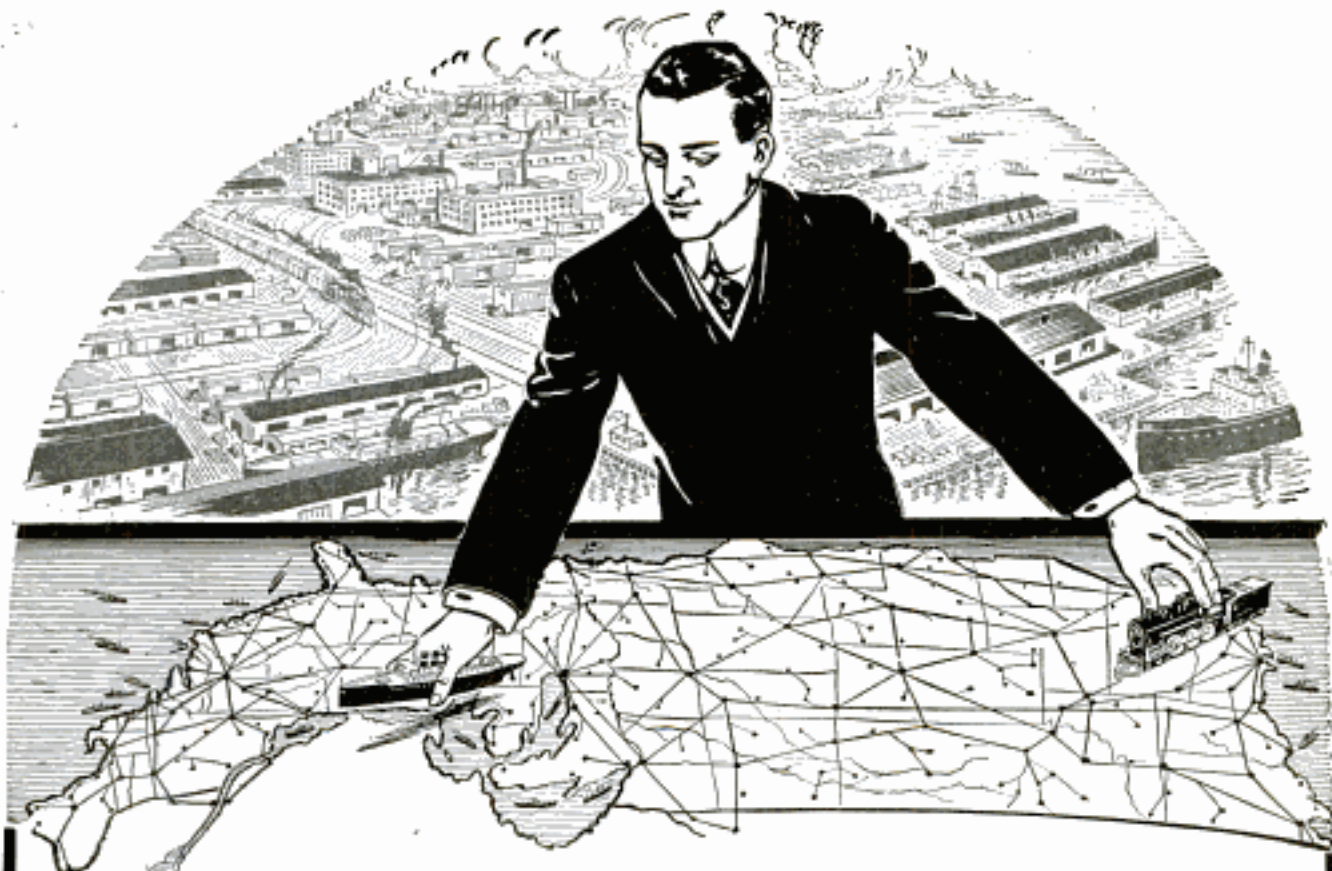
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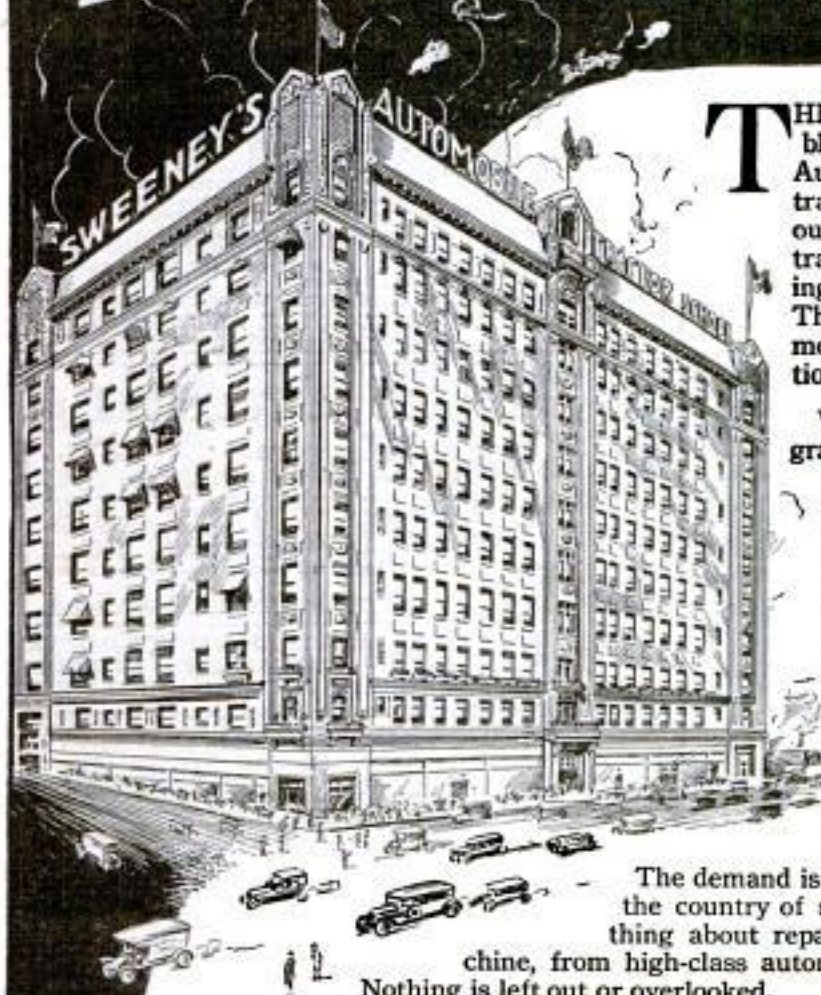
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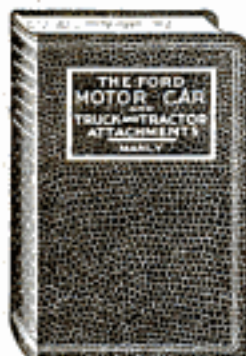
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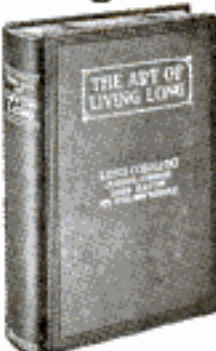
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<input type="checkbox"/> Electric Lighting	<input type="checkbox"/> ADVERTISING MAN
<input type="checkbox"/> Electric Car Running	<input type="checkbox"/> Window Trimmer
<input type="checkbox"/> Electric Wiring	<input type="checkbox"/> Show Card Writer
<input type="checkbox"/> Telegraph Expert	<input type="checkbox"/> Outdoor Sign Painter
<input type="checkbox"/> Practical Telephony	<input type="checkbox"/> RAILROADER
<input type="checkbox"/> MECHANICAL ENGINEER	<input type="checkbox"/> ILLUSTRATOR
<input type="checkbox"/> Mechanical Draftsman	<input type="checkbox"/> DESIGNER
<input type="checkbox"/> Machine Shop Practice	<input type="checkbox"/> BOOKKEEPER
<input type="checkbox"/> Gas Engineer	<input type="checkbox"/> Stenographer and Typist
<input type="checkbox"/> CIVIL ENGINEER	<input type="checkbox"/> Cert. Public Accountant
<input type="checkbox"/> Surveying and Mapping	<input type="checkbox"/> Railway Accountant
<input type="checkbox"/> MINE FOREMAN OR ENGINEER	<input type="checkbox"/> Commercial Law
<input type="checkbox"/> Metallurgist or Prospector	<input type="checkbox"/> Traffic Management
<input type="checkbox"/> STATIONARY ENGINEER	<input type="checkbox"/> GOOD ENGLISH
<input type="checkbox"/> Marine Engineer	<input type="checkbox"/> Teacher
<input type="checkbox"/> ARCHITECT	<input type="checkbox"/> Common School Subjects
<input type="checkbox"/> Contractor and Builder	<input type="checkbox"/> CIVIL SERVICE
<input type="checkbox"/> Architectural Draftsman	<input type="checkbox"/> Railway Mail Clerk
<input type="checkbox"/> Concrete Builder	<input type="checkbox"/> Textile Overseer or Supt.
<input type="checkbox"/> Structural Engineer	<input type="checkbox"/> Navigator <input type="checkbox"/> Spanish
<input type="checkbox"/> PLUMBING AND HEATING	<input type="checkbox"/> AGRICULTURE <input type="checkbox"/> German
<input type="checkbox"/> Sheet Metal Worker	<input type="checkbox"/> Poultry Raising <input type="checkbox"/> French
<input type="checkbox"/> CHEMICAL ENGINEER	<input type="checkbox"/> AUTOMOBILES <input type="checkbox"/> Italian

Name _____
 Occupation _____
 & Employer _____
 Street _____
 and No. _____
 City _____ State _____
 If name of Course you want is not in this list, write it below.

Please Mention Popular Mechanics



33,000 sq. ft. of
Additional
Floor
Space

Come to Detroit The Automobile Center and

DETROIT

trained men get preference and get jobs quickly. No other city can give what Detroit offers. Think what it means to learn in the Michigan State Auto

School. Factories endorse our school, glad to employ our graduates or offer them territory in which to sell cars and start garages. Unlimited opportunities.

71% of Automobiles are made in Detroit. You're right in the Heart of the Auto Industry. Men are needed everywhere as testers, repairmen, chauffeurs, garage men, and salesmen. Hundreds of our graduates start in business for themselves.

Earn \$75 to \$300 a Month

We teach you to handle any auto proposition. You graduate in from ten to twelve weeks. Our equipment is new, up-to-the-minute, and complete. No old, obsolete motors, chassis or electrical equipment used. Students actually build cars from start to finish, getting factory training in assembling, block-testing, road-testing, everything. Special complete course in Oxy-Acetylene brazing, welding and cutting, separate from regular course. Learn to time motors, rebore cylinders, adjust carburetors, magnetos, valves and bearings quickly and accurately. Six-cylinder Lozier, Chalmers "6," Detroit "6," Overland, and 8-cylinder King

are used for road instruction. We have the following completely equipped chassis:

Chalmers "6-30" 1917 chassis
Detroit "6-45" 1917 chassis
Buick Light "6" 1917 chassis
Willys-Knight 1917 chassis
Studebaker "6" 1917 chassis
Hudson Super-Six 1917 chassis
Cole "8" 1917 chassis
King "8" 1917 Chassis

Mets "4" 1917 Chassis
Detroit Electric 1917 chassis
G. M. C. 2 Ton Truck
Saxon "6" 1917 chassis
Maxwell 1917 chassis
Oldsmobile "8" 1917 chassis
Winton "6" chassis
Packard Twin "6" 1917 chassis
Chalmers "4" 1913 Chassis

All completely equipped for students to work on. We have more than 20 motors in our block test department—2 cyl., 4 cyl., 6 cyl., 8 cyl., and 12 cyl. Our electrical department is complete, having every standard starting, lighting, and ignition system, including Delco System as used in Buick, Hudson, and Packard Twin "6."

Detroit Is the Place to Learn—Start Any Time

There are 44 auto factories in Detroit and vicinity and 140 accessories and parts factories. Our students have the privilege of going through any or all of them. We operate Starting, Lighting, Ignition Service Station. This has added thousands of dollars' worth of equipment and makes our electrical department unequalled. Students get actual experience in handling all kinds of electrical auto equipment and taking care of trouble. We have just installed a Sprague Electric Dynamometer for block-testing purposes for students' use. Ours is the only Auto

school having this equipment. Auto factories need Dynamometer men constantly. Factories and garages are paying big salaries to men who know how to handle electrical equipment quickly and properly. Detroit is the automobile center. You get practical instruction. School open all the year. Enter classes any time, any day. Three classes daily: morning, afternoon, evening. All instructors are members of the Society of Automobile Engineers (S.A.E.) There is a great demand for Michigan State Auto School students. Auto factories write and phone for men constantly.

Follow the Crowd to the Michigan State Auto School. Come to Detroit

MONEY-BACK GUARANTEE

We guarantee to qualify you in a short time for a position as chauffeur, repair man, tester, demonstrator, auto electrician, garage man, or automobile dealer, paying from \$75 to \$300 monthly or refund your money. We have constantly more requests for Detroit trained men at GOOD salaries than we can supply.



THIS IS ONE OF THE FEBRUARY 1917 CLASSES



Additional Building and Equipment Factory Co-Operation

Thousands of dollars' worth of new equipment, plenty of room for students to work, at 687-89-91 Woodward Ave., in addition to our building at 11-19 Selden Ave. Our school has grown by leaps and bounds, students come from all over the world. We are constantly adding new equipment. Our electrical department is thorough and complete.

We have completed arrangements with the Auto factories to put them in touch with men who intend going into business for themselves. Men who know the auto business from A to Z are in biggest demand. Remember, the price of course is based on giving full value. Graduates in the complete auto course are competent to handle farm tractors.

Auto Factories Endorse Our School

The Leading Automobile factories in Detroit, as well as in other cities, endorse our school. They have been watching our school and graduates for years and are satisfied. They are putting their latest model, complete chassis in our school for students to work on. They are employing our graduates in their factories and service stations and assisting them in opening garages and salesrooms. They allow our students to go through their factories. They need trained, competent men and are asking for more of our graduates constantly. The Michigan State Auto School in Detroit, the heart of the Auto Industry, is endorsed by the Leading Auto Factories, is receiving their hearty co-operation. What better endorsement could you ask?

Act Quickly—NOW! Fill in the coupon; get full particulars, Illustrated Catalog. All absolutely free. Or better still, jump on the train, as hundreds have done, and come to the "Heart of the Automobile Industry," and learn right. We have no branches. Write or come direct to this school.

Michigan State Auto School

The Old Reliable School
308 Auto Building
687-89-91 Woodward Ave.

A. G. ZELLER, Pres.
DETROIT, MICHIGAN, U. S. A.

SEND THIS COUPON TODAY

MICHIGAN STATE AUTO SCHOOL
308 Auto Bldg., 687-89-91 Woodward Ave.
DETROIT, MICHIGAN, U. S. A.

Gentlemen: Send me absolutely FREE "Auto School News" and New Catalog, or better still, you can expect

me about.....

Name.....

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Our Country needs competent trained
Auto Mechanics in the
Quartermaster's
Dept. and Signal
Corps



A Packard Truck
Used By The
U.S. Government

The United States needs thousands of trucks, transport, aeroplane and motorcycle drivers. Trained competent men are needed, men who can take care of the machines, men who know how to keep them in service. Any piece of motor driven machinery the government owns or will own must be in service. Preference will be given to trained men. No matter what service the Army is doing it must be fed. If it is on the firing line it will need thousands of rounds of ammunition. The importance of trained men is very evident. Food and ammunition must be delivered regularly. Then too, the army must often be transported.

Quartermaster Department and Signal Corps Needs Trained Men

The Michigan State Auto School trains men thoroughly.

Every student learns pleasure cars, trucks, motorcycles and gasoline motors of every kind from A to Z. Graduates of the Michigan State Auto School are in big demand by the leading Automobile plants in Detroit. These factories know from actual experience that our men are thoroughly, completely and practically trained. No matter what happens to a truck or pleasure car, a Michigan State Auto School graduate is competent to repair it. Cars in the care of a graduate give highest efficiency.

This is the kind of men Our Government wants and is daily enlisting. Trained men who will be efficient themselves and keep every bit of motor driven equipment in the most serviceable condition.

This branch of the Army Service pays good salaries. There are wonderful opportunities for clean, clear headed, trained men to advance in the service and certainly now is the time to train.



Aerial View of Motor Truck Group at Ft. Sam Houston, Texas, Major F. H. Pope, Cavalry, Commanding

This view gives an idea of the large number of transport trucks that will be used in our Army. Thousands of trained men are needed and will be needed to care for these machines and keep them operating up to their highest efficiency. Trained men will be given preference and men who graduate from the Michigan State Auto School are now and have been holding big, responsible jobs in Detroit and over the country and will be able to serve their country in the most efficient way.

Thousands of Trained Motor Mechanics Needed in Army

Thousands of Motor Mechanics are needed in the army in the Quartermaster's Dept. and the Signal Corps. Nearly every man must be trained. Hundreds of thousands of men will be taken from every branch of the automobile business. Factories, garages and service stations will be depleted. There will be a crying need for trained men, both in the Army and out of it.

It is essential that an army be made up of the ablest fellows. It is absolutely necessary for men not of conscription age to fill the places left by men going to the front. Never were there such opportunities for men to get ahead in the Auto business. And never were trained men in such demand both in and out of the Army.

Thousands of Trained Motor Mechanics Needed at Home

With the army taking a million and a half men, there will be an enormous drain on the Automobile business. Trained men will be needed to fill the vacated jobs. Men older and younger than 21 to 31 years will step into the work. Trained Auto Mechanics will get the big paying jobs. Factories, service stations, garages, will be paying even higher salaries than ever. Thousands of new cars

are going into service daily. The United States and her Allies are ordering trucks and Autos by the thousands. Can you imagine a better chance to get into a money-making business? The Auto business has been good for years. It is getting better constantly. But right now is the opportunity of a lifetime — Get busy — write for catalog — train now to help Uncle Sam or yourself.

No matter whether you join the colors or stay at home,
you can do your bit best as a trained Auto Mechanic.



*Southern
Pine*

and Interior Beauty.

THE interior beauty of any home depends largely upon the kind of wood selected for the trim, woodwork, and flooring. These three are necessary to properly set off the home furnishings—to make a successful interior.

Southern Pine

"The Wood of Service"

is suitable for all interior work because of its striking grain and soft, beautiful texture. No other wood that grows offers a wider range of choice in figure—there is no monotonous sameness—some of it is large and bold, some fairly uniform, and some delicately engraved.

Southern Pine is bright and attractive, and its general beauty and utility are not surpassed by the most expensive hardwoods. It takes and holds perfectly and permanently, paints, varnishes, and stains.

No effect of richness and beauty in color and tone is beyond the possibilities of the builder with Southern Pine, and all at small cost when quality is considered.

Send today for free booklets—"Directions for Finishing Southern Yellow Pine," and "Beauty Plus Service in Floors." Address Department F-5.

Southern Pine Association

New Orleans, La.



Please Mention Popular Mechanics

Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 28

AUGUST, 1917

No. 2

Continuous Firing Feature of American Gun

ANNOUNCEMENT has been made of the development of an American machine gun capable of continuous firing. Ammunition is carried to its feed block by an endless belt kept filled by an automatic reloading mechanism. Supply hoppers contain from 2,500 to 10,000 cartridges and are replenished or replaced without interfering with operation. Most machine guns fire about 500 shots a minute and are supplied with ammunition by belts holding approximately 250 cartridges. Thus they are able to fire uninterruptedly for only 30 seconds, while the new instrument spits thousands of missiles with-

out pausing, and thereby does the work of two ordinary pieces.



Two Types of the New Machine Gun and Their Respective Use are Illustrated Herewith. The Outstanding Feature of the Rifle Is That It may be Fired Continuously, a Thing Which is Made Possible by a Reloading Mechanism That Keeps the Feed Belts Filled with Cartridges. The Control System Employed Enables an Operator to Aim and Fire the Gun While Concealed in a Protected Place Some Distance from It

REDRAWN FROM PHOTOGRAPH COPYRIGHTED BY A. S. FORD

Somewhat similar to that provided for a motor-car engine is the cooling system that permits prolonged firing of the gun. Water contained in a jacket incasing the barrel is circulated through spiral radiator tubes by a centrifugal pump and cooled by a fan.

For specific purposes the gun is built integral with some vehicle, such as a motorcycle, aeroplane, or motorboat. Instead of being manually operated, its mechanism is motor-driven. The machine that rushes it into action, also mounts and operates it. No time is consumed in assembling or dismantling the piece when seconds are precious. An aeroplane pilot can be his own gunner, for by touching a button with a

finger or foot, the instrument is put into action. For trench use, a special mounting with creeper wheels is provided and an electric-cable control used. This arrangement allows an operator to remain in a protected position and dispatch the gun across "No Man's Land" on its deadly mission. The direction and speed of its movements, as well as its angle and rate of fire, are regulated with buttons. For protecting strategic positions, still another form—this with a tripod mounting—is used. It is possible for the gunner to station himself several hundred feet away, for in this case, also, a control cable may be employed. Such a gun is, of course, not made a part of a vehicle.

4623
**TINY LIGHTHOUSE SIGNALS
 FOR RESTAURANT TABLES**

When patrons in a well-known metropolitan restaurant wish to summon a waiter they are no longer re-



Ornamental Signal for Restaurant Table: By Turning the Button at the Top a Light is Flashed On, Indicating That Service is Desired

quired to wave their hands or call out loudly, for each table is provided with an artistic signal in the form of a miniature lighthouse less than a foot high. Any patron desiring attention merely turns the button at the top, and a red light shows in the lighthouse windows, indicating that service is desired. Either side of the base are holders for matches. The broad support on which the two match holders and the tower rest is fashioned and suitably colored to represent a portion of a cliff or a reef.

4644
NEW AERONAUTIC SCHOOLS

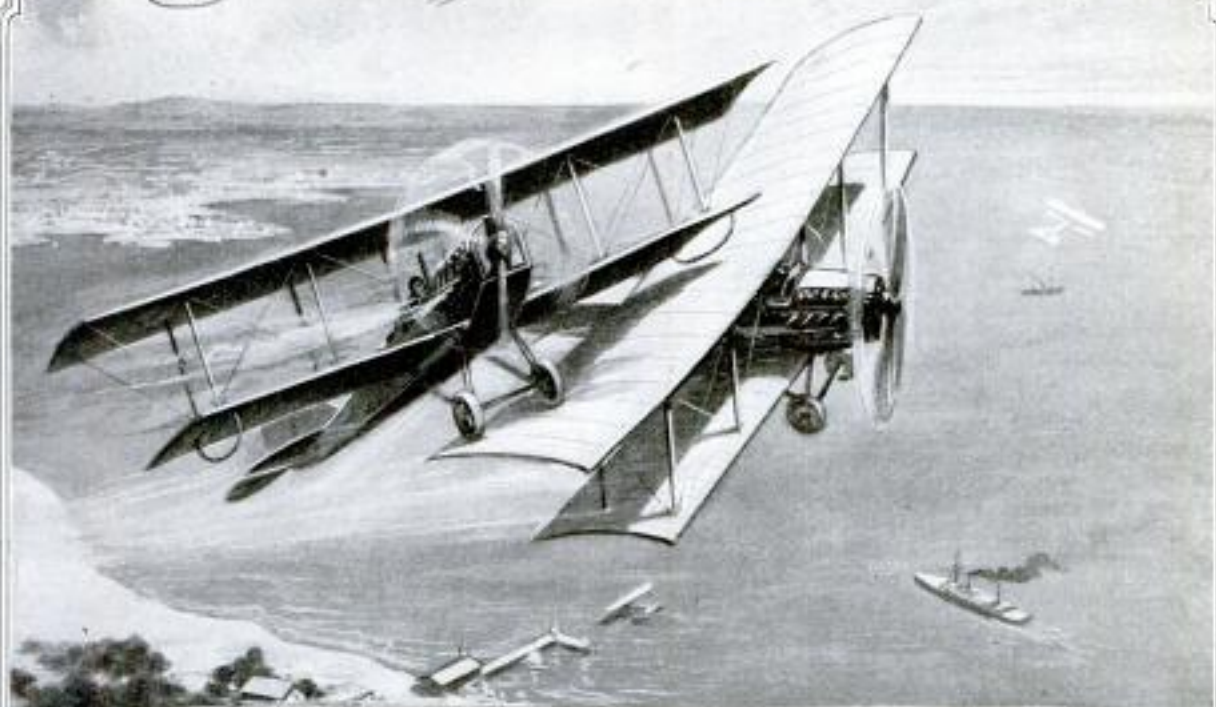
HAVE HIGH STANDARDS

High standards of scholarship are to be maintained in the six government schools in military aeronautics which have recently been opened at the universities of Illinois, Ohio, Texas, California, Cornell, and Massachusetts Institute of Technology. As a special incentive, those who attain a certain grade will be awarded a certificate marked "Passed with Honor." During the first eight weeks of the course, while the pupils remain on the ground, they will study such subjects as the care and operation of engines for air craft, the theory of flight, cross-country and general flying, including meteorology, astronomy, and photography, as well as gunnery and bombing, signaling, and wireless. Each student will be required to pass a written examination before he graduates.

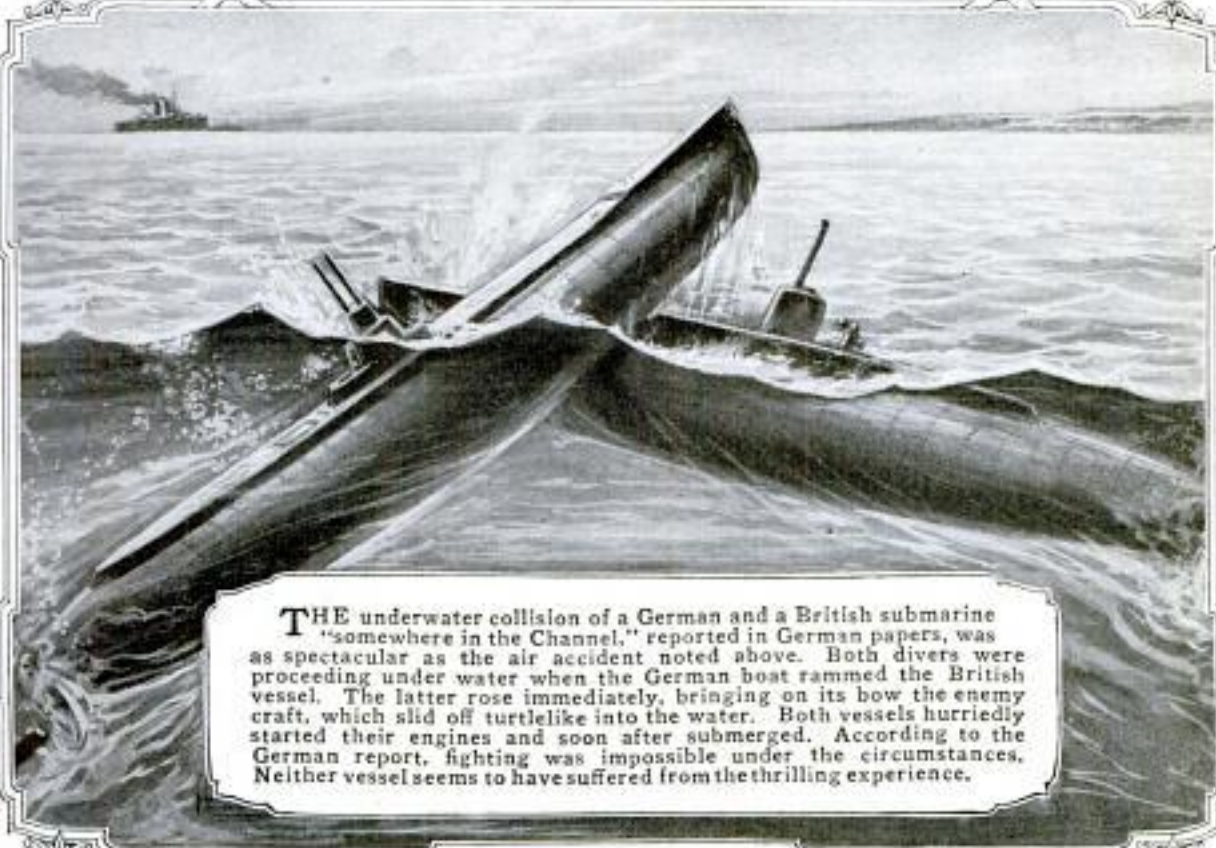
With a view to improving the housing conditions of the poor, the Philippine Health Service has constructed a number of model houses of new fire-proof material consisting of cement, sand, and ipa, or rice husks. These can be built for a little more than the present insanitary dwellings and, it is estimated, will last more than twice as long.

Ernest B. Peiffer
 Hotel Sherman Co.,
 Randolph at Clark St.,
 Ernest Peiffer, Chicago.
 Sec. 11

② Sergeant N. Frey & Flying Instructor
N.B. Robbins, North Island Aviation Sta. 4660
THRILLING MID-AIR AND UNDERWATER COLLISIONS
San Diego, Calif.



ONE of the most remarkable and unusual aviation accidents on record—a collision in the air—occurred recently above San Diego Bay when an officer, flying alone at a 90-mile rate, started to descend. Unaware of another aeroplane just beneath him, he crashed into it. This caused his tractor to dive tail first and then head first, finally plunging into shallow water. The flier almost miraculously escaped injury, while the other machine, after a perilous descent, also alighted in safety.



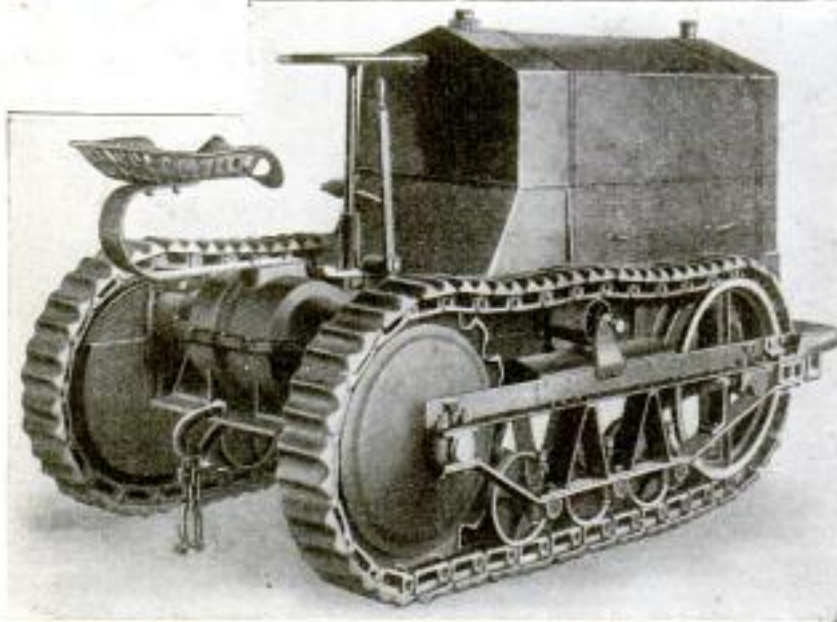
THE underwater collision of a German and a British submarine "somewhere in the Channel," reported in German papers, was as spectacular as the air accident noted above. Both divers were proceeding under water when the German boat rammed the British vessel. The latter rose immediately, bringing on its bow the enemy craft, which slid off turtlelike into the water. Both vessels hurriedly started their engines and soon after submerged. According to the German report, fighting was impossible under the circumstances. Neither vessel seems to have suffered from the thrilling experience.

**LOW-PRICED FARM TRACTOR
HAS ENDLESS-BELT TREADS**

Low first cost and also economy of operation have been sought in the de-

signing of a new tractor for year-around use on farms, in construction camps, etc. The machine is 8 ft. long and approximately 4 ft. wide by 4 ft. high, and can be driven over uneven

ground or through mud and sand, since it travels on two endless corrugated steel belts, 6 in. wide. It is equipped with a four-cylinder engine which delivers 16 hp. to the drawbar. The usual plowing speed is three and one-half miles per hour. Under good conditions the tractor can draw three 14-in. plows, and two when conditions are bad. It is steered by the power of the engine, the steering wheel serving as the means of control. The machine may also be used in many ways as a stationary engine.



Low-Priced Tractor for General Farm or Construction Purposes, Having a Plowing Speed of Three and One-Half Miles per Hour: It can Travel over Uneven Moist Soil or through Sand, and can Draw Two or Three 14-Inch Plows

4613
**FLAG PAINTED ON HOUSE
SHOWS OWNER'S LOYALTY**

A resident of this country, who is a German by birth and not yet a naturalized citizen, is determined that there

shall be no doubt as to where his sympathies are in the present war. Some time ago he hung a large American flag in front of his home, but this was



Flag Painted on Front of Home: Unmistakable Means Which a Foreigner, Residing in This Country, Took to Show Where His Sympathies Are in the Present War

stolen, and so he has gone to the trouble to paint the stars and stripes in a conspicuous space on the front of his residence.

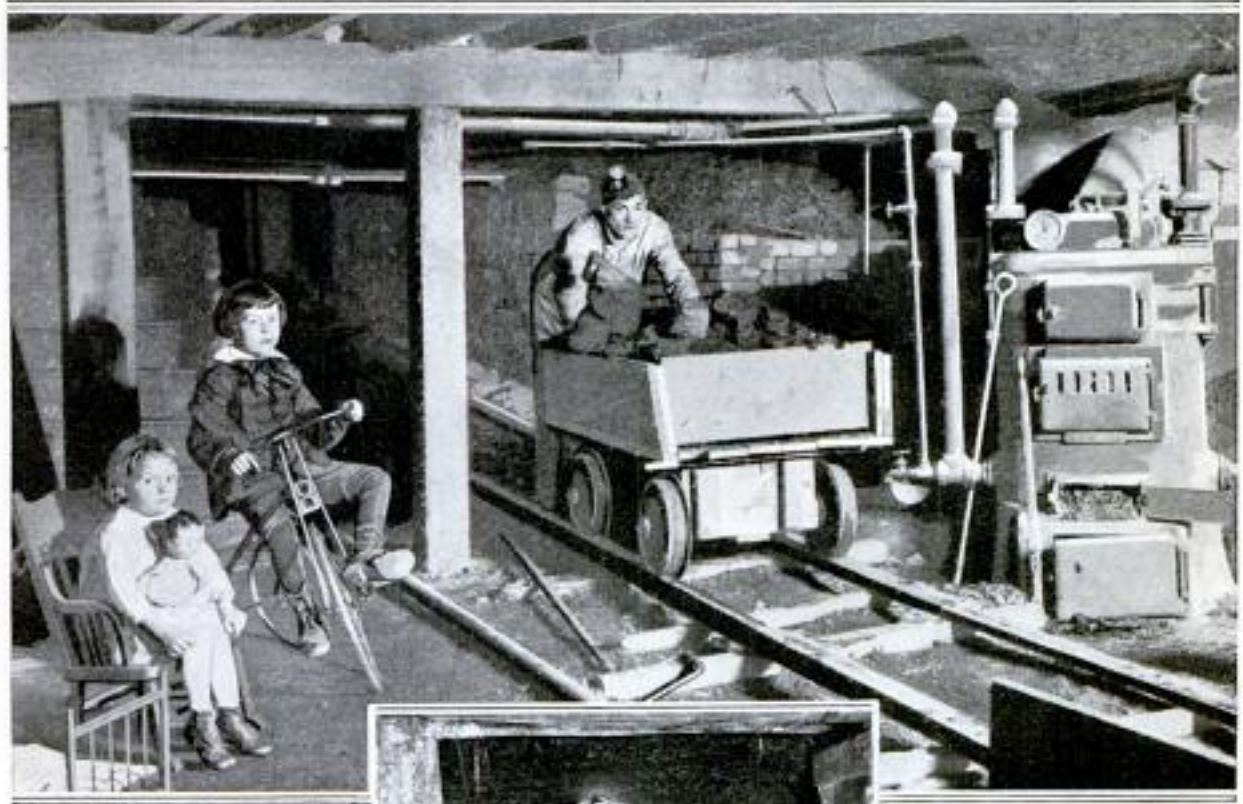
4706
**BUREAU GATHERS WAR DATA
ABOUT INSECTS**

Entomology, that branch of zoölogy which treats of insects, has a much closer relation to war problems than most people realize, and the Bureau of Entomology has asked that pamphlets, circulars, posters, leaflets, etc., pertaining to war phases of this field of science be sent to its offices in Washington, so that they can be assembled and classified for future reference. Among the questions that properly come under this head and have a bearing on the war are those pertaining to the attacks of insects on crops, the prevention of mosquitoes, insects in food and water, and so on. While many publications will not possess material of special scientific value, all will at least have a historic interest.

Wash
D.C.

Edward Arntwein,
New Brunswick, N. J. Copyrighted material

LAWYER HAS COAL MINE NEXT TO HIS FURNACE



Hauling Coal from the Private Mine to the House Furnace: The Wooden Track Leads from the Cellar to the



View in the Gallery Which Now Extends from the Lawyer's Cellar Out toward His Garden

Vein of Coal Discovered When the Cellar was Enlarged. The Children have Come Down to Watch the Miner

A turn of good fortune that has come to a Virginia lawyer, and one which is truly enviable in these times of high prices, is the discovery of a rich coal vein within a few feet of his furnace door. The surprising find was made by a workman who, while enlarging the lawyer's cellar, saw that the character of the dirt in which he was working indicated the presence of coal near by. A little extra digging revealed a vein, 5 ft. high and 4 ft. wide, within 30 ft. of the furnace. To lay in his fuel supply, the lawyer borrowed a mine car from one of the many mining companies in the town and laid a wooden track from his cellar to the vein. The first 15 tons which he mined cost him 30 cents per ton. The entry, or gallery, which has been dug now extends well out toward the lawyer's garden. Unfortunately

all the mining rights in the district are owned by certain concerns and this man is prohibited from selling the coal. He can mine it for his own use, however. A rainy-day pastime of the lawyer's children

has been to watch a miner bring coal from the near-by vein to the cellar.

4579 Ship
SUBMERGED WRECK FOULS LAKE VESSEL

Several weeks ago a car ferry collided with the wooden freighter "John Plankinton," laden with coal, and sent it to the bottom of the river at Detroit. The location of the wreck was marked, but in some strange manner the steel steamer "Wissahickon," bound for Buffalo with a cargo of grain, failed to avoid the danger point one night shortly thereafter. It ran squarely atop

the submerged vessel, crushing what superstructure there was and became fast, its keel extending from stern to bow above the hidden deck. All efforts to release the vessel without assistance were unavailing, and the lighter "Res-



Showing the "Wissahickon" atop the Submerged Coal Boat, and the "Rescue" Alongside, Taking Over Its Cargo

cue" was called upon for aid. The craft came alongside and worked until a large part of the cargo had been removed and the "Wissahickon" lightened sufficiently to float free.

— 4704 —

SHREDDED WASTE PAPER SUPPLANTS EXCELSIOR

A machine has been brought out recently which shreds various kinds of paper that are fed into it, making it into soft material which can be used for packing in place of excelsior, and the like. By utilizing their waste paper in this way, many firms are reducing the cost of preparing fragile goods for shipment.

4590

TINNED-COPPER ROOFING FOUND TO BE DEFECTIVE

An investigation which has been conducted by the Bureau of Standards seems to indicate that tinned copper is not superior in any way to tinplate for roofing material, and in view of the fact that its cost is greater, can no longer compete with it. The examination which led the bureau to this conclusion had to do with the roof of the Library of Congress, which about 1893 was covered with sheet copper, tinned on both sides. Within the last 10 or 15 years a large number of small pits have appeared, some of them extending entirely through the sheets.

Special interest attaches to the case because Washington, and particularly that section of it in which the library is located, is uncommonly free from smoke, and smoke is often a principal factor in hastening the corrosion of such roofing.

Examination showed that the defects were not due to accidental inferiority of the material but are such as may naturally develop in any case. Variation in resistance to corrosion was due in part, it was pointed out, to mechanical abuses, such as scratching and indenting, as well as to variation in the thickness and structure of the coating.

ⓈThe Public Health Service reports that there has been an unusual prevalence of cerebrospinal meningitis and calls attention to the special danger which might result from an epidemic of this malady at this time, since the disease frequently gains entrance to and spreads in troop encampments.

Chas. Expointer
June 1912

Bloomfield & Rabb Co.
108 No. Jefferson St.
Chicago

THE ORGANIZATION AND INSIGNIA OF OUR FIGHTING FORCES

BY SEARLE HENDEE

IN no first-class nation are civilians so grossly unfamiliar with army and navy organization as in America. Our lack of training, and our characteristic indifference to military matters, have brought about a striking situation. We are at war, yet comparatively few of us know what an infantry battalion is, or are able to distinguish between the insignia of a brigadier general and a major. When it comes to the navy, our ignorance is even more profound.

A few moments' study, followed by ordinary observation, will enable almost anyone to overcome his confusion and obtain a rudimental understanding of these subjects.

To commence with, the commissioned line officers of our army and navy rank, in relation to each other, as follows:

General	—Admiral
Lieutenant General	—Vice Admiral
Major General	—Rear Admiral
Brigadier General	—Commodore
Colonel	—Captain
Lieutenant Colonel	—Commander
Major	—Lieutenant Commander
Captain	—Lieutenant
1st Lieutenant	—Lieutenant, Junior Grade
2nd Lieutenant	—Ensign

In the army the rank of general is not held at present. The "Admiral of the Navy" was a title conferred upon George Dewey by a special act of congress. It died with him. Commodores are on the retired list only. Right now the highest ranking officer of our army is a major general. The office of general exists only when specially created by congress, and has been filled but four times in our history. In 1903, an act was approved that created the general-staff corps and the office of chief of staff. It provided that the latter should have supervision of all troops of the line and of certain enumerated staff corps. As a result of

this legislation, no person has held the office of commanding general of the army since the act became effective. Four years later legislation was enacted that abolished the office of lieutenant general.

A field army, which theoretically consists of headquarters, two or more infantry divisions, one or more cavalry brigades or a cavalry division, a field-artillery brigade, one telegraph battalion, one field-signal battalion, and ammunition, supply, engineer, and sanitary trains, is under the command of a major general. An officer of the same rank is at the head of an infantry division. The latter, as described by the recently enacted Hay bill, is composed of a headquarters, three infantry brigades, a cavalry regiment, an artillery brigade, an engineer regiment, a field-signal battalion, one aero squadron, and various trains.

In the cavalry the structure is similar, a division representing, in addition to headquarters, three cavalry brigades, a regiment of field artillery (horse), a battalion of mounted engineers, a mounted signal battalion, an aero squadron, and trains.

As his title implies, a brigadier general has charge of a brigade. The unit is typically composed of headquarters, three infantry regiments, or three cavalry regiments, according to the branch.

A regiment of infantry is commanded by a colonel, and made up of one headquarters company, a machine-gun company, one supply company, and three battalions. Each of the latter is in charge of a major, and consists of four companies composed of 100 enlisted men, including noncommissioned officers, who are divided into several platoons commanded by lieutenants or sergeants. A corporal, in rank the lowest noncommissioned officer, has charge of a squad consisting of eight men, including himself. In the cavalry the troop and the squadron correspond,

respectively, to the company and the battalion in the infantry. The term battery in the field artillery is analogous to the company in the infantry.

Established regulations specify the duties that may be assumed by naval officers of each grade. Thus, for instance:

An admiral commands a fleet, or may be chief of naval operations.

A vice admiral commands a squadron, or a large force or detachment on important, independent duty, or may be second in command of a fleet.

A rear admiral has charge of a squadron, division, or a force or detachment on independent duty, or a naval station.

To a captain may fall the command of a division, squadron, destroyer or submarine flotilla, naval station, battleship, armored cruiser, or first-rate ship. He may also be chief of a flag officer's staff.

A commander may be in charge of a division, squadron, naval station, battleship, armored cruiser, or a first, second, or third-rate ship. Furthermore, he may be placed in charge of a destroyer or submarine flotilla, an unrated ship, or be assigned to serve as chief of staff for some flag officer, as fleet engineer, or as executive officer of an armored cruiser or battleship.

The lieutenant commander may take control of a destroyer or submarine flotilla or group, or command a third or fourth-rate ship, or a destroyer. On battleships or cruisers in charge of captains, he may act as navigator, or executive, gunnery, or engineer officer. Lieutenant commanders also act as flag secretaries on a commander-in-chief's staff, or as gunnery officers of fleets.

A fourth-rate ship may be under the command of a lieutenant. This rank also permits an officer to take charge of a torpedo boat, a submarine, or a division of them; to command a destroyer, unrated ship, tender, or tug; to be navigator, or executive, gunnery, engineer, or watch officer on a vessel commanded by a superior, and to act as a flag officer's aide, or be a flag lieutenant.

For the lieutenant of the junior grade is the command of a torpedo boat, submarine, unrated ship, a tug, or a tender. He may also be assigned to a ship commanded by a superior and given such posts as fall to a lieutenant under like circumstances, or be made aide to a division commander. An ensign, a commissioned officer of the lowest rank, may command the same list of vessels, or serve aboard a superior officer's vessel in about the same capacities as a lieutenant, or as a junior officer under a lieutenant.

Midshipmen on duty afloat outrank all officers who are not commissioned. They may be given watches, or assigned to division or other duties.

Boatswains, gunners, and machinists are classified as warrant officers of the line and appointed by the secretary of the navy from among those who successfully pass certain examinations. Commissions raising them next to the ensign in rank and prefixing "chief" to their titles, are given by the president after they have spent six years in the service and qualified themselves for promotion. A boatswain has charge of the rigging, anchors, cables, and cordage on a war vessel, and summons and directs members of the crew when certain duties are to be performed.

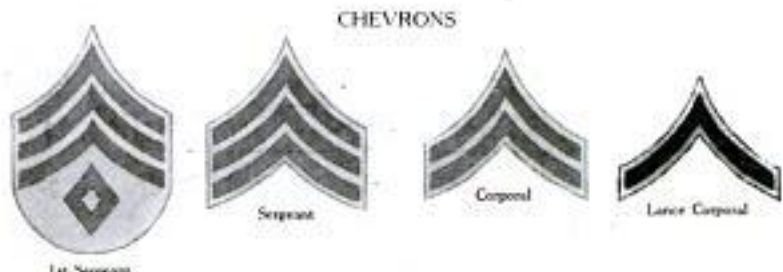
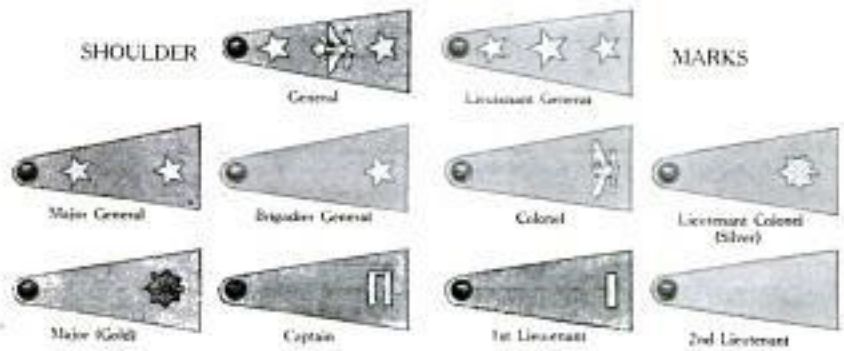
Gunners have charge of a ship's ordnance. The machinist is an assistant to the senior engineer officer, who may be a lieutenant commander, lieutenant, or ensign. Most of the warrant officers are former enlisted men. By passing examinations and receiving appointments it is possible for them to obtain commissions as ensigns, which place them on a footing with graduates of the naval academy and in line for promotion to higher ranks.

At the top of the enlisted personnel are the chief petty officers and first, second, and third-class petty officers, who are analogous to the noncommissioned officers of the army. They are appointed by a captain and may be disgraced by him. In addition to these, in the seaman's branch just indicated, there is the master-at-arms, who is responsible for the maintenance of order,

INSIGNIA WORN BY SOLDIERS TO INDICATE BOTH THEIR RANK AND BRANCH OF SERVICE



Cap Device, Com-
missioned Officers



* Coast Artillery Corps





MARKS SHOWING RANK OF COMMISSIONED AND WARRANT OFFICERS IN U. S. NAVY

Cap Device, Commissioned Officers



NAVAL OFFICERS' COLLAR DEVICES



COLLAR DEVICES

Admiral



Vice Admiral



Rear Admiral



Captain



Commander



Lieutenant Commander



Lieutenant



Lieutenant, Junior Grade



Ensign



Chaplain



Chief Boatswain



Chief Gunner



Chief Mechanic

SHOULDER MARKS



Admiral



Vice Admiral



Rear Admiral



Captain



Commander



Lieutenant Commander



Lieutenant



Lieutenant, Junior Grade



Ensign



Chaplain



Chief Boatswain



Chief Gunner



Chief Mechanic

SLEEVE MARKS

MARKS



Vice Admiral



Rear Admiral



Admiral



Commander



Lieutenant Commander



Lieutenant



Lieutenant, Junior Grade



Captain



Chief Boatswain, Gunner, Machinist



Boatswain, Gunner, Machinist



Ensign

for the discipline, and for the custody of prisoners on a man-of-war. The chief master-at-arms, who is a chief petty officer, is the head of a vessel's police. A coxswain has command of a ship's boat in the absence of a higher officer, and steers when it is in the water. In the navy, a quartermaster is a petty officer and therefore of widely different rank from that of the commissioned officer in the army who bears a like title. He is under the direction of the navigator and looks after the helm, binnacle, signals, and similar things. A gun captain is appointed by the commanding officer of a ship and is in charge of a gun's crew. In command of a turret crew is a turret captain, a chief or first-class petty officer who ranks next to the officer while on duty. An electrician can also be given rank. All of these officerships are grades to which capable seamen in good standing are eligible for appointment. It will be remembered, however, that a recruit is an apprentice seaman, and through promotion must become an ordinary seaman, and then a seaman, before he

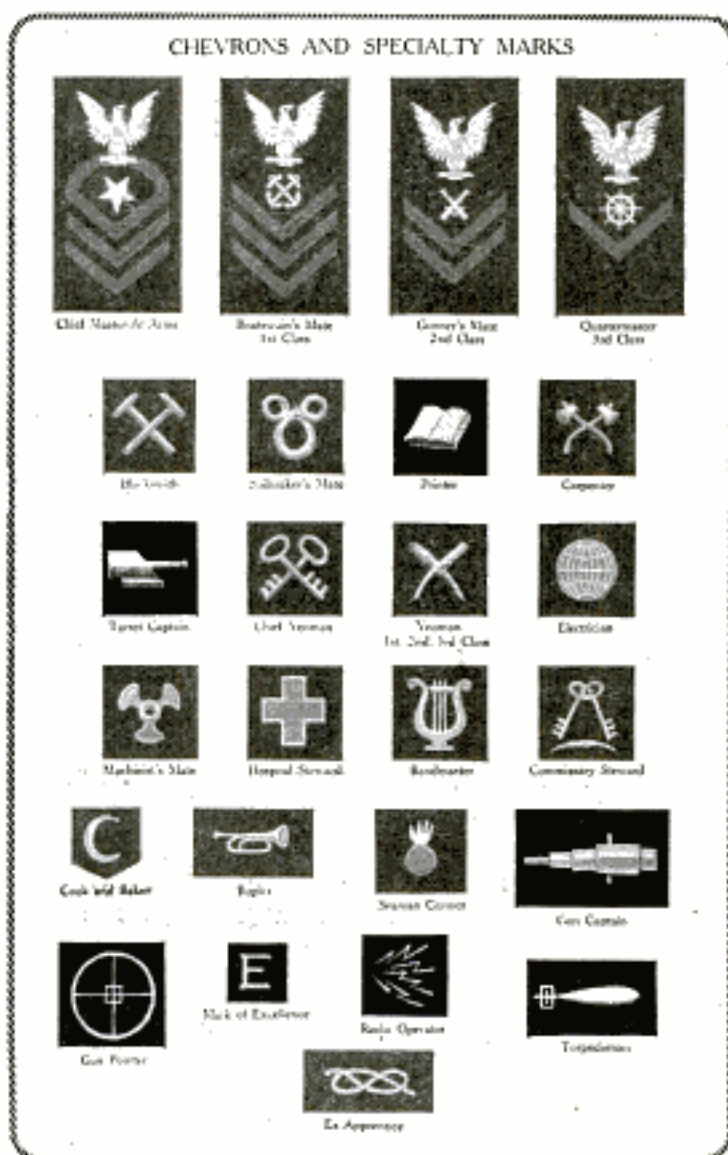
is due for elevation to the rank of petty officer.

The engineer force, which is now included in the line, is separated into the engine-room and fire-room divisions.

Under the first group come the machinist's mates, who are petty officers of the chief, first, and second classes. Chief water tenders and water tenders are chief and first-class petty officers in the fire room charged with the duty of attending to the water in the boilers and seeing that the firing is done properly.

Our sea force is divided into three fleets, the Atlantic, with headquarters on the east coast; the Pacific, detailed on the west coast, and the Asiatic, stationed at the Philippines. Theoretically, a fleet consists

of two or more squadrons. A squadron, in the United States Navy, is regarded as a tactical unit and comprises about eight ships. Fleets and large squadrons are separated into divisions, consisting usually of four vessels. A flotilla is an organization of divisions or groups of destroyers, submarines, or other small craft.



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At the Top are Illustrated in Order the Chevrons Worn by Chief, First, Second, and Third-Class Petty Officers of the United States Navy. Enlisted Men of Such Rank Correspond to the Noncommissioned Officers of the Army. The Devices Worn with the Chevrons Are Specialty Marks, Others of Which Are Also Pictured

WATER WHEEL IS FEATURE OF NEW LAWN SPRINKLER

A distinctly new type of lawn sprinkler has been brought out, which, it is claimed, will cover times as much

four or five ground at one setting as the ordinary sprinkler, and throws the



Lawn Sprinkler Which will Cover Four or Five Times as Much Ground as an Ordinary Sprinkler: The Curved Arm and Water Wheel are Swung Round in a Circle. The Hose is so Attached That It does Not Become Twisted

water in small drops in such a way that it falls much like rain. The spray is produced by a water wheel which is revolved by directing a stream from the hose against its upper edge. The wheel is mounted at the end of a curved arm, to which the hose is also attached, and as it turns it operates gearing connected with the upright

standard of the sprinkler. This gearing causes the arm to revolve so that the area within a large circle is sprayed repeatedly.

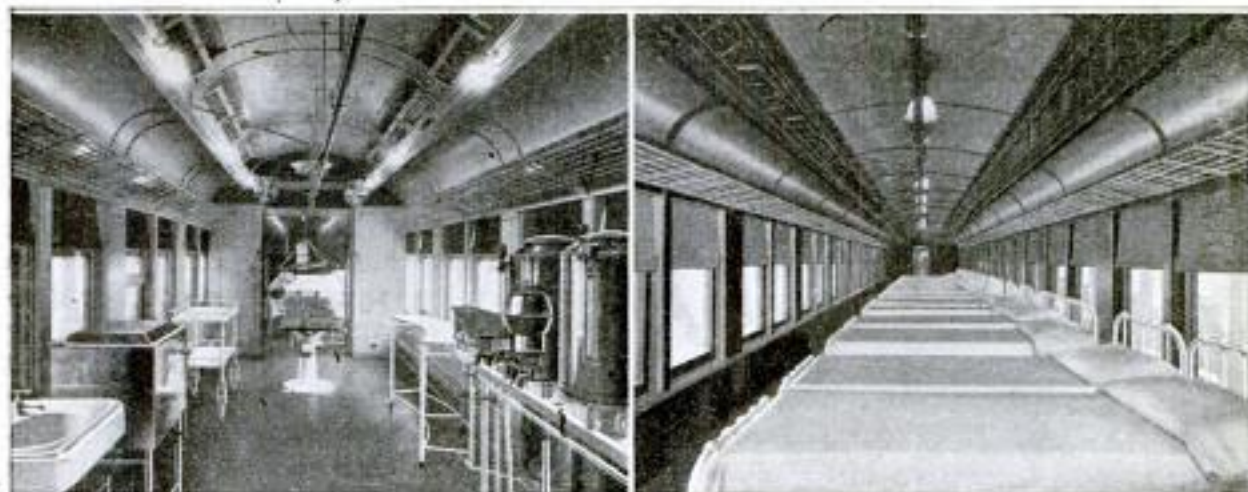
— 4558

NEW EXCAVATING MACHINE SERVES MANY PURPOSES

To take the place of the time-honored scraper for road grading, and similar work, a self-loading excavator has been developed that appears to have merit. It is claimed to reduce by about two-thirds the usual cost of making cuts and fills. Four horses, or a light tractor, pull the machine, and one man is able to control it. Essentially the outfit is a low-swung wagon with an adjustable bed, the bottom of which is an endless-belt conveyor. At the front is a scraper that peels the ground when the apparatus is inclined. One and three-fourths cubic yards of earth can be excavated and loaded, it is said, in about 20 seconds. The machine is designed to dump in one spot, or distribute dirt evenly across some low place that needs filling. This feature makes it useful as an agricultural implement, for it enables rich soil, that has been washed into depressions, to be recovered and deposited on thin spots, and manure to be spread for fertilizing purposes.



The Self-Loading Excavator, Which Peels Up One and Three-Quarters Cubic Yards of Dirt in About 20 Seconds, is Said to Reduce the Cost of Road Grading, Making Cuts and Fills, and Doing Similar Work, Nearly Two-Thirds. A Battery of the Machines in Use, and a Close View of One of Them, Appear Above



Left: View of Operating Room in Maryland's Hospital Train. Showing the Overhead Trolley and a Suspended Stretcher, at the Far End, by Which a Patient can be Conveyed to and from the Operating Table. Right: Interior of the Dormitory Car of the Hospital Train

4588

STATE'S HOSPITAL TRAIN READY FOR WAR SERVICE

A complete hospital train, equipped in an up-to-date manner for modern war service, has been furnished by the state of Maryland to carry wounded soldiers, sailors, and others, to our base hospitals. The train consists of a Pullman express and dining car, a dormitory coach, and an operating car. A special feature is an overhead trolley running through the cars, by which a patient, when placed on a suspended stretcher, can be conveyed with ease to or from the operating room. The same apparatus can be used in conveying trays back and forth. Electric lights and fans, a call bell for each bed, and screens for the doors and windows, are provided for the comfort of the sufferers in whose service the train will be employed. In the operating room are a regulation operating table, sterilizers, linen chests, etc. The cars are the gift of the Western Maryland, the Pennsylvania, and the Baltimore and Ohio railroads.

4631

CITY LOT ON HILLSIDE TERRACED FOR GARDEN

An example of gardening which should be a stimulus to the owners of sloping plots of ground, is a lot, 150 ft. deep, on a steep hillside in the heart of a city of 500,000 people. This piece has been terraced its full length,

secondhand lumber being used in making the retaining walls. Vines have been set out next to the walls to help hold the soil back, and most of the



City Lot on Steep Hillside Terraced Its Full Length and Utilized for Raising Fruit and Vegetables: Being a South Exposure, the Vegetation Grows Rapidly

level spaces have been planted with vegetables and fruit trees, except at the top where there is a poultry yard.

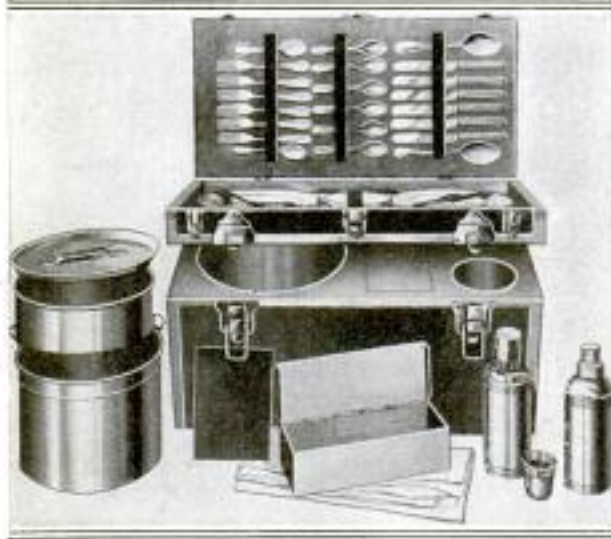
☞ An automobile concern has offered to accept Liberty Bonds in payment for cars bought, a premium of \$2 per \$100 being allowed to the purchaser.

National Clock & Mfg. Co.
20 W. Lake St. Chicago.
4605 POPULAR MECHANICS

Camping
174

MOTOR-CAR CANTEN BUILT IN COMPACT FORM

For the motor tourist, camper, or power-boat enthusiast, a fireless-cooker kitchenette outfit, completely equipped



With 14-Quart Cooking Capacity and Table Accessories for Six Persons, This Lunch Outfit Is Only 25½ Inches Long, 13 Inches Wide, and 15 Inches High

to meet the needs of six persons, is a serviceable and convenient accessory. Such a unit has been introduced lately and is so constructed that it may be satisfactorily carried on the runboard of a car. It provides a 10-qt. kettle and a 4-qt. inset for the preparation of different foods; a cold box for meats, butter, and similar things, and vacuum bottles for hot and cold beverages. In addition, a special compartment is supplied with silverware and dishes. Compactness is another of its agreeable features.

— 4663

A SIMPLE ROTARY SHELL PAINTER

The manufacture of high-explosive shells and shrapnel is by far a bigger proposition than the loading of such projectiles, and entails many painstaking and delicate operations, some of which, though apparently simple, have necessitated the development of many unusual processes of performing certain tasks.

Just prior to the shipment of the completed shells to the plant, or ar-

senal, at which they are to be loaded with explosives, the inside of the shells is given a thin coat of varnish, primarily to guard against rusting of the carefully finished surfaces within the shell. This is one of the apparently simple tasks which has proven to be exceedingly annoying, and hard to reconcile to the high efficiency developed in the more difficult machining processes performed during the stages of the evolution of a finished shell from the crude forging or block of metal. The coating of varnish must be uniform and thin and must be carefully applied.

A machine has been constructed whose simple operation has been accomplished by two boys, not necessarily unskilled, but just ordinary shop boys. Briefly, the machine consists of a horizontal rotating shaft, carrying four shell-holding spindles. Each spindle is kept turning by the revolving shaft, through suitable gearing. At the end of each spindle is a cuplike receptacle in which the shell is inserted for the painting process.

The operation is even more simple. One boy inserts the shell into the cup, while a second boy sprays the inside, using a sort of atomizer supplied from a tank under pressure. The first boy then removes the painted shell and inserts another while the sprayer is doing the second, and so on. The steady rotating of the shells permits a very fine spray of varnish to be evenly distributed over the inside of the shells. These two boys can varnish about 400 shells in an hour.

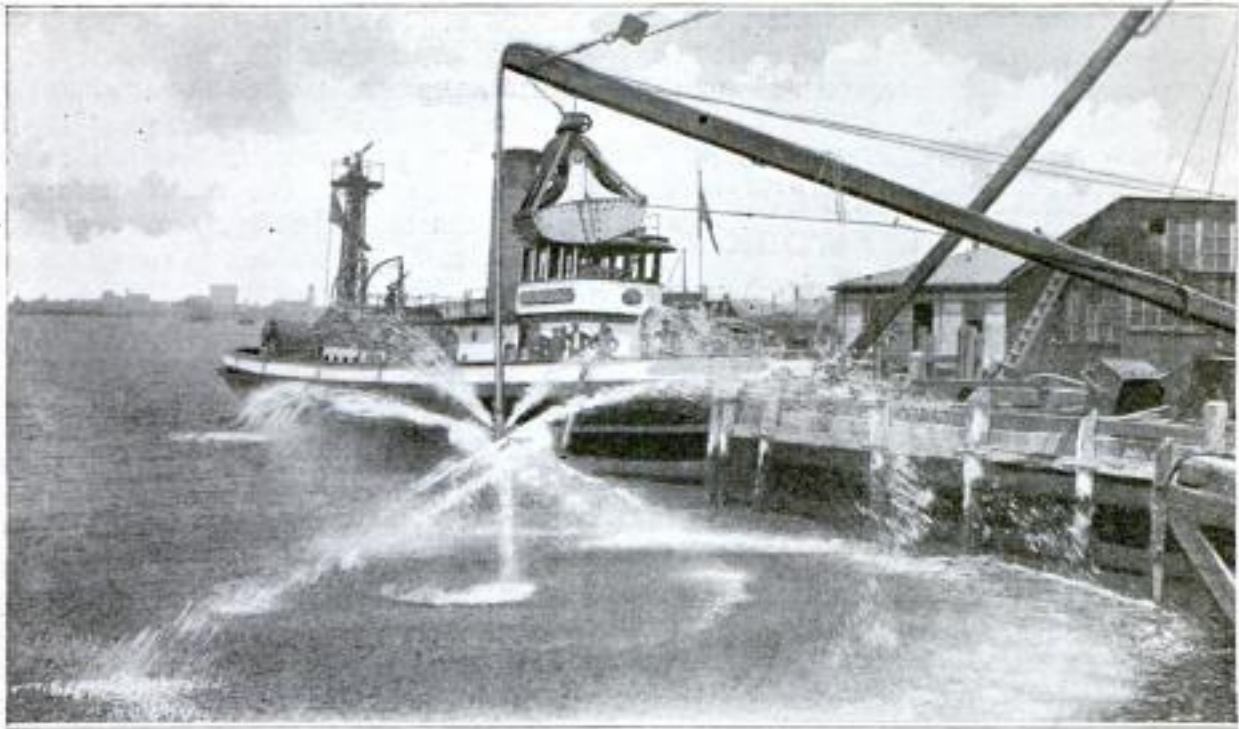


COURTESY OF MACHINERY
With This Machine Two Boys can Spray a Varnish Coating on the Inside of 400 Shells per Hour

Vermont Cannon Works.
Bellevue Falls, Vt.

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Jas W. Hefferman, Chf. 3rd Battalion
533 1st St. Brooklyn
4617 **POPULAR MECHANICS** *175*
N.Y.



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Putting the New Revolving Fire-Fighting Nozzle through Tests: It is Designed for Combating Blazes in the Holds of Ships and Spreads Water over an Area 125 Feet Square

True Note
REVOLVING NOZZLE HURLS WATER OVER LARGE AREA

Although intended particularly for fighting fires in the holds of ships, a revolving nozzle, lately subjected to tests, seems well adapted for combating conflagrations in other places difficult of access. When fire starts below a vessel's main deck it is sometimes impossible to direct a stream of water upon all parts of it through a hatchway with ordinary equipment. Because of its angle, the water strikes the lower decks only a short distance from the hatch opening and thus fails to reach a blaze that is back near the bulkhead. The new nozzle is especially designed to meet this problem. Radiating at different points about its periphery are nine outlet pipes of diameters ranging from $\frac{1}{2}$ to $1\frac{1}{8}$ in. that discharge at various angles. When attached to a $3\frac{1}{2}$ -in. hose with the water at a pressure of 40 lb., the nozzle delivers about 1,400 gal. a minute. It has proved most efficient when making one revolution every four seconds.

4655
DEVICE WRITES JAPANESE ADS IN WATER ON STREET

That the ingenuity of people in the Orient sometimes finds expression through thoroughly modern channels is demonstrated by a sprinkler, employed in Osaka, Japan, which writes advertisements in water on the road-



Water Sprinkler Provided with Perforated Revolving Drum That Traces Advertisements in Water on the Roadway

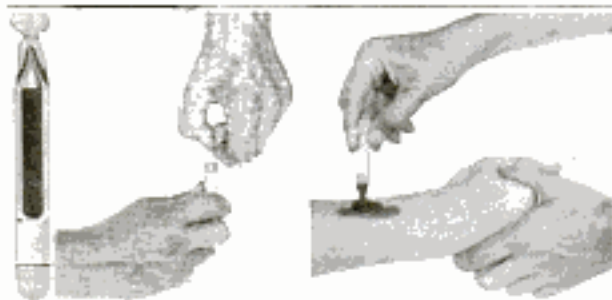
way, as it is drawn along by man power. Solidly mounted on the axles of a two-wheel cart is a per-

H. H. Hibberd
Glasgow, Pa.
67 d
 Copyrighted material
1911

forated drum, filled with water, which revolves with the wheels and as it does so, traces oriental characters along the thoroughfare.

4636
SANITARY IODINE SWAB FOR FIRST-AID WORK

A first-aid appliance of much value, both to the surgeon at the front and the physician engaged in private prac-

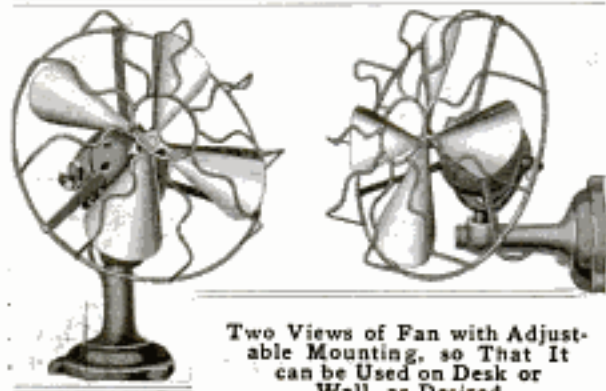


Iodine Swab Consisting of Hermetically Sealed Phial Inclosed in a Woven Case, One End of Which Serves as a Brush: To Use, the Pointed End is Broken, Releasing the Liquid

tice, is a swab consisting of a hermetically sealed phial containing enough iodine for one application and inclosed in a woven case, one end of which serves as a brush. When the sterilizing liquid is wanted, the brush end of the tube, which is pointed, is broken between the thumb and finger, after which the iodine can be painted over as large an area as desired.

4638
CONVENIENT ELECTRIC FAN FOR WALL OR DESK USE

An electric fan of new design has recently been brought out, which will run on either alternating or direct current and is especially convenient, be-



Two Views of Fan with Adjustable Mounting, so That It can be Used on Desk or Wall, as Desired

cause it can be instantly converted from a desk fan to a wall fan without using additional parts. When screwed to the wall a special locking device with which it is provided, holds the fan at the proper angle. The mechanism has full trunnion-and-swivel movements, and a two-speed switch is provided in the base.

4658
FLOODS AND IRRIGATION CAUSE LOSS OF FISH

Because a large number of fish were killed by being carried over the Roosevelt dam during last spring's floods it has been suggested that a screen be placed several hundred feet upstream from the dam to prevent such loss in the future. By such means the fish would be kept from getting too close to the spillways. Large quantities of fish have been killed also by diverting water from the Colorado River for irrigation purposes. The Bureau of Fisheries found that in one locality the bed of the stream had been left entirely dry, causing a loss, it is said, of tons of fish. An investigation of the Salt River irrigation project in Arizona showed that no fish were lost there because the ditches always contained sufficient water to enable the fish to return to the river.

Was
 etc

4695
MANY THOUSAND SHINGLES SHIPPED BY PARCEL POST

A western lumber company made exceptional use of the parcel-post system not long ago when it shipped a consignment of 30,000 shingles through the mails. The destination of the shingles was 52 miles from the shipping point, and the postal charges were less than \$50. Although a shipment of this size is uncommon, the parcel post is frequently used in the western states to send supplies to remote places in the stock-raising country as well as to the mines, many of which are far from the beaten paths of travel, and so have no adequate railway facilities. The lot of shingles referred to went via a star rural-delivery route.

M. Boker & Co., Inc.,
 101 Duane St.
 New York

Madison Lbr Co.,
 Brangerville
 Idaho.
 Copyrighted material



A Dry-Land Swimming Lesson—First Position: Body of Pupil is Supported so That She can Extend Her Hands Forward, While Rings Support the Feet



Learning the Leg Movements: After This Group Training, Each Pupil Uses the "Waterless Swimming Device," First on Land and Later Suspended above the Water. Finally He is Let Down into the Water and Goes Through the Exercises. With Such Preliminaries Real Swimming Soon Becomes Natural



Second Position: Arms are Swung Back so That They Extend Horizontally and at Right Angles with the Sides, Palms toward the Feet, Which Remain in First Position



Third Position: Hands are Drawn Up under Breast, with Palms Together, While Knees are Drawn Forward. Note Position of Feet Also



Fourth Position: The Kick has Just been Made, Spreading the Legs Apart. Arms are Extended Downward, Preparatory to Assuming First Position



An Elementary Swimming Lesson: A Physical Instructor in the Schools at Belleville, Ill., has Had Excellent Results in Carrying Out His Theory That Children could More Easily Learn to Swim if They were Taught the Fundamentals on Land. Here Is a Group of Children Practicing the Arm Movements, Which Each will Apply Later While Suspended in the Device Shown in the Smaller Views

NOVEL SYMBOLS EMPLOYED AT BALL-PARK OPENING

A huge plaster-of-Paris baseball, filled with sparkling liquid, took the



Christening a Ball Park for Employees of Shipbuilding Firms: Above, the Tiny Ship, Sliding down a Wire Leading from the Grand Stand to the Home Plate. The Lower View Shows Result of Collision with Liquid-Filled Ball

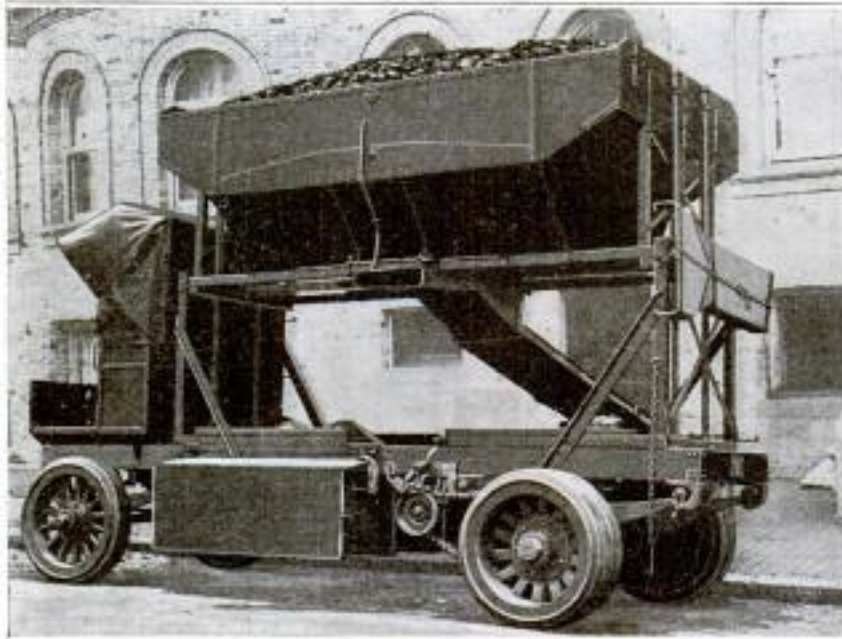
place of a bottle of champagne, and a model of an ocean liner served in place of a real boat, in a most unusual christening which marked the recent opening of a ball park, laid out for teams representing large shipbuilding firms at Seattle. The ball was placed on the home plate and the ship concealed behind a flag on top of the grand stand. When the flag was unfurled, revealing the ship, the latter was released from its support and began to slide down a wire which extended to the home plate. As the ship neared the ground it struck the big ball and broke it, spilling its contents on the diamond, which was thereupon turned over to the players representing the shipbuilding concerns.

4211

HOIST SCREWS RAISE BODY OF SELF-EMPTYING TRUCK

The important feature of the six-ton self-emptying electric truck shown in the accompanying illustration is

that the hopper body can be lifted in a level position to a height of 10 ft. by means of hoist screws situated near



View of Six-Ton Electric Truck Showing Body Elevated by Hoist Screws to a Height of 10 Feet, so That It can be Emptied by Gravity

the four corners. These screws are operated by a special electric motor. The advantage of this form of construction over the common tilting body is that even when a long chute is employed it can be set at enough of an incline to feed the coal by gravity. Thus, when the truck is placed at the curb the coal can be fed across a wide sidewalk or strip of lawn and no carrying or shoveling is necessary. The amount of time saved in this way is also of importance.

General Vehicle Co., Inc.
Long Island City, N. Y.

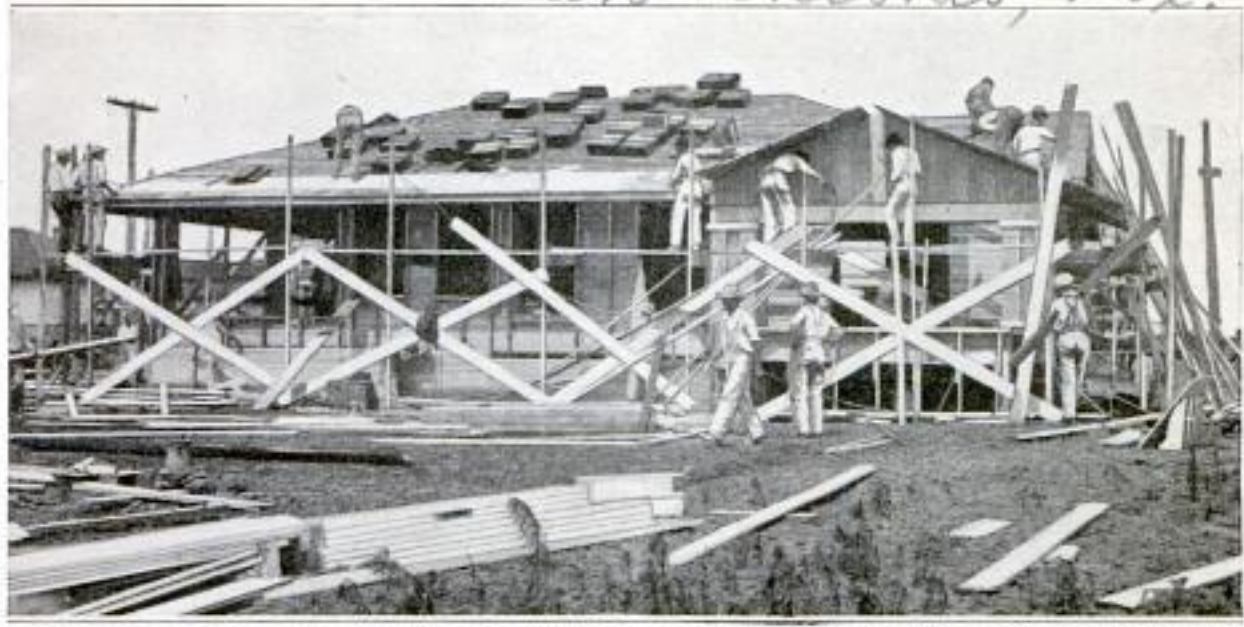
Sidney E. Gordon, 628 Elmira st.

4586

POPULAR MECHANICS

179

San Antonio, Tex.



A "Built-in-a-Day" Bungalow as It Appeared Two Hours After Its Construction had Begun: Among the Big Crews of Workmen Employed Were 31 Carpenters

PLEASING BUNGALOW BUILT IN EIGHT HOURS

A bungalow, valued at \$6,000 when furnished, sprang up like a mushroom in a southern city not long ago, only eight hours and 15 minutes being required to construct it from foundation to shingled roof. Work on the dwelling began at eight o'clock in the morning, and during the busy hours that fol-

lowed, 31 carpenters, 14 common laborers, five plumbers, four electricians, and three painters were employed on the job. The bungalow was offered as a prize for the best discussion of the topic, "Why I should Own My Own Home," and was a prominent feature of a home-ownership campaign. Only



The Bungalow at Four O'Clock on the Same Day: All Materials and Furnishings were Donated by Local Concerns. The Completed Home is Valued at \$6,000

those who had families dependent on them and did not own their homes were allowed to compete. All materials used in the construction, the fixtures, and the furnishings were donated by local merchants and manufacturers.

4484
**LIGHTED TRAP SHOWS FISH
 STILL LIVE IN LAKE**

In recent years practically no fish have been caught or seen in Devils Lake, N. D., though 20 years and more ago many varieties were plentiful there.



This View Shows the Screen Funnel Removed and the Electric Light Which Lures the Fish into the Trap

The present condition appears particularly strange in view of the fact that during the past three years the state Bureau of Fisheries has placed some 20,000,000 pike, yellow-perch, and black-bass fry in the lake. Some investiga-

tors have come to the conclusion that the older fish, at least, have escaped through a newly formed subterranean outlet. But that many of the fish put in by the bureau still remain has been proven by the use of an especially constructed fish trap. It consists of a wooden box, 2 ft. long, 1 ft. wide, and



The Six Concrete Tanks, Each Containing a Different Proportion of Brackish Lake Water, in Which the Minnows are Placed Successively to Acclimate Them to the Lake

1 ft. high, in one end of which is inserted a wire-mesh funnel with its small end, 3 in. in diameter, pointing inward. Within the box, directly opposite the entrance, is an electric light supplied with current by an automobile storage battery. All the electrical connections are made thoroughly waterproof. By lowering the trap into the water and turning on the light, small specimens of all the varieties that had been placed in the lake have been secured, many being caught in the deepest parts. It is believed that, in time, systematic restocking will make the lake a good fishing place once more. The water is brackish, however, and to acclimate the hatchery minnows to it, it is necessary to provide a series of six concrete tanks. The tank in which the minnows are placed first contains a small proportion of lake water, while in each succeeding reservoir the proportion is increased. The fish reach the last tank at the end of six days, after which they can be placed in undiluted lake water without injury.

4545
**NEW BRIDGE SUPPORTS OLD
 STEELWORK DURING RAZING**

After the new superstructure of the Union Pacific bridge across the Missouri River, at Omaha, had been slipped into place on the original stone piers some months ago, the dismantling of the former one, which had been moved onto timber supports alongside, presented an interesting problem. It was realized that, at its flood stage, the river would sweep away the temporary falsework and any additional piling that might be driven. The period of high water was near, and the danger of the old superstructure falling and damaging the bridge was therefore imminent. In working out the engineering puzzle, each span of the new bridge was made to help support the discarded one corresponding to it. At regular intervals, heavy trusses were placed beneath both. This amounted to putting the old spans on brackets extended out from the new ones. A track was built along the top chords of the bridge for



Showing Operations in Progress before Flood Time: The Old Superstructure is Supported on Temporary Piers and by Trusses Anchored to the New Bridge

the accommodation of a traveling crane. As the steelwork was dismantled, the parts were swung to cars waiting on the tracks below. Much of the work was accomplished in this way before the river reached its high level. One of the temporary piers was eventually washed out, however, and two of the old spans fell into the water, but without injuring the bridge.

4669

PINHOLE IN WATER PIPE SOON PROVES COSTLY

Information recently circulated by the water department of a small municipality where meters are used, shows the importance of discovering and mending leaks that may occur in a piping system. Under a pressure of 40 lb. it is estimated that, in 24 hours, 170 gal. of water will pass through a hole a shade larger than the period at the end of this sentence. An orifice slightly bigger than the head of a pin will permit 3,600 gal. to escape in a similar length of time. Thus, ever so slight a hole may cause the wastage of a great volume of water if it fails to receive immediate attention. It is easy to test a plumbing system and ascertain its condition. This may be done by closing all cocks and then reading the meter. If, after a half hour or more, the meter reads the same as originally, the pipes are free from leaks.

Water Dept.,
Evanston, Ill.

FRUIT GROWERS USE TOWER TO FIGHT FROST

Frost fighters of the Rogue River Valley, Ore., recently used a wireless tower to obtain information concerning the probable amount of fuel and labor necessary to heat their orchards on cold nights.

Sets of carefully housed recording thermometers and thermographs were exposed at the top of a 300-ft. wireless-sta-



Placing Instruments in Shelters for Hoisting to the Top and Middle of Wireless Tower Used as a Meteorological Observatory by Oregon Fruit Growers; Below are Shown the Housings Used for the Instruments

tion tower; another set at the middle, and still another at the base. On nights when all three sets of instruments recorded nearly alike, the inference was that there was a great depth of air to heat, as cold air from aloft would constantly descend to replace the heated air. On such nights the frost could not be successfully combated, if severe.

However, if the instruments on the tower showed temperatures progressively warmer with altitude, the inference was that the surface cold air was a thin layer, due to radiation, and it was only necessary to heat this to obtain safety.

The latter is the usual, or average, condition according to meteorologists,

4544

CALCULATING ATTACHMENT FOR TYPEWRITERS

A new mechanical calculator has been brought out, which is intended to be used as an attachment for practically



The Calculator Shown at the Right Attaches to Any Ordinary Typewriter, Serving as a Base in the Manner Illustrated at the Left

any typewriter, making the latter perform the service of both a writer and an adding and subtracting machine. It serves as a permanent base for the machine with which it is used, and is contained in a shallow metal case, as wide as a typewriter and a little longer, with three slots on the front side in which appear the results of the calculations made. Arms projecting upward from the device are joined to corresponding parts of the typewriter so that all calculations are made by using

while the former condition is of only occasional occurrence, due principally to an influx of cold air from other regions, and not to local radiation.

Incidentally it was noted that the daytime maximum temperatures were about one degree cooler at the top of the tower than on the ground, while the minimum temperatures at night averaged nearly five degrees higher at the top of the tower. Also the minimum temperatures occurred half an hour later at 150-ft. altitude, and an hour later at 300-ft. altitude during the period of records. And the low temperatures lasted half an hour longer at the top of the tower, the duration of the extreme lowest at the surface being comparatively brief.

the regular numerical keys. The latter can be disconnected from the attachment whenever desired, by pressing a button. Operations involving as many as three or more columns of figures and fractions can be performed with ease.

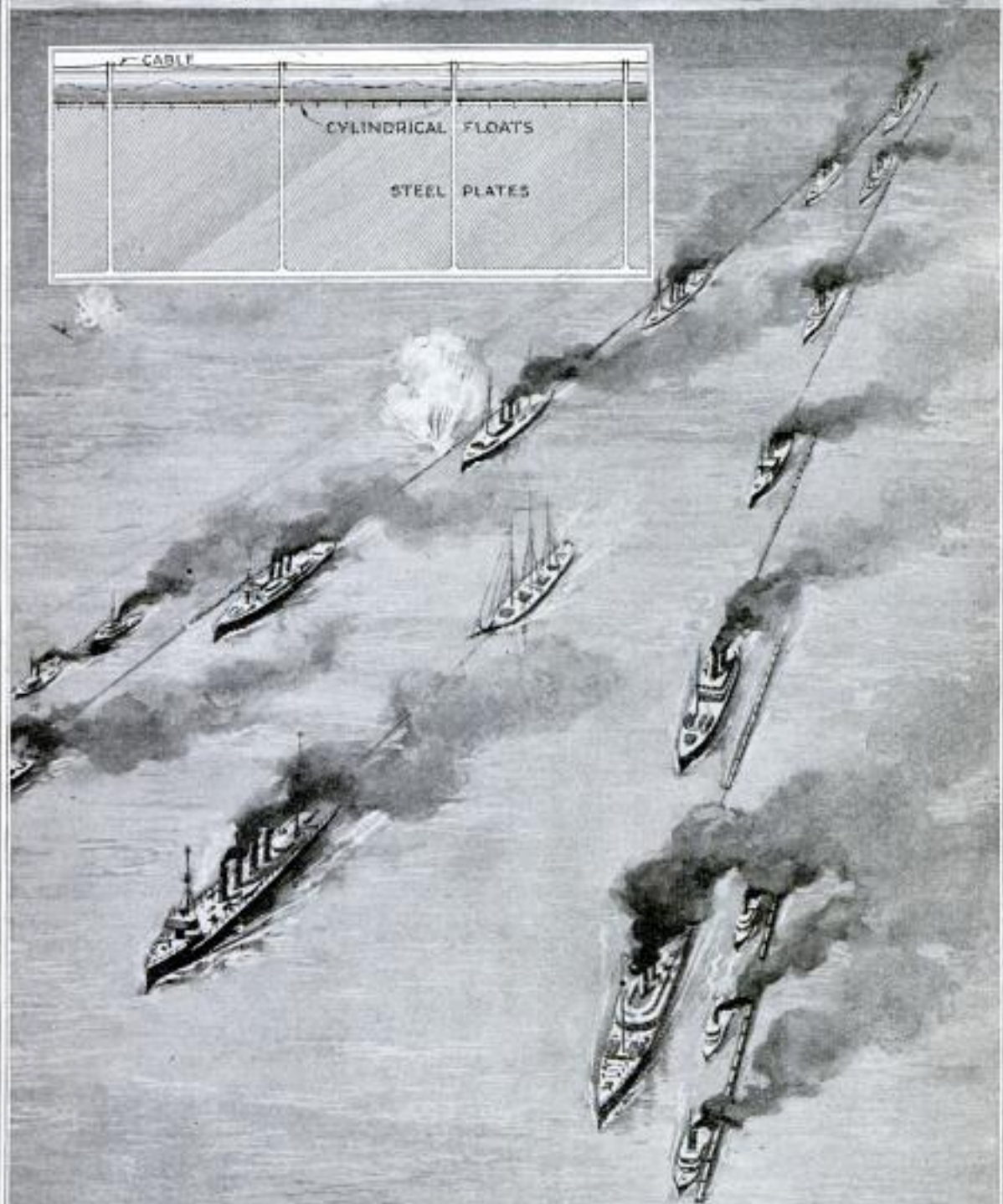
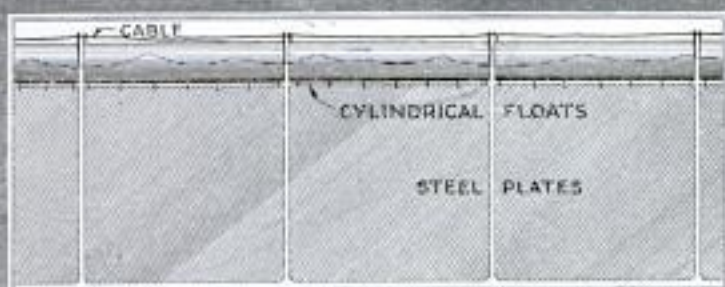
4641

FLEXIBLE STEEL CURTAIN NEW TORPEDO SHIELD

To render merchantmen and transports immune to submarine attacks by means of floating steel curtains towed alongside, is an interesting proposal that has been submitted to the government for consideration. One of the flexible barriers would consist of a series of air-tight cylinders, each supporting a large 8-in. steel plate fastened to it longitudinally like a keel. The latter would extend to a depth slightly below that at which a submarine's missile travels. The buoys would be of the same length as the metal sheets attached to them and placed end to end along a connecting cable. Upon being struck by a torpedo, one of these units, and possibly one adjacent to it, might be destroyed. It then would devolve upon a repair tug behind the screen to mend the gap quickly by inserting new members, or by drawing an auxiliary curtain across the opening. The barriers would be towed on either

Jan. Russell
1254
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Chgo.

Typewriter Calculator Attachment + Co.,
338 De Baliviere Av., St. Louis, Mo.



Herewith the Artist Illustrates How It is Proposed to Protect, by Means of Flexible Steel Barriers, Fleets of Merchantmen Passing through the Submarine Zones. By Steaming in the Formation Indicated, and Each of Them Towing One of the Screens, the Vessels would Shield Each Other from Torpedoes. The Character of the Floating Barrier is Described by the Insert at the Top of the Page

side of a vessel, or fleet, at a distance of 200 or 300 ft. For this purpose sea-going tugs, or stanch yachts of slight draft, could be employed. It is estimated that in good weather a powerful tug could tow a 600-ft. barrier at a rate of about 15 miles an hour. A fleet could protect itself by sailing in two staggered rows, each vessel tow-

ing a screen which would shield the ship following it. The curtains guarding the leading steamers, of course, would be handled by tugs. Under present conditions the plan would only be employed in the submarine zones, but, if necessity dictated, ships could be convoyed all the way from port of departure to destination.

4410

HORSE AND ENGINE POWER COMBINED TO DRAW LOADS

When it was found that auto trucks employed in making an excavation for

steep incline the team was hitched to the front of the machine and by thus combining horse and engine power the ascent was made without delay.



The Team Shown Here was Regularly Employed in Helping Six-Ton Motor Trucks Make the Steep Ascent from the Bottom of This Excavation to the Street Level

a department store did not have enough power to carry their loads up a 30-per-cent grade that led from the pit to the street level, a heavy team of horses was brought into service and overcame the difficulty. When a truck, loaded with six tons of dirt, approached the

4705

INTERNATIONAL REPORT ON LAKE OF THE WOODS

6/13/17
Off Bulletin

On the boundary between the United States and Canada, about midway between the coasts, lies the little-known Lake of the Woods, one of the most picturesque bodies of water in America and one of large economic importance to the United States and Canada. Because various problems pertaining to the lake and its level have arisen, an international joint commission was appointed some years ago and recently, after extensive investigations and hearings, has reported to the two governments concerned. This report recommends, among other things, that a certain water level be maintained. This level is established with due regard to the water power which the commission recognized as the dominant interest of the region. The recommendations provide for the utilization of this lake, and others, as immense reservoirs for power purposes. While this will damage some farm land it is purposed to fully compensate those who suffer. It is proposed also to fully safeguard navigation and the fisheries.

¶The Council of National Defense has ordered the compilation of data regarding all firms in this country which can in any way aid in making air craft. A list of industrial engineers whose knowledge would be of value to the government, will also be prepared.

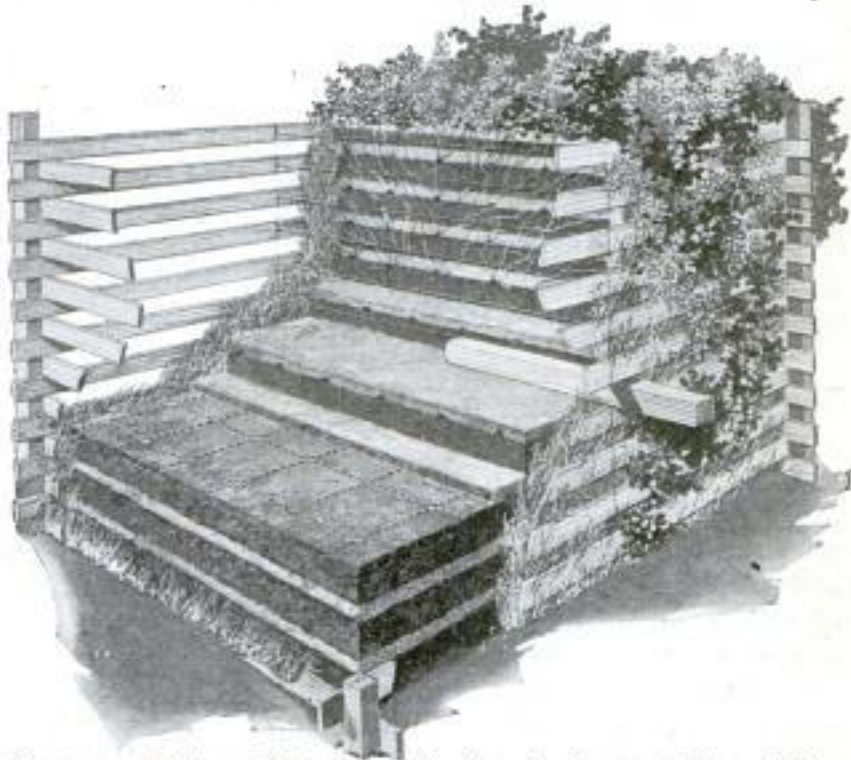
**ENORMOUS CROPS PROMISED
FROM CUBICAL POTATO BED**

Ind. Star 5/25/17

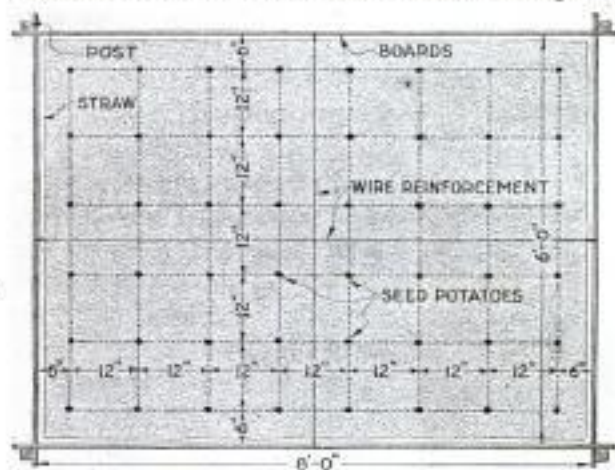
A new and truly remarkable method of raising potatoes, by which it is claimed one can produce as much as 40 bu. on a plot of ground 6 by 8 ft., has been tried for three summers with such success that the originator of the plan believes that it will revolutionize potato raising. The method is described by a writer in the Indianapolis Star. Calculating on the basis of the three crops obtained, an acre of ground could be made to yield several thousand bushels.

The plan involves little cost except for seed and, in some cases, fertilizer. The first step is to construct a bin, measuring 6 by 8 ft. and 6 ft. high, the sides of which are composed of strong boards, or slats, placed horizontally, 2½ in. apart. In this bin the gardener spreads a 6-in. layer of dirt. The surface is then marked off with lines drawn length-

wise and crosswise every foot, with no lines closer to an edge than 6 in. A piece of seed potato is placed at each intersection, the pieces being cut with at least two eyes each. The seed and earth are then covered with an inch or two of well-rotted manure, and thoroughly sprinkled. Another 6-in. layer



Diagrammatic View of Potato Bed Showing the Layers of Dirt and Fertilizer and the Plan for Planting Each Layer: The Beam Projecting from the Center of the Side at the Right Is the Moisture Tester



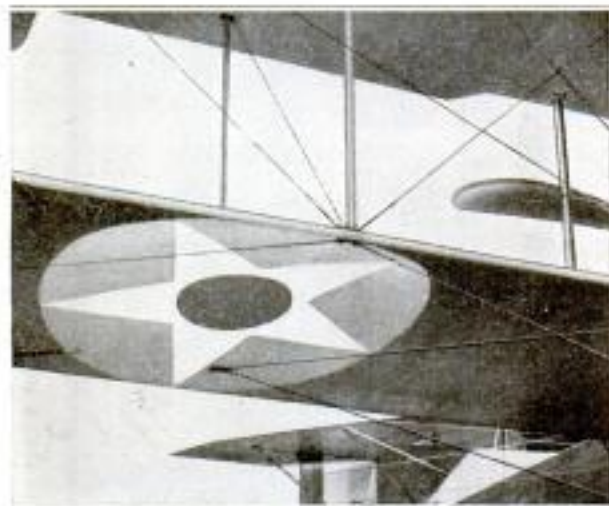
Plan of a Layer Showing Dimensions: This Potato Bed Measures Eight by Six Feet and Is Six Feet High. Wire Reinforcing is Used to Keep the Sides from Bulging. In Planting the Seed as Shown, the Pieces are Set 12 Inches Apart

wise and crosswise every foot, with no lines closer to an edge than 6 in. A

of earth is then added, and the process is repeated until the bin is full. Straw can be used at the edges to keep the dirt from running out. At the fourth layer a large stick, or timber, should be inserted about two feet, to serve as a moisture tester. The earth on the top should be slanted toward the center to prevent rain from draining off. By sprinkling about twice a week, except in rainy weather, the soil is kept moist. Its condition can be ascertained by temporarily removing the tester and inserting the hand into the hole. The potato vines will take the shortest route toward the light, in time issuing from the top and sides. About 90 days are required for the maturity of the tubers. To harvest the crop, the bin is taken down, and the potatoes raked out. With this method the planting can be done much later than usual, since moisture, ventilation, and drainage are all under the gardener's control.

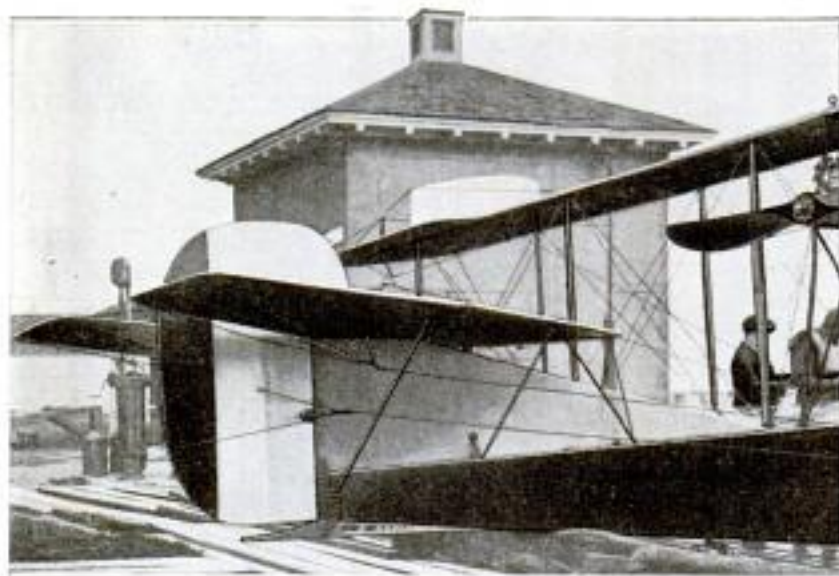
RED-CENTERED STAR MADE FLYING-CORPS DEVICE

As the insignia for all of our air craft, the government has ruled that a five-



Showing the Red-Centered Star of the United States Flying Corps Painted on the Lower Side of an Army Biplane

pointed star with a red center be painted on a circular background of blue. In addition, the rudder of a machine carries on both sides the national colors in three wide bands arranged vertically, the blue one appearing next to the rudder post. The star design



Red, White, and Blue Bars Applied to the Rudder of a Military Air Craft

appears on the under side of the two lower wings, and on the top of each of the upper ones. Its diameter is the

same as the width of the chord of the wing on which it is placed. The colors are of the same shade as those used for the flag. The device is also displayed on the top and bottom sides of dirigibles and captive balloons.

SHIP WAYS OF GREAT SIZE NEARING COMPLETION

To facilitate the construction of one of our big battle cruisers, an eastern shipbuilding company is erecting a special set of ways at a cost of about \$500,000. The fact is particularly interesting because the structure will be 990 ft. long, which will give it the distinction of being, so far as is known, as large as any in the world. It will be provided with electric cranes of great power and other equipment of the most modern type. The foundations, keel-supporting crib, launching ways, and blocks are to be of concrete.

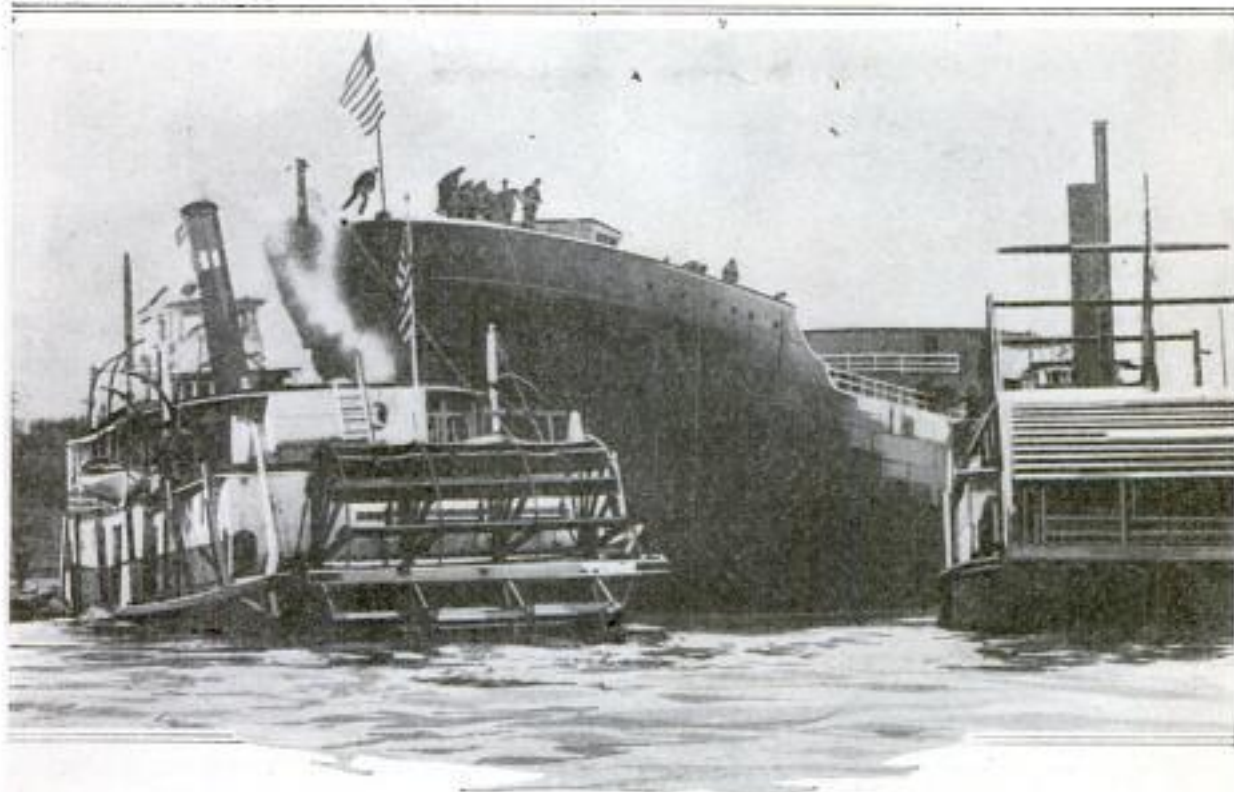
RAILROAD PLANTS TREES FOR SNOW SCREENS

As an experiment, the Minneapolis, St. Paul, and Sault Sainte Marie Railway has planted trees along its right of way to serve as snow screens. On the south side of the tracks, at the sheltered points, there are four rows and on the north side eight rows, 8 ft. apart. The four rows farthest to the north are willows and the other rows on that side, in their order, are box elder, green ash, poplar, and another hardy variety. The tracts devoted to these living snow fences were plowed and twice harrowed, and then allowed to stand a year before the trees were set out. A tree-planting machine which, it is said, is able to plant as many as 20,000 trees a day, is used to expedite the work.

Albert H. Allen - Boston Construction Co.

4731

4703



After Leaving Its Ways, the Steel Ship Shot through the Water for a Half Mile and Smashed into a Stern-Wheeler at the Opposite Side of the River

4373

COLLISION MARS LAUNCHING OF NEW STEEL VESSEL

As a stanch steel freighter left the ways for its maiden plunge, at Portland, Ore., some weeks ago, it shot across the Willamette River and crashed into a stern-wheeler. The latter, a wooden wrecking craft, was fully a half mile away from the place of launching, and was supposed to be safe. Three men were seriously injured in the collision. The ship, originally named the "Vesterlide" and intended for Norwegian interests, passed into the hands of the Cunard Line before its completion, and since has been rechristened the "War Baron." The company in naming its new vessels is using the word "war" as a prefix. Thus two other ships under construction for it on the Pacific coast are to be named the "War Lord" and the "War Knight." The submarine menace has so taxed shipyards in Great Britain that English shipping companies are in the unfamiliar position of seeking bottoms in America. Much of this business is going to the Pacific

coast. The "War Baron" is 425 ft. in length, has a dead-weight carrying capacity of 8,800 tons, and a speed of about 12 miles an hour. It mounts a steam-turbine engine that is designed to operate at 3,200 revolutions a minute.

4431

IMPROVED BUMPER RAIL FOR MOTOR CARS

A new bumper, or buffer rail, for automobiles is clamped to the front springs so that the rail protects the whole forepart of the car. It comprises a channel bar, which is the guard rail, two special springs, and two heads or frame connections, and combines lightness with great strength. The springs are full-elliptic and have a range of spring action of approximately three inches, a feature not found in the ordinary bumper.



Stewart-Harrison
Frederickson & Co. Inc.
1848 River Street
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1317 S. Alameda



Panorama of the Calaveras Dam, Now under Construction near San Francisco, Which will More Than Double the Width at the Base, 1,300 Feet. Steam-Shovel Operations are Shown, also the

4414 *Electric*
**COVER FOR SWITCH BUTTON
 WHILE PLASTERING**

Contractors will find that a distinct need is filled by small steel covers designed to protect electric switch buttons and switch boxes while plastering and decorating are being done. They are held in place by screws in the regular screw holes and are removed when the face plates are put on. These covers can be used repeatedly.



4200
**BIG EARTH DAM TO DOUBLE
 CITY WATER SUPPLY**

When a huge earth dam now under construction in the coast mountains of California has been completed, the resulting reservoir will more than double the supply of water for domestic use in San Francisco. This supply is now 44,000,000 gal. daily. The new Calaveras reservoir will have a capacity of 165,000 acre-feet, or an amount of water sufficient to cover 165,000 acres to the depth of one foot, and will insure an additional supply of 57,000,000 gal. a day, which will take care of the needs of a population more

than twice as large as the present population of the city. In point of height and volume in proportion to its length, the Calaveras dam will be the largest earth dam in the world, exceeding in these respects even the great Gatun dam of the Panama Canal, although not comparable with the latter in length. Its height will be 240 ft.; width, one-quarter of a mile at the base, and length at the crest, 1,300 ft. When completed, it will contain 3,000,000 cu. yd. of earth.

The work of construction was begun by the water company in 1913, and it is expected that the dam will be finished by May, 1918, at an ultimate cost of about \$2,500,000. At the present time the dam is completed to an elevation of something over 170 ft. above bed-rock. The remaining 70 ft. will require about 1,000,000 cu. yd. of hydraulic fill, the material used being graded from a coarse rocky mixture to rock, sand, and clay, with a final core of pure clay in the center of the dam. Practically all of the fill has been pumped into place, gravel, sand, shale, sandstone, and clay being obtained in the neighboring hills and pumped for a distance varying from 1,000 to 4,500 feet.

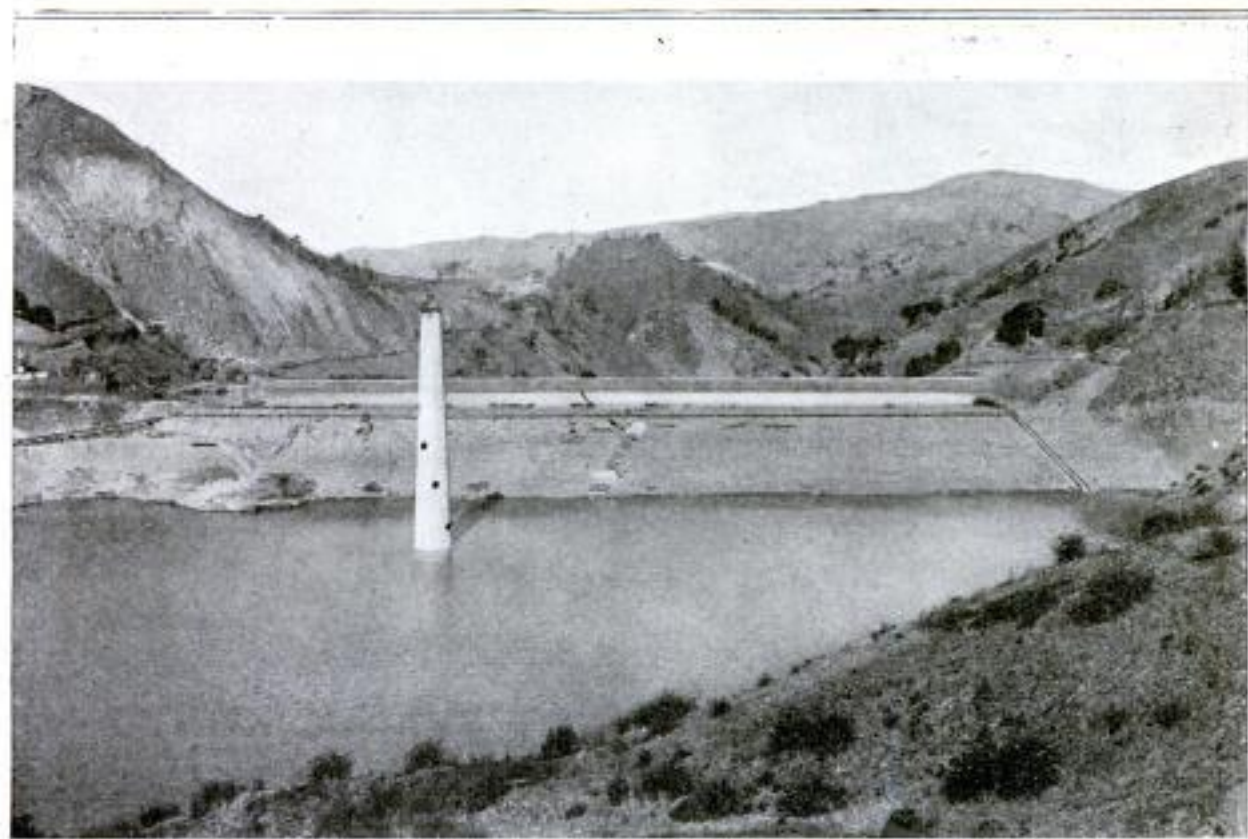
Situated on Calaveras Creek, one of the tributaries of Alameda Creek, about 45 miles southeast of San Francisco,



the City's Water Supply and will Be the Largest Earth Dam in the World: The Length at the Crest will Equal Outlet-Control Tower, 239 Feet High, and Working Camp in the Background

the new dam will convert the Calaveras Valley, once the home of a number of prosperous farmers engaged in the raising of hay, into a veritable lake, four miles long and one and one-half miles wide. The Calaveras basin has a direct drainage area of 100 square

miles. This will be increased to 138 square miles by the construction of a tunnel, 9,000 ft. in length, which will divert the water from what is known as Upper Alameda Creek into the Calaveras reservoir formed by the big earth dam.



Near View of Calaveras Dam, as Far as Finished Early This Year, Its Height at the Time Being About 170 Feet above Bedrock. The Outlet-Control Tower in the Foreground Is of Reinforced Concrete

CONFLAGRATION DESOLATES GEORGIA'S CAPITAL,



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A View of Desolated Mattoon, One of the Chief Illinois Cities to Suffer Wholesale Destruction from Tornadoes That Swept Middle Western States from Kansas to Tennessee a Few Weeks Ago: In Mattoon Alone More Than 50 Persons were Killed and 500 or More were Injured. Not Only were Cities and Towns Reduced to Wreckage, but Farms Suffered Greatly in the Loss of Houses, Barns, Implements, and Stock

A Close-Up View of the Destruction Wrought: The Force of the Wind Was so Terrific That at Mattoon It Picked Up This Cow and Hurlled It against the Tree, the Body Almost Encircling the Trunk

A Fallen Tree in the Vicinity of Mattoon, Illinois, Which Shows the Power of the Storm: About 140 Blocks in That City were Swept by the Wind That Razed 500 Homes and Rendered Nearly 2,000 Persons Homeless. Many of These Sought Shelter in Tents in a Park

AND TORNADOES WORK HAVOC IN MANY STATES



Doll Views Destruction Serenely: This Plaything Passed through the Tornado Unharmd and was Found Seated on a Gasoline Tank in an Andale Front Yard with Wreckage All about It

All That was Left of the Schoolhouse at Andale, Kansas: The Series of Storms Which Did Such Damage in Illinois and Neighboring States were First Felt in Kansas and as Far Southwest as Arkansas. All Told, Over 150 Persons were Killed and Over 1,000 Injured

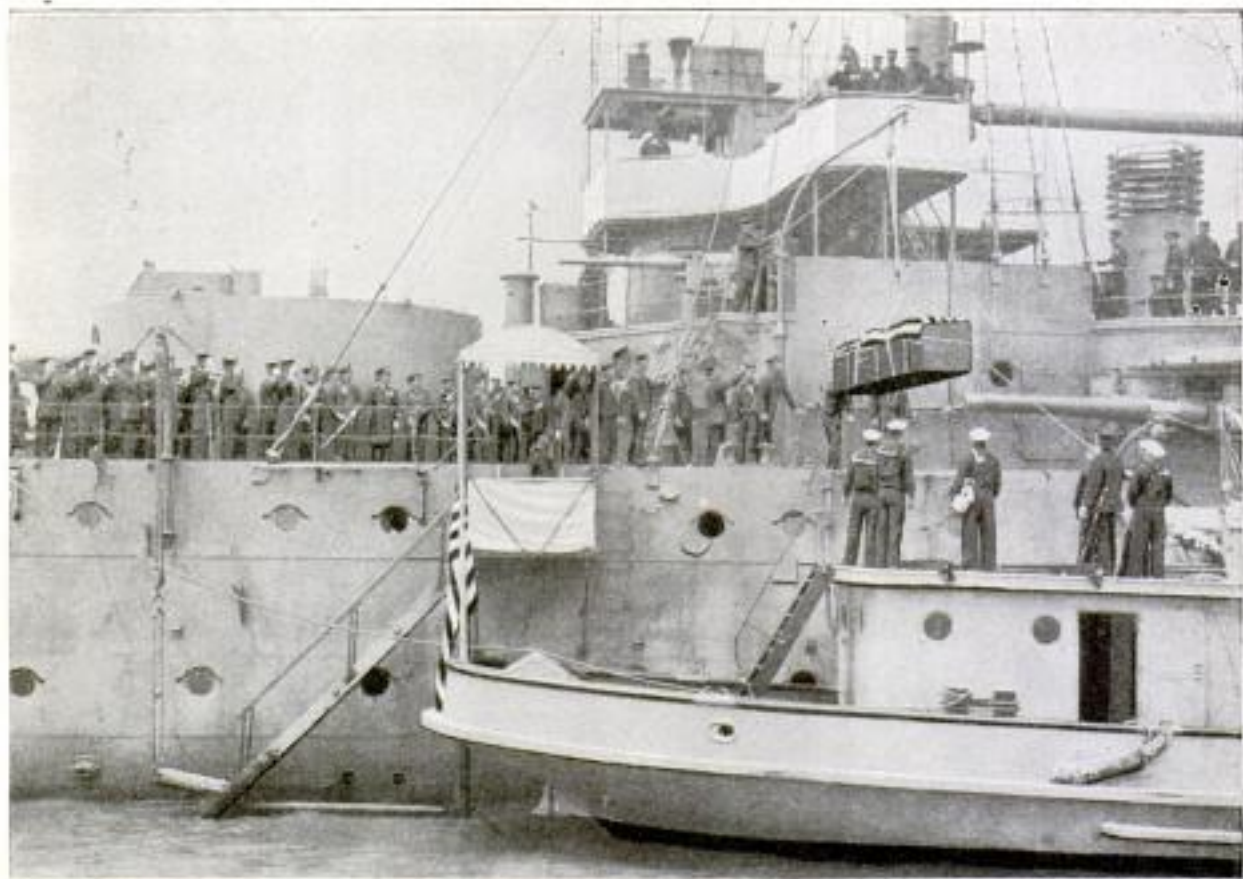


Dynamite Spares Mirror: Remains of an Atlanta Home Which was Destroyed to Check the Fire, Showing the Chimney Standing Intact and, over the Fireplace, a Mirror That was Not Even Cracked



A Forest of Chimneys in Fire-Swept Atlanta: A Conflagration, Which Raged for 12 Hours, May 21, Destroyed More Than 1,500 Buildings and Caused a Property Loss of Over \$3,500,000 in Georgia's Capital. One Woman Lost Her Life from Shock and Many were Injured. Over 3,000 Men in an Army Training Camp Near By were Rushed to the Scene and Aided in Guarding Property and in Dynamiting Homes, to Check the Wall of Flame That Leaped from Block to Block

4665



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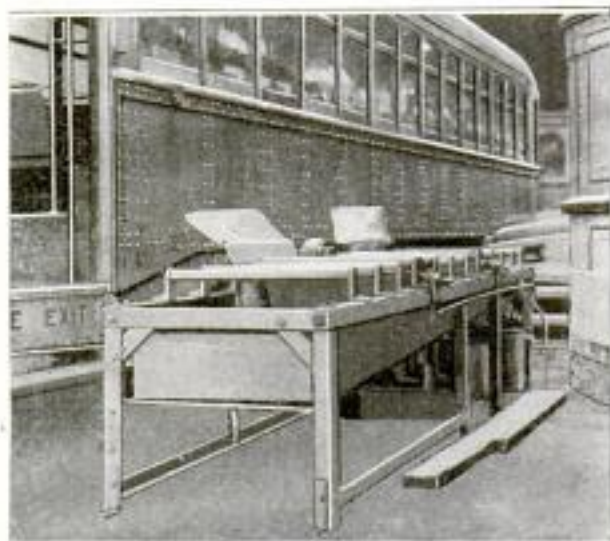
JAPANESE SHIP BRINGS HOME ENVOY'S BODY

THIS solemn scene marks the end of a journey across the Pacific made by one of Japan's first-class cruisers, the "Azuma," to bring home the body of George W. Guthrie, the late American ambassador to Japan. Within San Francisco's harbor the big fighting ship came to anchor, and when a tender had drawn alongside, the coffin, covered with the Stars and Stripes, was slowly lowered to the deck of the waiting craft, while the crews of the two vessels stood at attention. From San Francisco the body was carried overland to Pittsburgh, the ambassador's former home.

4570 *Street Car*
WASHING MACHINE USED FOR CLEANING CAR SEATS

Periodically the cane seats in cars operated by a western traction com-

pany are thoroughly scrubbed. The operation is made comparatively easy by a washing machine especially built for the work. It consists of a long tank spanned by a series of horizontal rollers and provided at intervals with power-driven rotary brushes. As the seats are removed from a car, they are placed, one at a time, on the washer and pushed across the rollers to the first brush, which applies a liberal amount of liquid soap. The scrubbing is accomplished by the second brush. After a seat has then been rinsed and dried, it is returned to the car.



The Cane Seats are Moved across the Rollers to Revolving Brushes, Which Apply Soap, Water, and Plenty of Scrubbing Force

ⒸThe United States has arranged to buy the privately-owned Tanana Valley Railroad in Alaska and will make it part of the government's line.

COMMENT AND REVIEW

IN the departments at Washington and throughout the country many of the nation's best business executives are hard at work; men who have successfully built up and managed our greatest industries.

*Cut Out
Red Tape*

Others are ready to serve in similar capacities and will be called as the work expands. Generals in administration at home are every bit as essential as generals at the front, and their services are being given as gladly and unselfishly. Accustomed as they have been to quick action in business emergencies, and to cutting through trifles and etiquette at one stroke to reach the result which is the final aim of effort, they frequently are finding themselves hopelessly entangled in old-time regulations and methods of procedure which are the inheritance of two generations. While a reasonable amount of safeguarding is admittedly necessary, this is no time for quibbling over any ideals of official etiquette which have always been incomprehensible to business men in times of peace, and which simply clog the wheels of progress in such a time as the present. Department officials may well profit by listening to these generals of industry, and feel no humiliation in learning and adopting the modern and better way which business has found absolutely necessary to its success. Our Government is a great business enterprise, entrusted with the management of national affairs, and the sooner modern business methods replace much of the time-honored and obsolete departmental system, the better it will be for all of us.

Already there are rumors of delays occasioned by those old-time handicaps of politicians and hangers-on with selfish interests to serve and promote, and even of graft. The temper of the people is in no mood to tolerate these two evils which, in peace times, are condemned but go unpunished for lack of widespread public sentiment. These are days when the citizen body is alert and sitting up, and will insist on a square deal and right doing all along the line. The first provable instance should be made a noteworthy example, regardless of who is hit; there is yet room and a place in our Federal prisons for all such, who are even worse than avowed traitors.



DURING the past three years the science of war has undergone radical changes, rendering obsolete much which past effort and study had established as standard. Cavalry has largely given way to

*Evolution
of
War*

infantry, which now moves farther and faster in motor cars than was ever possible with animals. Machine guns have changed the conditions of infantry attacks. Heavy artillery at long range now accomplishes much of what formerly was assigned to an infantry charge. The difficult and always perilous work of the field spy and scout has been left behind by the airman who goes forth openly and noisily, sweeping over enemy lines at a mile a minute. On sea, it is no longer the ship which can shoot the farthest, or the fast cruiser which cannot be overtaken, that sinks the most enemy ships, but the submarine whose underwater missiles are often unseen and never heard.

Trench warfare as practiced today is an evolution of the old earth-work idea, but so changed and expanded as to have little resemblance. It was a German invention, worked out to include streets and alleys with main arteries of communication from the rear, and complete underground habitations capable of housing men by thousands. These underground rooms are not only one but often two stories deep, the lower level being reached by concealed trapdoors. In the Japanese-Russian war the Japanese made use of zigzag open trenches as a means of approach to a fortress, but to nothing like the extent employed now.

The development of both the submarine and aeroplane has requisitioned abilities, training and qualities which are largely new, and uncalled for in the past. Especially is this true as regards the aviation corps, which demands the best in the superman. So essential and rigid are these requirements that our public, unacquainted with modern warfare, has little conception of the qualifications. One would naturally suppose the ability to successfully loop the loop time on time would indicate an airman abundantly able to leave the fair grounds, report himself at headquarters, be assigned to a machine and go aloft on a military mission. As a matter of fact, such a one is merely an air chauffeur and nothing more. It is not only a question of undaunted courage—there are plenty such—nor ability to guide a plane through all manner of pyrotechnic maneuvers, though these two things are required. The army airman must be, and know, and do, ever so much more. Indeed the operating of a plane under normal conditions is only the first reader in the aviation corps.



ONE would naturally expect, on joining the flying division, to board a plane and joyride skyward with an experienced pilot, then go through the motions with the various controls and levers in a dummy machine on earth; a few days later go up again with a teacher; and the next to fly with the instructor as a passenger. But not so fast, son, notwithstanding your ambition to distinguish yourself is most noble and praiseworthy. Remember, the qualifications for the air corps include not only all the physical conditions of both army and navy, but a great many more.

*Essentials
in Aviation
Corps*

The candidate must be sound in every part of his body; possess internal organs equal to the rapid change in altitude, for he will often drop a mile in a minute; perfect vision, which will instantly and unfailingly adjust itself one instant to objects far away and the next to ones close by; and he must have no failing as to colors; his hearing must be faultless; he must possess a mental balance which will remain true and undisturbed when shells from the air guns are bursting uncomfortably close by; and, finally, that difficult-to-describe natural gift which turns his face toward his own lines instead of the enemies', when clouds or smoke blot out all landmarks. It is the same kind of intuitive quality which in a newspaper man is termed "a nose for news," and which leads the skillful physician to correctly diagnose a patient when the usual symptoms are absent, or the navigator to head his vessel into port when fog shuts him in and tide swerves him from his course.

The responsibility attaching to the aviation corps is almost beyond estimate, and the ability of a single air scout to discern and comprehend, or failure to do so, may easily win or lose a battle. His signals bring the artillery into action dropping shells in the right place, and correct the fire of those guns whose faulty range is throwing away tons of projectiles each minute. The airman is more than the familiar term, "the eye of the army"—he must be a thinking eye. The submarine may even better do without its periscope than the army without its aeroplane.

Thus it will be seen that, setting aside all the other numerous and radical changes which the present war has called into being, the submarine for the sea forces and the aeroplane for the land forces are the two weapons which stand out preëminent; and of the two, the aeroplane is the more essential. A service so thrilling, so responsible, so possible of great accomplishment, cannot fail to appeal to the best there is in the young American; and while all service at the front is fraught with danger, it will comfort the airman's mother to know that, contrary to generally accepted belief, service in the air fleet is several degrees removed from the most dangerous military occupations.

Our ability to win this war will lie largely in two efforts: to defeat the submarine, and to produce at the earliest possible moment a fleet of aeroplanes which shall be numbered by tens of thousands.



THESSE are days when we may well be proud of our American girls and women. The fields of France for countless miles are this moment being cultivated by the French women with never a man to assist. That American women would as promptly, resolutely, and effectively take up the same burden, did the same necessity exist here, there is not the slightest doubt. The voice of the scoffer at the suffragette is hushed in admiration at what the women are doing in the demands of the moment. In crowded cities and by the isolated farm side the American girl and woman without regard to wealth or social distinction is employing every spare moment in Red Cross work. Without any brass bands to call a crowd they flocked to the training places to learn and to do, nor has their interest and enthusiasm waned; on the contrary it has steadily grown.

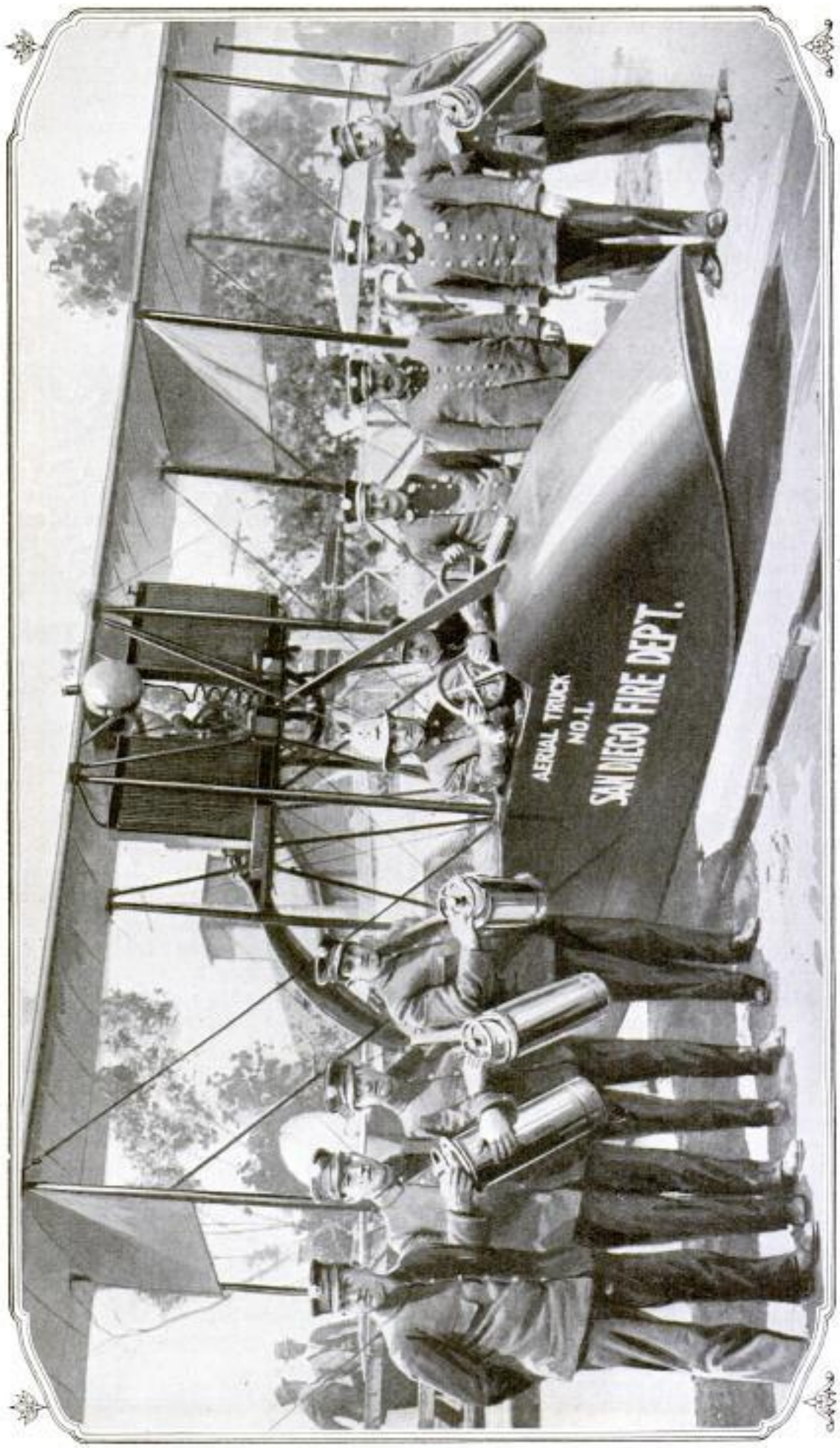
*American
Women No
Slackers*

The subscription to the Liberty Loan afforded another opportunity to show of what stuff the patriotism of the American woman is made. In countless shops, stores, factories, and offices, girls receiving only a few dollars per week, and too often responsible for the support of widowed mothers and younger brothers and sisters, loyally made their subscription for a bond, when to do so meant actual sacrifice and even privation for 50 weeks. But no one hears them complain of this, and their only expressed regret is their inability to take a larger amount.

These are days when the American man and boy has greater occasion than any time in the past half century to revere, love, and honor his mother, sister, and sweetheart.

June 25

H. H. WINDSOR



AERIAL TRUCK IS FIRE DEPARTMENT'S NEWEST ADDITION

An addition to the fire department of San Diego, California, which is a decided innovation, consists of two 100-hp. flying boats, one of which is shown here. These craft, intended especially for fighting wharf fires, are built so that they can light on land or water. Each is equipped with eight chemical extinguishers, and searchlights for night work.

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ALADDIN'S TRAINING CAMP

Save American Lives by Utilizing Canadian Experience!

Dominion Has Vast Specialized Training Ground and
Many Incapacitated Officers, but No More Recruits

By JACK LAIT

70 The Herald, Calgary.

AS though Woodrow Wilson had rubbed a magic lamp and commanded genii to lay out, equip, and perfect an unsurpassable training institution for the vast army that is to rise in American khaki and enter the greatest game of all ages, the contest for the championship of the world, stands Camp Borden.

Fifty miles from Toronto, situated on two trunk railroads that run from populous American centers to every corner of the camp, is this superdeveloped institution dedicated to the mission of making expert European soldiers out of the raw stuff which is the courage of this hemisphere plus the patriotism of loyal men.

Through its gates have poured 150,000 of the bravest and finest soldiers that history has known, the Ontario contingent of the Canadian expeditionary forces. And now there are no more for Ontario to give, for it has exhausted its givable volunteers. Should conscription carry in the Dominion, Borden may need to train conscripts; but that is now in abeyance, and, if it be passed, winter will have frozen this continent stiff before Canada can again use its superb drill college for its own.

Meanwhile, the United States, just frantically starting what Canada has gallantly finished, not only has not nearly enough camps ready, and will not have for months, but, should she employ her sternest efforts and eat up any reasonable measure of precious time, she will not then be able to provide facilities that will be comparable with Borden's matchless training opportunities.

We have not the experience. We have everything else. But the difference between thorough preparedness

and inefficient incapability is contained entirely in that one word—experience.

Canada has been all through what we are just entering. It has cost her billions of dollars and thousands of her best sons. But now she knows and she has. And we are her ally. She does not want us to pay the tax she paid; she is eagerly, graciously, generously willing that we mount to glory and to accomplishment over the mounds of her dead, over the mountains of her prodigally given gold.

Camp Borden is manned today by Canada's and England's heroes, invalidated officers, and noncommissioned officers, who have been through hell and have come back, their souls bounding as before with zeal to help, but their bodies slashed and gashed, their lungs and eyes seared by venomous gases.

These men have thrown into their present work the task of sending new men on to do the work that they had to lay down, the same spirit and the same knowledge which has made Canada's page in the great European war a record of bravery and achievement. They have reconstructed Camp Borden into a miniature French battle field, a transplanted section of the vital arena "over there" where humanity stands at bay, giving its last ounce against the most cruel and atavistic and supermodern murder machine that depraved ambition and cold aggression ever conceived.

Camp Borden has about eleven miles of trenches, built by the experts who came back from overseas, who helped build the historic ones abroad, who saw them under the indescribable fire of Titanic artillery, in the "up-and-over" rushes of immortal charges, in every manifestation and in every ramification of the unheard-of system of

warfare now being waged in Europe, the like of which until this struggle had been unknown.

These officers have seen the effects of all manner of training, and they have eliminated, with the true eye of the expert observer and intimate participant, the needless; and they have substituted the intensive essential elements, the specialized branches which give a man a chance for his life against Germany's brilliant barbarian butchers.

What do we know of these things? We have read, we have heard. But Canada, in the war, armed with the same infantile knowledge of these things that we now possess, spent its richest blood in oceans to learn how tragically little she knew. Must we, too, scorning the lesson of that sacrifice, have our textbook written in the martyr blood of our sons?

Camp Borden can accommodate at one time 100,000 American soldiers. It is a field of 22,000 acres, more than 25 square miles of plain and hills and ravines and woods—every kind of ground on which men can fight—with two navigable rivers traversing it, with a system that pumps 1,000,000 gal. of purest water daily, electric-lighted, paved at crisscross intervals with highways of asphalt, ready with drill fields, tenting areas, sanitary sewage plants, shooting ranges, hospitals, buildings for every conceivable military need, and all those individual refinements beyond standard training-camp utilities which have been the immediate outgrowth of the new and terrifying methods of this war.

Not on this side of the Atlantic are there trenches such as those at Borden, laid out, built, tunneled, and fortified in accurate replica of the types abroad where the fierce fight itself is being driven. Nowhere else except upon the western front in France can one see barbed-wire entanglements such as those between the two sets of opposing trenches.

Moreover, while our American recruits doubtless respect their officers, war is war; and war cannot be fought except where war is. Therefore our

boys, who are as human as anybody's boys, reserve in their own hearts some misgivings as to the depth of wisdom behind the teachings of their superiors, who have, themselves, seen nothing of what they are telling others. But at Borden the instructors wear service stripes—they wear more, for many of them have the Distinguished Service Order or the Military Cross, some of them both. And when one of these illustrious veterans says this is done this way or that must be the other way, his words have a weight beyond the code-book dictum of the mere soldier.

This war has eliminated the soldier. There is no such thing in France as a soldier. Every man there who wears a uniform must be a specialist, and he must be a specialist in a new specialty born and developed right there on the ground since 1914.

For three years 10,000,000 men, the brains and the souls and the bodies of many nations, composed of units from every walk of society and every trade and profession of science, have engaged night and day in the sole business of killing one another. Have they learned things and discovered ways which one who has not been of them cannot know? Hundreds of thousands of dead men, could they utter one word, would give the answer in one voice.

Can one doubt the imperative necessity, not to say the plausible feasibility, then, of training a goodly contingent of our men at Camp Borden?

Drilling soldiers on foreign soil is not a new or revolutionary idea in this war. Britain trained many of her men, and is today doing so, on French territory; it is our own plan, now, to give many of our battalions weeks of preparatory work in France. If in France, at the tail end, why not in Canada from the start?

Camp Borden can receive 6,000 raw soldiers a day without straining its ready resources. It can give them room and all needs up to a quota of 100,000 at once. It can turn out a comparative veteran, as new troops are judged, from the primary product in 12 weeks. If we started sending our

boys there now, we could make 150,000 superior soldiers there before snow-fall.

The moral surroundings cannot be surpassed. There is not a saloon within 180 miles of the gates, and every other problem correlated with the guardianship of the character of men is thoroughly solved. And the morale of the men would be intensified in that they would be "at it" instead of only on the way. Every military expert will tell you that the first big step toward making a soldier is to get him away from home, where he has no distractions, where he worries little about the "home papers," where he settles down to the business, not the pastime, of the army. And Canada would be "abroad," and Camp Borden, with its complement of war-made heroes, would give the zesty atmosphere to create a perfect vibration for this deplorable but indispensable fighting viewpoint, the factor which makes armies invincible.

When Camp Borden was full of Ontario brigades, at times holding more than 50,000 troops, the cadets stood guard and did their tasks and enacted their sham fighting with all the grim earnestness of reality.

They took their tricks in the trenches through the full periods of active regulations, living, sleeping, feeding, fighting in them, night and day for eighteen days of hours crammed with the actual existence of modern war. They scouted and they sniped, they bombed and they bayoneted, and they charged and they operated all the lines of communications, they burrowed dugouts and they constructed wire barricades, they took the rehearsals with the full vim and deadly intensity of life-and-death combat, not of high-school maneuvers.

Before they entered the trenches they were put through the intricacies of bombing and of grenade hurling and of grenade shooting and of rapid-fire-gun operation and of machine-gun manipulation.

And these are sciences in themselves.

No throwing, in all the variations of throwing from David's slung stone to

Walter Johnson's curved third strike, ever resembled the tossing of a hand bomb, the egg-shaped little contrivance of shrapnel and explosive which has taken so many lives of late.

The man who throws it stands down in a fissure, seven feet deep. He cannot, of course, see above it. He must fling it into another ditch, from sixty to more than a hundred yards away, which also is not more than three feet wide. His projectile must describe a parabola that takes into account not only distance and sending and arriving angle, but time, for some of the destroying things go off with burning fuses instead of on contact, and they must strike just in time—the lapse is five seconds. And woe unto the thrower—and to those about him—who grows panic-stricken and cannot let go, or who drops his can of carnage from a trembling hand, or who bumps his fist in the backward motion against the rear wall of his trench, for he and his comrades will be torn to flinders.

Bayonet work has been found the straw which breaks the back of the Hun defenses in France. One might scarcely fancy that with artillery which shoots accurately, as guided by aerial monitors over enemy trenches, at from 12 to 14 miles, hand-to-hand fighting would be of much account. But it is the bayonet after all which drives the enemy from its positions, which takes territory, and which, therefore, stabs in its crude orthography the records of fate and history.

The German hates a bayonet like a mad dog does water. Those who have been in the big mix-up will tell you, to a man, that the kaiser's troopers will stand and give life for life, will go where death is certain if they know they can cause death—except where they stand facing the points of bayonets. That is where the Prussian hands fly up and the hoarse Prussian throats cry "Kamerad."

The British Tommy and the French poilu, in direct and grateful antithesis, love the bayonet and swing it jocosely.

But bayoneting must be learned. It must be learned all over again, for it

differs down in the furrows from its technique as standardized through the centuries on straightaway surface fighting.

At Borden there are bayonet teachers who have worked out from the remotest to the seemingly most obvious tricks of wielding the "pig sticker" in defense and attack at every angle in the subterranean labyrinths, the damp catacombs which now are the channels of war.

We know nothing about these tactics.

At Camp Borden there is an aviation school. At its head is an American-born British flying hero, Major Filley, a Virginian and a Harvard man. He, his fellow officers tell me, did more than any other single flier during the period of his active service to bring down enemy planes.

To hear him lecture and to see him demonstrate the myriad duties of the overhead soldier of nowadays is a revelation in modernity and a rushing of blood to the heart in realizing how minutely the masters of the western front have worked out the finesse of the slaughtering trade.

The airship in this war serves as the vehicle of the fighter, the defender, the observer, the scout, the photographer, the artillery eye, the reconnoitering binocular, the message bearer—it is the air dreadnaught.

The biplane is an American invention. But it is an English improvement and a French perfection.

To illustrate, let us point out that the best machines that we manufacture today in the United States could not pass inspection as practice planes at Camp Borden. Our equipment will do between 60 and 80 miles an hour and will climb 3,500 ft. in 10 minutes. The pony biplanes now used at the front do 160 to 175 miles an hour and will climb 15,000 ft. in 10 minutes.

And the climb is more telling than the traveling speed across the map. Airmen cannot kill upward. They can only shoot on the level, through machine guns opening between synchronized propeller blades, or they can drop

bombs by pressing foot levers, releasing the missiles through the bottom of the carrier. Therefore the highest machine wins.

The officers at the Borden aviation school have all been through the overhead hell. They have brought down their men and they have been sent to earth. They have sounded the psychology and the physiology and the mechanics and the strategy of the clouds. We know how to fly—that is all we know about aviation. The messengers for the British pilots know that. They run errands in air-planes. But fighting in them is a study not to be acquired from books or even from the lips of lookers-on. It must be learned, in truth, from the ground up—up to the sky—in faithful and enthusiastic apprenticeship under the veterans who have helped to solve its unknown quantities by tragedies, who have had much of the secret mysticism of it demonstrated with bombs and bullets, who have invaluable information and bits of shrapnel in their heads.

Yet America is teaching its fliers simple navigation and wireless operating and wigwagging. The graduates of such a school, after they will have learned in France to guide machines which go about three times as fast as the ones they are now using, will be competent to serve as note runners or relief "trouble men" for the seasoned air battlers of our allies. Can we stand for this? Can we look such a condition in the eye when at Camp Borden the bullet-scarred returned corps men are twiddling their thumbs in impatient petulance because they have the machines, the knowledge, the grounds, the zeal, but nobody to use any of these life-saving assets on?

A few days ago I visited an American training camp. It was a standing barracks, long in use as a regular military post. It was officered by our best commissioned men, West Pointers largely.

Honest and well-meaning army men, these, they were drilling the volunteers who are going to carry our banner in France by the rule books that obtained

for fighting Indians, Mexicans, Spaniards, and Filipinos.

The result was not only that our recruits were not learning the bedrock lessons of today's warfare, but they realized that they were being trained for a preliminary to a preliminary, that what they were getting was the primer-class A B C, and that they must, when they get to France, begin to be taught what fighting is like. So they went whistling at their tasks, like grammar-grade kids on a fire drill. Some of them had carnations stuck down the barrels of their rifles.

It sickened me. It almost made me weep. Over in France there is a war in which these misguided boys must participate, in which their lives are to be staked, which is no carnation festival. I had seen men—men just like our own, in the same comparative stage of training—at Camp Borden. There were no flowers and there was no whistling there.

The Canadians, looking up to their officers who had heard the bombardments and who had seen the star shells of the night and who had been into the bowels of doom and out again, were tensely earnest. The spirit of the war into which they were moving had been translated to them. Their practice work was showing them what a deadly, homicidal, know-how-or-die thing they were going against.

They realized, they understood, they felt. It had all been visualized by the replica paraphernalia, by the recited first-hand experiences of the men who had "been there."

It was no picnic. No women and children were to come on the week-

ends with jam and with gossip. They were at war; and war was a science that demanded specialization, concentration, application. They knew of the first Canadian contingent, the pre-Borden-trained volunteers who had gone at the first bugle, who, stunned by the unsuspected methods of their enemies, were slaughtered without a chance to fight, to run, or to hide.

The Borden graduates went into battle with the respect of the powder-burned legions that had been through action. They knew. They had but to transpose the realistic dummies into living, moving actuals. They were no rookies fighting baffling demons. They were veterans of three months' war.

Our men, trained as they are now being trained in our old-style camps—not to speak of those who are on reserve because there isn't even that kind of camps for them yet—will not be the match, man for man, of the vengeful foes against whom they are to be flung. Isn't it a pity? Our intentions are so sincere and so hearty. Yet our ways and our wherewithal are so insufficient, so obsolete.

America must learn all that Canada has learned. It must do more: It must improve on all that, for it is going in to win the war, not merely to help carry it on. To do things one—a nation or a man—must learn how. If there were a civil institution in Canada where we could get superior education in commercial or industrial affairs our fathers would send their sons there a-flocking. We must not overlook the parallel case in this critical military exigency, when so much more is involved.

4732
**ALLIED AIRMEN PHOTOGRAPH
 THROUGH BATTLE SMOKE**

To the American inventor of the "tear gas," that has been used with great success by our allies, belongs credit for another war-time invention of importance. By the use of an infrared screen, the scientist has provided a means by which airmen are enabled

to photograph clearly the enemy's positions when they are hidden from vision by thick clouds of smoke. The device absorbs all but the ordinarily invisible infrared rays, which are capable of penetrating smoke and gases. Impressions are made upon specially prepared plates sensitive only to the particular ray that passes through the screen.

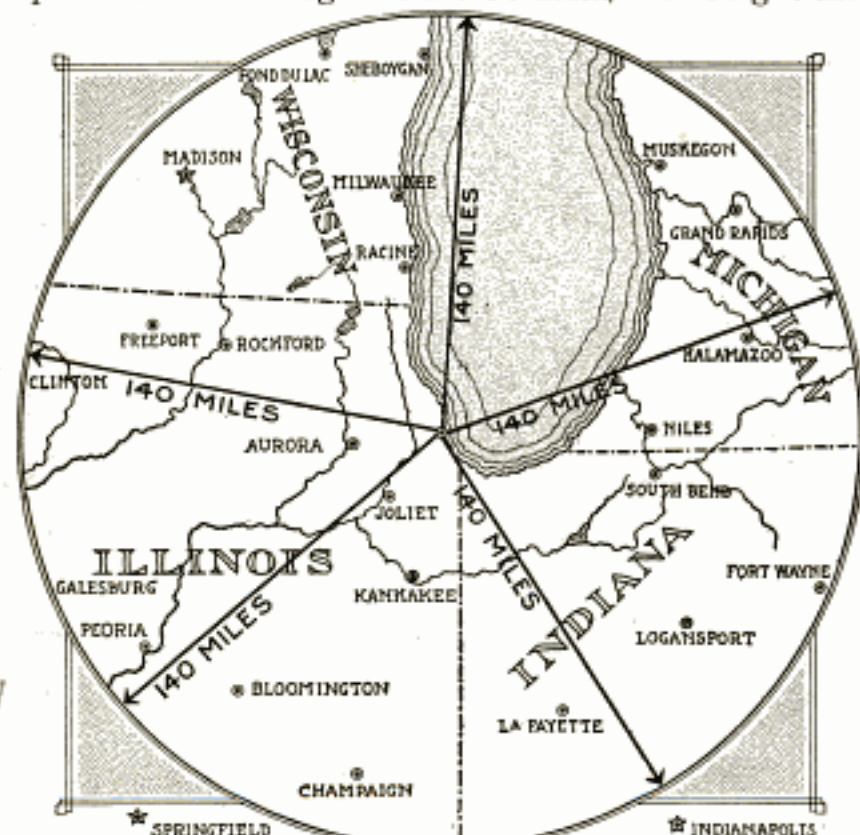
*Robert W. Wood Prof. of Experimental Physics
 Johns Hopkins University
 Baltimore, Md.*

ROAR OF GREAT WAR BLAST IS HEARD IN ENGLAND

When the British, early in June, reopened their drive against the Germans

the signal for "Tommy Atkins" to advance. This terrific stroke was the culmination of months of difficult work successfully executed. An interesting side light involves the British premier.

David Lloyd George was spending the night at his country estate in England, 140 miles from the firing line across the water. He had been notified of the exact moment that the Titanic charge would be touched off, and therefore left instructions that he should be awakened at 3 o'clock in the morning. With other members of his household, he heard the blast that shook the battle front for miles. The roar, probably the greatest ever produced by man, was also heard at London and other British points. According to mathematical calculations, it was 11 minutes and 18 seconds after the explosion actually occurred that



The Map Shows Towns and Cities Situated in Four States within a Radius of 140 Miles of Chicago, and Illustrates Graphically the Distance David Lloyd George Was from the Battle Front When He Heard the Terrific Report of the 1,000,000 Pounds of Explosives Discharged beneath the German Trenches by the British

in Belgium, the climax of seven days of continuous artillery bombardment was the detonation of a million pounds of high explosives planted beneath the enemy's trenches. The colossal upheaval, which rocked the earth and annihilated hundreds of soldiers, was

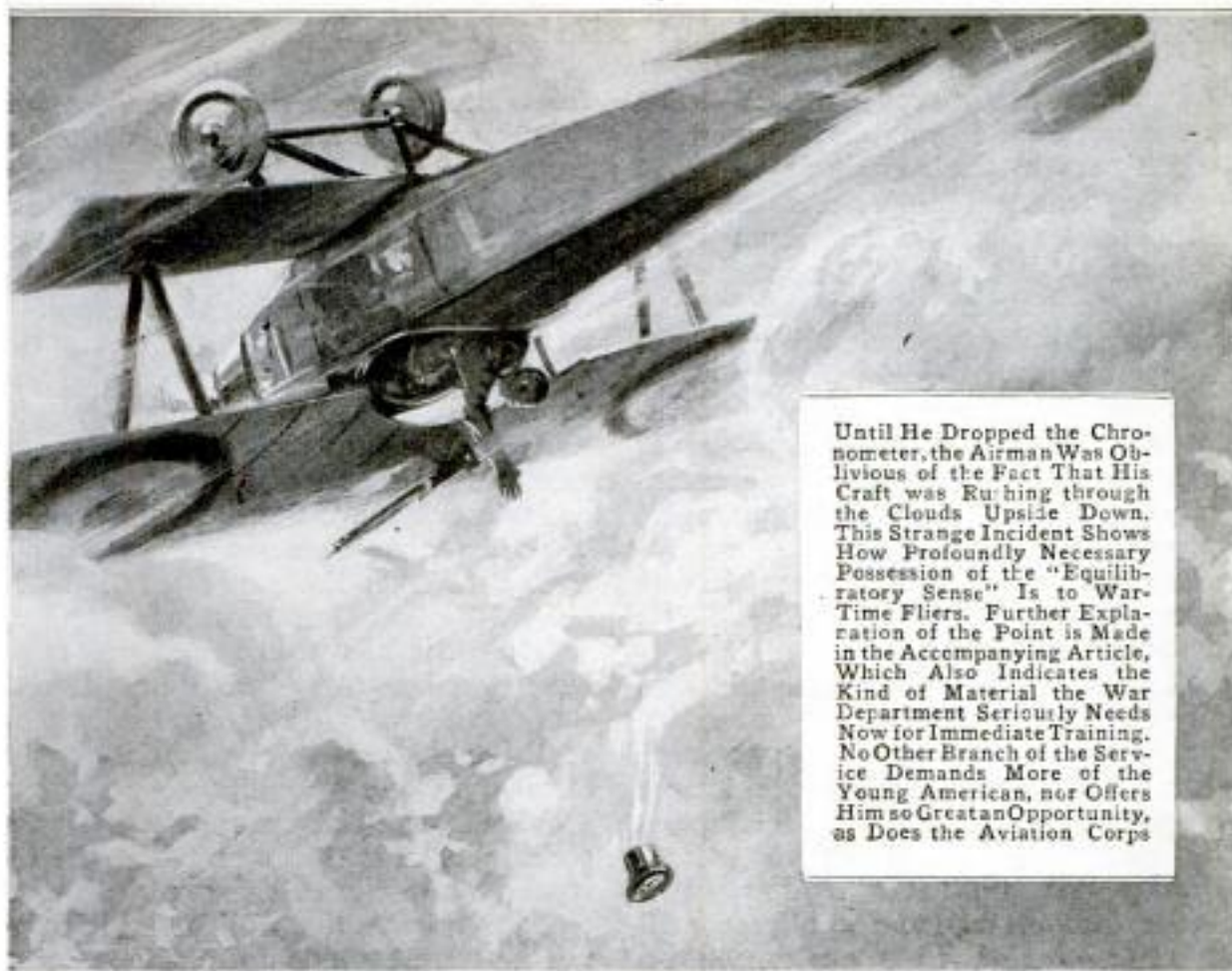
the premier heard its sound. For purposes of illustration, a similar blast at Chicago would be heard in about the same number of minutes at Galesburg, Bloomington, and Peoria, Illinois; Ft. Wayne, Indiana, Muskegon, Michigan, and Fond du Lac, Wisconsin.

4493 GROWING NUMBER OF WIVES ARE WAGE EARNERS

More than one-tenth of the married women of the United States were engaged in gainful occupations in 1910, according to figures recently given out by the Bureau of the Census, and over 25 per cent of all women 16 years old or over were wage earners, business women, etc. Since 1910 the percentages undoubtedly have increased rather than diminished, for the tendency of

women in this country has been toward greater economic freedom for many years. In 1900 the number of married women in gainful occupations was only 769,000, while in 1910 it was 1,890,000. The statistics referred to show that the proportion of women—married, single, and widowed—who are earning their living, is greater than ever before, but it is particularly interesting to find that of all the groups cited, the proportionate increase in the number of married women is the greatest.

Dept of Commerce.



Until He Dropped the Chronometer, the Airman Was Oblivious of the Fact That His Craft Was Rushing through the Clouds Upside Down. This Strange Incident Shows How Profoundly Necessary Possession of the "Equilibratory Sense" Is to War-Time Fliers. Further Explanation of the Point is Made in the Accompanying Article, Which Also Indicates the Kind of Material the War Department Seriously Needs Now for Immediate Training. No Other Branch of the Service Demands More of the Young American, nor Offers Him so Great an Opportunity, as Does the Aviation Corps

HAND-PICKED MEN TO FLY AMERICA'S AIR CRAFT

ANNOUNCEMENT that the War Department's aerial program contemplates the immediate expenditure of some \$600,000,000 for the construction of thousands of aeroplanes for early service at the front, has raised the popular query as to the government's ability to provide pilots, in the necessary numbers, quickly.

Despite all that has been printed regarding the severe requirements to be met before one can qualify for admission to the aviation service, the youth of America still clamors for application blanks. This is encouraging, for men are needed, but it is strikingly apparent that the average boy with aeronautic aspirations has a poor conception of the type of physical and mental material the work demands.

There is no branch of the service that is so exacting in the selection of its personnel as this one. A man ideally equipped for other kinds of difficult

work that call for a sound body and a healthy mind, might easily lack some of the essential qualities necessary to the war-time flier. The enormity of the government's task in acquiring the number of pilots that undoubtedly will be wanted, can scarcely be overestimated, but there is reason to believe that the War Department knows how the situation is to be handled.

Good sight, sound ears, a strong, healthy body, an alert, decisive brain, a perfectly tuned nervous system, delicate sense of balance and direction, ability to resist fatigue and maintain absolute poise in the midst of confusion and excitement are a few of the absolute prerequisites. Deficiency in one of them means incapacity. Possession of all of them labels a young fellow a possible candidate, providing his education is good and he shows ready response to training.

Failure to pass the iron-bound re-

quirements has already caused some professional and amateur airmen to lose berths in the aviation corps. It will be clear, therefore, that the man who hopes to fly an American aeroplane at the front must be more than a clever exhibition birdman, more than a conscientious and determined defender of our national liberty. An ability to fly, a reserve supply of death-ignoring nerve, a true wish to serve; these are mere incidentals. For instance, an airman not long ago was before an examining board. He appeared to be a fit subject until it was found that his hearing was poor. This incapacity ruled him out.

The reason for stringent regulations may not be patent to all at first sight. But when it is considered that three years of modern warfare have taught every one of the belligerent nations the profound importance of scientifically determining a man's fitness before permitting him aloft, it will be realized that they are based on sound principles. One airman is characterized as worth a troop of cavalry; he is one of the many eyes of an army. No eye that is faulty is efficient; no airman, whose capacity is questionable, is safe to the lives of those depending upon his hazardous, difficult work.

Some slight indication of how severely aviation in war time tests a man's powers may be afforded by the story of a British airman's peculiar experience. He had successfully passed through an aerial combat with an enemy plane and was gliding through a dense cloud bank when he had occasion to note the time. Instead of

4546

204

IN MAKING SOLDIERS' HOSE RULES MUST BE FOLLOWED

There is misapprehension among many regarding the task of knitting hose for our boys in khaki. The work, unless properly done, may do more harm than good. It is expedient that the regulations be followed. According to the superintendent of a Red Cross workroom at Chicago, hand-

referring to his wrist watch, he unthinkingly removed his chronometer from its case. In doing so it slipped from his fingers and fell. He was puzzled at the direction it took, for it appeared to float "up" and away from him, as if it were lighter than air. The truth was that it shot straight for the earth and that the airman had been completely oblivious of the fact that he was flying upside down.

Interesting as an illustration of an odd phenomenon, the case also serves to stress the keenness of perception and the splendid sense of balance needed by war-time birdmen.

Of late it has been found that man has special senses other than the five that are universally recognized. One of these, particularly essential to the airman, is the "equilibratory sense," provided by an extremely delicate stabilizing organism situated in the internal ear. It is this that plays a tremendous part when a birdman is driving through clouds or darkness at a great height, where he can see nothing of the earth, feel nothing of it, or hear nothing of it. At such times, without this "sixth sense" an airman would be lost. With it, he knows intuitively whether or not he is rising or falling, turning to right or left, or proceeding straight ahead. For this reason the man who would be a flier must possess a normally acute equilibratory sense, in addition to being physically acceptable for military service. To determine certainly that one is fit in this respect, scientific tests have been devised by which the special quality can be measured as accurately as can vision.

knitted socks last a soldier in the trenches about three weeks, while the average life of machine-made ones is only one week. Thus the former, although requiring more time for production, are much preferred. The color of yarn, uniformity of knitting, size, and weight are other things that must be distinctly understood. Rules for doing the work, as well as instructors for teaching it, are available.

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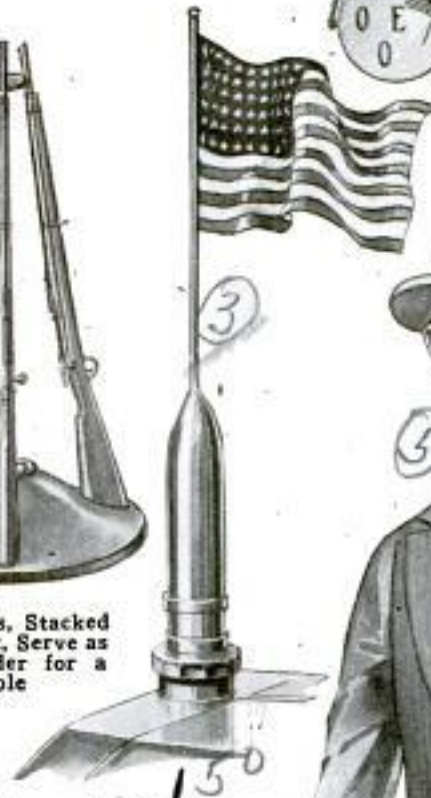
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Tiny Rifles, Stacked about Shot, Serve as Flag Holder for a Table



By Spinning This Two-Faced Charm, "I Love You" Appears Beside Flag



Suggestive Flag Support for Auto Radiators, Being a Rustproof Reproduction of a Five-Pound Shell



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An Inverted Bulb Connected with Car's Lighting System Beautifully Lights the Flag Fastened to This Metal Staff



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Headlight Dimmed with Red-White-and-Blue Sheet, Held in Place by Lamp Door

At Back of Headlight Is Easily Attached Wire Holder for a Flag



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STRIKING WAR VIEWS FROM FRANCE SHOWING



COURTESY, MOTOR CYCLE, LONDON

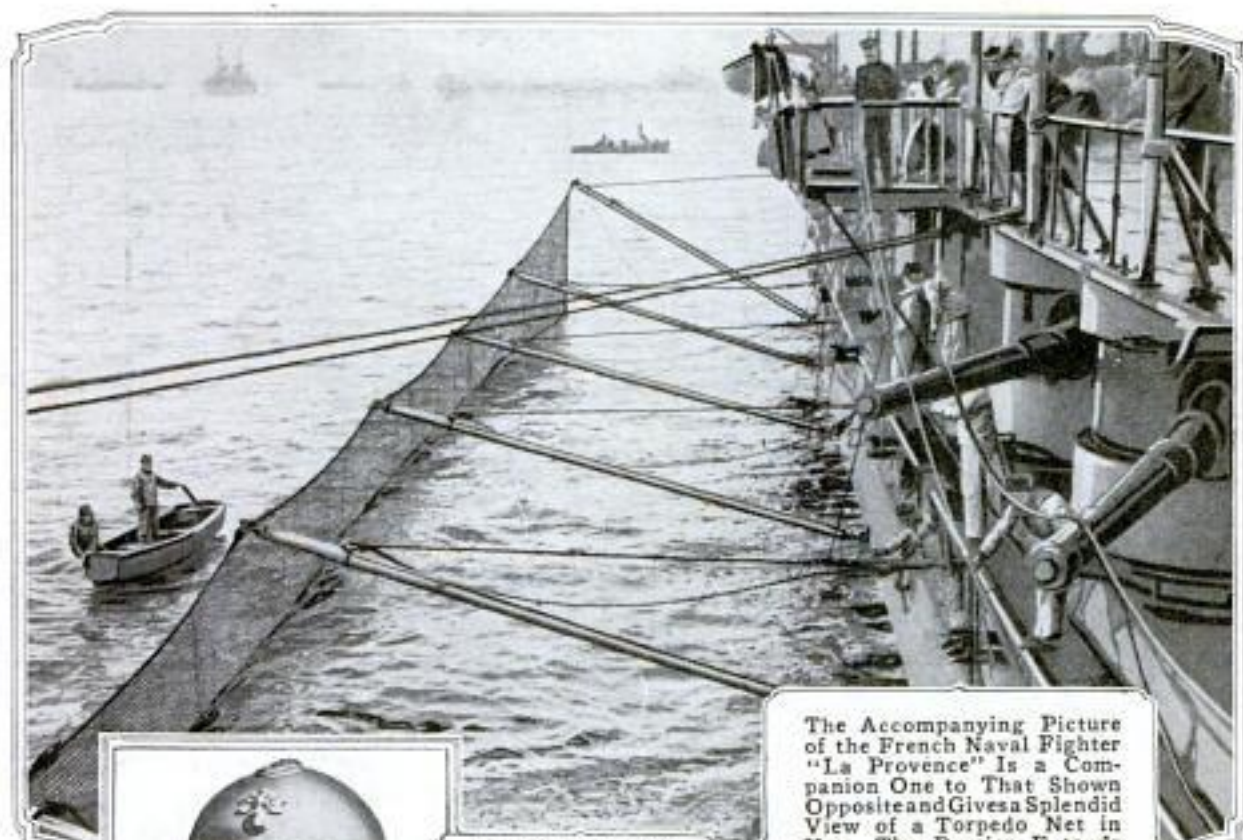
The Gallant Fellows Who Man the Terrifying British "Tanks" are Distinguished by a Special Insigne. It is Worked in Black and White Silk and Represents a "Tank"

In Actual Practice Apparently Nothing has Proved More Effective in Protecting a War Vessel from Enemy Torpedoes than Nets. The Photograph Reproduced Above Gives One a Close View of French Seamen aboard "La Provence" Preparing for Eventualities. They are Unrolling a Heavy Net Preparatory to Suspending It at the Extremity of Outriggers



So Successful have the British "Tanks" Been in Operations against the Germans, That the French Army has Also Adopted Their Use. Above is Pictured One of the Creeping Machines of the Tricolor and Its Crew. The Photograph was Taken Just Before the Engine Made Its Last Attack. Becoming Disabled within the Enemy's Lines, the Commander Prevented Its Capture by Blowing It Up at the Cost of His Life

SIDE LIGHTS ON FIGHTERS AND EQUIPMENT

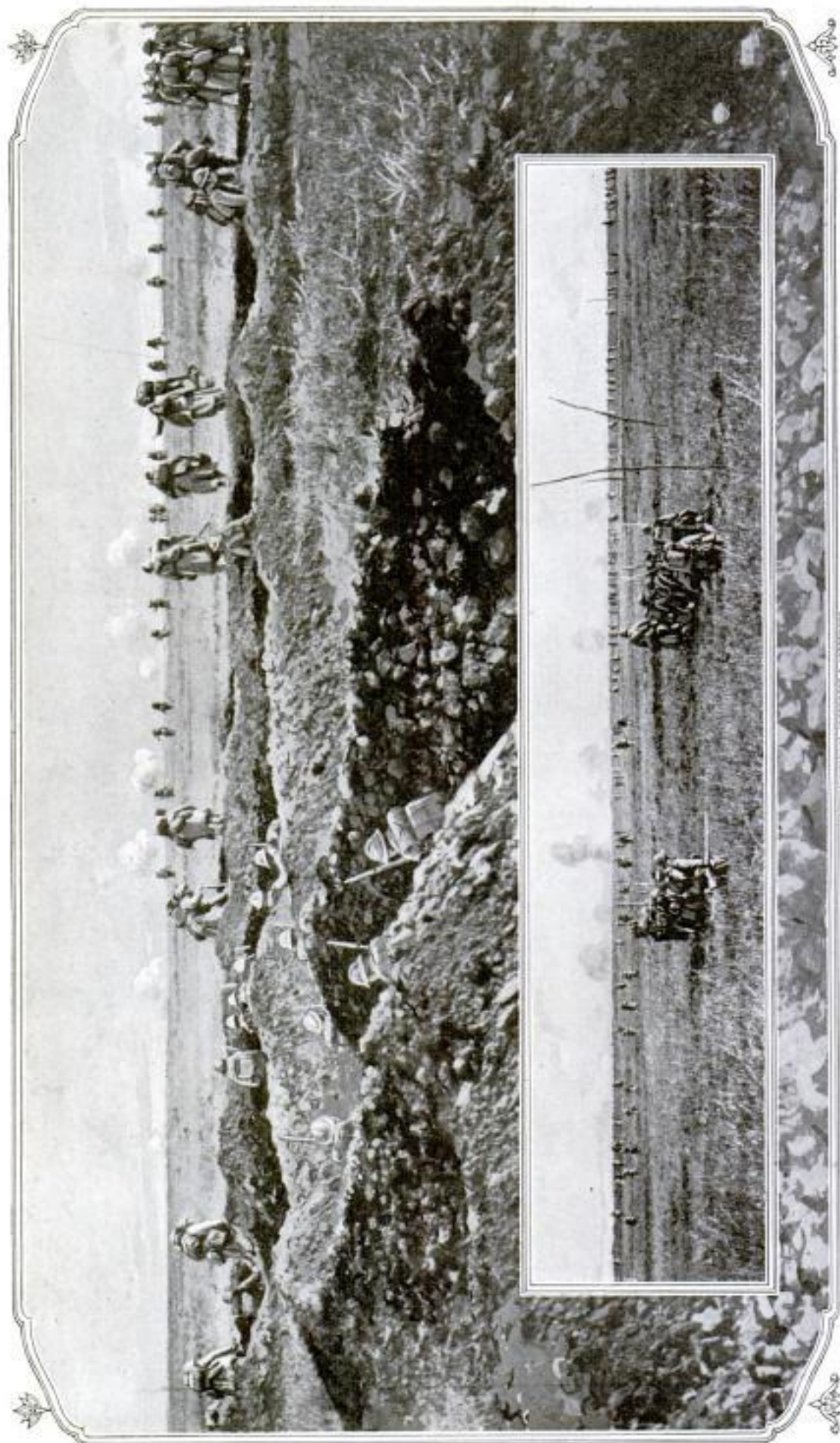


COPYRIGHT, INTERNATIONAL
FILM SERVICE
So Many Soldiers
have been Blinded and
Otherwise Injured
about the Face by
Shrapnel Fragments,
That the French have
Devised a Protecting
Visor, Which Fits to
the Front of the
Trench Helmet

The Accompanying Picture
of the French Naval Fighter
"La Provence" is a Com-
panion One to That Shown
Opposite and Gives a Splendid
View of a Torpedo Net in
Use. The Barrier Extends
beneath the Surface of the
Water to a Point Safely be-
low the Depth at Which
Torpedoes Travel, and There-
by Prevents Such Missiles
from Striking the Ship's Hull



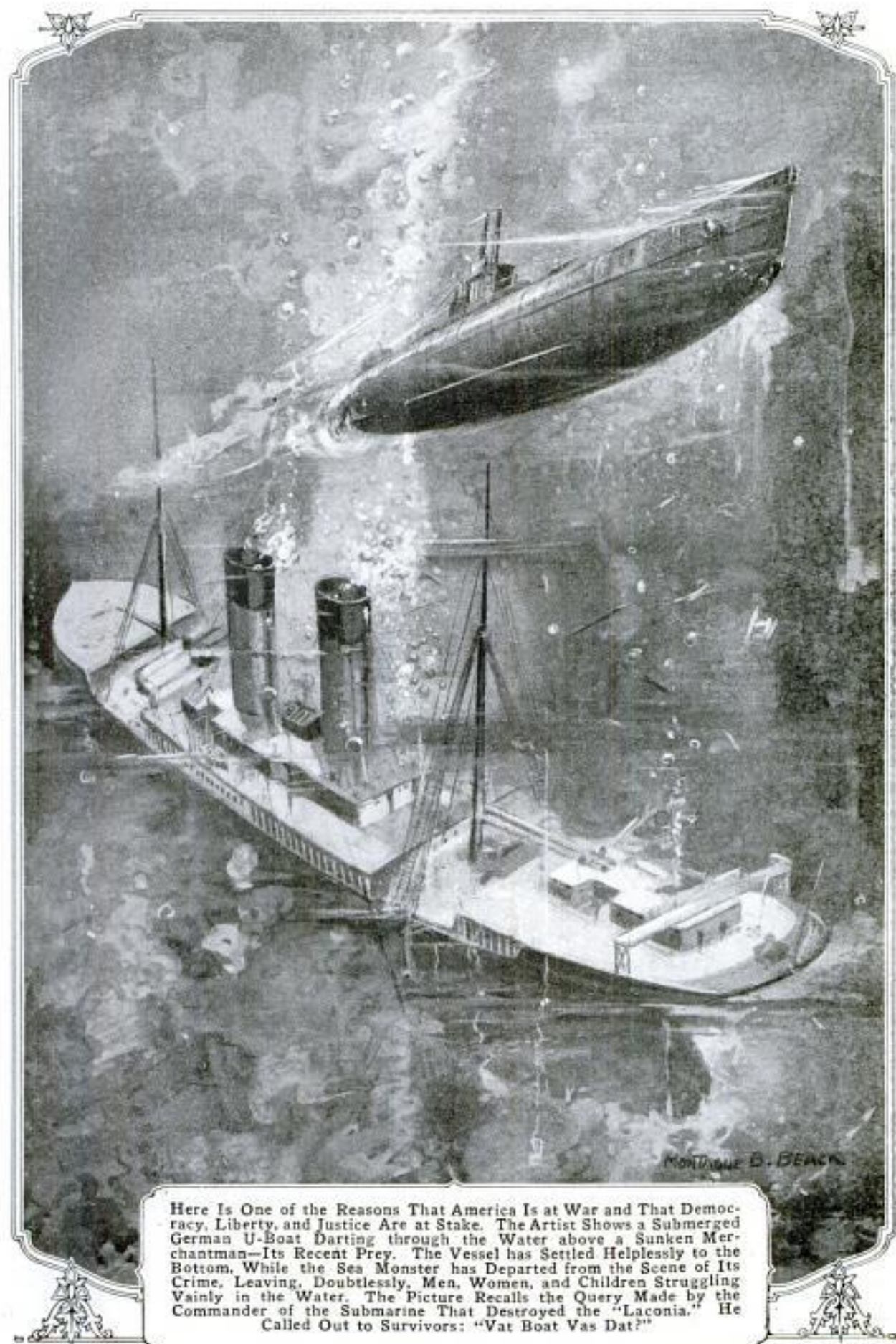
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Captain Guynemer, One of France's Famed Airmen, Aloft: The Much-Admired
Pilot, Whose Feats are Widely Known, has Ascended to a Height of 10,000
Feet to Assist in Guarding Some Observation Planes. The Birdman's Mastery
of Flying has Made Him a Greatly Feared Antagonist



FRENCH IN FIERY ATTACK UPON ENEMY LINES

Two Remarkable Photographs Depicting the French Attack of May Fifth upon the German Positions at Chemin des Dames, are Presented Herewith. The Upper One Shows the First "Wave" of Infantrymen Leaving the Trenches and Pressing Forward, under Protection of the Artillery's Barrage Fire, toward the Ridge Commanding the Ailette Valley. The Insert Shows Members of "La Liaison," Who are Charged with the Hazardous Duty of Keeping the Advanced—or Advancing—Lines in Constant Communication with Those Behind. In the Background the First Wave is Just Reaching the German Works

THE RUTHLESS STEEL SHARK AND ITS PREY

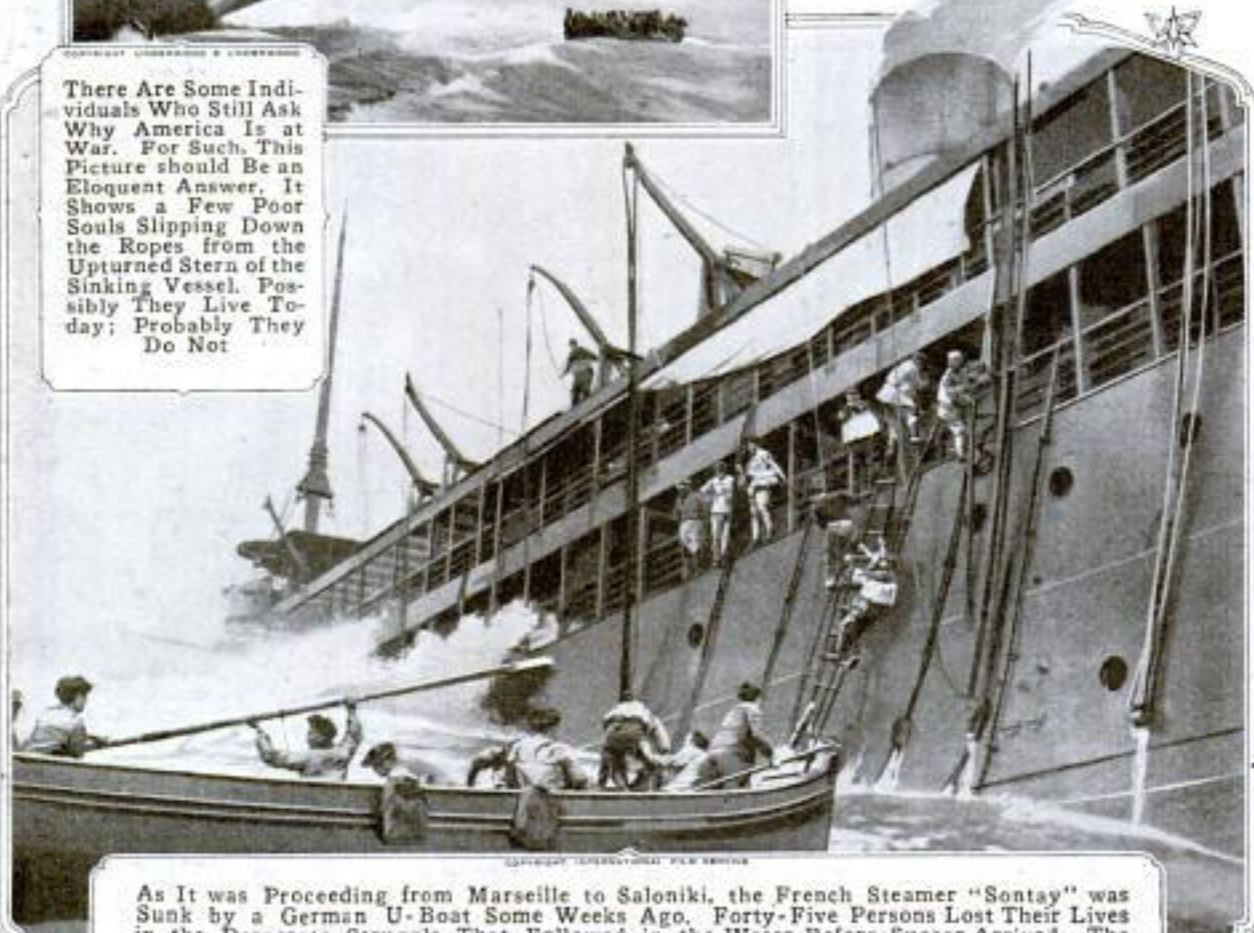


Here is one of the reasons that America is at war and that Democracy, Liberty, and Justice are at stake. The artist shows a submerged German U-boat darting through the water above a sunken merchantman—its recent prey. The vessel has settled helplessly to the bottom, while the sea monster has departed from the scene of its crime, leaving, doubtlessly, men, women, and children struggling vainly in the water. The picture recalls the query made by the commander of the submarine that destroyed the "Laconia." He called out to survivors: "Vat Boat Vas Dat?"

REMARKABLE PICTORIAL STORY OF SINKING



There Are Some Individuals Who Still Ask Why America Is at War. For Such, This Picture Should Be an Eloquent Answer. It Shows a Few Poor Souls Slipping Down the Ropes from the Upturned Stern of the Sinking Vessel. Possibly They Live Today; Probably They Do Not



As It Was Proceeding from Marseille to Saloniki, the French Steamer "Sontay" was Sunk by a German U-Boat Some Weeks Ago. Forty-Five Persons Lost Their Lives in the Desperate Struggle That Followed in the Water Before Succor Arrived. The Photograph Presented Herewith Shows the Sinking of the Big Boat and the Escape of the Last to Leave It. The Water Breaking over the Inclined Deck Gives One an Impression of the Character of the Sea at the Time and of the Difficulties Encountered by Those Who Were Not Fortunate Enough to Gain Places in the Small Boats.

OF FRENCH SHIP AND RESCUE OF SURVIVORS

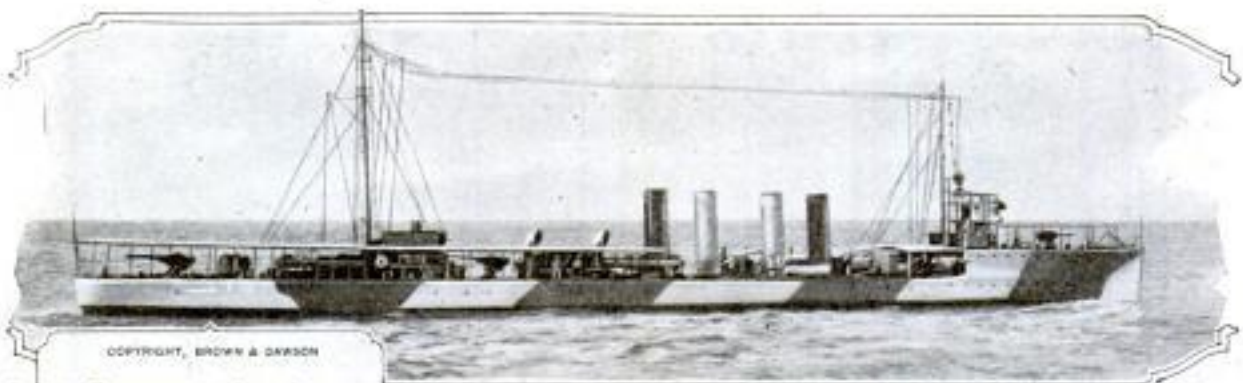


Adrift amid the Wreckage, the Survivors of the Liner "Sontay" Battling for Their Lives While a French Gunboat Approaches to Take Them Aboard: Had It Not Been for the Timely Arrival of This Vessel, the Death List would have Been Much Longer than It Was. Although Such Pictures as the One Above have Become Alarmingly Numerous during the Present War, Each New One Serves to Impress upon All Lovers of Justice and Humanity the Horror of Ruthlessness



Rescue of Passengers and Crew after Their Harrowing Experience in the Mediterranean Following the Torpedoing of the French Steamship by a German Submarine: The Photograph Shows a Boatload of the Survivors alongside the Gunboat being Assisted Aboard, and Other Small Craft in the Background Yet to be Picked Up. Many Persons Nearly Exhausted from Exposure were Taken from the Water, While Others were Released from the Floating Wreckage to Which They had Clung Tenaciously

U-BOATS AND THE BUSINESS OF SINKING THEM

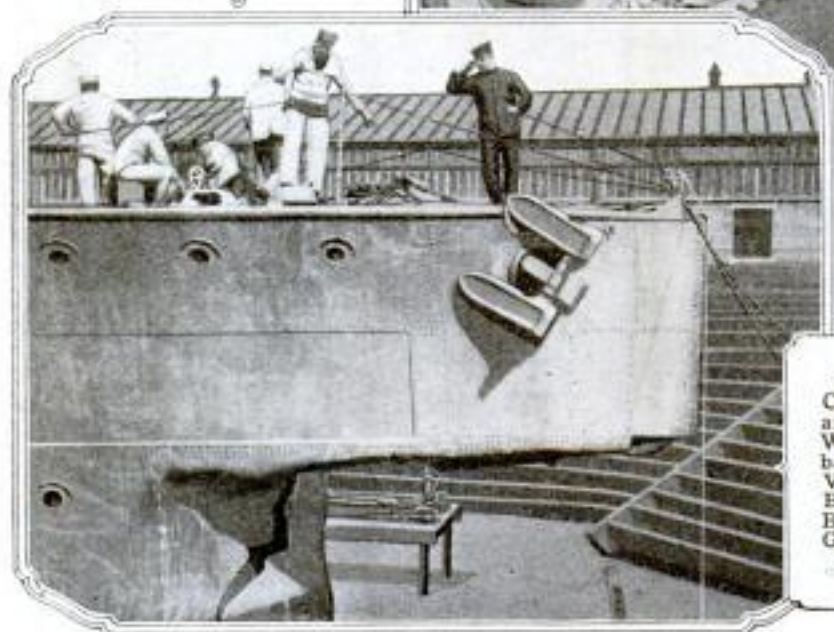


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Destroyers—American No Less than Others—Are Alert Enemies of Germany's Mad Dogs of the Sea, Its Depraved Submarines. The Trim, Businesslike Little Vessel Above, Spotted with War Paint So as to Render It as Inconspicuous as Possible, Is One of the Many Similar Craft Flying Our Flag and "Doing Their Bit" to Rid the Atlantic of Steel Sharks

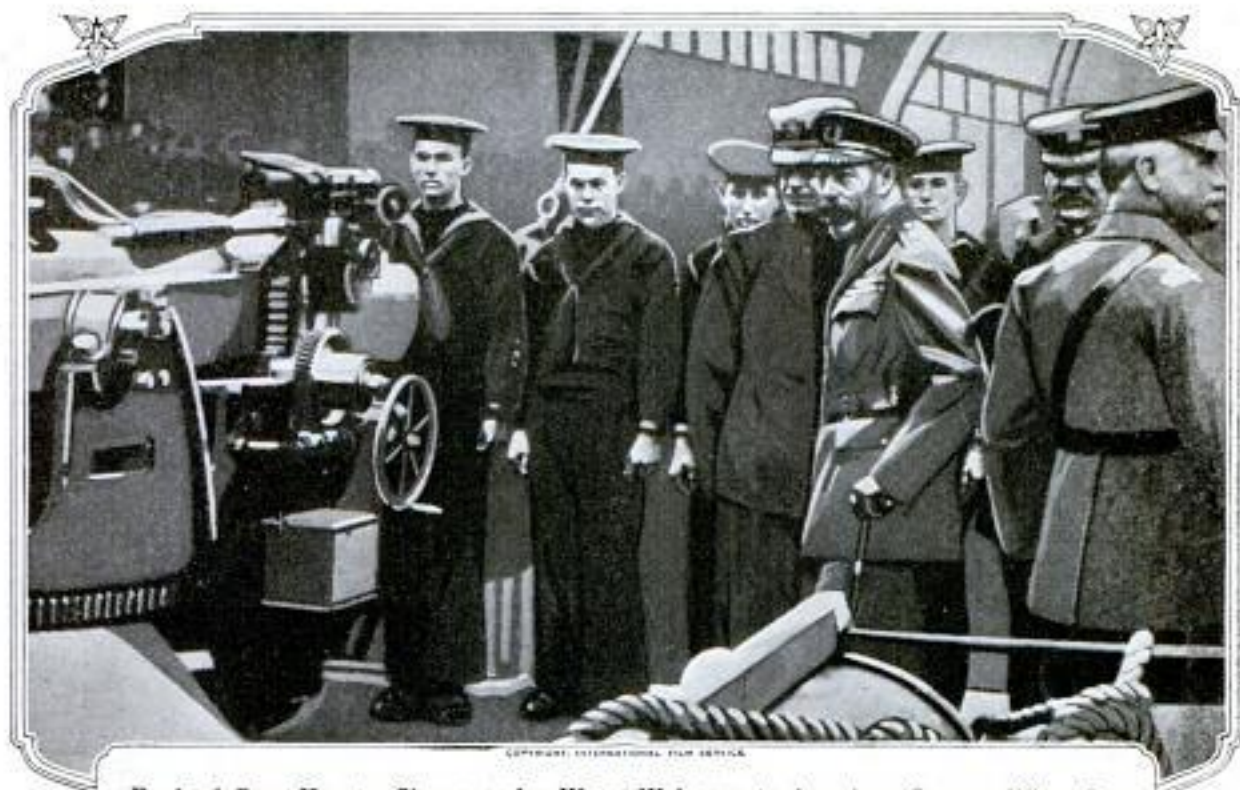


In a Crisis, the Value of Discipline Is Self-Demonstrative. When the Australian Troop Ship "Ballarat," a Deck View of Which is Given at the Right, was Torpedoed Some Time Ago, It Sank within a Few Minutes, but Carried No Man with It. The Picture Shows the Orderly Manner in Which the Soldiers Took to the Boats and Escaped from the Doomed Vessel



Battle Scars Earned in Honest, Clean Fight Are as Good as Medals and Official Mention, Particularly When They are Sustained by a Combatant So Easily Repaired as a War Vessel. At the Side is Pictured the Badly Smashed Prow of a Game British Destroyer That Rammed a German Submarine Unwise Enough to Show Itself in the North Sea

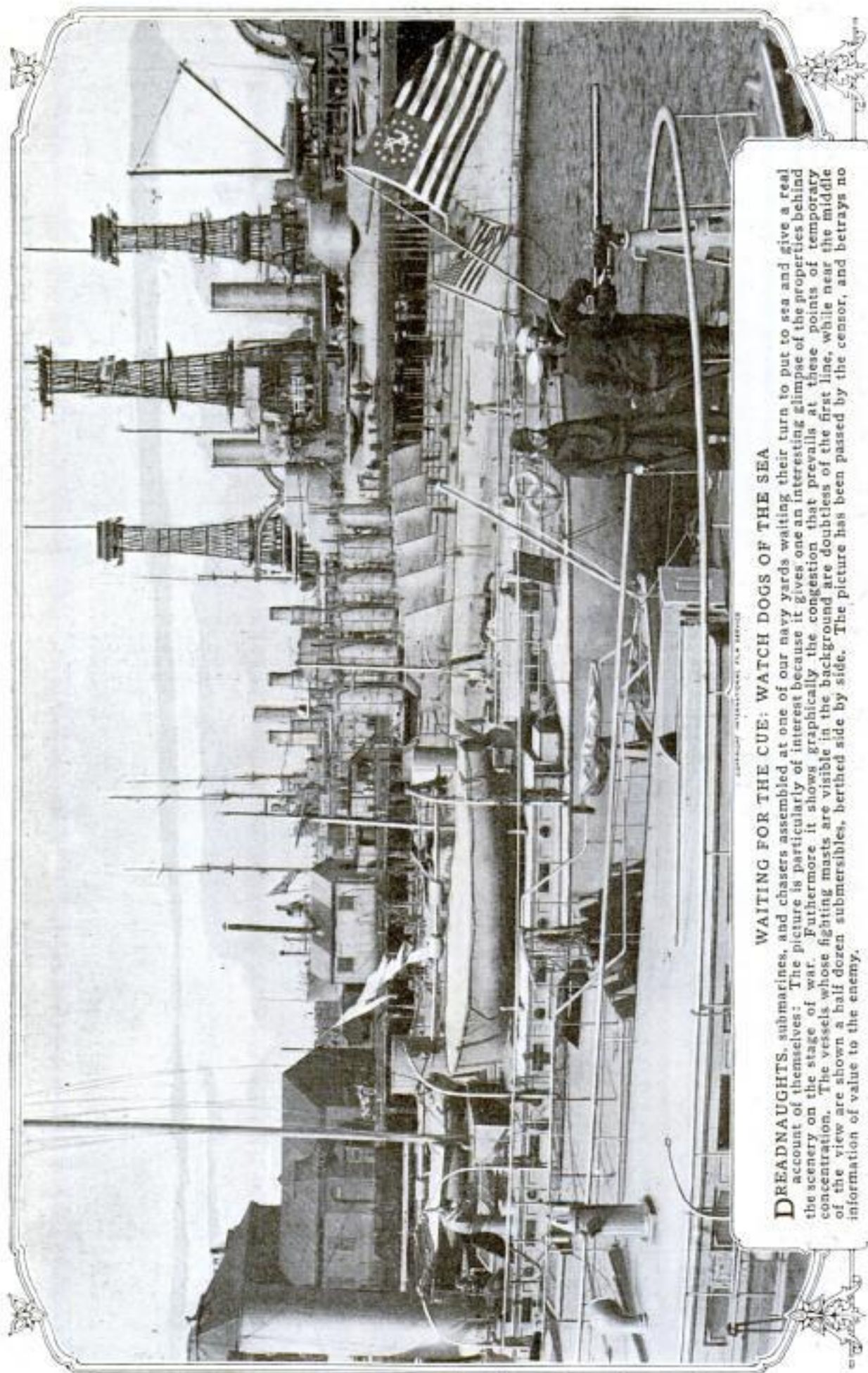
OUR BOYS AT WORK IN THE BUSINESS OF WAR



England Gave Hearty Cheers and a Warm Welcome to American Seamen When Our Destroyers, Commanded by Vice Admiral Sims, Reached British Waters to Lend a Hand in the Campaign against Germany's Murderous Submarines. Since That Occasion Our Jackies have Given a Good Account of Themselves and have Helped Much in Relieving the Shipping Situation. The Picture Above was Taken When King George was Paying His Respects to the Commander



Porto Ricans at San Juan have on Several Occasions of Late Demonstrated Their Loyalty to Their Protecting Flag Most Fittingly. This Picture Shows the Great Crowd That Gathered Recently to Give a Hearty "Send Off" to the Soldiers Departing on a Transport for Important Duty Elsewhere. No City could have Shown Its Spirit More Clearly than Did This One. Thousands of Cheering Men and Women Thronged the Line of March



WAITING FOR THE CUE: WATCH DOGS OF THE SEA

DREADNAUGHTS, submarines, and chasers assembled at one of our navy yards waiting their turn to put to sea and give a real account of themselves: The picture is particularly of interest because it gives one an interesting glimpse of the properties behind the scenery on the stage of war. Furthermore it shows graphically the congestion that prevails at these points of temporary concentration. The vessels whose fighting masts are visible in the background are doubtless of the first line, while near the middle of the view are shown a half dozen submarines, berthed side by side. The picture has been passed by the censor, and betrays no information of value to the enemy.

AN OCCASION OF PRAYER AND THANKSGIVING

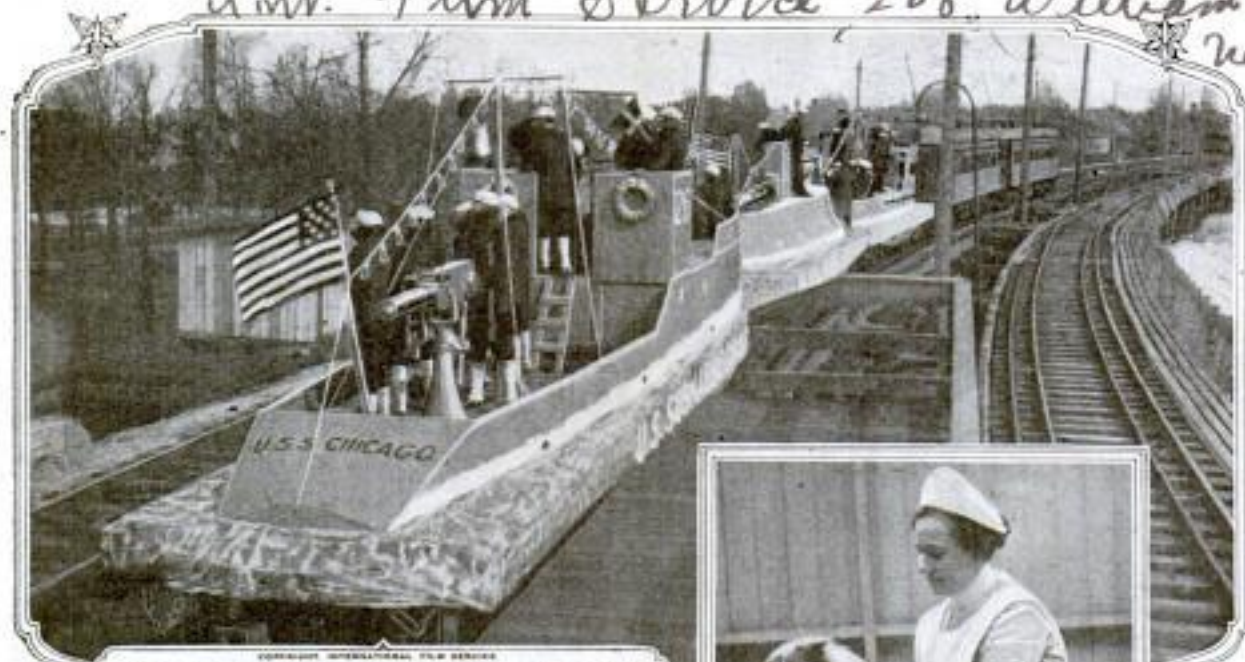


Old Glory and the Union Jack Hung Side by Side While the "Star-Spangled Banner" and the British National Anthem were Sung Solemnly but Joyfully during the Impressive Service at St. Paul's in London on the Occasion of the Entry of the United States into the World's War for Liberty. Of the Ceremony an English Magazine Said: "St. Paul's has witnessed many solemn services, but never one of such momentous import, or so charged with historic memories and racial aspirations, as that which was held on Friday, April 20."

4153 U + U, 417 Hych ave. New York City.

AMERICA MAKES READY TO MEET THE GERMANS

Cont. Film Service 238. Williams St. New York



COPYRIGHT INTERNATIONAL FILM SERVICE

To Assist in the Campaign for Naval Recruits, This Fleet of Dummy Vessels was Recently "Navigated" over the Elevated Railways at Chicago. Manned by Apprentice Seamen from the Great Lakes Training Station, and Equipped with One-Pound Guns That Roared Thunderously When Fired in the City's Loop District, the Trains Attracted Attention and Doubtless Many Volunteers



COPYRIGHT UNDERWOOD & UNDERWOOD

War Dogs get Wounded and Sick as Do Soldiers, and Therefore Need Tender, Intelligent Treatment. Nurses are Trained to Care for These Plucky Little Fellows When They are Injured, and the Picture Above Illustrates One Phase of the Instructor, That of Applying Bandages



Despite Machine Guns, High-Powered Rifles, and Other Instruments of Modern Warfare, the Bayonet Continues to Be as Deadly and Important as Ever. All Fighters are Drilled Painstakingly in Its Use. Above, a Squad of Marines is being Given a Work-Out



COPYRIGHT INTERNATIONAL FILM SERVICE

Cooks are Needed for the Army, and the Business of Teaching Enlisted Men to Assume the Work is Undertaken in an Eastern City by a League Organized by a Number of Prominent Women. The Organization Has a Corps of Instructors and is Equipped with the Regulation Ranges and Field Outfits. Potato Soup Is under Consideration in This Picture

WAR'S VARIED PHASES SEEN FROM SIDE LINES



Students of Economics Realize That the War's Effect upon Industry will be Profound After Peace is Established. In This Connection the Picture Above Is Noteworthy. It Shows a Group of English Girls and Women Employed in One of the Railroad Yards

One of the Sordid Clearing Houses Back of the Trenches on the Western Front, Showing German Prisoners at Work as Stretcher Bearers: The Point Is an Ambulance Station Where Seriously Wounded Soldiers Receive Surgical Aid. When This Is Not Necessary, the Men are Placed in Ambulances That Take Them to Hospital Trains Bound for Bases



The Caution Imparted by the Sign in the Accompanying Photograph might Well be Heeded Elsewhere than at Europe's Battle Front Alone, for Many a Horse is Injured by Nails in the Cinders Scattered on Driveways and Public Roads



British Officers Making a Tour of Inspection in a Newly Captured Village Somewhere along the Western Front Following the Enemy's Retirement: It will be Observed That at the Right of the Motor Car There Is an Alarm Station from Which Warning is Given upon the Approach of Clouds of Poison Gas

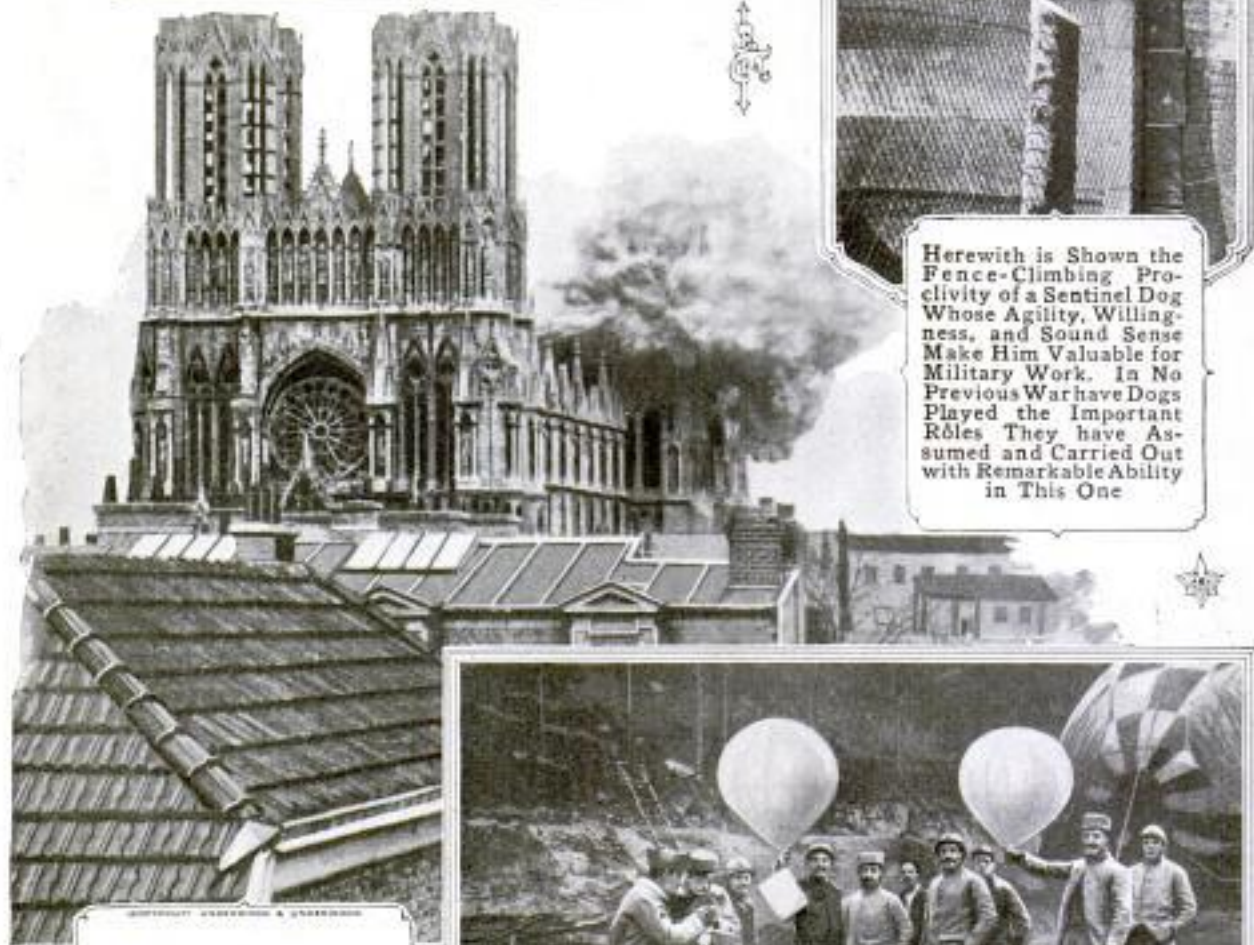
ASPECTS OF WAR FROM FRENCH VIEWPOINT



Colonial Gunners Operating a Highly Efficient Quick-Fire Rifle That is Now Employed by the French: The Cartridge Held by One of the Soldiers Indicates the Size of Projectile Used



Herewith is Shown the Fence-Climbing Proclivity of a Sentinel Dog Whose Agility, Willingness, and Sound Sense Make Him Valuable for Military Work. In No Previous War have Dogs Played the Important Roles They have Assumed and Carried Out with Remarkable Ability in This One



In View of the German Outrages That have been Perpetrated under Its Guise, the Term "Military Necessity" has Grown to Mean Wanton Destruction and Dastardly Vandalism. Above is Rheims Cathedral, Still a Target for Boche Shells, One of Which is Here Seen Bursting over It. Precious as is Ammunition, the Teutons Continue to Have Plenty of It for Churches



Small Balloons, Carrying Pamphlets That Tell of the Progress Made against the Enemy, are Sent Up by the French on the Western Front so That They may Fall behind the German Lines and Give Cheer to Countrymen under German Control in Occupied Territory. The Picture Shows "Poilus" Preparing to Release Some of the Gas Bags

LIFE IN DUGOUTS ALONG WESTERN FRONT



Above is Given a Glimpse of One of the Nerve Centers in the Important Defense System That Protects Paris from the German Hordes. It Is a Headquarters Chamber Situated Underground behind the Lines. Equipped with Electric Lights, Telephones, and Telegraph, It Has All of the Facilities Needed by the Staff That Occupies It



Photographs Usually Give One the Impression That, When in a Dugout, a Soldier is Comfortably Quarters and Has Little to Worry Him. This Is Not Always the Case, as the Picture Reproduced Herewith Indicates. It was Taken Following a Heavy Rain and Shows a Group of Men Pushing Back a Flood of Chalky Mud from Their Subterranean Quarters

WOODEN CROSSES IN FIELDS AND CHURCHYARDS



Propeller Blades, Bearing Inscriptions and "Iron" Crosses, Mark the Burial Places of Two Boche Airmen Killed in Macedonia. Their Machines Were the Targets of Successful French Gunners and Fell on Ground Then in the Possession of the Bulgarians



Each Soldier Wears an Identification Disk, but This Device is Often Lost or Destroyed When a Shell Bursts and Kills a Fighter. Such Was the Case in the Above Instance; so the Cross Bears the Information: "Here Lies a Hero of the 121st Regiment. The Number of His Bayonet P.33619 P. P. L." The Initials Mean, "Pray for Him"



A Ruined Church, a Grave, and a Sorrowing Mother. Three Phases of the War That Are to be Found at Every Hand in Outraged Belgium and France. One Has but to Study the Expressions of the Two Figures in This Picture, the Peasant Woman and the Little Child, to Read a Story of Hopelessness and Grief. The Woman has Returned to Her Village, Following the Retreat of the Germans, to Find—the Grave of Her Son



*Hotel Marlborough
 74. Chandler, S. Ave., Broadway, #32nd
 4702 POPULAR MECHANICS N.Y.C. 221*

**"WAR BREADS" NOW POPULAR
 IN HOMES AND HOTELS**

In the face of a serious food shortage occasioned by the war, American housewives, bakers, and hotel chefs are discovering that there are many satisfactory ways of making bread by which a saving of wheat flour can be effected. An effort is also being made to check America's wastefulness in the matter of food products. Bakers are trying to educate the public to the fact that stale bread is as wholesome as fresh bread, and in many cases more digestible. At present, vast quantities of stale loaves are collected periodically from the bakeries and sold at a fraction of the original price, as a base for stock foods. With a view to utilizing clean stale bread in making new loaves, an organization representing leading hotels has issued a "war-bread" recipe which calls for a thorough soaking of stale bread and crusts in water. This base, after it has been properly salted, is strained through a flour sieve and to it are added yeast and enough flour to make a very stiff dough.

A prominent New York hotel has recently added to its menu a bread containing rye flour and whole-wheat flour in addition to white flour. Another method of saving wheat flour which is being well received, is to use one part of cottonseed meal to four, five, or six parts of wheat flour. A United States senator not long ago served bread made from these ingredients to several of his colleagues in Washington, and they seemed much pleased with it. Government chemists have demonstrated that flour can also be made from peanuts, dried peas, sweet potatoes, etc., and that such flour can be mixed with wheat flour to make excellent bread.

4602
**SMALL SOFT-DRINK OUTFIT
 MOUNTED ON WHEELS**

A dispenser of cold drinks has altered his bicycle so that he can use it to carry all his supplies from his home to the park where he plies his trade. Between the rear wheel and a third wheel, placed

to one side, he has mounted a box having two compartments. One of these is



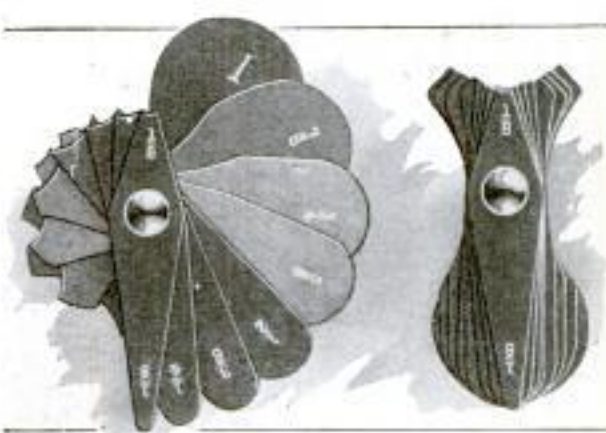
Portable Soft-Drink Stand: The Box is Divided into Two Compartments, One Containing Ice and the Other Various Utensils. Holders are Provided on Top for Bottles and Glasses

for ice and the other for utensils, while on top are holders for bottles and glasses.

4583

**SERVICEABLE RADIUS GAUGE
 OF CONVENIENT FORM**

For gauging the concave and convex surfaces of tools and determining their radii, an instrument of convenient arrangement has been introduced. When round-nosed implements are being ground, the gauge is particularly useful to a workman. It consists of eight small leaves, convex at one end and



Radius Gauge Designed for Determining the Concavity and Convexity of Round-Nosed Tools

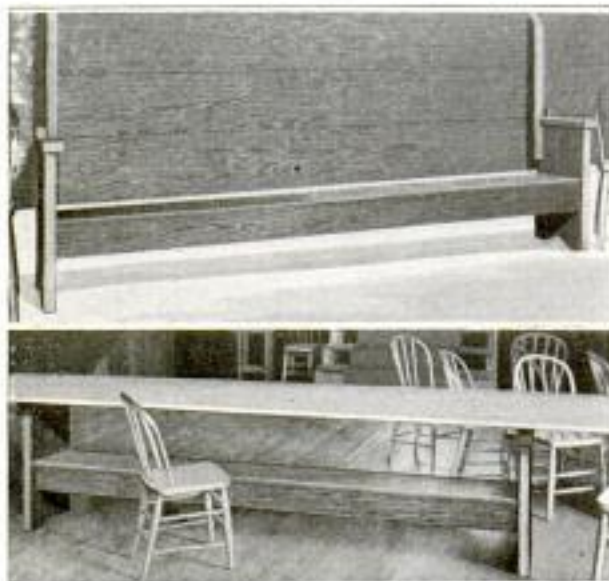
concave at the other, that are pivoted together. Their sizes range from an eighth of an inch to one inch.

*Mass-Ochlo
 3387 E. 116th St.
 Kalamazoo
 Mich. S. H. O.*

*Mr. T. ...
 5th - ...
 Los Angeles.*

CHURCH TABLES SERVE ALSO AS BENCHES

The pastor of a church which maintains a much-used parish house has



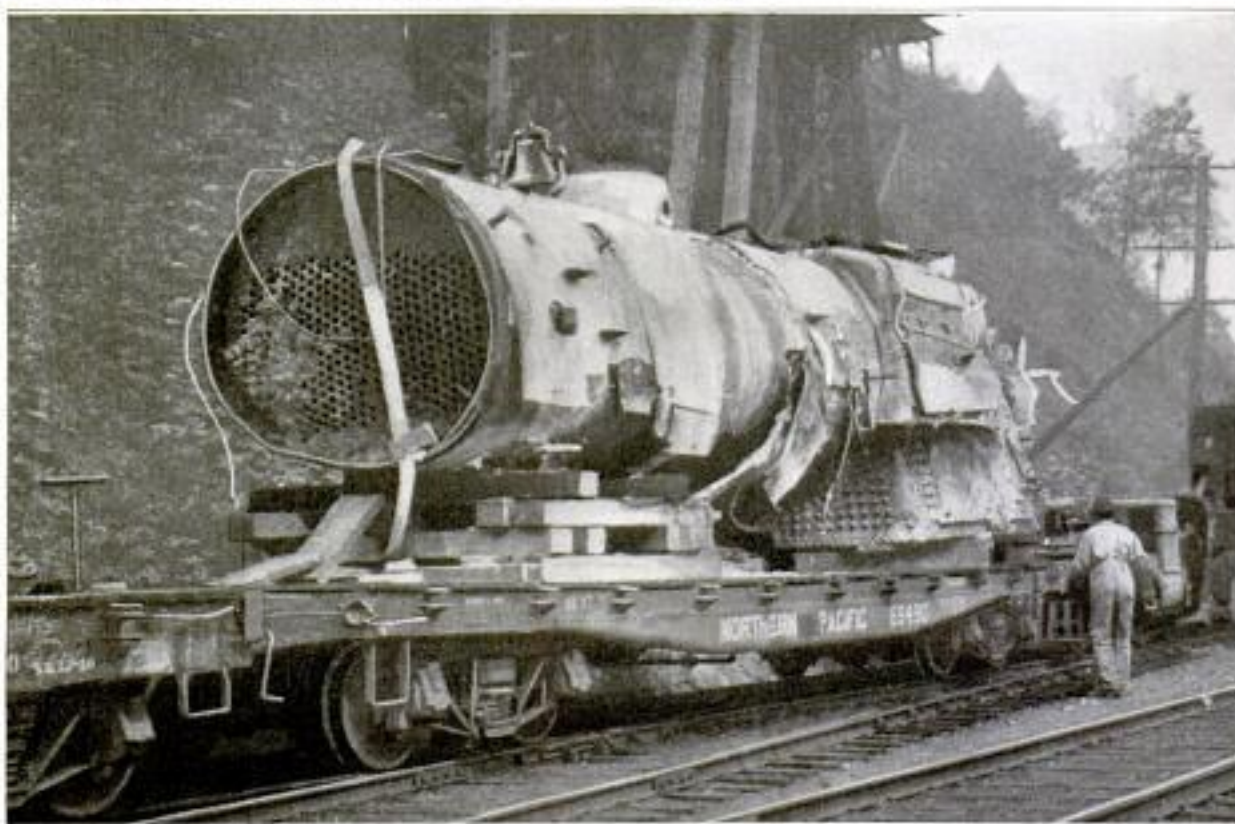
Parish-House Table Which can be Converted into a Bench by Tilting Up the Top: Upper View Shows the Table Set against the Wall and Transformed into a High-Back Bench

devised a very serviceable type of table that can be converted into a wall bench. The top is composed of three planed

boards fastened together and hinged to one side of the broad supports at either end, which take the place of legs. By lifting up the free edge of the top it can be swung to one side and into a vertical position, revealing a seat extending between the two supports, which then serve as ends of a bench. At social events the tables can be used first for a repast and afterward moved to the sides of the room and converted into benches.

BIG LOCOMOTIVE WRECKED BY QUEER EXPLOSION

4571
While taking water near Lester, Wash., the boiler of a powerful Mallet locomotive exploded with such terrific force that it was torn free from the drivers and hurled 195 ft. Examination showed that from some strange cause the boiler had been burned down nearly to the mud rings, in spite of the fact that it contained, according to the fireman, a liberal amount of water. The remains of the engine were loaded on five freight cars and moved from the scene.



What Remained of the Boiler of a Big Mallet Locomotive After It had been Torn by an Unusual Explosion



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BATTLESHIP IN CITY PARK WINS RECRUITS

ON the greensward of Union Square, New York, in the midst of giant skyscrapers, rests the U. S. S. "Recruit"—the first wooden battleship to be used by the United States Navy in more than a generation. It is 200 ft. long, and with fighting tops and big guns, four of which are of 12-in. caliber, it is an appropriate headquarters for the recruiting activities of the Navy and Marine Corps in New York. Though without motive power and built only of wood, it has become, since its christening and "launching" a few weeks ago, an important addition to our fighting forces, because of the men who have enlisted under its flag.

4578

BIG WARNING SIGNAL FILLS TWO FOLD PURPOSE

Near a dangerous curve in Loring Avenue, at Salem, Mass., a conspicuous warning signal has been erected for the benefit of motorists. It consists of a tall, brightly painted wooden figure, representing an officer with one hand raised and the other holding a red flag. Because of its size and color, the sign cannot escape notice, and therefore doubtless has a greater effect than would a more conservative sign. It was installed by a tire company beside one of the latter's billboards, and thus performs the twofold function of calling attention to the curve and so-and-so's products. Somewhat similar advertising schemes have been used elsewhere to good advantage.



In Addition to Warning Motorists of a Dangerous Curve, This Conspicuous Wooden Figure Calls Attention to What Appears on the Billboard

464

ENGINE LEAPS FROM TRACK WEAKENED BY FRESHET

A sudden rise of water in an Oregon creek so seriously undermined a



View of Railroad Wreck That Occurred When a Freight and Passenger Train Started to Cross the Wooden Bridge, Which had been Weakened by a Freshet

wooden railroad bridge recently that, when a train composed of freight and passenger cars started to pass over it, the structure gave way, and the engine plunged 20 ft. into the stream below. One freight car followed and landed on end next to the overturned tender. But for the slow speed of the train many cars would have been piled up in the creek. Two members of the crew were drowned, pinned under the engine.

4696

FLYING-BOAT PILOT KILLED IN MAKING WEIRD LANDING

When an aerial instructor recently wrecked a flying boat in attempting to make a landing at Buffalo, he was killed instantly and his pupil critically injured. The mishap was apparently due to a misjudgment of distance. The airman, navigating at a height of only 1,500 ft., began a spiral descent, while some distance from the river where the hangar was situated. When about 200 ft. from the ground, he seemingly discovered his danger and attempted to

alight on a narrow canal extending parallel with the larger stream. The machine, however, was at too low an altitude for this to be accomplished. The tragic end came when the craft collided with a telegraph pole and was deflected from its course so that it struck the top of a motor car. Otherwise the flying boat might have settled to the ground without fatal results.

4413

LIFELIKE MOVIE DRAWINGS MADE BY INGENIOUS MEANS

Certain methods employed rather crudely in making animated cartoons have been refined to produce "animated drawings" that have almost the realism of motion-picture photographs. A noteworthy achievement in this line, a 500-ft. film showing the sinking of the "Lusitania," suggests that here is an interesting field for artists. Though several thousand exposures were necessary to make this film, the amount of drawing required was materially reduced by using two sets of backgrounds in front of which were held transparent celluloid sheets. On these the objects in motion were drawn. One set of background pictures showed the sky, and the other, consisting of about 200 drawings designed to be used in order over and over again, showed the tossing sea.



This arrangement left the sinking ship, the passengers, the submarine, etc., to be drawn on the celluloid sheets, which were held, one after another, in front of the proper background when the exposures were made. One of the artist's difficult problems was to determine the correct relative motion of falling and flying bodies, timbers, etc., in the explosion scene. The rate at which objects fall, the film's speed, and the distances represented, all had to be considered to make the picture true to life.

Minidown the Tay (Amv.)

Curtiss Aeroplane & Motor Corp in Buffalo, N. Y. Copyrighted material

4477

POULTRY FLOCKS SMALLER THAN THREE YEARS AGO

Reports recently gathered concerning 5,298 flocks of poultry on farms and in small towns in all parts of the country show that the average number of hens per flock this year is 107, as compared with 146, in 1914. This information, which was obtained by an incubator manufacturer in the middle West, indicates that shortage of supply has been an important factor in producing present high prices for poultry and eggs. It appears that a very considerable number of poultry raisers have sacrificed many of their hens for the sake of immediate profits—a policy the effects of which are now being felt by the entire country.

4462

CONVERTIBLE CHAIR HAS SEVERAL USES

The mechanical ingenuity of a western man was brought into play lately, during his spare time, in the construction of a chair which is convertible into several forms, for a variety of purposes. Primarily it is a comfortable armchair of mission type, with back and seat upholstered. An adjustable back converts it in a moment into a reclining chair, and a slight pull brings a padded foot rest into place. The top of the foot rest being removed, a shoe-shining stand is disclosed; a shelf swinging from the right arm, when raised, forms a small desk for writing, and when the chair back is folded forward onto the arms, the result is a table suitable for several uses.

ELECTRIC COOKING RANGE FOR HOTEL USE

The advantages of an electric oven and various other electric cooking appliances have been combined in a new



Electric Range for Hotels: The Four Plates on the Top Serve the Same Purpose as Gas Flames or Burning Coal and, of Course, Produce Less Dirt and are Easily Controlled

electric range, designed for hotel use. It consists of an oven and four hot plates, each provided with a three-heat switch, cut-out, and inclosed fuses. The plates are situated on the top of the range and, at high temperature, serve the same purpose as gas flames or burning coal, without such undesirable features as smoke, fumes, etc. In the oven the heaters are located at the top and-bottom, leaving a large clear space for baking and roasting. Approximately 12 kilowatts is the maximum current that this range will use at one time.

1616 Macmillan St., Portland, Ore.

Design by Electric Heating Co., Lowell, Mass.



The Four Uses of the Convertible Chair Illustrated Here Are, from Left to Right: Desk or Table; Shoe-Shining Rest and Writing Leaf; Morris Chair, and Ordinary Armchair

E. G. MacMecken
4481 City Service Bureau,
Denver, Colo.

CONCRETE CASTS OF MOUNTAINS USED AS ZOO SETTINGS

THE city of Denver has moved a replica of a mountain top to its city limits, a distance of 20 miles. The demand by museums for scientific ac-

animals and birds behind their bars and wire fences have so long reminded the visitors of convicts.

For a considerable number of years natural settings of a kind have been used in some cities, notably Hamburg. Even in Hamburg the rock formations were modeled by hand. When the park authorities of Denver determined to abolish bars from the city zoo they sent an expert taxidermist and nature student to copy a mountain top and remove it to the city.

This taxidermist, the inventor of the system, packed cement, clay, glue, hemp, food, and even water, to the top of this mountain, near Morrison, Colo., and with four companions,



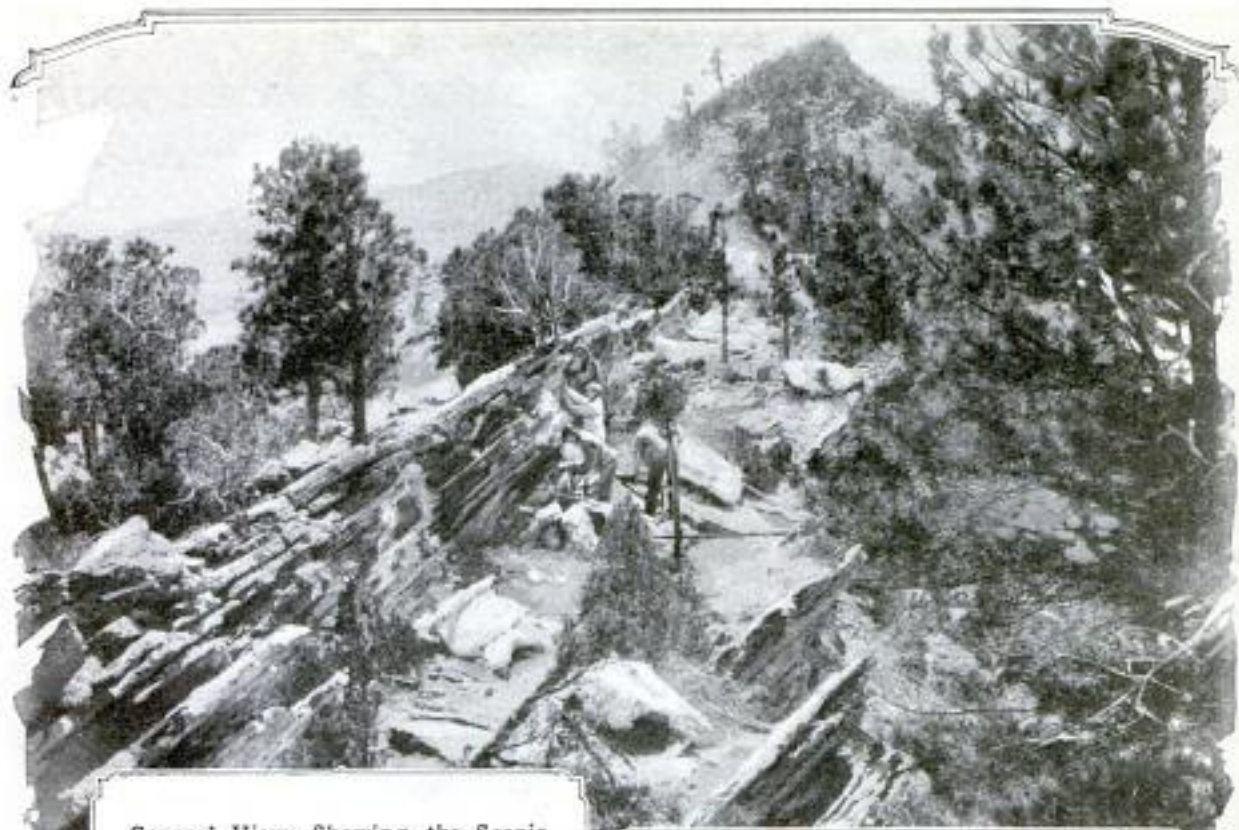
Two of the Makers of Mountain Replicas, with Burros Carrying Cement, Hemp, Clay, Glue, Food, Water, and Other Necessaries, to the Rocky Site of Their Activities

curacy in group mountings of wild animals, which led from the ungarnished show case to colored photographic transparencies for backgrounds, has extended to the zoo, where the live

spent three weeks in recording an exact replica of the rocks and crags in plaster. This was done by marking out a cliff section with a raised band of cement. Within this was pressed half an inch of clay. A mixture of cement and hemp fiber covered the clay and rested upon the raised boundary. When the cover dried, the modern nature fakers removed the cover, scraped the clay away, replaced the cover and filled the space between it and the rock surface with a mixture of hot glue. Nail holes in the cement cover were filled with clay as the glue oozed out, thus eliminating all air spaces. From this glue cast, when removed, was



The First Step in Preparing a Replica of a Cliff: Covering It with a Layer of Clay One-Half Inch Thick



General View, Showing the Scenic Sculptors Copying the Mountain Top to Supply a Realistic Setting for the Denver Zoo: Even Pockets and Recesses were Duplicated, Thereby Furnishing Places in Which Trees could be Planted



This Is the Small Model of the New Zoo Which Won the Park Authorities Over to the Idea That Captive Animals Should, as Far as Possible, be Kept amid Natural Surroundings Instead of behind Iron Bars



Pouring the Glue: After the Clay Layer and Its Cement and Hemp Cover have Hardened, the Clay is Removed, the Cement Cover is Then Replaced and the Space between the Cover and the Cliff is Filled with Glue

Permanent Cast Made from Concave Side of a Glue Cast: This Picture Also Shows the Cover of Cement and Hemp and the Face of the Rock That was Copied. The Latter is Bounded by a Band of White Cement



made the plaster cast, or permanent model, the glue cast, of course, being an inverted copy of the cliff.

The molds, from which the concrete construction was made, were taken from the plaster cast. Pigments were used to stain the concrete, before pouring, this imparting the natural colors of the rock to the concrete. The inclosures for the carnivorous animals were poured in one piece, caves being opened in the surface, which led to the dens of the animals in the concrete work. Pockets in the concrete also permitted the planting of pine trees, quaking aspen, mountain underbrush, and native grass.

When completed, the inclosure showed a series of basins, hemmed in by overhanging cliffs, 35 to 40 ft. high, open on one side. A moat, filled with six feet of water and topped on the side where the public walked by a straight concrete wall, prevented any escape by the animals. Every tiny crevice and water erosion was faithfully reproduced in the model.

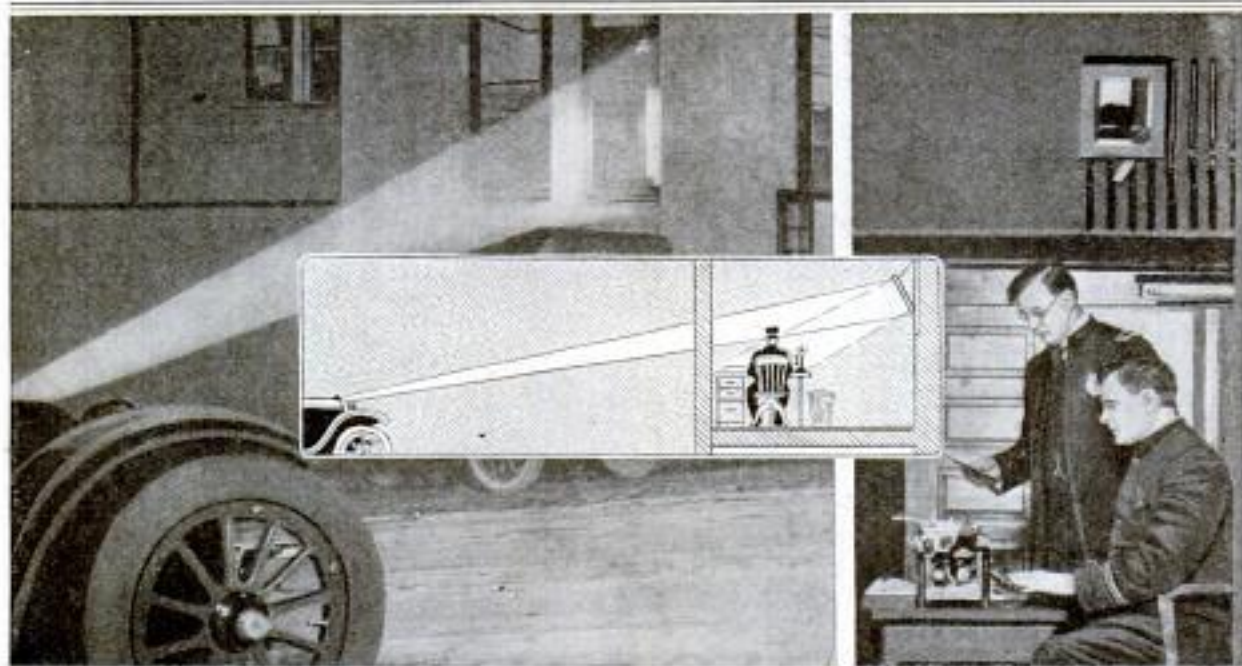
The accurate cliff definition makes the work of a high educational value, which is added to, in the monkey inclosure, by an exact replica of a Mesa Verde cliff dwelling.

METHOD OF SHOES

A French se commended a formula for wa clothing. It is and gasoline, th proximately or paraffin to one shoes it can b brush, while cl it cold. The so the softness an Uniforms can b out removing t

POLICE STATION WITH LAMPS

For a period geles police st tric lights a f water in an e a short circuit. The building was not piped for gas and most of the offices remained in darkness, or were dimly lighted with candles. In order that the police service might not be too seriously handicapped an officer decided to light the lieutenant's room with the aid of the lamps on a car belonging to

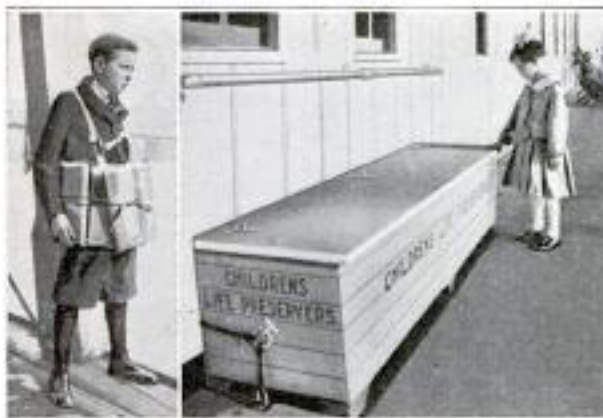


Illuminating Police Station with Automobile Lights: The Entrance was Lighted by the Head Lamps, While a Beam from the Searchlight through a Window was Reflected by a Mirror onto the Lieutenant's Desk, as Shown in the Diagram. At the Right Is an Interior View of the Station, Showing the Mirror

the force. The automobile was stationed across the street with its headlights shining into the station's entrance hall so that even strangers could find their way in without difficulty. The searchlight was directed through a window into the lieutenant's office and against a mirror on the wall, which reflected the powerful rays onto a table that temporarily served as a desk.

4078 —
LIFE PRESERVERS FOR USE OF CHILDREN

Nowadays the question of life preservers for use in an emergency at sea is properly classed among the all-important. Some large passenger ships furnish special equipment of this kind for children, made to fit about the chest, with armholes and buckled fastenings. They range in size from 29 to 33 in. chest measure, and are usually



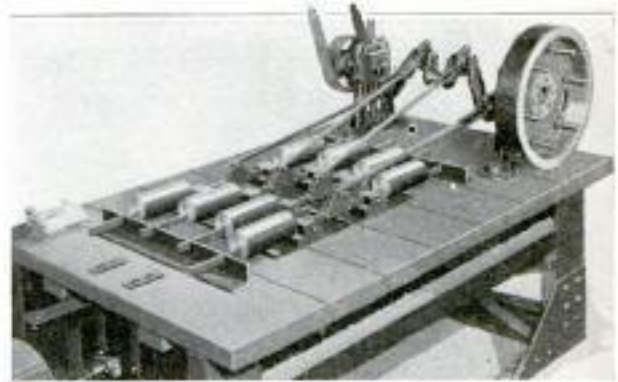
How the Special Life Preservers for Children are Stored on Board Ship Ready for Instant Use

kept in large chests or lockers secured to the decks, with prominent signs showing their location.

4486 —
MACHINE TESTS SANDPAPER SAMPLES ON STEEL

An automobile plant has found it profitable to employ a simple machine to test samples of sand and emery paper before purchasing the large quantities of that material needed in the establishment. The samples are attached to the bottoms of several shoes, all of which are weighted alike. Beneath the samples are placed steel plates of uniform hardness and known

weight. The paper is driven back and forth across these plates by means of a crankshaft with which each shoe



Machine for Testing Sandpaper: The Crankshaft Drives Four Shoes Which Rub Samples of Sandpaper on Steel Plates

is connected. At the end of the test accurate weighing shows which piece of paper has removed the most steel per unit weight of lost emery.

4515
MOTORCYCLE MADE TO JUMP LIKE A CAVALRY HORSE

That messengers and scouts mounted on motorcycles can be of special service at the front because of their ability to pass through shell craters and, in some cases, jump trenches, without dismounting, is the contention of a group of motorcyclists who are seeking to enlist. At a recent demonstration one of their number jumped his machine from embankments and over depressions in a way that strikingly resembled cavalry feats.



Photograph of a Motorcycle and Rider in Mid-Air, Taken While a Jump was being Made from an Embankment: This and Other Feats were Performed to Demonstrate the Type of Service Motorcyclists could Perform at the Front

Dodge Bros.
 Metallurgical Dept.
 Detroit, Mich.
 Copyrighted material

GIRL'S "REFLECTED" IMAGE IN PHOTOGRAPH OF EYE

Ingenious photographic work is always interesting, but particularly so,

Am. Press Ass'n



Necromancy in the Movies: A "Doctored" Picture That Apparently Shows the Reflected Image of the Heroine on the Hero's Left Eye

little who—shows the image of a "smiling favorite" appearing as a reflection on the ball of his eye. While it amounts only to a freak bit of faking, it might easily cause a spectator unthinkingly to consider it a legitimate, and therefore remarkable, reflection portrait. As is proverbially the case, when technical points are involved, a mistake was made which brands the picture for what it is. It was seemingly forgotten that although an image may be clearly mirrored on the pupil of an eye, it is almost impossible for a reflection to be seen on the iris. In this particular

to many, when it involves the movies. In a film play of recent release, a close-up of the hero, or villain—it matters

picture, the so-called reflection extends across both the pupil and iris, completely blotting out the former.

4487

TYPIST'S STROKES COUNTED BY CYCLOMETER

Mechanical means have been found for measuring accurately the work of a typist, consisting of a cyclometer attached by a steel bracket to the rear of a typewriter so that it engages the escapement wheel. It is gauged to register one point for each 180 or 240 strokes, according to the make of the typewriter. It has been found that the average typist receiving, for instance, \$16 per week, is paid about \$4.11 per 100,000 strokes. Calculating on some such basis, a reasonable piecework rate can be established, where the cyclometer is used. The result is that many typists are stimulated in their efforts by the accurate daily records which the attachment supplies. The device is useful also to the writer who is paid at space rates, for it enables him to esti-

mate very accurately the number of words he writes.



The Cyclometer Attached to This Machine, Engaging the Escapement Wheel, Records the Number of the Typist's Strokes, Thereby Furnishing an Accurate Measure of the Work Done

used by Simmons & Hales Co. St. Louis, Mo.

*St. Elias Oil Co. -
 Moved by Capt. Dan Decker, Katalla Lighter
 age Co. 4482 POPULAR MECHANICS 231
 all of Katalla, Alaska*



Towing an Oil Tank along the Alaska Coast to a New Location: The Tank Is 45 Feet in Diameter and Drew Only Six Inches of Water When Floated for the Voyage

OIL TANK MAKES TEN-MILE TRIP ON OPEN SEA

Floating upon its own bottom and drawing only six inches of water, an oil tank, 45 ft. in diameter and 20 ft. high, was successfully towed over 10 miles of open sea recently, to a new location at Katalla, Alaska. When it became advisable to remove the tank from its original location to the refinery of its owners in the Katalla oil field, a lighterage expert decided upon the towing plan, instead of taking the tank to pieces. It was then skidded down a hill to tidewater, and after waiting five weeks for favorable weather put to sea in tow of two launches, crossing two dangerous bars during the unusual voyage. The tank weighs 15 tons and has a capacity of 5,200 bbl. of oil.

4651 —

LANDING FIELD'S COLOR MAY AFFECT AEROPLANE

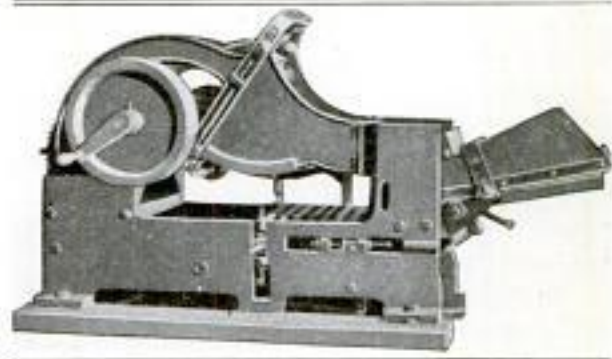
Strange as it may seem, the color of a landing field may have an effect on an aeroplane that is about to alight on it. For example, an area which is dark from being plowed or burned over will make the air above it several degrees warmer than that over land of lighter color, such as a stubblefield, thus causing a disturbed condition of the atmosphere, which may make landing difficult if not dangerous.

*Naval Flying Corps Monthly,
 May, 1917.*

NAME PRINTED ON CIGARS BY NEW MACHINE

4501

Names of cigars can be printed direct on the tobacco-leaf wrapper by means of a machine of late invention, not yet placed on the market. The freshly rolled cigars are fed into the machine at one end and conveyed side by side on a belt to the printing stamp, at the end of an arm that is operated by a hand crank or may be run by a motor. The name is printed lengthwise on the cigar in ink, without injuring the wrapper. The machine is designed to replace the perforating devices now in use for the same purpose. It will brand 25,000 cigars a day, it is said,



A Machine That Labels Cigars: It Prints the Name in Ink on Each Cigar without Injury to the Wrapper

at a considerable saving in cost over that of cigar bands, put on in the usual manner by girls.

Sm. - John Decker, St. Louis, Mo.

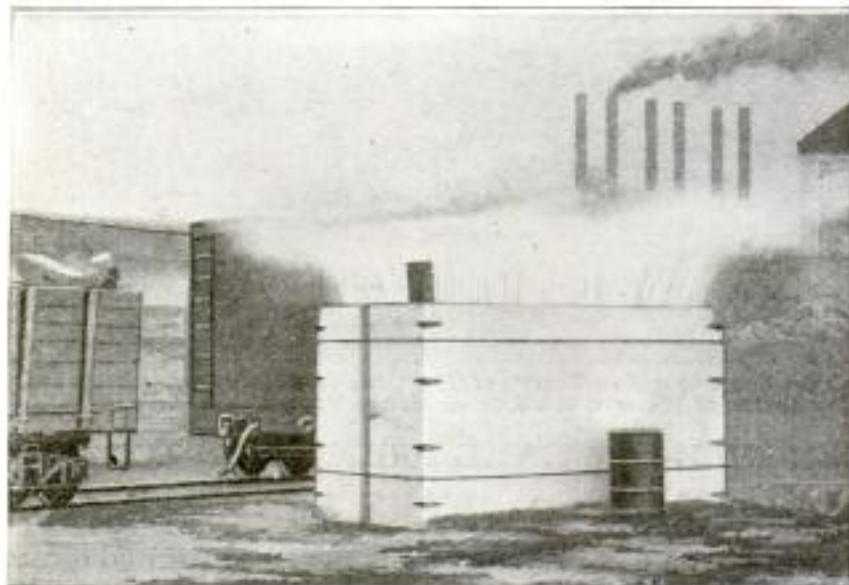
Harold Motor Co., Detroit, Mich.
W. L. Graham Legal Dept.

4471

LOOSE TOPS ON ENAMELING OVENS NEUTRALIZE BLASTS

The tops of all enameling ovens in a well-known automobile plant have

sions that may occur in the heated chambers. Since it seemed impossible to prevent occasional blasts, an attempt was made, by way of experiment, to render them harmless by



Photograph of Test Explosion being Made in an Enameling Oven, Showing How, by Having the Top Loose, the Blast is Rendered Harmless

providing safety lids on the top of an oven. But these vents did not prove sufficiently large when the tests were made. Consequently the entire top was loosened and its own weight, which is 7 lb. per square foot, was relied on to keep it in place ordinarily. Then, with locked doors, tests were conducted and it was found that the explosions lifted the top from 3 to 15 in. into the air but did not harm the oven. Hence all oven tops in the plant were loosened in

been loosened to permit the harmless dissipation of the force of any explo-

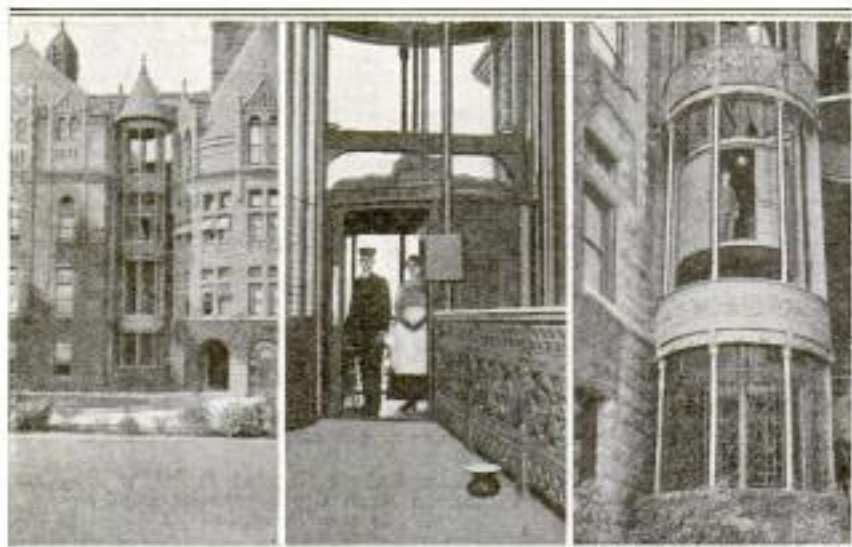
a similar manner, and the remedy has, so far, proved effective.

4135

NOVEL OUTDOOR ELEVATOR OF A COURTHOUSE

A curious example of elevator construction is seen at the courthouse in

Los Angeles, Calif., where, owing to the architectural design of the building and its location on a hill, the elevator is placed outside the walls. One of the streets on which the building fronts is



Los Angeles Courthouse Fresh-Air Elevator: Three Views of Unique Lift That Carries Passengers to and from a Tunnel Connecting with a Street Two Stories below the First-Floor Level. Center View Shows Passage-way Leading to Elevator

two stories lower than the courthouse, and the elevator shaft runs down to the level of this street, access from which is gained by means of a tunnel beneath the courthouse lawn. The shaft is of steel construction, with a circular front and ornamental ironwork at each floor. The design would not be practical in any but a mild climate, and the elevator is said to be the only one of its kind. It serves four stories above the higher street.

Llewellyn Iron Works
Los Angeles.

4521

RED CROSS BUILDING A MEMORIAL TO WOMEN



TO the large number of imposing public buildings in Washington has been added this handsome headquarters of the Red Cross, which has been completed at a cost of \$300,000. In the minds of those sharing in the recent dedication it seemed to symbolize the reunited devotion of the women of the North and the South. Over the portico are carved these words: "In Memory of the Heroic Women of the Civil War."



THESE three stained-glass windows convey some idea of the beauty of the interior of the Red Cross building, which on its completion immediately became the center of nation-wide preparation for war sufferers. In these panels the artist has depicted ideally scenes expressing the spirit of mercy and the love of humanity which underlie all the work of the organization. It will be noted that a cross appears in each composition.

Int. Film Series

COMBINATION RACK AND TIRE HOLDER FOR CARS

A new motor-car attachment having many uses is a combination tire holder and rack on which baggage, milk cans,



Steel Rack Which can be Easily Attached to the Rear of an Automobile: It can be Used to Hold Tires Only or to Carry Sacked Grain, Baggage, or Other Articles in Addition to the Tires

sacked grain, etc., can be carried. It consists of a steel frame that is attached by two arms to the rear of the chassis and by two adjustable braces to the members that support the car's top at the rear. The tire holders are situated on the under side of the rack, and when the latter is not in use the entire attachment folds up against the body, bringing the tires into an almost vertical position.

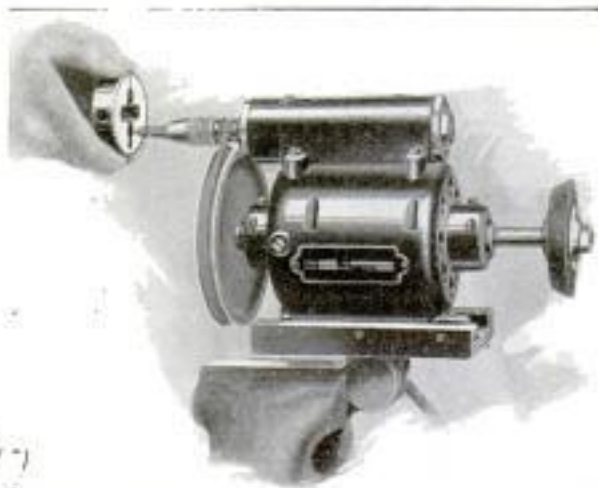
4661
WOOL SHORTAGE TO MAKE NEW STYLES SIMPLER

Because of the threatened shortage of wool, the styles for 1918 promise to be very simple indeed. This change is one which is not being dictated so much by fashion as by the grim necessity of war. The commercial economy board of the Council of National Defense has urged representatives of the

woolen and worsted manufacturers to conserve the wool supply by eliminating patch pockets, flaring skirts, cuffs on coats and trousers, unnecessary pleats, etc. No effort will be made to curtail the sale of goods already in stock, for such a move would lead to loss, it is thought, but undoubtedly in next year's output the board's recommendations will be widely adopted. It is proposed also to cut down the number of styles of woolen fabrics, to reduce the number of models of garments, and to simplify the weaving of cloth.

4451
MOTOR-DRIVEN OUTFIT FOR REGRINDING BUTTON DIES

A motor-driven grinder especially suited for regrinding button dies, such as used in cutting screw threads, has been put on the market to meet the demand caused by the scarcity of cutting tools of this kind. This compact outfit is designed to be set in a vise and consists of a motor with an extended shaft, on one end of which is a belt pulley, while on the other is an emery wheel. The belt over the large wheel drives a spindle and carborundum pencil, mounted above the motor, at a very high speed. The teeth, or



Motor-Driven Outfit Especially Serviceable for Regrinding Button Dies: The Chuck Holds a Carborundum Pencil That can be Dressed Down to Any Desired Size

cutting edges, of the die are ground by inserting the pencil in each of the four holes of the cutting tool, in turn.

Wisconsin Electric
Racine
Copyrighted material
1918



COURTESY OF HOWELL'S MICROCOSM AND THE CHICAGO DAILY NEWS

Curved Relief Map of Europe Measuring 15 by 20 Feet: The Location of 200 Places is Indicated by Electric Bulbs Which can be Lighted as the Demonstrator Desires. The Names and Numbers of the Index are Illuminated Simultaneously with the Corresponding Bulbs

4570

WAR GEOGRAPHY DEPICTED BY COSTLY RELIEF MAP

A remarkable war map, the construction of which required skill in draftsmanship, carpentry, modeling, casting, painting, and electrification, has been put on exhibition in this country. It depicts the greater part of Europe, showing the topography of the country in vivid relief. The chart measures 15 by 20 ft., and one of its unusual features is that it is curved to represent the curvature of the earth's surface. The horizontal scale is 7.8 miles to the inch, and the vertical scale is 8 miles to the inch. Not only are the plains, mountains, and bodies of water painted in realistic colors, but the location of some 200 places, many of them being points of interest on the eastern and western war fronts, are indicated by electric bulbs. While a demon-

strator is explaining the map he can light any one of these lamps to show the location of any city under consideration. At the same time a bulb is lighted, the name and number of the town is illuminated on a large indicator that stands beside the map. The electrical apparatus can also be set to run automatically.

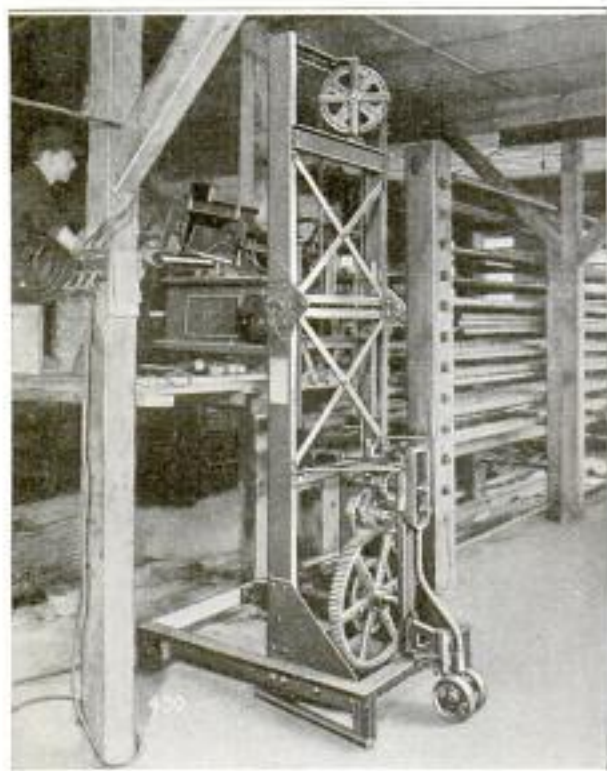
— 4550

FACTORY CUSTOM REVERSED AND EFFICIENCY GAINED

Time and labor have been saved at a Chicago manufacturing plant by the adoption of a novel plan for handling heavy shafting. Instead of following the usual practice of moving the long steel rods to a motor-driven hack saw when they are to be cut into specified lengths, the work is carried out at the racks where the material is stacked. A saw is mounted on a portable tier-

Mechanical Appli-
cations Co. Copyrighted material
327 S. La Salle, Chgo.

ing machine built especially for the purpose, and is readily raised to any desired level. All unnecessary handling



Sawing Shafting at the Racks in Which It is Stacked: A Novel Scheme That Saves Labor

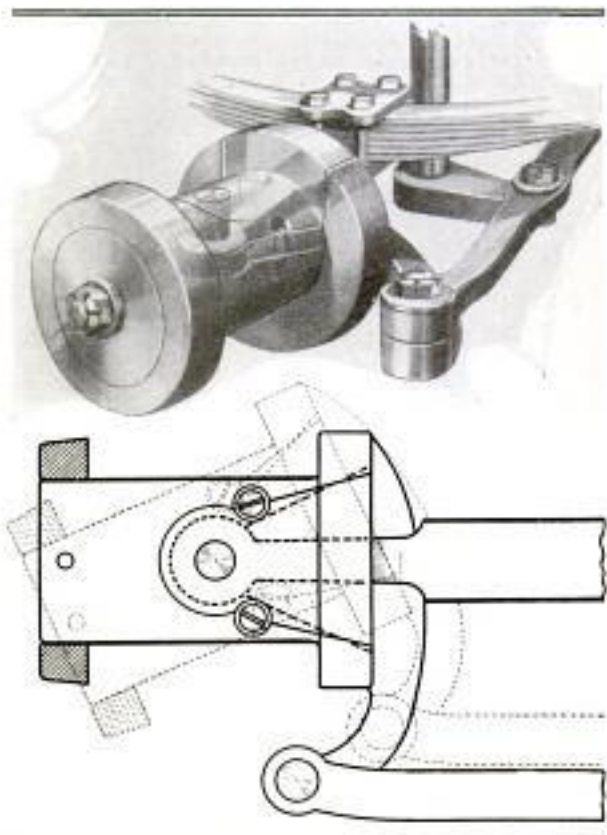
of the shafting is thus eliminated. Only one operator is needed, although formerly six men were employed in carrying large sizes of shafting to the cutting machine.

1382

NEW FRONT-AXLE DESIGN FOR MOTOR CARS

Motor enthusiasts will be interested in a front axle of distinctively new, and mechanically good, design for automobiles. It involves a radical departure from standard practice and is intended to overcome certain inherent disadvantages of the conventional arrangement. Safety features, power economy, and tire protection are offered by it. Essentially the invention consists of pivoting the spindles at their exact centers to the circular ends of a straight axle. The members are constructed with V-shaped openings in their inner ends to permit oscillation of about 30° forward and backward. By this arrangement no leverage is exerted, and

the front wheels are held parallel in a vertical plane so that at all times they rotate in the line of motion, instead of across it. This is one of the big features of the invention, for as will be seen, the necessity of toeing in, or inclining, a wheel to bring the center of the tread as nearly as possible in line with the steering pivot, is obviated. Thus the wheels rotate smoothly in a straight line, instead of being pushed along. This reduces friction and lessens tire wear materially. Important also is the fact that the major force of a shock is borne directly by the axle, instead of being transmitted to the steering wheel. It is this feature that promotes safety, for an impact that might ordinarily cause a machine to swerve from its course has little effect in this case. The invention is suited for both pleasure cars and commercial trucks, and may be adapted to vehicles using four-wheel drive. As may be appreciated, the use of larger bearings, than those usually employed, is necessitated.



Phantom View at Top Shows How the Spindle is Pivoted to the Axle End, While a More Detailed View of the Construction is Given by the Diagram

Inv. Wm. Lincoln
562 W. Adams, Cal.

4625

THE EVOLUTION OF A CARTRIDGE CASE

By REGINALD TRAUTSCHOLD, M. E.

39 Charles St. New York

NEARLY every one knows what a cartridge case is—it is the brass shell holding the charge of powder which propels the projectile—but how a cartridge case is made is a mystery to many. The transformation of a flat brass disk, as shown at the left in Fig. 1, into a completed cartridge case, such as shown at the right of the same illustration, cannot fail to be, to the uninitiated, a source of wonderment.

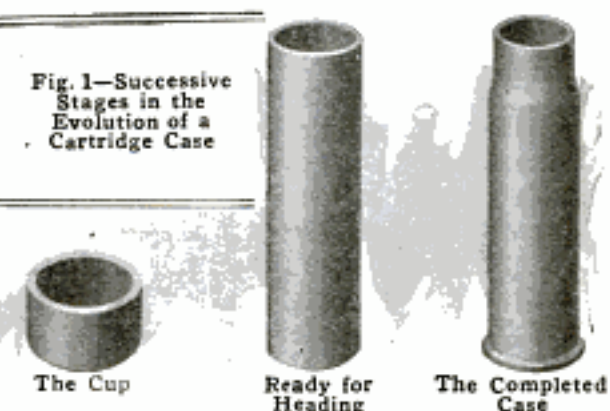
Just consider the metamorphosis of a brass disk somewhat less than 3 in. in diameter and considerably less than $\frac{1}{4}$ in. in thickness into a cartridge case nearly $5\frac{1}{2}$ in. long, slightly more than $1\frac{1}{2}$ in. in diameter, and destined to accommodate a projectile weighing one pound and the powder charge capable of projecting the missile for miles. Or, take a brass disk, $6\frac{3}{8}$ in. in diameter and about $\frac{3}{8}$ in. thick, and therefrom may be manufactured a cartridge case 12 in. long and of the proper diameter to hold an 18-lb. projectile. For a $4\frac{1}{2}$ -in. howitzer cartridge case, a brass disk less than 6 in. in diameter is required. And the processes by which these remarkable transformations are brought about are quite simple.

The first step in the making of a cartridge case consists in stamping out a round, flat disk of brass of a diameter which appears small when compared with the dimensions of the finished shell, and which is actually little thicker than the base of the finished case. This flat disk is placed in a powerful press and squeezed into the shape of a shallow cup—a simple enough operation, but one which materially affects the physical properties of the brass. The flat disk is comparatively soft and ductile, but on being forced into cup shape, the metal becomes much more brittle, harder, and less pliable—much as does a rubber band after it has been stretched—so

that any further squeezing or stretching of the cup would be liable to cause breakage or the formation of cracks. Therefore, before any further operations can be successfully performed on this brass cup, the metal must be returned to its original condition of softness and ductility.

To accomplish this, the cup is placed in a furnace, or oven, maintained at a high temperature, usually in the neighborhood of $1,250^{\circ}$ F., for from half to three-quarters of an hour. This sweating process is known as annealing, and during it the metal limbers up. The intense heat, however, scorches the skin of the cup, and this scorched skin has to be removed. So the heated cup is taken from the furnace and placed in a hot acid solution—hot, in order that the metal may not be chilled, and acid for the purpose of removing the charred skin, or scale. Any acid that may adhere to the cup after this process is removed by a hot-water bath. The brass is now as pliable and ductile as it was in its original form of a flat sheet.

The cup is then taken to another press, where, by the process technically known as drawing, the depression is made deeper, the walls at the same time becoming thinner. Great care must be taken not to overstretch the metal. When the brass has been stretched as much as is practical, the cup is passed back to the furnace for



another annealing. Thence back to the acid tank for pickling—that is the name applied to the process of remov-

ing the scorched skin—and then back to a press for another stretch.

These steps of stretching, annealing, and pickling are repeated until a deep cup, slightly longer than the finished cartridge case, is obtained, with walls as thin as those of the finished product; its base, however, not much thinner than the thickness of the original brass disk.

Interposed between the drawing operations, it is customary to perform what are known as *i n d e n t i n g* operations. These simply consist of indenting the bottom and distributing the metal so as to form a hump, through which, later, is bored a hole for the accommodation of the primer cap—that little device for igniting the powder charge with which the cartridge case is subsequently filled.

On the completion of the necessary number of drawing operations, the protruding flange at the base of the case is formed. This is also done in powerful presses and is known as heading. Annealing is not necessary for the heading operations, as the metal in the base of the deep cups is quite ductile, having been little affected by the draws. To guard against possible cracking of the base, however, the heading is done gradually, two, and sometimes three, partial heading operations being performed before the flange is completed.

At this point in the evolution of the cartridge case, the walls have been reduced to their final thinness, and the base needs only the primer hole to complete it. The walls, however, are virtually straight, or, perhaps, with a

slight flare toward the top. In the completed case, the top has to be contracted to hold the projectile, sometimes with a shoulder, as shown in the illustration, or, in other cases, with a gradual taper from the bottom, or head, end of the case to the top.

To prepare the metal for this tapering, it must be again made ductile by another annealing or semi-annealing process. In this case, however, the previous methods are too drastic, for now the annealing must be accomplished without formation of scale, the walls being of just the required thickness for the finished case.

To anneal without scorching and forming scale is a ticklish undertaking and is performed in various ways. The heated cases are sometimes plunged, open end down, into a solution of saltpeter, heated to about 760° F.

Such heat is not sufficient to scorch the metal, and yet the hot solution possesses the requisite properties for softening the brass.

Another simple way of performing the same task is to place the cases inside of red-hot iron pipes, extending into an oil or gas furnace. The cases are thus prevented from coming into direct contact with flame, and the temperature is not sufficient to scorch their skins.

One of the most interesting methods that has been developed during the present activity in the production of war munitions is the variety of flash-annealing, shown in Fig. 2. The case to be softened is placed, base down, in the cup of the revolving spindle and flames of burning gas are directed

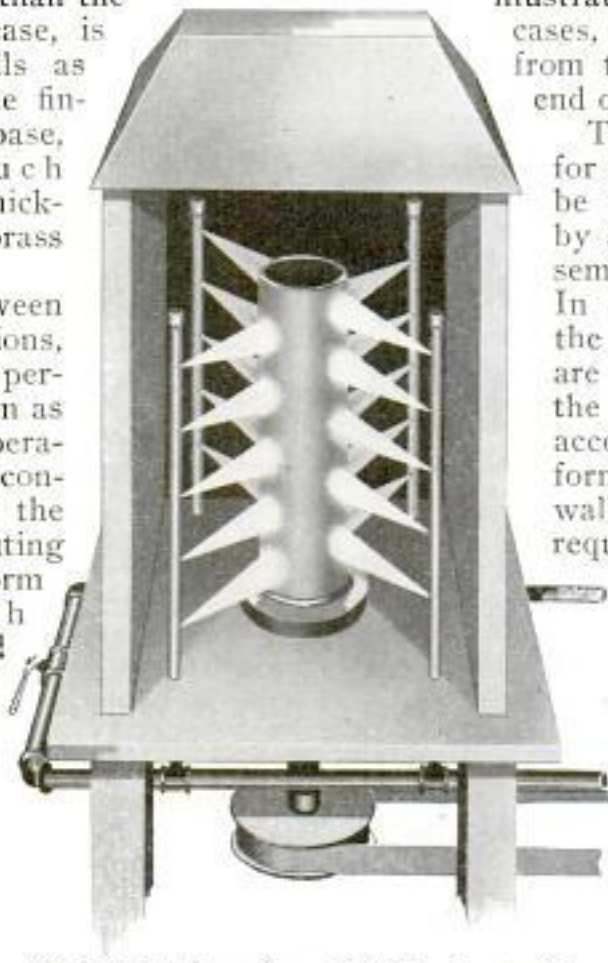


Fig. 2—Flash-Annealing a Cartridge Case: This Method Has Greatly Increased Production

*Inv. Mr. Shelby, Bldg
670 Metropolitan
Los Angeles*

against it from all sides. The cases remain on these revolving spindles only until they become red-hot, when they are removed with tongs and allowed to cool gradually. A high rate of production and excellent results have been secured by this flash-annealing method. The operators soon learn to judge accurately the proper duration of heat treatment by the color of the shells.

Following this last softening of the metal, the cases are tapered and brought to final form, after which the primer hole is made in the base and any other necessary machining operations performed.

4453

SHIP'S DECK PILED HIGH WITH CARS FOR ALASKA

There steamed into Seattle harbor a few weeks ago a freighter that attracted much attention because of its enormous deck load, consisting of the tops of 74 flat cars, securely tied down by cables. These cars were used in the construction of the Panama Canal and were being transported to Alaska where they will be utilized in building the government railroad. Below deck, the vessel carried car wheels and eight locomotives, knocked down, while a large barge towed behind was loaded with

similar equipment—all of which shows that the great government project in Alaska is rapidly assuming tangible form.

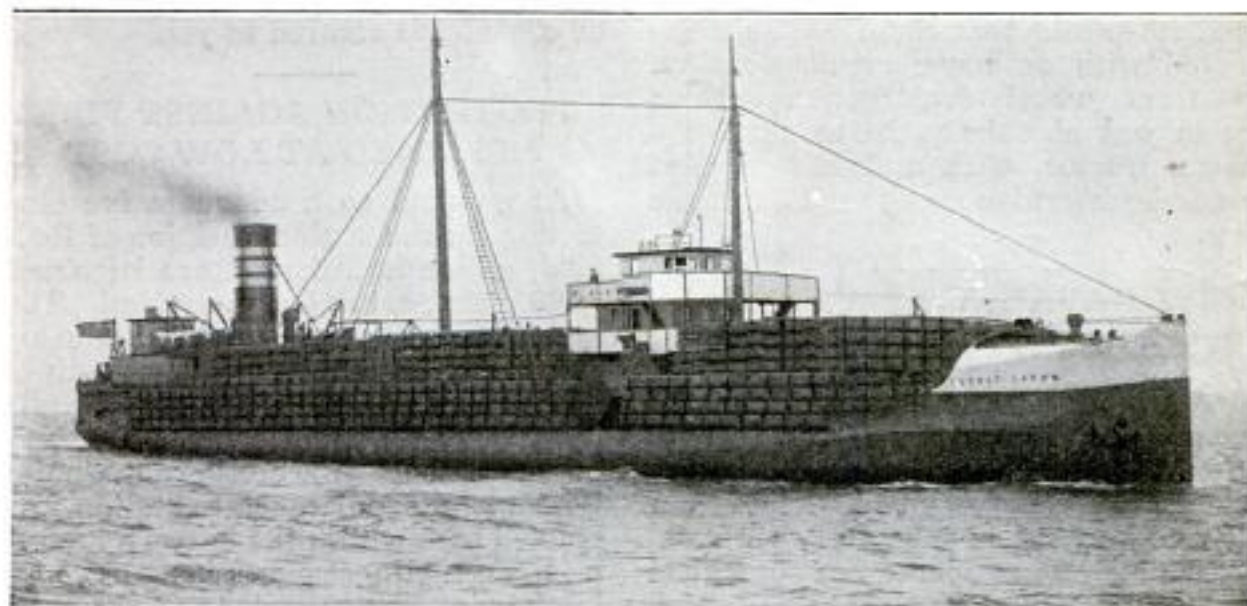
4474

ATTACHMENTS MAKE A SAW SERVICEABLE AS SQUARE

By riveting two properly fashioned steel plates close to the handle of a saw with a straight back, that tool can be used as a square, the metal parts serving to hold the saw at an angle of 90°, or 45° with relation to a given edge. The combination not only effects a saving in money but also a saving of space in a tool box.



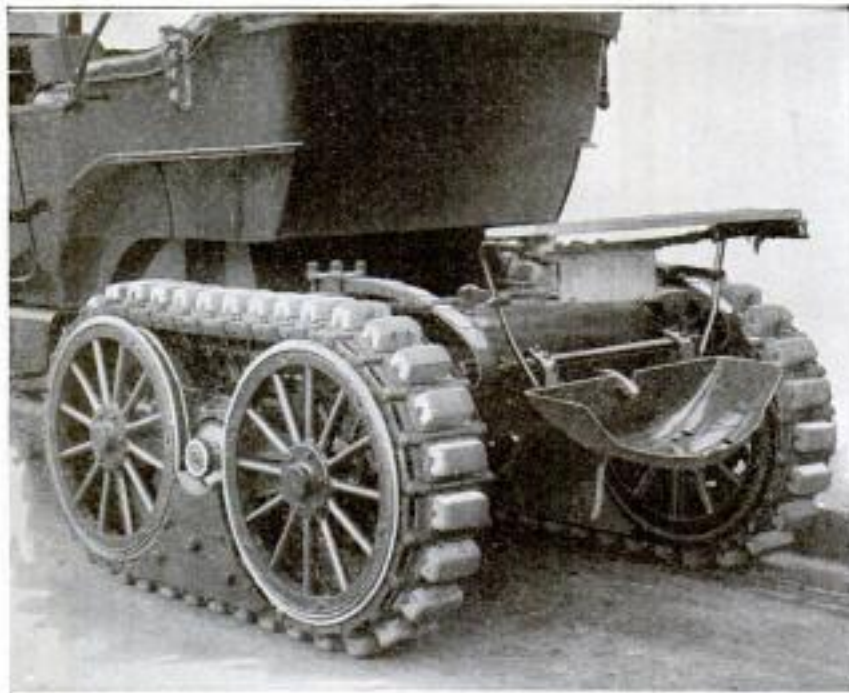
Government authorities have rented a large hotel in North Carolina to provide accommodations for nearly 2,000 German civilians now interned at various immigration stations. These groups consist chiefly of the crews of formerly interned German ships.



Freighter Traveling Northward from Panama Canal with an Enormous Deck Load of Flat Cars to be Used in the Construction of the Government Railroad in Alaska: Below Deck the Vessel Carried Car Wheels, and Eight Locomotives, Knocked Down. The Ship Also Towed a Barge Loaded in a Similar Manner

TRACK-LAYING DRIVE USED ON AN AUTO STAGE

Special wheels of the track-laying type were installed on an automobile



Track-Laying Drive Designed for This Automobile Stage, Which Runs over an Alaskan Route Comprising Hundreds of Miles of Bad Roads

prepared in Seattle for use over the Chitina-Fairbanks stage route in Alaska, a distance of 320 miles. This form of drive was rendered advisable by the nature of the roads encountered on the route, including deep snow, stretches of ice, mud, gumbo, rocks, and steep hills that could not be negotiated with ordinary pneumatic tires. The rear-wheel construction decided upon was as substantial as that of a farm tractor, with a double-wheeled track-laying drive on either side of the car.

NEW NAVAL ALARM REVEALS

NEGLECT BY MAN AT WHEEL

An automatic alarm has been invented by a young naval officer in Ecuador which serves to notify the master of a vessel of any deviation from the course. It is intended as a safeguard against accidents due to neglect on the part of the man at the wheel. The device recently underwent satisfactory tests.

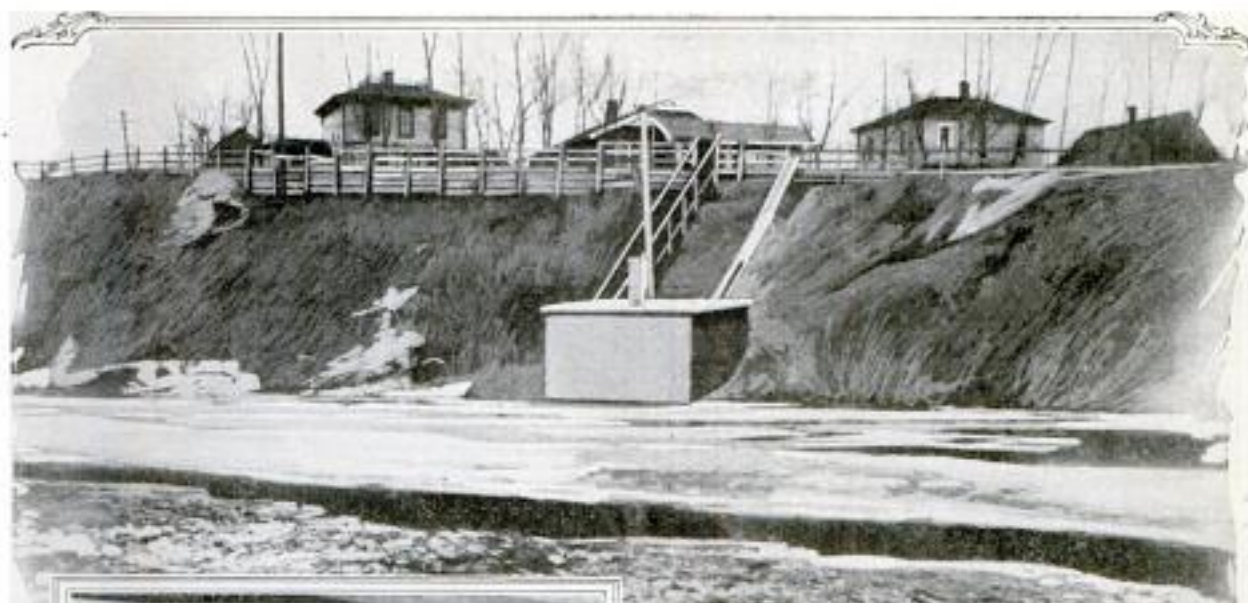
SCIENTISTS BREEDING FROST-PROOF CORN

Investigators for the Department of Agriculture are in a fair way of developing a variety of corn that will withstand frost and will grow at low temperatures. In fact, they have already achieved results along this line, and if their efforts prove wholly successful, the outcome will be to increase greatly the amount of this grain raised by extending the corn belt. The investigators for the government planted a special variety of corn in February, 1917, and found that plants which were several inches high withstood a drop in temperature, on March 5, that froze the

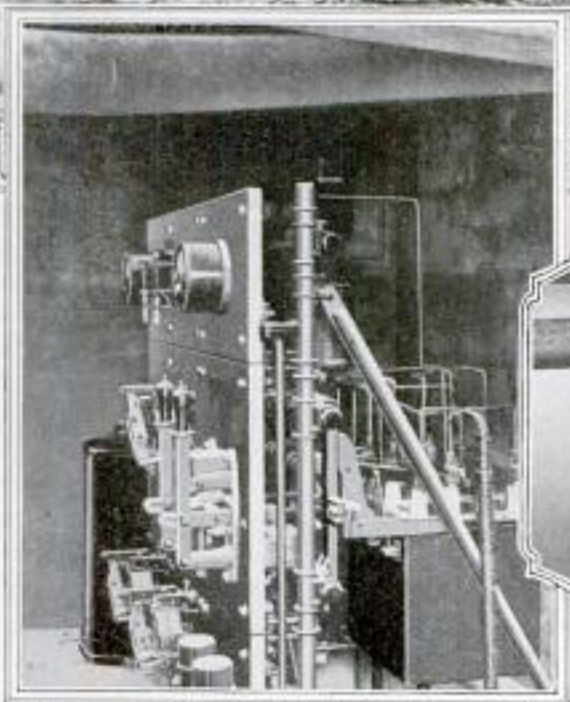
ground to a depth of 2 in. Of even more importance is the fact that some of the individual plants continued to grow during periods of low temperature when ordinary corn would have been at a standstill. Experimentation continues, however, as success cannot be considered assured as yet.

PROTECTION AGAINST FIRE ATTAINED AT LOW COST

At nominal cost, adequate fire protection for the business section of Redfield, a South Dakota town of about 3,500 persons, has been provided. The system is one that might prove valuable as a model for other small communities where similar conditions prevail. At the foot of the main commercial thoroughfare there is a creek. On one of its banks a small concrete station was erected and, within the latter, a motor-driven centrifugal pump installed. An intake pipe was extended to the middle of the stream and a 10-in. main projected, for a distance of some four

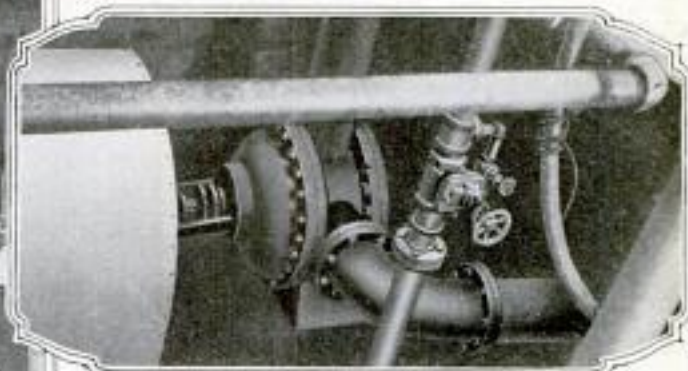


Small Concrete Pump House on the Creek Bank at Redfield, South Dakota: It Serves a Main Used Solely for Fire Protection in the Business District of the Town



Switchboard Installed in Pumping Plant at the Creek: All Connections are Made so That Current can be Turned On from an Electric-Light Station a Few Blocks Distant

blocks, beneath the business street. Essentially, this constitutes the system, which was provided at a cost of \$8,200. In case of fire, a call is sent to the local electric-power house, where the pumping-plant circuit is controlled. By the time the town fire fighters can assemble, water at a pressure of 110 lb. is available. Otherwise, Redfield's chief source of water is artesian wells. These do not deliver a flow of sufficient pressure for protective purposes. A gasoline pump mounted on a cart is used as a substitute fire engine, and water taken from the regular supply



Interior of the Station, Looking into Pumping Pit: The Equipment Is Capable of Supplying Water at Good Pressure for Eight Leads of Fire Hose

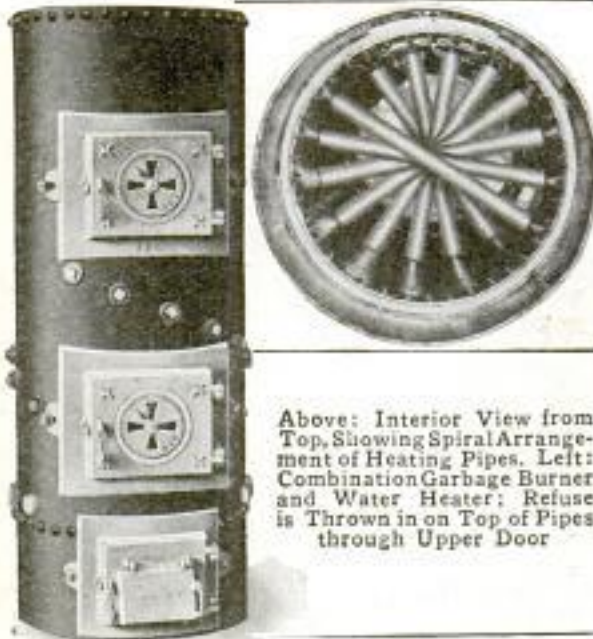
mains, when a conflagration occurs in a residential district. If the pumping is continued for long, however, mud and sand are drawn into the pipes in large quantities. The inadequacy of this scheme, for combating large fires, brought about the installation of the special system for the business section.

— 4223 — SPIRAL GRATE IN GARBAGE BURNER HELPS HEAT WATER

A combined incinerator and water heater is provided with a special grate made of brass pipes, on which the garbage is consumed and as it burns helps heat water, thereby effecting a con-

Andrews Hy. Co.
Mpls. Minn.
Copyrighted material

siderable saving in fuel. The burner consists of a vertical boiler having a deep fire pot, above which are numer-

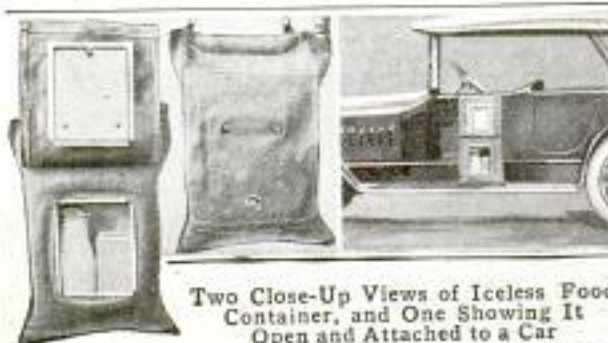


Above: Interior View from Top, Showing Spiral Arrangement of Heating Pipes. Left: Combination Garbage Burner and Water Heater; Refuse is Thrown in on Top of Pipes through Upper Door

ous brass pipes that are arranged spirally and connect opposite sides of the boiler. Waste to be burned is thrown into the uppermost of three doors and spreads out over the spiral grate, gradually dropping lower and lower as it is consumed. Much of the heat generated in this way is utilized in warming the water which passes through the pipes.

ICELESS FOOD CONTAINER INCLOSED IN WATER BAG

A refrigerator which is kept cool by a water bag is one of the recently invented substitutes for an ice-cooled food container. The provision chamber consists of a water-tight copper, or galvanized-iron, box surrounded on all but one side by a canvas water bag



Two Close-Up Views of Iceless Food Container, and One Showing It Open and Attached to a Car

which is kept cool by the evaporation that continually takes place on its moist surface. The lid of the box is fastened to the inner side of a canvas flap which is kept moist by contact with the rest of the bag. A small-sized container of this type measures 8 by 12 by 18 in., while a larger one is made to be attached to the running board of an auto. The latter is provided with a faucet at its lower end, in addition to a capped mouth with which the small bag is also equipped.

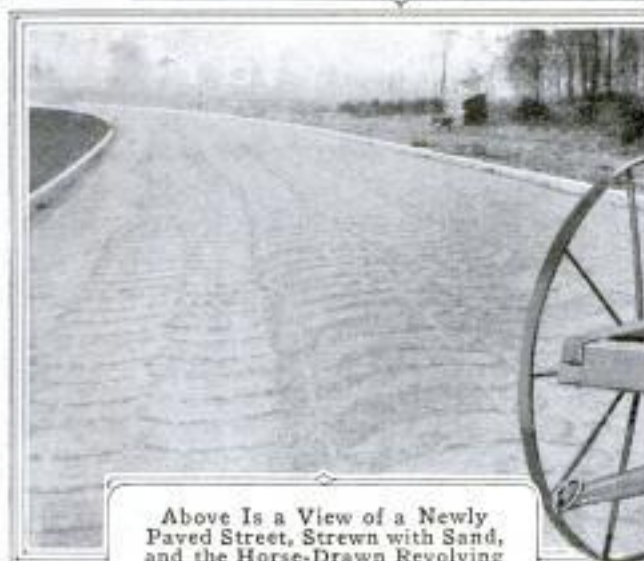
ASPHALT-BLOCK PAVEMENT WITHSTANDS AUTO WEAR

Asphalt blocks are now being used in various parts of the country for paving, because they are especially suited to withstand the destructive friction and suction which motor tires exert on a street surface. This paving material is factory-made and produced under conditions more uniform than those of ordinary asphalt surfacing. Each block measures 5 in. wide, 12 in. long, and from 2 to 3 in. thick. The material used is crushed trap rock mixed with asphalt cement at a temperature of 300° F. and fashioned into blocks at a pressure of 7,000 lb. to the square inch. The blocks are laid like bricks in cement mortar on a 6-in. concrete base, no heating plant being required. The cost of the pavement, in place, is about the same as that of brick. As much as 1,600 sq. yd. has been laid in one day by a gang of 16 laborers. Every 15 feet, anchor blocks having strips of steel projecting from their under sides, are laid across the street to prevent creeping of the surface layer. The blocks at the ends of the rows are cut by a machine into the desired lengths. After the pavement has been laid, fine sand is scattered over the top and swept into the cracks. A convenient revolving brush has been designed to do the sweeping. It is mounted between two wheels, driven by gearing connected with the revolving axle, and drawn by a horse. Traffic is kept off the street for a week after the work is finished.

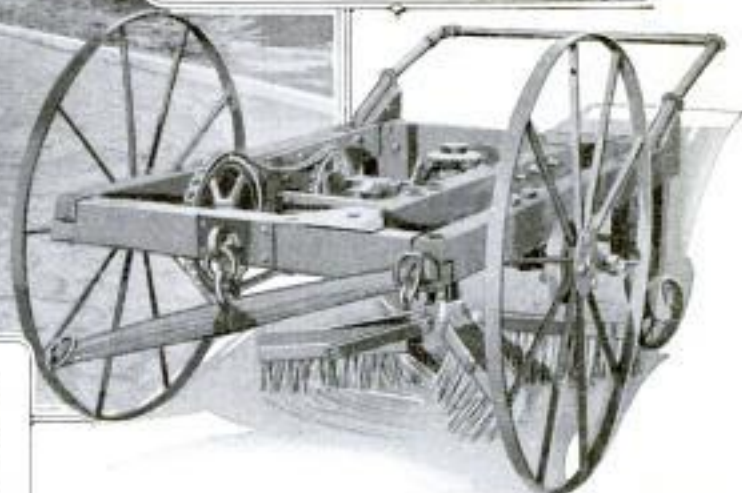
*Barringer Water Bag Refrigerator Co.
Denver, Colo.*



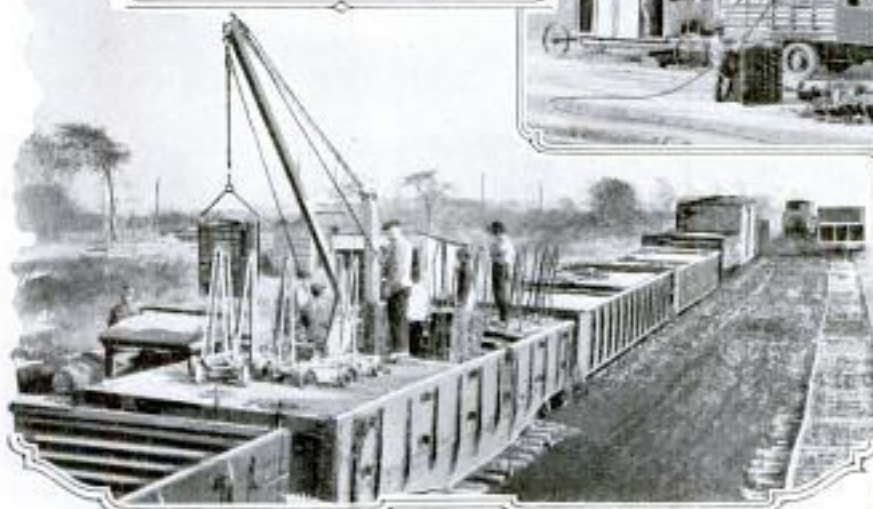
Laying Pavement of Factory-Made Asphalt Blocks: The Blocks are Set in Damp Mortar Made of One Part Cement and Four Parts Sand, and Rest on a Six-Inch Concrete Base. The Anchor Blocks, Which are Used Every 15 Feet and Have Strips of Steel Projecting from Their Lower Surfaces, are Shown in Insert at the Left



Above is a View of a Newly Paved Street, Strawn with Sand, and the Horse-Drawn Revolving Brush That Sweeps the Sand into the Cracks. Formerly This Work was Done by Hand and Consumed Much More Time



Unloading of the Blocks is Shown at the Right. After the Portable Derrick has Lifted the Cages, Filled with Blocks, from the Truck They are Wheeled to the Crew of Layers



Unloading the Asphalt Blocks from the Cars: To Reduce the Handling of Material to a Minimum, the Blocks are Piled into Low-Wheeled Cages, Some of Which are Shown on the Top of the Car. The Derrick Transfers Them Bodily to the Waiting Truck, from Which They are Eventually Unloaded, by Similar Means, near the Pavers

SURVEYORS BUILD TOWERS IN PRIMITIVE FASHION

The ingenuity of government surveyors to whose lot it falls to make observation records



for triangulation in wooded tracts in the far West or in our distant possessions, is often severely taxed, for if no natural observation points can be found, high towers must be built. In the remote regions where these men work, the facilities for such construction are very limited. In the Philippines, for example, the

surveyors have sometimes been compelled to build crude tall frameworks of slender poles, fastened together with such means as are at hand. The accompanying photograph shows such an observation tower in process of construction. Here tackle has been at-

tached to the top of a giant dead tree, and one of the crew can be seen suspended in mid-air, 100 ft. above the ground.

4657 MANY DIAMOND FACTORIES CLOSED IN AMSTERDAM

Com. Rep. 5-19-17
The cutting and polishing of diamonds, which is one of the important industries of Amsterdam, Netherlands, has been concentrated in 24 of the larger factories in that city so that about 80 of the smaller ones are closed. This move has been taken following a government order that the amount of coal used must be materially reduced. The men employed in the smaller establishments have not been thrown out of work but have merely changed their place of work. However, except for the present depression in the diamond business, such a change could not have been made. Because the war has seriously curtailed the diamond trade, over 5,000 men, out of a total of 11,500, have been idle this spring.

¶ In England men may soon be forced to wear soft collars in place of stiff ones, for it is proposed to prohibit the extraction of starch from cereals.

4502 TRACTOR MAKES LONG HAUL OVER WESTERN MOUNTAINS

The ability of four-wheel-drive trucks to perform reliable service in



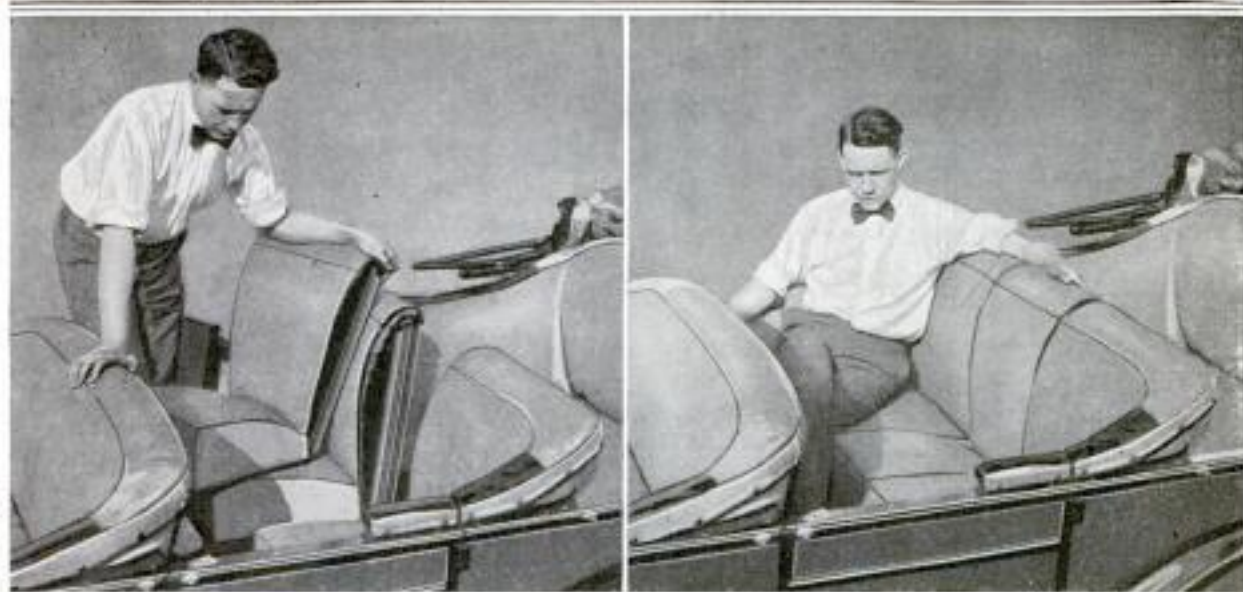
Tractor of Four-Wheel-Drive Type and the Load Which It Drew from the Pacific Coast to the Utah State Line in Spite of Miry Roads and Swollen Mountain Streams

a machine of this type, which drew a load of several tons from the Pacific coast to the state line of Utah. The load consisted of two good-sized construction-crew houses mounted on running gears and carrying a large amount of telephone equipment that was distributed along the way. At several points the rough trail which was followed ascended to an altitude of 10,000 ft. and in many places swollen streams and miry roads blocked the path. But in spite of all obstacles the overland train arrived

in spite of great handicaps is vividly illustrated by a trip recently completed by

at its destination in safety after having been on the road several weeks.

*Grady Motor Car Co.
Salt Lake City, Utah.*



Seating Arrangement of New Automobile Stages in California: Removal of the Central Seat in the Middle Row Allows Access to the Rear Seats. The Car Holds Eight Comfortably

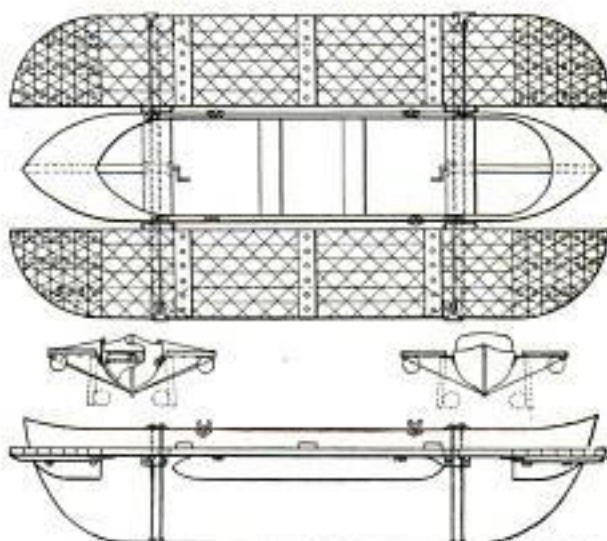
NOVEL SEAT ARRANGEMENT OF STAGE-LINE CARS

The motor cars for a new stage line in California are of the seven-passenger type, but comfortably accommodate eight by the installation of a deeply upholstered middle section instead of the usual auxiliary seats. The central part of this section is removable, to provide access to the rear seats. When in place, its tongued edges fit snugly into grooves in the middle section. The cars of the new line have distinctive names, as "Bret Harte," "Mark Twain," and "Roaring Camp," to serve as a sort of link between the new means of transport and the stage-coach period of the Golden State.

LIFEBOAT WITH WINGLIKE RAFT ON EACH SIDE

Rafts that spread out on either side of a lifeboat like wings have been devised for a life-saving craft of new design, for the purpose of increasing its capacity and stability. These wings are hinged to the sides close to the water line, and are provided with metal floats on their under sides to give the craft additional buoyancy. On deck these boats occupy no additional room, for the rafts fold down against the sides of the hull and serve as sup-

ports. When the boats are lowered the wings spread out in the water automatically. The outer edges of the rafts on each boat are connected by cables which extend under the hull, passing through pulleys at the keel. When a wave raises one wing up, the opposite one is drawn down correspondingly. The object of this arrangement is to help keep the boat stable. The wings also act as buffers. While a lifeboat stands close beside a vessel at sea, the rolling motion of the big hull will have less tendency to upset the little craft because of the up-and-down play of the raft. Small boats of this sort would be rowed, larger ones driven by motors.



Top, End, and Side Views of Lifeboat with Hinged Side Rafts, Which can be Used as Supports on Deck

Ed. L. Kellan (Inventor)

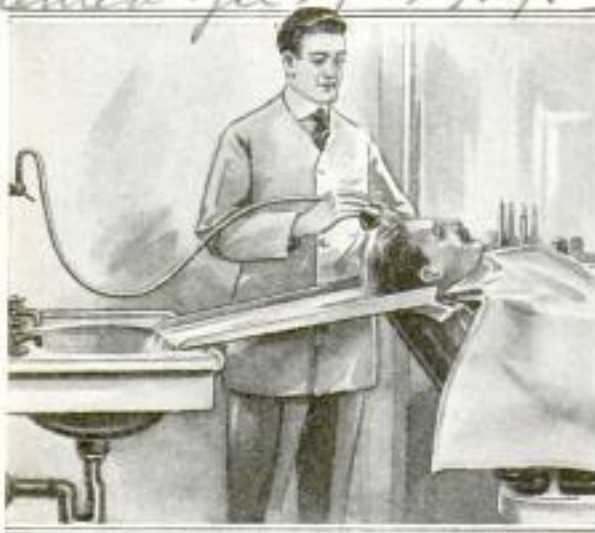
661 Riverside St., Copyrighted material

Pat. No. 1,311,300, Board Co.
Attention F. B. Elliott
 216 **4470 POPULAR MECHANICS**
 331 *H. K. Dr. Pittsburgh, Pa*

**BARBER-CHAIR ATTACHMENT
 SIMPLIFIES SHAMPOOING**

A narrow drain board of aluminum has been devised which attaches to a barber's chair in place of a headrest and

Patented April 17-1917.



An Aluminum Drain Board Which Attaches to a Barber Chair in Place of the Headrest, Enabling the Customer to have His Head Shampooed without Leaving His Seat

enables the barber to give a customer a shampoo without the latter's leaving his seat. After the back of the chair has been lowered to an almost horizontal position the customer rests the back of his head on the end of this board. The outer end of the attachment slants down to a washstand, and as the barber cleanses and rinses the hair the water drains off into the bowl.

4629

**KEEP COLLEGES FILLED
 IS PATRIOTIC PLEA**

Off. Bulletin 5/25/17

Instead of being diminished, as now seems probable, the number of men attending college ought to be larger than usual next fall, according to government officials who have made a study of the country's educational needs and are looking to the future and the relation of the present great emergency to it. It is pointed out that, for patriotic reasons, as large a number as possible should enter higher institutions of learning and thereby gain the advanced training so necessary for future leadership in various lines. In normal times, there are about

350,000 students in the colleges, normal schools, and technical and vocational schools of the higher grade. It is inevitable that the number in the upper classes will be diminished, but this deficiency should be made up by increasing the enrollment of the lower classes. In a short time there may be a great need for more trained officers, and after the war there will be a tremendous demand here and abroad for young engineers and scientific men, in industry, transportation, etc. The war has already greatly enlarged the field of women's endeavor, and there is sure to be an unprecedented demand for trained women.

4525

**PORTABLE WOODEN GARAGES
 RENTED BY THE MONTH**

Portable garages, which can be rented by the month or bought on the installment plan, are among the latest conveniences devised for the motorist. The idea originated with the wife of a milling company's manager. Should a car owner, living in the city where these structures are made, decide that he needs one, all he has to do is to call the manufacturers on the telephone and in a short time the garage is delivered and set up in his back yard. It is transported either knocked down or with the parts assembled, according to the accessibility of the site selected for it. Each shelter measures 17 by 9 by 8 ft., and has two windows in the double doors constituting the front end. The

W. D. McGowan, Milling Co. Car Parts & Milling Co. Portland, Ore.



Type of Portable Garage Which Measures 17 by 9 by 8 Feet and Rents for \$2.50 per Month: It can be Transported Either Knocked Down or with Parts Assembled

Dr. P. P. Claxton
U. S. Commissioner of Education



Hauling a Log Out of the Woods with a Sky-Line Trolley: The Top Cable is Held Fast by a Donkey Engine, Which Also Pulls the Log Out by the Line Attached to Its Forward End

lower portion of the sides are clap-boarded and the remainder shingled. Tar paper is used for the roof and the sills are of redwood, which does not decay easily.

“SKY-LINE” LOGGING METHOD OF WESTERN CAMPS

In the logging camps of Oregon and Washington a “sky-line” method of logging is proving much cheaper and more efficient than the former method of dragging out logs from the forest by a donkey engine and cables operating on the ground. The sky-line plan is to run a cable through blocks or pulleys suspended at a great height on giant trees, so as to form a sort of trol-

ley line, by which the logs are hoisted into the air and then hauled over the tops of ordinary trees and other obstructions to the rollway, where they are loaded aboard freight cars for shipment. The donkey engine which operates the sky line has five drums, including two for main lines and two for trip lines. The top cable, from which the log is suspended, is one of the main lines, while the other is used to haul the log. In operation the top cable is lowered with its block, or trolley, directly over the log to be picked up; it is then pulled taut, raising the log with it by means of a “choker,” or steel tongs. In the air a log can, of course, be moved much faster than on the ground.

STORAGE-BATTERY LIGHTS MAKE TUNNEL WORK SAFER

As a special safety measure, storage-battery lights have been provided for

and the resulting explosion killed nearly a score. The cap of each worker is now equipped with a storage-battery lamp, which is locked with a key to which the men do not have access.



Group of Tunnel Workers in Cleveland with Portable Storage-Battery Lights in the Foreground. Some of the Men's Caps are Equipped with Electric Lamps Also

Powerful portable lights are also used. These were constructed by installing storage batteries and automobile headlights in heavy cases that are locked so the men cannot tamper with them. Some of the cases have two lamps and others one. The former are recharged every eight hours, while the latter will run 18 hours. It is believed that this means of lighting provides an adequate safeguard against further explosions. At the same time the advantages of electric lighting have been retained.



The Portable Lights, Showing the Storage Batteries in the Center and the Lamps Installed at Either End

the men that are digging the Cleveland water-works tunnel under Lake Erie. Formerly the lights used were on an ordinary circuit, but last July a chance

electric spark ignited the marsh gas that had accumulated in the tunnel,

4352

MOTOR-CAR LOCK COMBINED WITH STEERING WHEEL

A steering wheel is now being installed on cars of various makes which is provided with a special lock at its center, comprising a hexagonal hub and a set of tumblers.



When a car so equipped is to be used, the hub is locked rigidly to the rest of the steering apparatus, giving

the driver complete control. A turn of the key with which the lock is provided disengages the steering wheel from the hexagonal hub so that the former can be made to spin freely on its axis, leaving the front wheels entirely without means of control.

Designs for a low-priced tractor of a well-known American make have been adopted by British authorities, who are asking English manufacturers to cooperate in producing uniform parts according to the plans and models furnished by the American owner.

Perry Auto Lock Co.
1238-40 Mich. Av., Chgo.
Copyrighted material

Westinghouse, Church, 12000 St.,
37 Wall St., New York.



View of Marshy Shore of Long Island That was Made Over into a Golf Ground

TRANSFORMING AN OCEAN MARSH INTO A GOLF COURSE *Link*

By STANLEY W. TODD

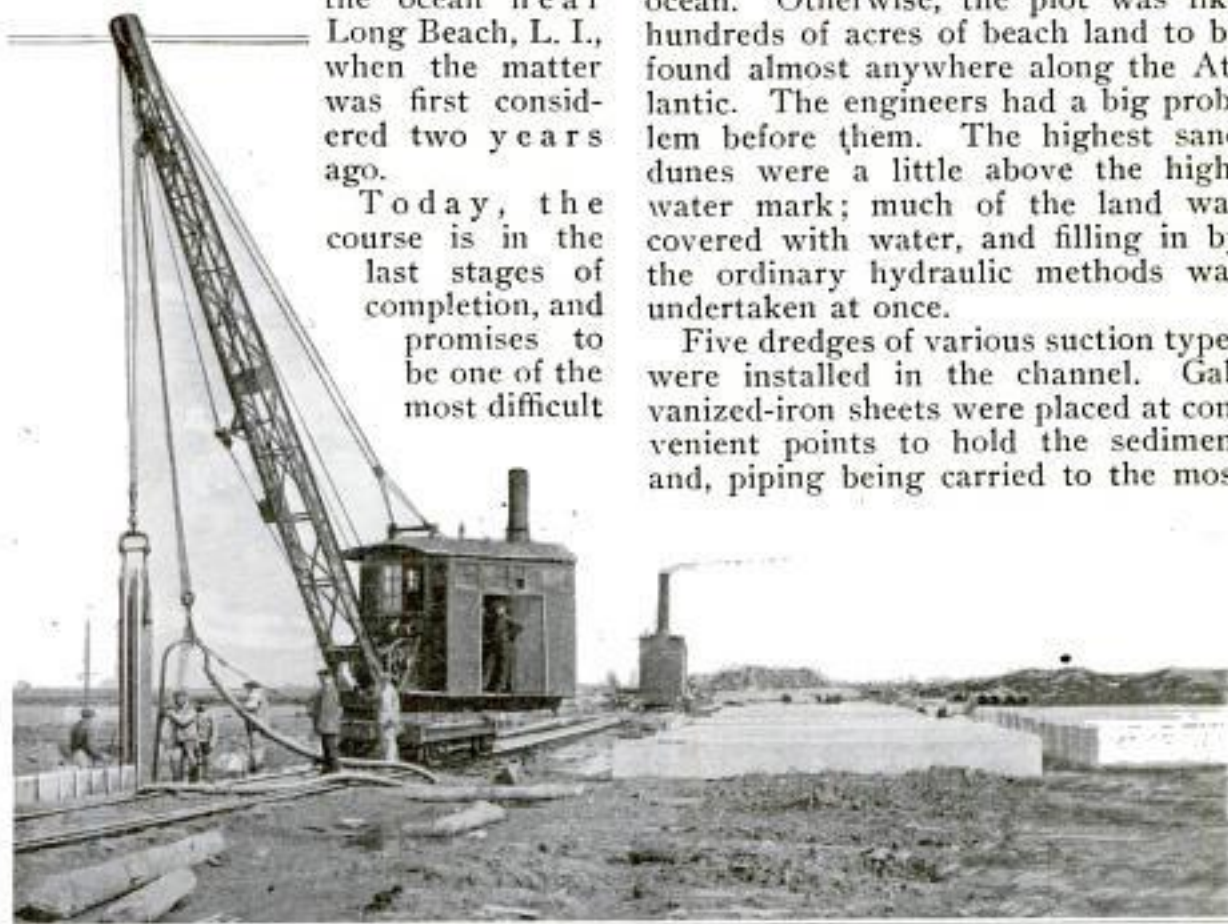
AS a rule, the average golf course is located many miles from the ocean front. The low, level land along the Atlantic coast, particularly, does not lend itself very readily to the uses of golfers, who prefer hilly slopes and advantageous mounds for tees and hazards. Handicaps such as these, however, did not deter a group of wealthy landowners from establishing a golf course on a 200-acre plot facing the ocean near Long Beach, L. I., when the matter was first considered two years ago.

Today, the course is in the last stages of completion, and promises to be one of the most difficult

in the country. But the undertaking was not a simple one, and it stands out prominently as a golf-club exploit, for there are not many clubs willing to go to the heavy expense involved, to have the ocean on one side of their course.

When the course was planned as the major part of the exploitation of the plot, it was nothing more nor less than a sandy marsh. On the north was a shallow channel; on the south, the ocean. Otherwise, the plot was like hundreds of acres of beach land to be found almost anywhere along the Atlantic. The engineers had a big problem before them. The highest sand dunes were a little above the high-water mark; much of the land was covered with water, and filling in by the ordinary hydraulic methods was undertaken at once.

Five dredges of various suction types were installed in the channel. Galvanized-iron sheets were placed at convenient points to hold the sediment and, piping being carried to the most



Sinking the Concrete Piles Forming the Bulkhead Which Permitted the Dredging of the Adjacent Channel to the Desired Depth: The Piles were Lowered with the Aid of High-Pressure Water Jets

suitable places, the pumping started. By this hydraulic fill, which delivered 20-per-cent solid material, the land was slowly filled in and the pools and bays began to disappear. Over a space 2,360 by 4,000 ft. in extent the land level was raised from 5 to 8 ft. with mounds at certain points as high as 25 ft. At the same time, the channel was being deepened from 8 ft. to 60 ft., although half the latter depth would have been enough for waterway purposes.

In order to keep the land from washing into the channel, it was necessary for the engineers to construct a reinforced-concrete bulkhead of the ordinary tongue-and-groove style, and then dredge the shore in front of it. The concrete piles, which were made on the ground, were lowered into position by means of a locomotive crane and high-pressure water jets. When this was completed, the northern boundary of the course was a solid concrete wall abutting on Reynolds Channel.

Then came another improvement, namely a lagoon, more for ornament than for practical use, not very far back of the concrete channel abutments. A converted dredge of the

dipper type, adapted for movement on tracks, was brought into position and loaded excavated soil upon small dump-carts for filling in at other points in

the development. The completed lagoon is quite extensive and has as a distinctive feature a picturesque island in the middle.

While all of this was going on, the ocean front needed attention. The heavy seas characteristic of the

south shore of Long Island threatened to wash away, or shift, the sand in a way to interfere with the development. The engineers decided to forestall trouble by sinking rows of wooden piles, all along the 2,360 ft. of beach, 12 ft. apart, in rows of a dozen every 300 ft. But instead of planking up the piles in rows of solid walls, as is sometimes done, only the bases of the rows were boarded up, thus avoiding the creation of eddies which do more to tear down the beach through the action of the waves, than to protect it and build it up, as intended in this particular case.

With the completion of the filling-in operations



The Dredging of This Lagoon, with the Island in the Center, Was One of the Costly Features of the Big Reclamation Project



Protecting the Ocean Side of the Golf Course from the Action of the Waves: Wooden Piles were Sunk at Intervals and Boarded Up in Such a Way as to Avoid Producing Destructive Eddies



Leveling with Scrapers After the Filling-In had been Completed: This View Gives a Good Idea of the Large Scale on Which the Operations were Conducted

came the large task of leveling the tract as much as feasible. Teams of plow scrapers were employed to make certain selected portions suitable for subsoil and eelgrass, to hold the sand in windy weather. Then, too, there



A Finished Tee: The Work of Reclaiming the Big Tract, Begun in the Latter Part of 1914, is Now Nearly Completed

were places to be tufted and covered with grass, according to the plans. Now the golf course is assuming shape, with the green-covered tees and bunkers looking like veritable islands in oceans of sand. Eventually it will all be covered



Preparing Subsoil and Putting In Eelgrass: The Latter was Employed at Various Points to Prevent the Sand from being Swept Away by the Strong Winds. Other Parts were Tufted and Covered with Grass to Serve as Tees and Bunkers

like the ordinary course, but top soil has to be brought a great distance, and grass does not grow on ocean shores very readily. In addition to all these operations, it was necessary to pipe the course with a sprinkler system, to keep the ground in good condition for play.

The southern portion of the develop-

ment is given over to a residential area, but the golf course will probably remain for many years. In the meantime, it will be unusual, if not unique, in having an ocean frontage, and a channel on the north side that will permit the members to journey to the course in motorboats.

3115
**SAFETY-FIRST GUARDS AT
 GARAGE ENTRANCE**

Because many motorists are apt to mar or bend the fenders of their cars by



driving through a doorway carelessly, a garage owner in Los Angeles has so placed strong guards at either side of his garage entrance, next to the floor, that injury to fenders is quite improbable. The

guards are big, rounded iron castings which project far enough from the walls to turn a wheel to one side before any part of a car body strikes the door frame. Each is painted white and bears the words "Safety First" in red letters.

3564
**CURTAIN-ROLLER MOUNTINGS
 HELD WITHOUT SCREWS**

Mountings for roller shades have been invented by means of which win-



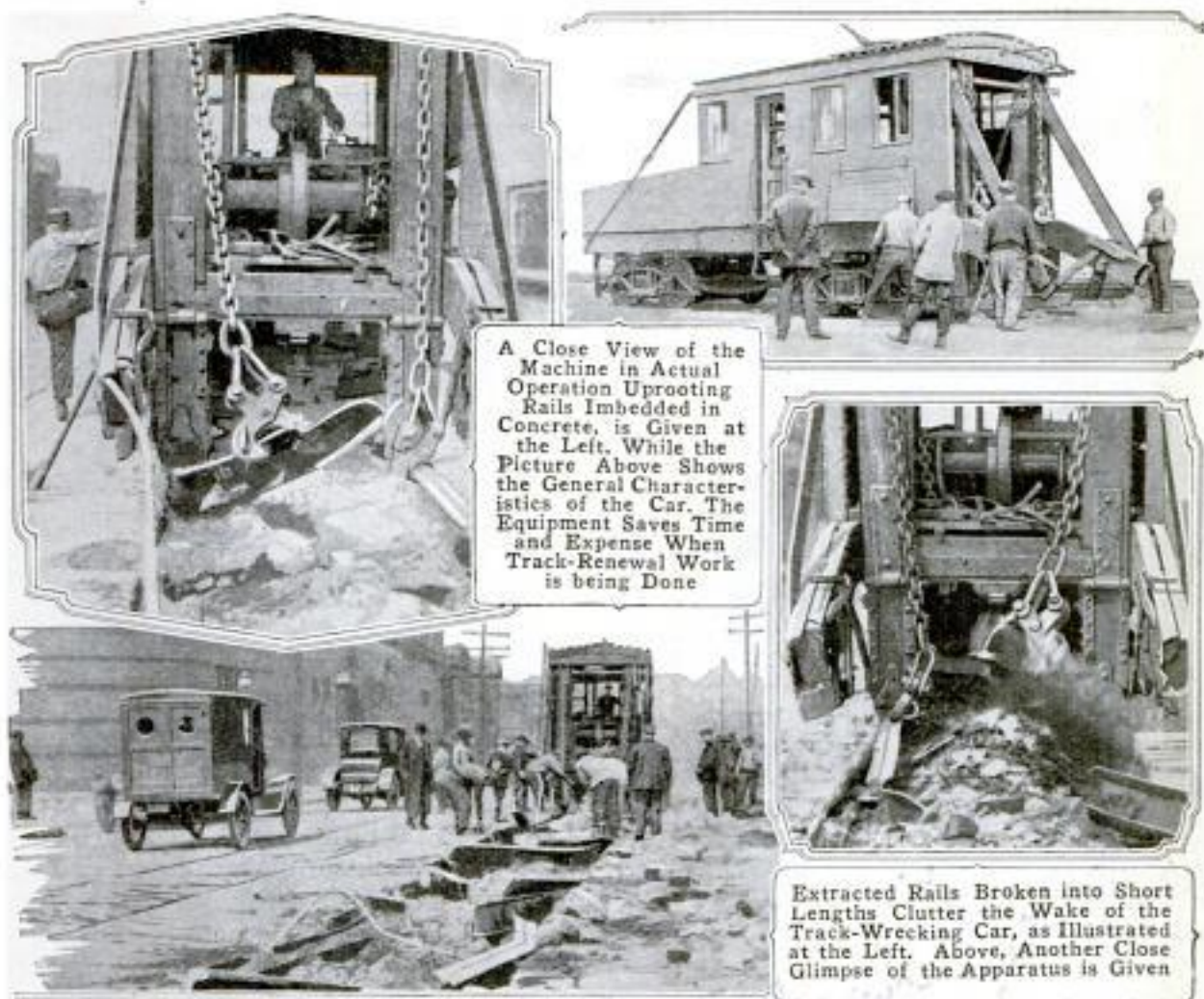
These Mountings Hold the Curtain Roller in Position by Means of Buffers That Press against the Window Jambs but do Not Mar Them. It Is Only a Matter of a Moment's Work to Put Up a Roller or Change Its Position

dow shades can be installed without tools and without marring the woodwork. Each set of mountings consists of a pair of small cylinders, one with an opening in one end to receive the roller spindle, and the other similarly made to fit over the key at the opposite end of the roller. The outer ends of the mountings are provided with buffers that are pressed against the window jambs by a coil spring contained in each cylinder. To install a roller the mountings are fitted on its ends and pressed inward so that the roller can be inserted between the sides of the window frame.

4500
**RAIL-BREAKING MACHINE
 TEARS UP TRACKS**

When new street-car tracks are to be laid on any of the business thoroughfares of St. Louis, the work of tearing up the old tracks laid in concrete is facilitated by the use of a rail-breaking machine that saves much time on the job. This machine was built in the street-railroad shops by the company's own men and has proved very effective. It is a strongly built wooden work car, weighted down at one end with scrap iron to give it stability, and equipped with a powerful electric motor. This runs a drum, around which wind heavy chains that pass over a pulley and are hooked on to the rails to be removed. Two posts with steel tips rest on the track in front of the car and as the chains pull up the ends of the rails, the latter break under these posts. Rails and ties are torn out of the concrete at one operation, the rails being broken into lengths of about eight feet, which makes them easier to handle and to dispose of as old iron. Ten blocks of

Eugene N. Stern
 225 N. Main, Boston, Mass. Copyright 1914



A Close View of the Machine in Actual Operation Uprooting Rails Imbedded in Concrete, is Given at the Left. While the Picture Above Shows the General Characteristics of the Car, the Equipment Saves Time and Expense When Track-Renewal Work is being Done

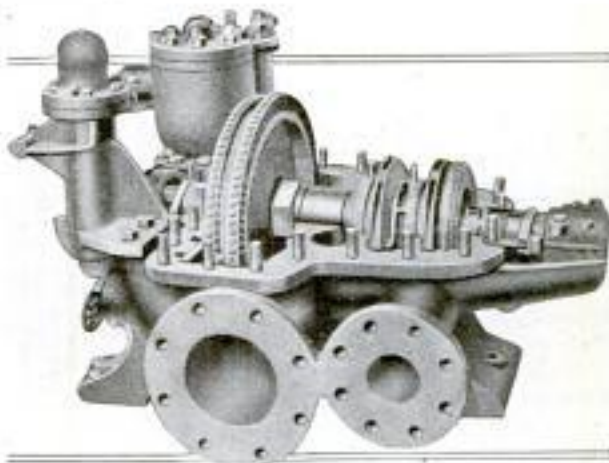
Extracted Rails Broken into Short Lengths Cluster the Wake of the Track-Wrecking Car, as Illustrated at the Left. Above, Another Close Glimpse of the Apparatus is Given

track have been torn up and relaid in about two weeks when this machine was used, it is stated, whereas, when manual labor, picks, and shovels were employed in the work of removal, the time required was nearer two months. Only a small crew is needed to operate this machine.

4387— COMBINED STEAM TURBINE AND BOILER-FEED PUMP

By a recent development of the centrifugal boiler-feed pump in the direction of compactness and simplicity, a 3,000-hp.-boiler feeder is combined in one casing and on one shaft with a steam turbine. This combination weighs only about one-tenth as much as an ordinary duplex reciprocating pump of the same capacity, and occupies only about one-eighth as much floor space and one-fifteenth as much

cubical space. The pump end contains two single-suction impellers cast from special bronze. The steam end consists of a turbine with either two or three rows of moving buckets, according to the extent of steam economy desired.



Combined Steam Turbine and Centrifugal Boiler-Feed Pump, with Casing Cover Removed, Exposing the Turbine Rotor and Pump Impellers

*De Laval Steam Turbine Co.
Trenton, N. J.*

*#Geo. H. Gibson Co. Tribune Bldg, N. Y. C.
Advertising Engineer.*

Taylor Registering Projector Co.,
717 Title Bldg.

4353 POPULAR MECHANICS Baltimore Md

REGISTERING PROJECTOR FOR PRINTERS

A new machine for use in printing establishments utilizes the principle of



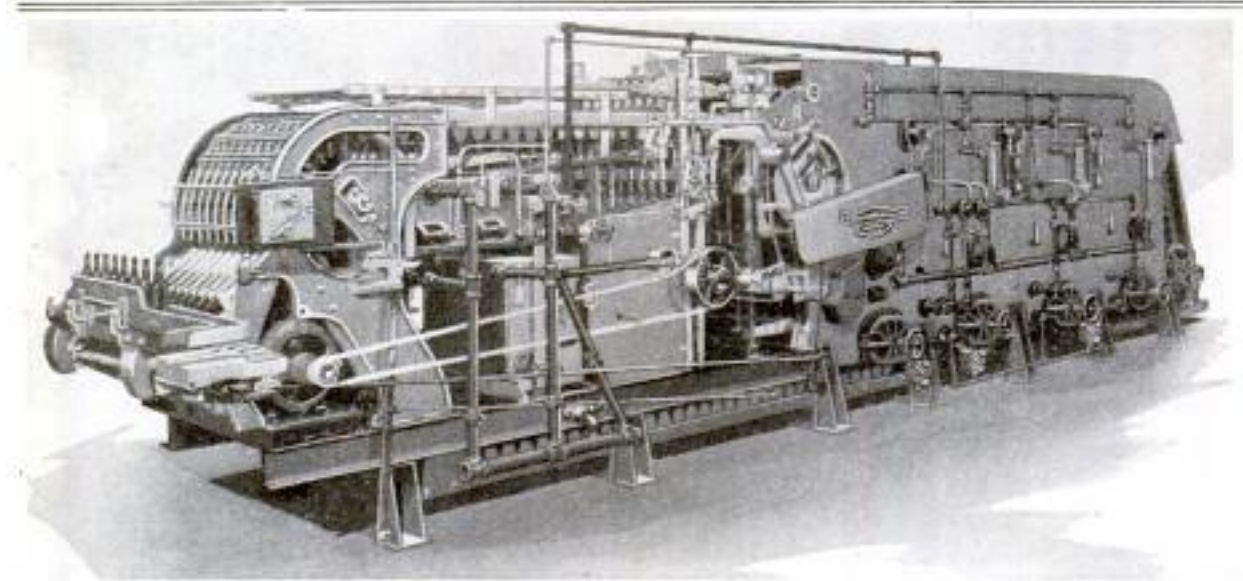
Registering a Printer's Form for the Press by the Aid of a New Projector, Which Throws an Image of the Copy Downward from Above: The Man Works inside a Curtained Inclosure While Adjusting the Plates

the opaque optical projector—the kind that projects post-card pictures and the like—for the purpose of registering plates in a form; that is, adjusting them accurately in position, so that

line falls upon line, or edges correspond, as in color printing. A copy of the registering plan, or detail, is placed on a glass plate facing downward, at an angle, at the top of the machine, and an image of this detail is projected onto the form below. The image is stationary, and the plates are moved by the operator until they coincide with it in the form.

MACHINE FOR STERILIZING BOTTLES

Bottles which have contained mineral water or other liquids are prepared for refilling by a machine, manufactured in Milwaukee, which automatically performs the six operations of soaking, brushing, washing, sterilizing, rinsing, and cooling them, untouched by human hands. The bottles are placed in carriers, or racks, at the loading end of the machine, each carrier consisting of a series of pockets, from 8 to 20 in a row according to the capacity required. By the power of a motor of from 2 to 4 hp., the bottles then pass over a series of sprocket wheels into successive compartments of the soaker, three of which contain solutions of caustic soda at increasing temperatures, and the fourth fresh water at 200° F. Thence they go to revolving brushes which scrub them



Soaking, Washing, and Sterilizing Machine Which Automatically Cleanses 100 Bottles a Minute: Several Soaking Compartments Contain Hot Solutions of Caustic Soda

20th Century Mch Co.
Milwaukee, Wis.

thoroughly outside, and then they are brushed internally and rinsed twice with water at 170°. After this they receive four more rinsings at decreasing temperatures before going to the filling machine.

— 4645

PATRIOTIC PRINTING JOB DONE IN RECORD TIME

Chgo. Tribune 6-5-17

A patriotic desire to place the president's historic war message in the hands of every young man who was to register for the draft June 5, was the stimulus that made possible an achievement in printing which is believed to be a record in many respects. At a late date it was learned that the government's printing establishment would be unable to print copies of the message for nation-wide distribution, and in the emergency a printing firm in the middle West undertook the task. The type for the printed matter was received at 11 a. m., May 31. At 4 p. m. the same day 16 plates of each of the two pages into which the message was divided, had been received from the foundry and were on a press. Soon after, two other presses were started, each with 32 plates of each page. In a continuous run, which lasted 79 hours, the three presses turned out over 10,000,000 copies of this memorable address. As fast as they were printed they were bound in bundles and expressed to registration officials in every state in the union. The undertaking, which cost about \$50,000, was financed by Mrs. Emmons Blaine of Chicago.

— 3822

WEAK BATTERIES UTILIZED FOR CAR WORKERS' LIGHT

An electrician employed by a railway in Portland, Me., has devised a very serviceable lighting outfit for use by car inspectors and repair men, which is supplied with current from the storage batteries belonging to the car on which the men are working. The outfit displaces kerosene lamps, formerly used. It includes a low-voltage bulb set in a reflector mounted on a tripod and connected by a cord with a resistance coil.

The latter is connected with the storage batteries under the floor of the car. When the charge in the batteries



Portable Lighting Outfit for Repair and Inspection Crews Supplied with Current from the Car's Storage Batteries: The Resistance Coil Shown is Employed to Keep the Light Constant as the Supply of Electricity Diminishes

gets low the adjustable contact on the coil is moved along so as to lessen the resistance. Thus, with a diminishing supply of electricity the power of the light can be kept constant by adjusting the coil from time to time.

— 4517

PERILS OF DESERT ROUTE TOLD IN HIGHWAY SIGN

The warning sign shown herewith has been erected lest motorists enter unaware upon this desert road in the Southwest, along which neither drinking water, oil, nor gasoline can be ob-



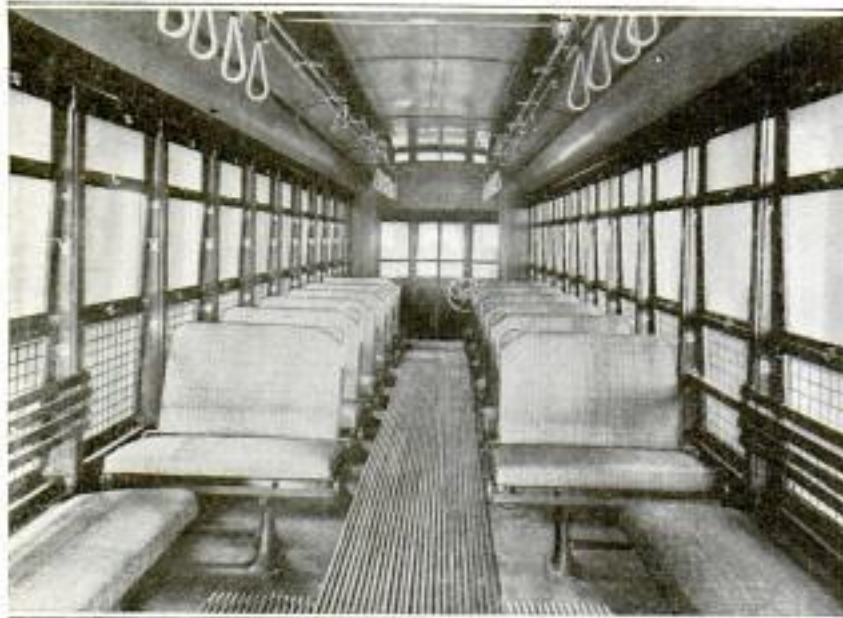
Warning Sign at One End of a Stretch of Desert Road along Which Neither Drinking Water, Gasoline, nor Oil can be Obtained for a Distance of 40 Miles

tained for a distance of 40 miles. At the opposite end of the barren stretch is a similar notice. The signs were erected by an automobile club.

*Inw. - Wm. L. Foss,
684 Forest Av., Woodford, Me.*

3483 POPULAR MECHANICS *Unusual*
CONVERTIBLE STREET CAR HAS EXTRA-LONG
WINDOWS

A New England street-railway company is experimenting with a type of street car for summer and winter use, the sides of which are practically all glass.



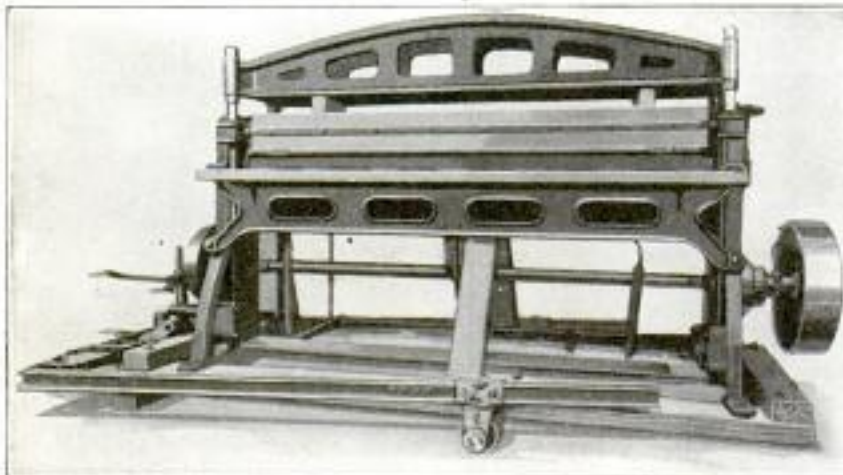
Convertible Street Car Having Windows That Extend Down to the Level of the Seats and so Flood the Conveyance with Light: This Arrangement Makes a Maximum of Fresh Air Available for Summer Service

The windows are made in three sections and extend down to within about 18 inches of the floor. The lowest section in each window is composed of small square panes, leaded. The seats placed lengthwise at either end of the car are provided with backs consisting of sets of slats fastened in front of the lower portion of the windows. With so much glazed wall space a conveyance of this type can be converted into what is practically an open car, for summer use.

4341 Industrial
NEW TRUCK AND JACK FOR
HANDLING HEAVY LOADS

A new three-wheel truck, with which heavy machinery can be moved with

"U" at any point desired. The frame is backed around the object and one end of the latter raised by the jack. A strong rod is then placed under the load, close to its lower end, in such a position that it passes through the hollow axles of the two wheels. By lowering the load the heavy object is automatically lifted off the floor, the rod serving as the fulcrum, so that the truck then bears the whole weight of its load.



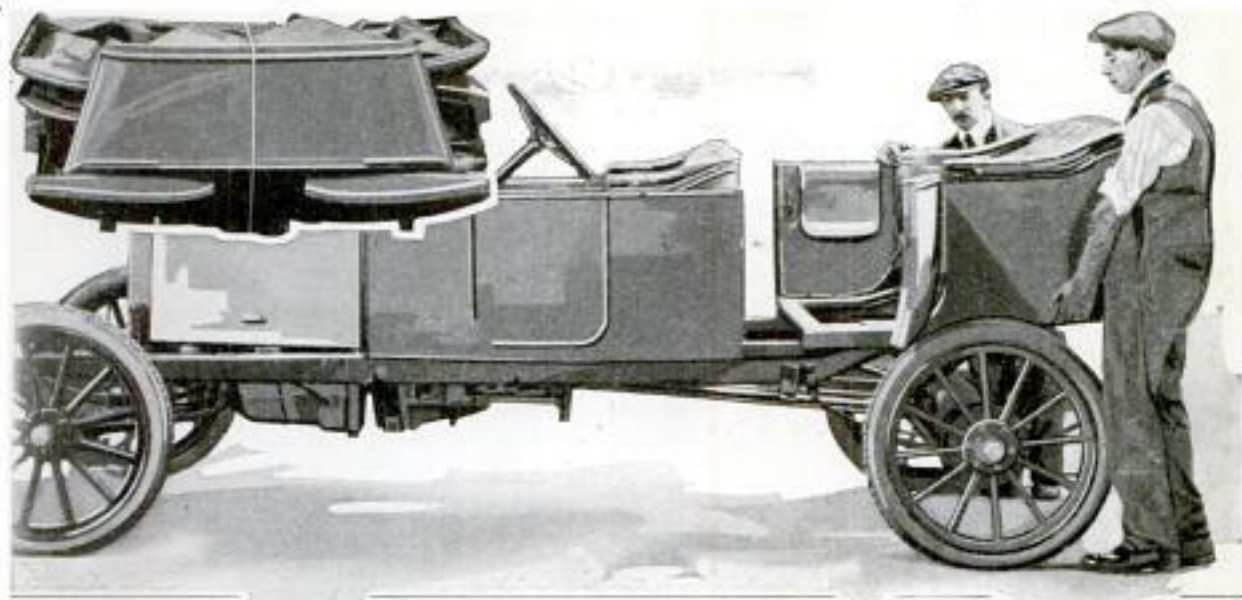
An 8,500-Pound Machine Which was Lifted onto the Truck Shown in 10 Minutes

ease, has a U-shaped steel frame, at the closed end of which is a powerful jack mounted above one wheel. The other two wheels have hollow axles and can be attached to the arms of the



The Jack by Which the Load is Tilted is Shown at the Right-Hand End

F. J. Bloodgood Co., Binghamton
(Inv.) V. E. Beagle
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Auto Body Made in Sections, so That It Packs Flat for Shipment: The Men are Removing the Rear-Seat Section Bodily, Though It Consists of Three Parts. Above is Shown a Car Body Taken Apart for Shipment in a Box

4391

AUTO BODY PACKS FLAT IN SECTIONS

A motor-car body made in sections, so that it will pack flat and occupy little space in shipment, is an idea recently introduced from South Africa, where it originated. The parts are made with upholstery attached, and a few bolts hold the sections firmly together without rattling, while the appearance is that of a standard body. A four-passenger body of this kind reached the United States in a packing case of only 66 cu. ft. capacity, and it is claimed that this form of construction will enable 12 packed bodies to be shipped in a box car that would contain only six of the ordinary bodies.

4646

MILLION-DOLLAR AVIATION SCHOOL NEAR DETROIT

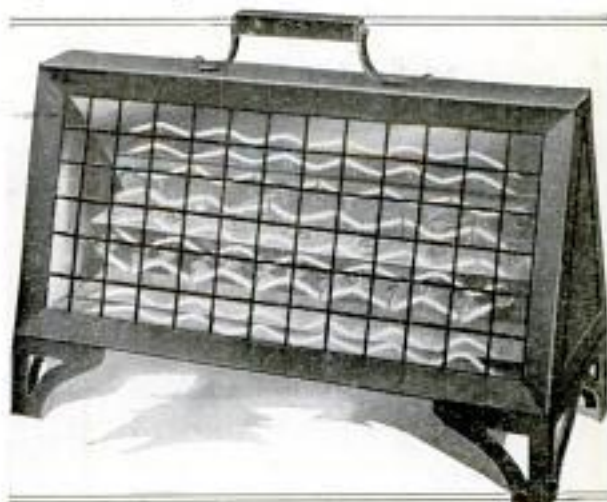
A small army of laborers, representing many lines of construction, have been working with all possible haste on the government's new \$1,000,000 aviation school, which is being built not far from Detroit, on the shores of Lake St. Clair. The school will be what is known as a one-squadron plant, with 12 hangars, each capable of sheltering 12 machines, and with six barracks, which will house 150 men each. The equipment will include

separate quarters for the officers, a club, a school building, measuring 200 by 60 ft., a hospital, a heating plant, and a sewer and water system. Though much of the construction will be of a semitemporary character, it will be thoroughly modern and sanitary.

4385

ELECTRIC RADIATOR WIRED TO ANY LAMP SOCKET

A portable electric radiator has appeared in the market, furnished with a cord and plug for attachment to any lamp socket. It is made with a dull-black casing and a screen through which coils of wire glow, when heated, against a polished reflector.



This Portable Electric Radiator Is 12 Inches High and Weighs Only Five and One-Half Pounds

Worcester Electric Htg. Co.
Cambridge, Mass.

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INEXPENSIVE FURNITURE OF INGENUOUS DESIGNS

Chs. 2.50, 3.50, 4.50

2.80 4.00 5.00



Hexagonal Table, with Drop Leaves, and Odd Chair: Flower Holders Are Test Tubes Set in Holes. Underneath Are a Compartment, a Shelf, and a Linen Drawer

There Is a Place for Everything in This Child's Costumer. Each Hook and Shelf Has a Special Use

2.50
3.50
4.50



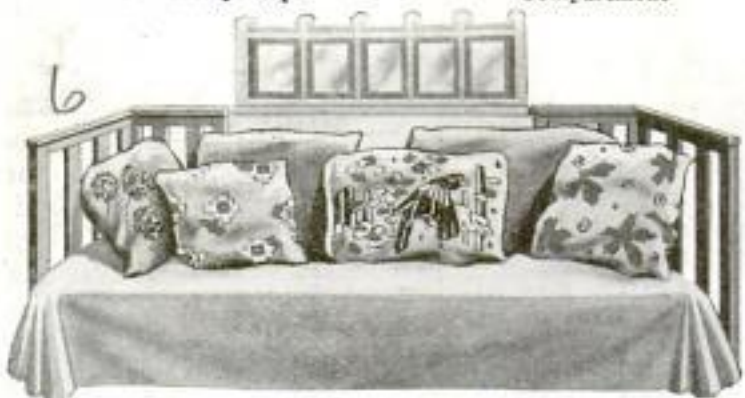
Simple Candelabra Suitable for Use over Table Shown Above: Cords Are of Knotted Hemp Rope



Triangular Dressing Table Built for a Corner: Behind Middle Mirror and in Candle Posts Are Shelves. Under Chair Seat Is a Compartment



2.28
3.20
4.20



By Reason of the Mission-Style Davenport Ends on This Couch It can be Used with Pleasing Effect under a Window



Above Are Two Views of a High Chair That can be Changed into a Low Chair and Table. Under the Seat Is a Place for Baby's Things

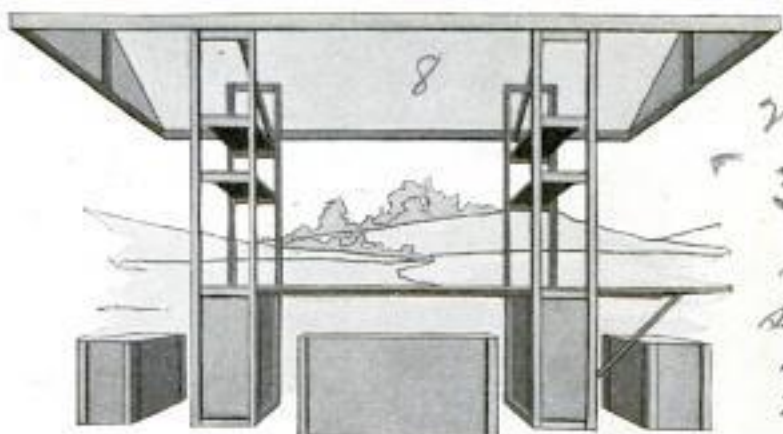
5.50
7.75
9.50

APPROPRIATE FOR A HOME OR SUMMER COTTAGE

3 50
5 20
6 25



Chair with Colorful Panels of Chintz and a Handy Storage Place under the Seat



Artistic and Very Useful Camp Table and Canopy: Shelves in the Upright can be Used for Dishes, and the Compartments in the Benches for Luggage or Provisions

21 50
39 00
set (6)
15 50
22 00

16.
22.
28.
Ch
3 50
To
6 25



At Either Side of This Very Unconventional Dresser Are Shelved Compartments, with Slatted Doors to Match the Chair



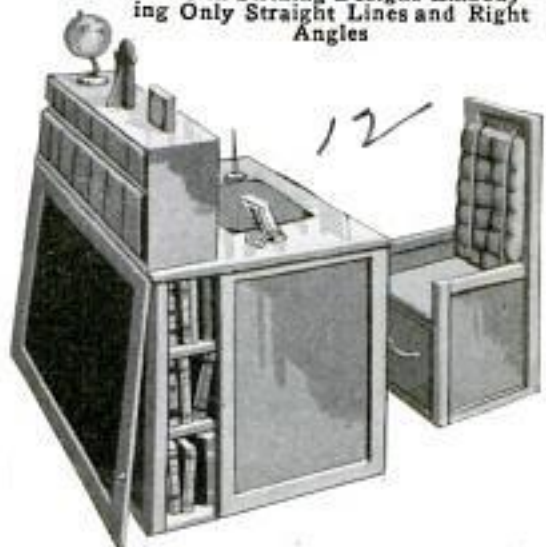
Chairs and Greek-Cross Dining Table with Four Hinged Leaves. Made in Striking Designs Embodying Only Straight Lines and Right Angles

To
7 00
To
12 50
C. Stier
85.
To
175
Ch
1 75
To
3 12

To.
7 50
11.
13 75
Ch.
2 50
2 75
2 25



Child's Octagonal Table with Very Convenient Shelves and "Cornerwise" Chairs That can be Stood Close Up under the Table Corners



Desk That would Delight Any Boy or Girl Because of the Hinged Blackboard, Post-Card Rack, and Shelves: The Chair Has a Drawer under the Seat

Desk
12 75
17 50
22.
Ch.
2 50
3 50
4 50

4216
**LAMP-POSTS ADORNED
 WITH CITY'S EMBLEM**

Artistic lamp-posts of concrete and iron have been erected in Alhambra,



DESIGN COPYRIGHTED BY ALHAMBRA,
 CALIF.

Calif., which were made especially for the city according to a design that has been copyrighted, so that posts of this type cannot be used elsewhere. The insignia of the city is a crescent and star, which is suggestive of the Moorish palace in Spain bearing the same name as this California town. This emblem has been used very effectively in designing the arms which support two of the three lights on each

post. It also appears on the sides of the base. Above each of the latter ornaments is a mission bell. One of these bells serves as a door to the fuse box situated within.

4534
WAYS TO SAVE FOODS

FOR USE IN WINTER

U.S. Dept. of Agric.
 Now that the entire nation has awakened to the need of increasing our food supply it is exceedingly important that means be employed to conserve all surplus products for use the coming winter. The following suggestions for the various foods indicated will be found so simple and practical that they can be used in almost any household.

CARROTS: Carrots gathered shortly before the frost may be preserved in a condition practically as fresh as when taken from the ground. Take

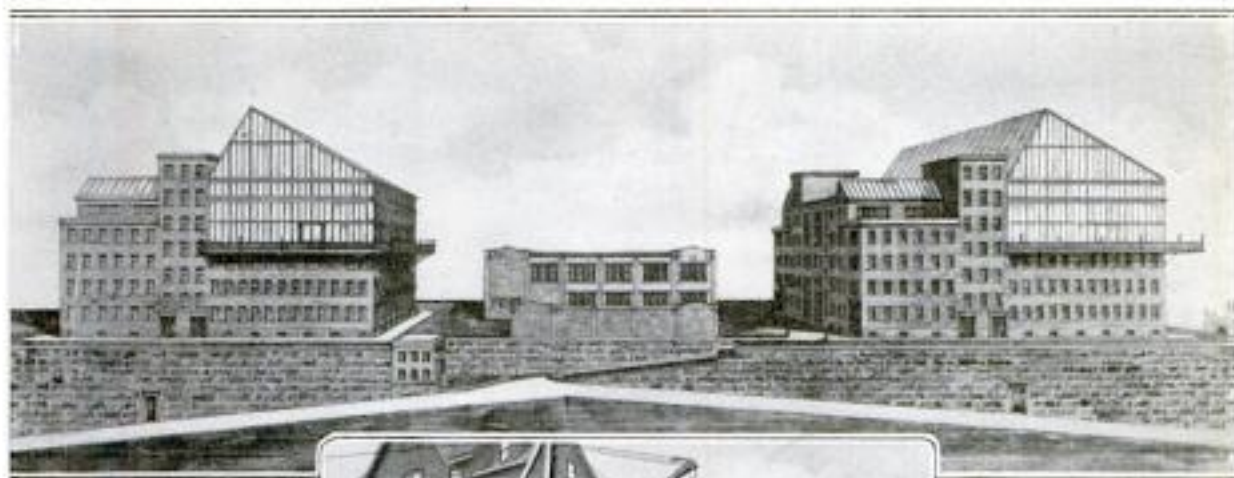
a box of convenient size, spread a layer of moist sand or garden earth in the bottom about two inches thick, and on this place the carrots as close together as possible without their touching. Then sift on an inch of earth packed fairly tight with the hands, and proceed to the next layer. If the earth becomes dry during the winter it can be sprinkled occasionally. Carrots packed in this way should be perfectly fresh until the last of March. Place box in dark, cool spot in basement.

EGGS: Eggs, if properly put down in water glass (sodium silicate), can be kept for use practically all winter. They must be perfectly clean and preferably not more than two or three days old. A washed egg is apt to spoil because its gelatinous coating has been removed. The eggs must be free from the smallest cracks, and the crocks in which they are stored should be scalded and allowed to cool before use. The solution used consists of one part of water glass to nine parts of cool boiled water. The crocks should be covered and set in a cool place where they will not be moved. Up to November the eggs can be used for soft boiling and poaching. They are satisfactory for frying until about December. After that they can be used chiefly for omelets, custards, cakes, and general cookery. Limewater can be used instead of water glass and in a somewhat similar way.

TOMATOES: Ripe tomatoes may be had until New Year's or even later by pulling up the vine by the roots just before frost, and hanging in the basement. First pick off all ripe tomatoes and leave only the green ones. Hang vine on a nail driven into the side of wall, with the roots up, and the green tomatoes will gradually ripen from week to week, and be almost as good as ripe tomatoes when first gathered.

WATERMELONS: Watermelons may be kept some time with a fair degree of success by sealing the end of the stem, where it is cut from the vine, with wax.

NEW FILM CITY IN HEART OF THE METROPOLIS



Right in the heart of New York City, a \$2,000,000 motion-picture studio is to be built, on a block of ground elevated 40 ft. above the level of the street on which the buildings will front. This is a new street recently cut down to the city-datum line, leaving up in the air on the edge of a rocky cliff some of the old-time residences of the block. These



PHOTOS COPYRIGHT, BROWN & DAWSON
 The Architect's Drawing Reproduced at the Top Shows the Big Movie Plant as It will Appear When Construction is Completed. The Lower Picture Gives a Glimpse of the Block of Ground Left High in the Air by Street Graders and Shows the Difficulty Encountered at the Outset in Getting Fuel and Other Materials to Residences Above

will be removed to make way for the new film city, which will be the largest of its kind within urban limits anywhere. The reason for selecting the elevated site was that no shadows can fall upon the skylights of the studio from any surrounding buildings, making it an ideal site in that respect. The plant will be operated as soon as construction can be completed.

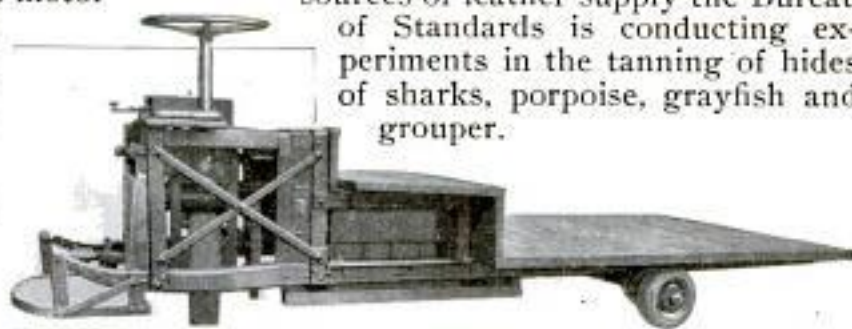
4443

ELECTRIC FLOOR TRUCK WITH NEW FEATURES

Among the new features of an electric floor truck and tractor for industrial purposes is that the motor employed is attached to a 16-in. front caster wheel, which enables the truck to turn in its own wheel-base length. It will carry on its low platform a ton of freight, such as lumber, bricks, or machinery, and tow on trailers several tons more. The motor is mounted on

the yoke over the traction wheel. A 14-cell battery is supported under the truck.

In an effort to find additional sources of leather supply the Bureau of Standards is conducting experiments in the tanning of hides of sharks, porpoise, grayfish and grouper.



Electric Floor Truck That will Turn within Its Own Wheel-Base Length, Which Is 66 Inches: It will Run from 25 to 40 Miles without Recharging the Battery

Enterprise Machine Works,
 115 W. Redondo St.,
 Los Angeles.



Second Brigade, Ohio Infantry, Consisting of the Fourth, Fifth, and Eighth Regiments, Commanded by General Picture Gives One a Fairly Good Idea

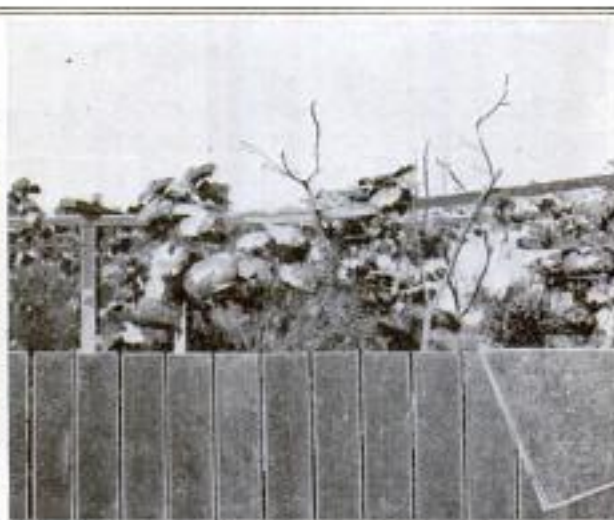
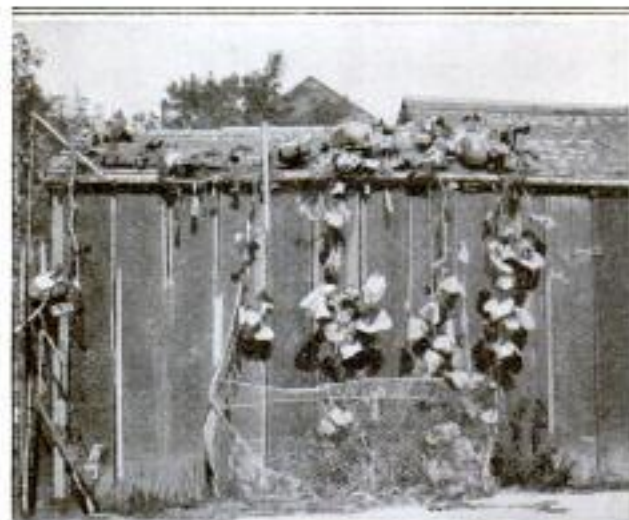
4632
#6. L. Edholm 68 W 97th N.Y.C.
**VEGETABLE VINES TRAINED
ON ROOF AND TRELLIS**

In the roof garden for vegetables and the laden trellis, shown herewith, there is a suggestion for many who have only small tillable plots and yet wish to raise the maximum amount of foodstuffs for the coming year. In these instances pumpkin vines were trained up onto a shed roof and an overhead trellis, thereby lifting them out of the way and leaving more ground for other uses. It will be noted that blocks have been placed beneath some of the pumpkins on the sloping roof to prevent their rolling off. The blossoms below the level of the eaves

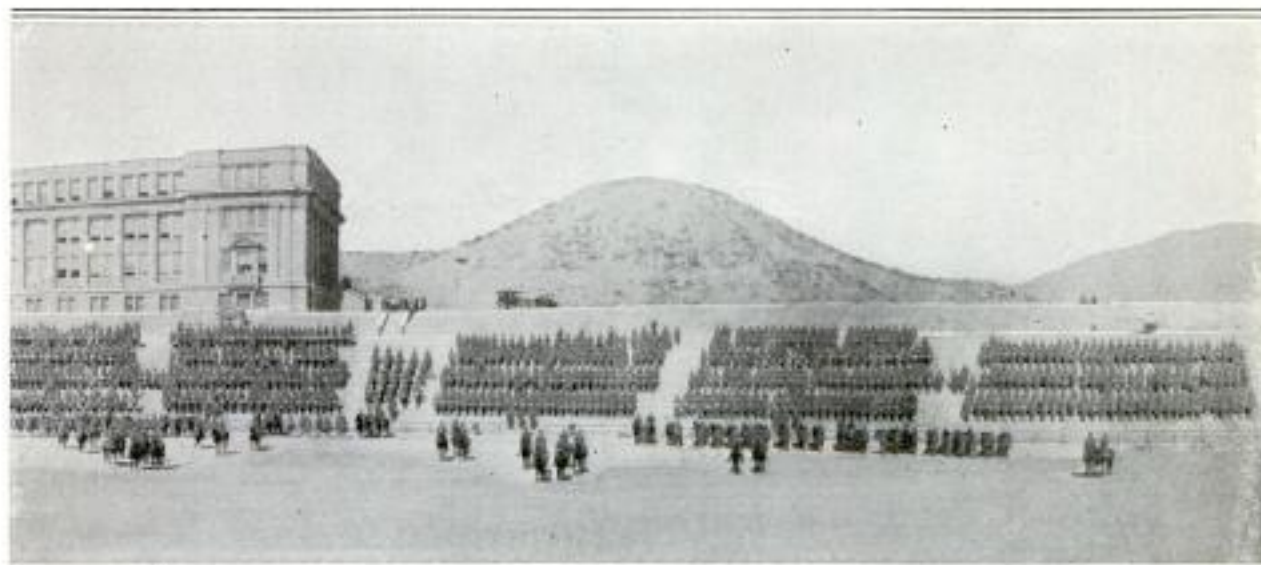
were picked off so that only those would mature which had a satisfactory resting place.

4611
**OHIO BRIGADE FINDS SPACE
ABUNDANT IN STADIUM**

When the second brigade of the Ohio infantry, composed of the fourth, fifth, and eighth regiments, occupied the concrete stadium at El Paso's new high school some months ago, a striking conception of the structure's proportions was afforded. The hundreds of men and scores of horses and pack mules left abundant space for about three more units of similar size, or an army division. And even then the ex-



Roof Garden for Vegetables: Pumpkin Vines Grown Next to Old Shed and Trained Up onto the Roof. At the Right: View of Garden Trellis Used as Support for Pumpkin and Other Vegetable Vines



John C. Speaks, Occupying a Sector of the Big Concrete Stadium at the New El Paso High School: The Immense Size of the Structure

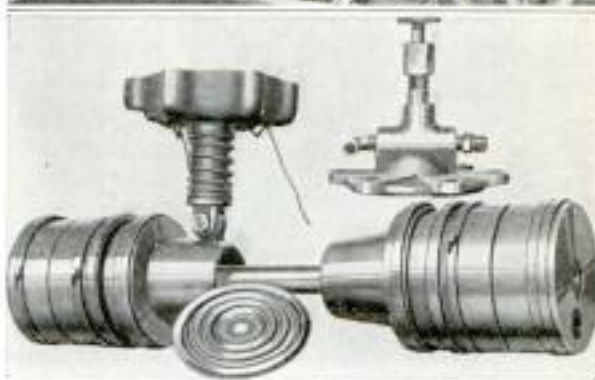
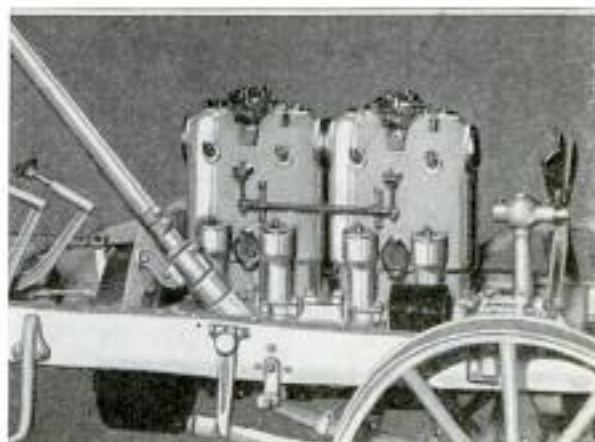
pansive athletic field below the encircling tiers of seats would have been almost vacant. The big bowl, which is spoken of as the largest amphitheater in the Southwest, seats about 12,000 persons and is comparatively new.

4506

NEW ENGINE OF TWO-CYCLE FUEL-INJECTION TYPE

A radical departure in gasoline-engine design is seen in a motor of recent development, which combines the two-cycle and fuel-injection principles in such a way, it is claimed, as to secure double the power of the ordinary four-cycle engine with half its weight. This makes the motor available for aviation as well as for automobile and marine work. Its main feature is a double "pneumatic" piston, or sliding valve, which opens and closes ports in each of two cylinder heads, regulates the amount of gas left in the explosion chambers after each stroke, and also, by means of cams, the amount of atomized gasoline injected into the head. This horizontal piston operates in a special cylinder on top of and cast integral with each pair of engine cylinders, its ends being sealed by caps bolted direct to the casting. Compression spaces at each end form pneumatic cushions which cause and also check the travel of the piston back and forth

above the engine cylinders, the compression and exhaust of which supply the gas cushions. It is possible to throttle the engine down to the lowest speeds, or as slow a rate as 100 r. p. m. The carburetor is eliminated, also poppet valves, lifters, cam shafts, and other complications.



Four-Cycle Automobile Engine Transformed into a Two-Cycle by the Installation of Cylinder Heads of New Design: Below are Shown the Pneumatic Piston, Fuel Pump, and Injector

William Motor Co.,
1414-16 Commercial
attention Mr. Rose.

Copyrighted material

WRECK OF BIG DRAWBRIDGE DELAYS BOSTON COMMUTERS

A fortnight after the installation of three new spans of an important rail-

the spans snapped, and the heavy steel parts plunged into the river. As a result rail traffic was tied up during the evening rush hour and the river channel was closed for several days. Officials immediately began an investigation to ascertain if the bridge, which had been under military guard for some time, had been tampered with. The third span, which was only slightly damaged, was soon utilized in relieving the rail congestion. So many Boston commuters were delayed by the mishap that certain telephone exchanges had to hurriedly summon additional operators to serve the large number that sought to communicate with their homes. Extra elevated



Railroad Drawbridge over Mystic River near Boston. Wrecked by the Snapping of the Cables of Two Spans: The Third Span, the Most Distant One Shown Here, was Utilized as Soon as Possible in Relieving Traffic Congestion

road drawbridge over the Mystic River, near Boston, the lifting cables of two of

trains were also rushed into service to relieve the traffic congestion.

3321 RAISE FUNDS TO REPAIR CALIFORNIA MISSION

The increased interest in the history of the Spanish missions of California

to preserve these picturesque buildings from decay and further destruction.



A Portion of the Historic San Fernando Mission in California, Funds for the Repair of Which have been Raised Recently

which has been manifest in recent years, has resulted in various efforts

aside for making improvements and restoring various parts.

4436

PERSONAL COMFORT FOR THE RECRUIT

W. M. K.

By GEORGE M. PETERSEN

117

18th St Bflo N.Y.

1st N. Y. Cavalry, National Guard, U. S. A.

COMFORT for the soldier in service consists in an equipment which contains the essentials in their most compact form. What the essentials are is not a simple question. The following suggestions are made by a man who saw service on the Mexican border last year. They may prove helpful to many.—Editor.

THE man who desires to live on his monthly stipend and be a real soldier, cannot afford to pay a tailor to make repairs even though his regiment happens to have a tailor, which is not always the case while in the field. To meet emergencies of this kind a sewing kit, called a "housewife," is the proper article. This part of the soldier's kit may be purchased at prices ranging from 25 cents upward, although the writer made his own from a piece of condemned canvas and purchased the articles which he needed to make it exactly meet all requirements.

The housewife is shown in Fig. 1, the contents being held in place by means of quarter-inch elastic. The various articles shown are listed underneath the illustration. The cable splicer's shears can be used for manicure purposes, cutting wire, opening cans, repairing clothing, trimming a horse's mane and tail, and for numerous other purposes; the monogram or initial tape is invaluable for identifying one's clothing when every one's wearing apparel is identical; the white tape is useful for making loops on towels, wash cloths, etc., as well as reinforcing weak spots in garments; and the piece of sheet celluloid is used

to carry white, black, and olive-drab thread, as the regular round spools are too cumbersome to carry in the field. Extra safety pins are stuck in the flap of the upper pocket, for ready use, and bachelor buttons are stuck through the edges of the cover flaps. In the upper pocket are six 4-in. blanket safety pins, which are very desirable for making a bed sack from a regular army blanket. The lower pocket contains a small ball of beeswax for waxing the thread before sewing on buttons, and a small bag of assorted buttons in which should be several olive-drab buttons for the regulation army shirts, as these buttons are extremely difficult to obtain in the field. In the needle flap are kept the needles which are being constantly used. The writer keeps four loaded needles in this flap at all times, one threaded with

darning cotton and one threaded with each of the following: white, black, and olive-drab thread. To close the roll the flaps of the housewife are laid over the body so that the whole becomes a strip 6 in. wide and 14 in. long. It is then rolled tightly and tied with the tapes attached to the pointed end.

The subject of toilet articles is one of considerable importance, as "clean-

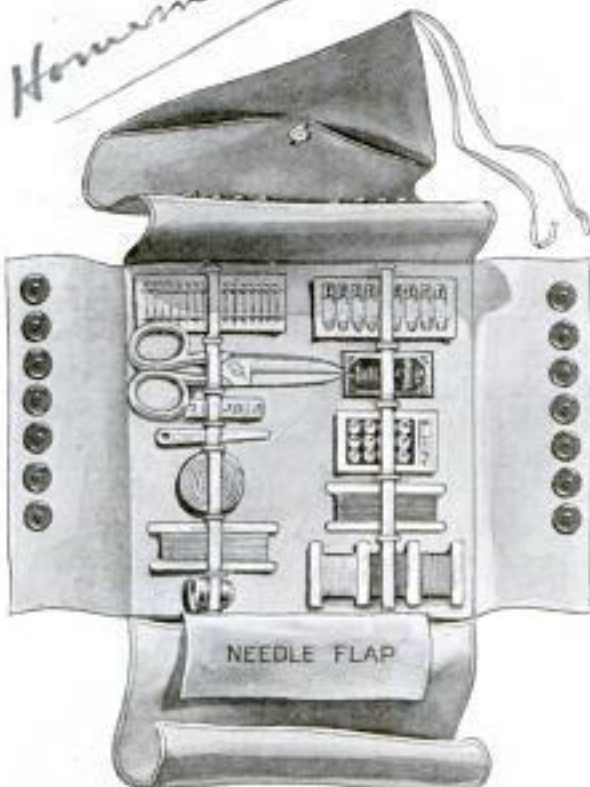


Fig. 1—A Carefully Planned "Housewife": Left Row Contains Common Pins; Cable-Splicing Shears; Initialed Tape; Tape Needle; Roll of Tape; Celluloid Thread Holder, Thimble. Right Row: Safety Pins; Needles; Underwear Buttons; White, Black and Olive-Drab Thread. The Pockets Contain Safety Pins; Beeswax; Buttons, etc. Bachelor Buttons are Fastened to the Flaps

Another Housewife - 5⁰⁰ - contains 18 articles
Nathan Novelty Mfg Co. 84-90 Reade St.
N.Y.C.

liness is next to godliness" even in the army. The great majority of the civilian soldiers on the border preferred safety razors to the old-fashioned kind for several reasons, principal among them being the fact that it was next to impossible to get a razor properly honed and a razor strop was an unnecessary bother. The thin safety-razor blades worked to much better advantage in the cold water than did the heavier blades of the old-style tool. Shaving soap was also somewhat of a problem until decided by a process of elimination.

Liquid soaps are practically out of the question because of the weight of the container and the liability to breakage. Shaving sticks have a tendency to get hard and dry up in hot climates so that they are hardly desirable. Collapsible tubes of shaving cream are liable to become punctured and allow the contents to distribute itself over the other articles in the roll and, also, the cream has the same tendency to harden as the shaving stick. The only disadvantage to the shaving powder lies in the size of the container, but it is more than likely that the manufacturers of this article will eventually put it up in small screw-top boxes, say, about four inches long and a half or three-quarters of an inch in diameter, for convenience in packing. There is no one thing which will freshen a man after a hard day's work as will a good shave. Personal appearance also goes a long way toward gaining promotion, and no man makes a good appearance if he needs a shave.

The best method of carrying a tooth-

brush in a blanket roll is somewhat of a problem. Many persons have a liking for aluminum tubes, with a screw cap, in which the wet brush is placed to dry. This tube affords excellent protection but the bristles discolor because of the lack of air. Probably the most desirable means of handling the wet brush is to cover the bristles with a little metal or composition cap which is freely perforated so that the air may readily circulate and dry the bristles quickly, thus preventing decay. The dentifrice used is

preferably a powder or a small tube of paste.

The toilet soap should be chosen for its cleansing and antiseptic qualities. A heavy metal soap box is undoubtedly the most desirable container, as it will withstand the rough usage to which it is subjected. For use after shaving, for chafing, etc., plain boric antiseptic powders are far superior and much more healing than the highly scented ones. Few men bother with hairbrushes, as the hair is usually kept pretty short and a comb is all that is needed to straighten it out, so that a small pocket comb which takes up practically no space is all that is necessary, although a small military brush may be taken if desired. When it is known that a soldier is going to be in a permanent camp for some time it is sometimes advisable to use a regular camp

toilet kit, which is a canvas roll having compartments for soap box, brush, comb, mirror, talcum powder, etc., but the roll is hardly suitable for men who are on the move, as the separate ar-

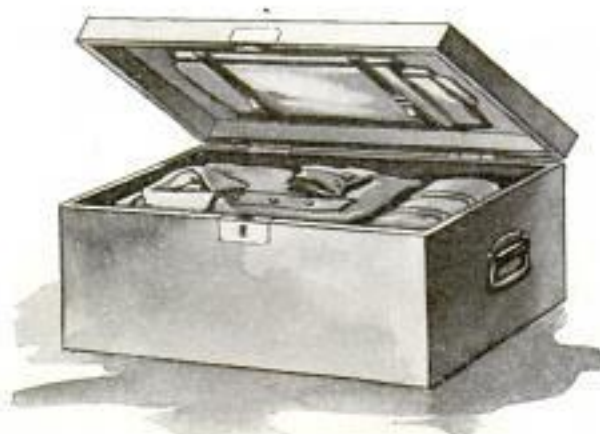


Fig. 2—Foot Locker for Surplus Clothing: The Bottom is Raised One-Half Inch so That Clothing may Not Become Moist



Fig. 3—Trousers Laced in This Way may be Removed without Unlacing—a Time-Saving Feature

ticles may be packed to much better advantage than can the camp kit. The shaving mirror may be one of the small round ones which can be obtained about three inches in diameter and about a quarter inch thick, the stand being used for a cover when the mirror is not in use. A wash cloth is a great convenience, especially when water is scarce, and it should be carried in a little rubberized bag to prevent the dampness from invading the adjoining articles. The recruit should also provide himself with two medium-weight Turkish towels, preferably the brown ones, as the inability to boil them when washing makes

the white ones a brown color so that they look dirty all the time even when they are really clean.

Surplus clothing is carried either in individual foot lockers or squad bags. The regulation locker is 30 in. long, 17 in. wide, and 13 in. high, and is provided with handles and lock. For field service the squad bag, furnished by the government, is usually used, and eight men put all of their surplus clothing and personal equipment into the one bag. It is advisable, therefore, for each man to buy a small duffle bag, into which he can put all of his personal kit and then put this bag into the squad bag for transportation. The duffle bags are merely canvas tubes having a draw string at one end and sometimes a handle to carry them by. The foot locker, shown in Fig. 2, has the bottom raised $\frac{1}{2}$ in. from the ground so that all moisture is excluded. The cover is made 2 in. deep and provided with canvas straps so that shirts, breeches, underwear, etc., may be secured to it and kept from becoming wrinkled.

The best method of lacing the regulation issue breeches is shown in Fig.

3. The laces need never be touched after they are once run in, and at the same time the breeches are held snugly in place on the legs without binding. The legs of the breeches stretch while



Fig. 4—Using a Poncho as a Bathtub: A Trench is Dug and the Rubber Poncho Used as Lining into Which Water is Poured

being pulled on or off, but fit snugly as soon as they are in position, and the amount of time saved by not having to lace them up is greatly appreciated when the sleepy soldier is trying to get dressed in time to stand reveille.

A few articles which will be found of great usefulness are a pair of sneakers, or moccasins, to be worn about camp so as to rest the feet; a can of solidified alcohol with which one can prepare a cup of hot coffee, tea, soup, etc., in about three minutes; a small pocket oilstone to keep the knife sharp; an absolutely waterproof match box; and a pocketknife. The soldier's pocketknife is not by any means the gentleman's penknife, nor is it the big jackknife, as many persons imagine. The ideal knife for a soldier is one made along the line of the boy scout's knife, one with a cutting blade, a cap lifter, leather punch, can opener, and screwdriver. The screwdriver is often valuable for adjusting the screws in the rifle or pistol, and no one who has not been through the mill can appreciate the great value of a can opener in the army. A knife of this type can be bought for about \$1, and another knife

made along similar lines can be obtained for \$2.50. This latter knife is provided with two cutting blades, a hoof hook, leather punch, corkscrew, can opener, screwdriver, pliers, and hammer, and is especially suitable for mounted men, such as cavalry or artillery. The leather punch is handy for shortening or repairing straps, the hoof hook for pulling stones, etc., from the horse's hoof, the pliers for breaking off or bending horseshoe nails, and the like.

Another desirable article, when the means of transporting it can be obtained, is known as the self-cooling water bag. These bags work on the principle of refrigeration by evaporation, and the bag material has a peculiar property of holding water and yet exuding just enough to present a continuous water surface to the air. These

bags are made in various sizes, but the gallon size is considered the best for this purpose. They can be easily handled if slung under the combat wagons where they will be out of the direct rays of the sun.

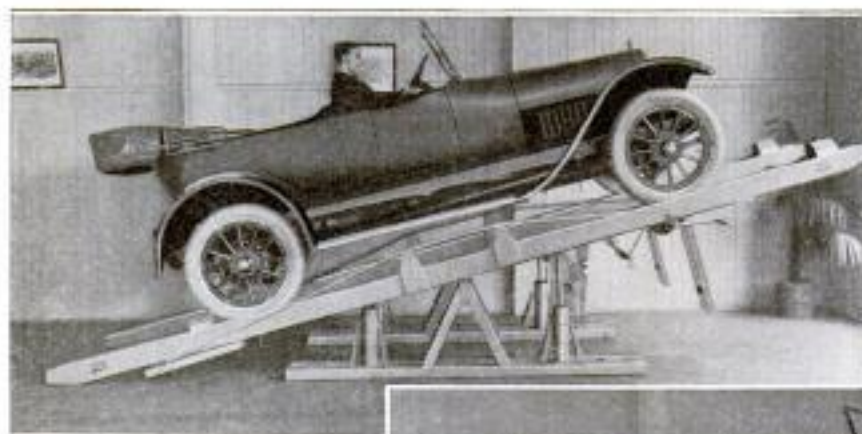
Bodily cleanliness is necessary at all times, but especially so when large bodies of men are thrown together in close contact with one another. In permanent field camps facilities are usually provided for bathing, but on the march the situation is entirely different. Of course, one can take a bath in a single pailful of water, though it could hardly be called a real bath, but men who are provided with the issue poncho can generally have a regular tub bath by digging a trench and lining it with the poncho and then filling it up with water, the poncho preventing the water from getting muddy.

4361 Garage Equip.

PORTABLE LIFT FOR AUTOS ELIMINATES THE PIT

No garage pit is needed to make repairs beneath an auto conveniently,

and a workman can make repairs while seated beneath the chassis.



Driving Car up the Inclined Runways of New Portable Automobile Lift, Which Eliminates the Usual Garage Pit

if an automobile lift of recent invention is available. This lift is a demountable and portable device which raises and lowers the vehicle by its own weight, and will hold it safely at a conven-



The Runways Take a Horizontal Position When Car Passes Center; Oil-Cushioned Plungers Bring This About without Shock

It consists of two independent units, each consisting of a tilting runway mounted on a horse, which in turn is supported by a wooden base. Across the horse the trackway is centrally hinged. It has flanges to guide

Inv. Albert P. Sollenber, Portland, Ore
 Sold to: Murphy & Murphy (Pat. Attys).
 Portland, Ore. Chamber of Commerce Bldg.



Entrance to the Open-Air Theater, with Rustic Seats in the Background



A View of the Stage with a Dancer Descending the Stone Steps

the wheels and is of sufficient length to reach the floor and form an incline of suitable pitch. Two cylinders with pistons cushioned on heavy oil support each runway, these cylinders being connected with a pipe which allows the oil to flow from one to another as the car is raised or lowered. In operation the car is either driven up the inclined runways under its own power, or hauled up by pulleys. When its weight passes center, the runways automatically level themselves.

2543

OPEN-AIR THEATER IN —RUSTIC SETTING

An unusually picturesque open-air theater has been opened at a seaside resort about 25 miles north of San Diego, Calif. It is so situated that a beautiful rocky bluff serves as a background for the rustic stage. Eucalyptus and pepper trees afford shade for the spectators, who occupy rustic benches. Flowers of many varieties add to the attractiveness of the scene. Approach to the theater is through a gateway made of logs and over a bridge built in a corresponding style. The spacious stage is bordered with

rough stones, and steps of the same material lead up from the rear of the stage. The place has proven particularly well adapted to exhibitions of artistic dancing and is much patronized by motorists.

GUARD ON GLOVE PROTECTS WORKERS IN STEEL

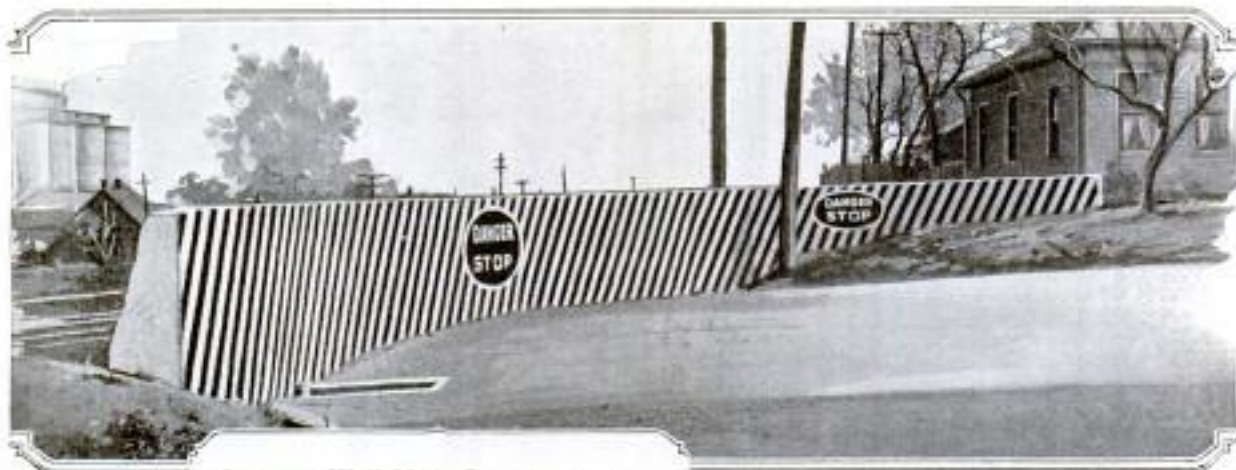
A glove, to the back of which is riveted a screen guard that projects from the side opposite the thumb, is one of the newer safety devices for workers in steel foundries. The glove is worn on the left hand, and the guard extends down beside the point of the chisel, or other tool being used, so that it effectually obstructs flying chips of steel. Without a guard, flying particles of metal are a source of serious danger to users of various cutting tools and those close by. The shield does not materially obstruct the view.



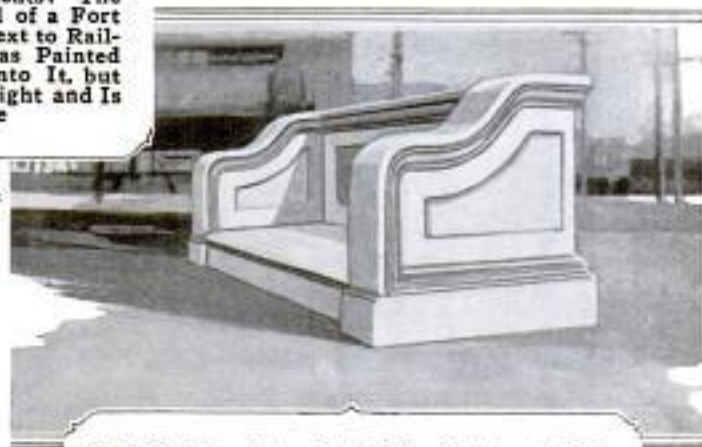
Stratford Theatre
Dec Mar, Calif

Bureau of Safety
National Trade Lab.,
Washington, Pa.

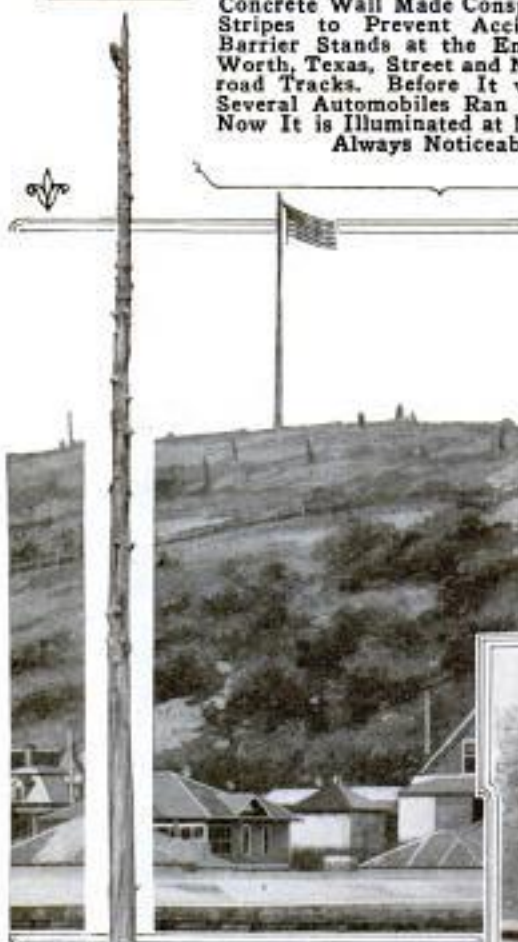
CIVIC FEATURES THAT PROMOTE THE COMFORT



Concrete Wall Made Conspicuous with Stripes to Prevent Accidents: The Barrier Stands at the End of a Fort Worth, Texas, Street and Next to Railroad Tracks. Before It was Painted Several Automobiles Ran into It, but Now It is Illuminated at Night and is Always Noticeable



This Substantial and Artistic Outdoor Pulpit has been Erected in Los Angeles for Use Free by Anyone. Formerly Impromptu Speakers Caused so Much Congestion in Park Paths That Two Rostrums Like This were Built, in Suitable Spots, to Accommodate the Orators



On a Hill 400 Feet High, Overlooking Chehalis, Washington, Nature Planted This 150-Foot Flagstaff. It is a Dead Fir Which Stood Uncared For Until War was Declared, When a Man Climbed to Its Top, as Shown in the Near View, and Trimmed It. Soon After, While the Whole Town Looked On and Cheered, Old Glory was Raised to the Breeze



In Des Moines, Picnics are No Longer Pastimes for Warm Weather Only. Folks in That City have Learned the Fun of Outings in Cool and Even Cold Weather, Since Union Park Authorities Built This Old-Fashioned Log Cabin. It is Heated with a Big Camp Stove for Which Firewood is Furnished Free, and Cooking Utensils can be Had on Application

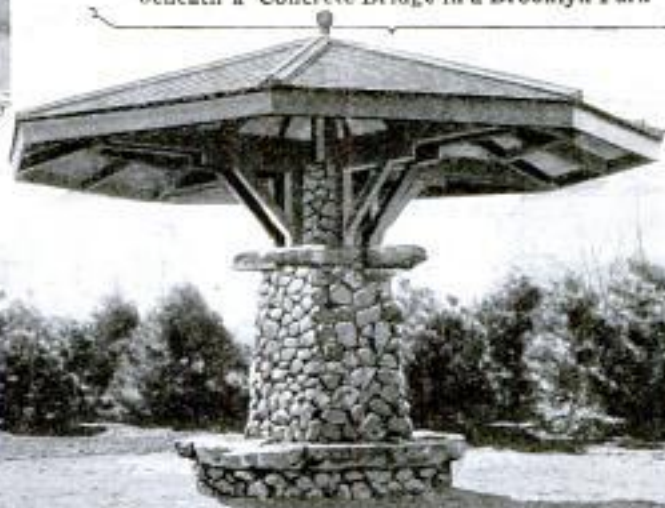
AND ENJOYMENT OF RESIDENTS AND VISITORS



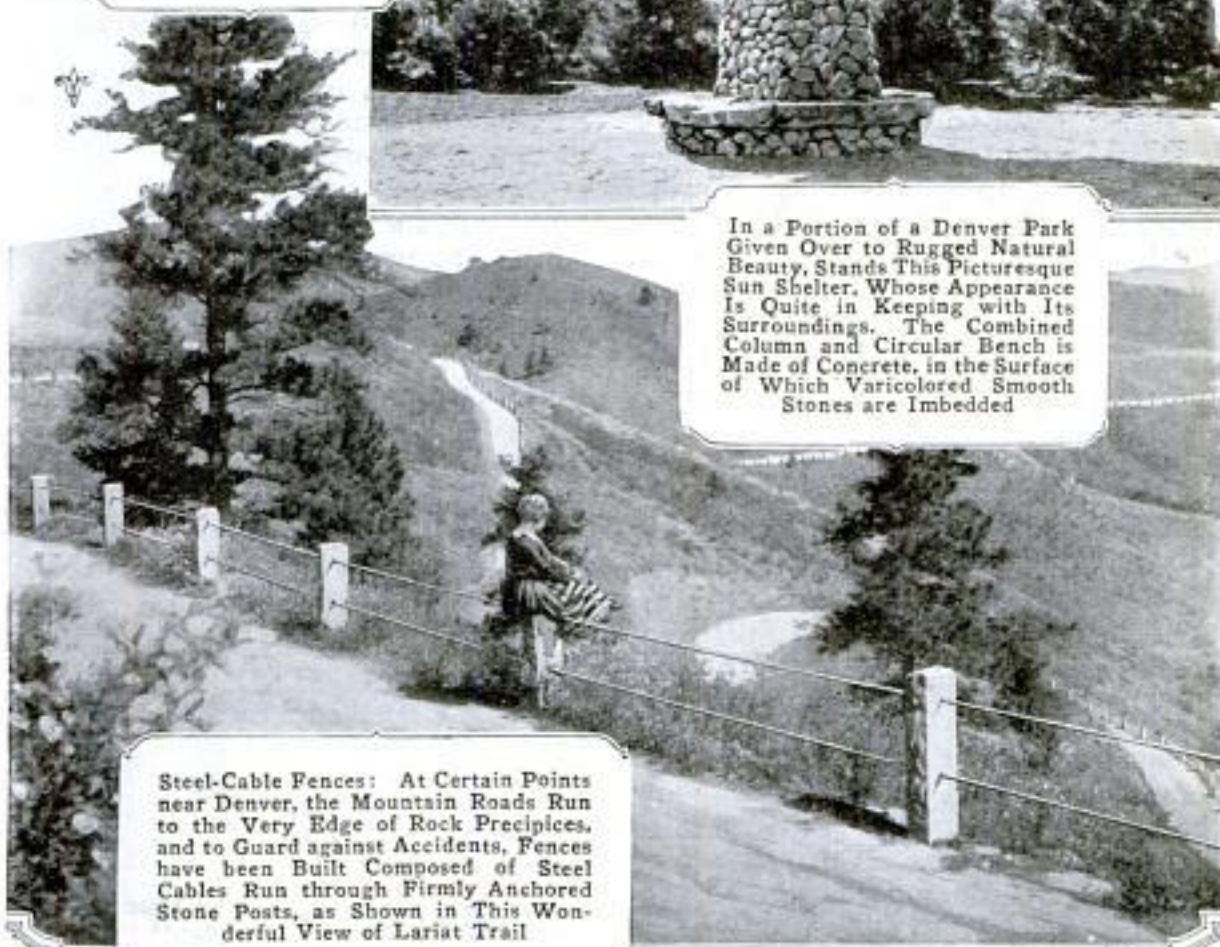
House Number on Street Curb: In a Residence Section of Pasadena the Houses Are so Far Back from the Street That, for the Public's Convenience, Blocks Bearing the Numbers on Two Sides have been Set at the Curb



Despite the Fascination of Motoring, Many City People are Taking Up Horseback Riding, Which Has a Charm Possessed by No Other Exercise. Evidence of the Pastime's Popularity is Found in This Inviting Bridle Path, Here Shown at the Point Where It Passes beneath a Concrete Bridge in a Brooklyn Park



In a Portion of a Denver Park Given Over to Rugged Natural Beauty, Stands This Picturesque Sun Shelter, Whose Appearance Is Quite in Keeping with Its Surroundings. The Combined Column and Circular Bench is Made of Concrete, in the Surface of Which Varicolored Smooth Stones are Imbedded



Steel-Cable Fences: At Certain Points near Denver, the Mountain Roads Run to the Very Edge of Rock Precipices, and to Guard against Accidents, Fences have been Built Composed of Steel Cables Run through Firmly Anchored Stone Posts, as Shown in This Wonderful View of Lariat Trail

272

4577 **POPULAR MECHANICS**
AMPLIFIER FOR TELEPHONE
IS USEFUL ACCESSORY

For the telephone user in a noisy office, a sound amplifier of compact



In Addition to Magnifying the Sound Vibrations, the Device Excludes Foreign Noises from the Telephone User's Ears.

and convenient form has been introduced. It is particularly suited for the person who receives many important toll calls, since in addition to magnifying the vibrations, it excludes foreign noises. The device consists of a small resonator to which an adjustable branched ear tube, such as is employed with a stethoscope, is attached. In use, the receiver is placed on top of the amplifier. A further convenience is that both hands are left free when telephoning.

4519
TWO ELEPHANTS RETURNED TO CIRCUS BY EXPRESS

Express companies have from time to time handled many curious and unusual live consignments, but probably no shipment has ever aroused more interest locally than the recent sending of two full-sized elephants by express a distance of nearly 100 miles, in northern Ohio. Shortly before this unusual shipment was made several elephants escaped from a circus, and the two in question eluded capture so long that the show had to proceed on its itinerary without them. In the meantime the countryside was aroused and terrified by the big beasts, which

Metropolitan Tower N.Y.C.
 crashed through fences and trampled down fields, some of the scenes enacted being humorous and others serious. The capture was finally accomplished by a large body of men, to most of whom elephant hunting was a new, not to say exciting, occupation. On being taken into custody the animals were held by authority of law until proper settlement had been made for damage done. Then, in order that they might be returned to their places in the circus as quickly as possible, they were shipped to their owners by express, the charges being \$100.

A few days after this costly episode, a fire, started by the explosion of an oil lamp in the elephants' car, burned to death three of the elephant herd of five. The two animals that had enjoyed the express ride were not among those lost.

4601
SPIKED ROLLER LOOSENS AND AERATES LAWN SOD

An implement which perforates sod, thereby aerating and loosening it in a beneficial way, without seriously marring its appearance, is now coming into use on golf courses, large lawns, polo grounds, etc. It consists of a roller made up of a number of sections from which project steel spikes at frequent intervals. The roller is supported at either side by small broad-tired wheels, and can be raised or lowered so that the spikes penetrate the turf to any desired depth as the roller revolves.



Lawn Roller Provided with Spikes Which Perforate and Loosen Sod as It Moves Along: It Is Especially Serviceable on Golf Courses and Other Much-Trodden Turf

R. W. Whitehurst & Mfg. Corp.
Norfolk, Va.
 Copyrighted material



Some of the Numerous Forms of Paper Containers, and Other Articles, Now being Manufactured of Hard Paper at Lower Cost than Similar Articles of Wood and Tin

4459
**HARD-PAPER SUBSTITUTES
 FOR WOOD AND TIN**

Many containers, and other articles, formerly made exclusively of wood, tinplate, vulcanized rubber, and metal or fibrous materials, can now be made of paper, at lower cost and equally serviceable, by means of special machinery which winds paper with an adhesive on one side, into tubes or barrels in an infinite variety of sizes and shapes. The times being especially opportune for such substitutes, hard-paper products may soon replace wood for shipping packages, large and small; also for machine accessories such as split pulleys, harvester rolls, tool and other handles, and many purposes in the electrical industry.

Paper containers may also replace tin for canning fruit and vegetables, thus solving an urgent war-time problem. The one-quart size with a thin interior coating of some milk preparation is said to make an ideal can for preserved fruits. Moisture-proof shipping barrels of hard paper are much cheaper as well as much lighter than those of wood, a half-hogshead in wood costing \$1.25, while the paper cask can

be furnished for 80 cents. The shipping advantages of paper containers are obvious. Oils, paints, and the like, can be shipped in them as well as in galvanized or steel drums. Even the steering wheels of a familiar automobile, it is said, are soon to be made of hard paper.

4342
**SIMPLE BRAKE IN CASTING
 REEL PREVENTS BACKLASH**

A new device for preventing backlash in casting, now incorporated in certain fishing reels, consists of a bar to which is attached a wire bail that serves as a brake lever. Whenever the fishline is taut it draws the bail up into such a position that it releases the reel brakes, but when the line slackens, as when the bait strikes the water, the bail drops down, setting the brakes so that the reel's speed is lessened and no backlash occurs.



Fishing Reel with Automatic Brake: Position of Bail Governing Brake is Determined by Line's Tightness

South Bend Bait Co.
 South Bend, Ind.
 Copyrighted material

4579

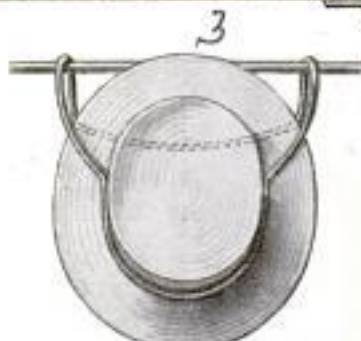
SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



1
Tough, Stringy Tissues in Coarse Cuts of Beef are Severed and the Meat Made Tender by the Revolving Toothed Knives of This Instrument. Price \$3.50



2
Particles of Dust are Quickly Removed from the Grooves of Phonograph Records with This Brush Made of Long-Napped Carpeting. Price 15 Cents



3
The Wire Hanger Provides a Means of Suspending a Straw Hat from the Robe Rail of a Motor Car. Price 25 Cents



4
An Extension Lamp for the Garage: The Pulley Is a Spring Reel That Pays Out the Desired Length of Wire and Rewinds It Readily. Price \$8.00



5
This Lawn Swing does Not Have a Sickening Rocking Motion, but Moves Forward and Backward in a Horizontal Plane. Equipped with a Canopy and Removable Table, It Costs \$18

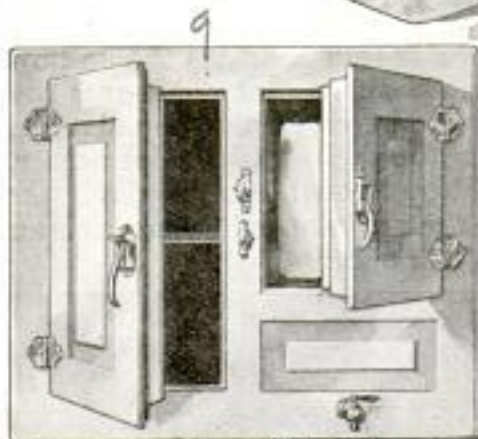


Neat Shoe-Polishing Outfit Especially Suited for the Traveling Bag: The Brush is Formed by Reversing the Cover and Snapping It around the Box, as Shown Herewith. Price 50 Cents



8
Three Cups, Instead of One, are Provided with This Vacuum Bottle. They Nest Compactly and Fit over the Bottle's Neck. Quart-Size, \$3

Receptacles for Red and Black Ink are Mounted on the Base of the Lamp, Which Forms an Attractive Part of a Desk Set



9
Enamelled Refrigerator of 25-Pounds' Capacity. Beneath the Ice Compartment is a Drip Tank. Price \$12



For the Hotel Apartment, Light-Housekeeping Suite, or Motorboat: Well-Built White-

INTENDED FOR THE HOME AND ITS MEMBERS



This Hinged Brush Makes It a Simple Matter for the Laundry to Clean a Clothesline Thoroughly before Hanging Garments upon It

The Convenient Feature of This Swinging Crib Is That It can be Suspended Wherever a Hook is Provided. It Costs \$2

Glass Elephant Aquarium, a Striking Novelty: A Small Opening is Provided at the Top. The Price Is \$30



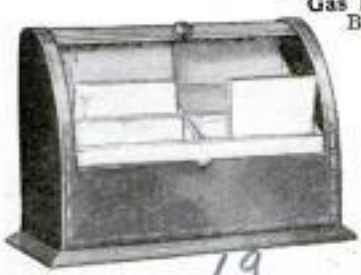
Powder, Contained in a Small Pocket, is Sifted through the Perforated Opening as Needed. The Glove Protects the Hand While White Shoes are Cleaned. Price 25 Cents



Each Time the Cover of This Sanitary Garbage Receptacle Drops into Place, a Deodorizing and Disinfecting Preparation is Discharged through the Perforations. Price \$4; West of Mississippi, 50 Cents Extra



When Placed in This Machine, Which is Equipped with a Gas Burner, Clothes are Boiled, Steamed, and Washed in One Operation. The Position of the Suction Plunger Changes as the Crank is Turned. Price \$25



Attractive Roller-Top Stationery Case Covered with Delicate Glazed Calfskin and Lined with Silk: It is about a Foot in Length and Costs \$30



When Eggs are being Boiled, a Sandglass Such as This One Serves Conveniently as a Timer. The Device Also Has Other Uses in the Kitchen. Price, Postpaid, 55 Cents



When Summer Beverages are Concocted, This Provides the Much-Needed Shaved Ice without Causing Needless Waste. As a Hole is Bored, the Receiver Fills with "Snow"



When Pinned to the Waist or Skirt at a Convenient Point, This Thread Cutter Proves Useful to the Woman Who Has Much Sewing to Do. Price 25 Cents



Batteries are Not Needed, for This Electric Bicycle Lamp is Provided with a Small Dynamo Which is Driven by the Front Wheel. The Price Is \$6.50



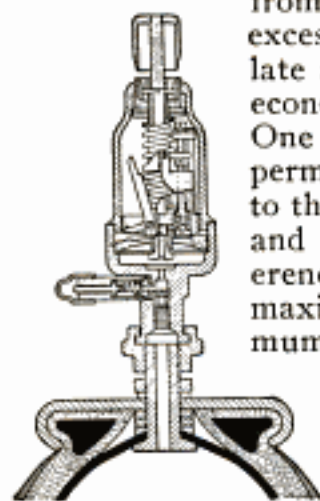
**MACHINE FOR CRISPING
 POPCORN CAKES**

An automatic machine for making crisp cakes of popcorn has been placed on the market lately by an Ohio concern. The crisping device is operated electrically, being easily connected to any lighting circuit. It comprises a circular revolving metal table, with molds of the required size on its outer edge, these passing

beneath two automatic plungers, one of which presses the hot corn, coated with sirup, into uniform disks, while the other taps the crisp cake as the table revolves, causing it to fall through a guide channel onto a conveyor belt which carries it to a wrapping table. The operator simply feeds the hot corn into the molds, and the machine does the rest.

4372 ———
**WARNING VALVES PROTECT
 TIRES OF MOTOR CAR**

Signaling valves that warn a driver when the tires of a car, because of slow punctures or other leakage, become underinflated, and also prevent them from being pumped to excessive pressures, are late accessories for the economical motorist. One of the devices is permanently attached to the valve of each tire and adjusted with reference to the advisable maximum and minimum pressures of the tubing and casing in question. If 90 lb. is the desirable pressure, for instance, the valve whistles loudly when that point is reached and automatically



prevents the admission of more air. In case the pressure drops to 60 lb.—assuming that to be the minimum at which the gauge is set—the signal sounds again, warning the motorist. The whistling continues until 15 lb. of air have escaped. Then it stops. The period gives a driver time to halt his car and determine which tire needs attention. In addition to increasing the mileage of a tire by preventing improper inflation, the valves give a motorist assurance.

4349 ———
**HAND FLASH LIGHT HAS
 SPECIAL CUT-OUT**

A hand flash light has been patented that can be operated at will by pressing a button, providing the lamp is held horizontally. A movable bar forms a part of the electric circuit, and when

the lamp is tilted into an upward direction the bar swings out of position, thereby breaking the circuit. To make the light usable in any position a small pivoted stop must be adjusted to lock this bar in place.

4409 ———
**TONGS FOR HANDLING PHOTO
 PRINTS IN SOLUTIONS**

Flat wooden tongs are now available for handling photographic prints in the developer and hypo solutions. They obviate the necessity of placing the hands in the solution and aid in making clean prints. Knob ends prevent their slipping into the tray when not in use.

ⓄThe "bowfin," otherwise known as the "grindle" or "mudfish," has always been shunned because of the softness of its flesh. The Bureau of Fisheries has lately discovered that this objection may be overcome by smoking and salting the fish, and when thus prepared it is declared to be a delicacy.

*Deliveries about June 1st.
 Price about 10¢*

*Dr. J. W. White,
 300 So. 54th St.
 Birmingham, Ala.*

*Dr. R. E. McKee,
 374 E 31st St.,
 Chicago*

*Burns & Harris
 240 E. Ohio St.,
 Chicago.*

1000 - A. E. Sanford
918 Sixth Av.
Great Falls, Mont.

4581 POPULAR MECHANICS 4343 277

COURT OBTAINS LARGE SUM FOR AID OF DEPENDENTS

A practical illustration of the social service which a court of justice can perform in ameliorating the wrongs that women and children suffer because of improper treatment by delinquent husbands and fathers is found in the work of Chicago's Court of Domestic Relations, which is one of several specialized branches in the city's famous Municipal Court. During the first four months of the present year this court collected over \$46,000 from defendants in nonsupport and bastardy cases, and distributed it to the women and children of the families affected. A staff is maintained under the judge's personal supervision, which sees to the systematic collection and distribution of such funds as are assessed upon those found guilty. A careful check is kept from day to day on the men who have been ordered to contribute to the support of their dependents, and any neglect on their part is quickly followed by court action.

Judge Stearns

4433 AUTOMATIC FEEDER TEACHES HOGS HOW TO EAT

An automatic hog feeder of recent invention is so arranged that after the hog has eaten the grain contained in an individual oval metal trough, he discovers a small quantity lodged between rooting prongs at the upper side of the bowl. In trying to get at this remnant of grain, he pushes the bowl upward and operates a valve in the bottom of a hopper, which lets down another small quantity of food. Perfect mastication is thus encouraged, the grain is kept clean, and the hog soon learns to feed himself small quantities at a time, which means a considerable saving of feed.



ENDLESS BELTS IN CONTACT HULL SMALL GRAINS

Two endless friction belts, held in close contact by rollers, are the essential parts of a simplified machine lately



The Arrangement of the Rollers, Which Hold the Two Belts in Close Contact, is Illustrated at the Top. The Second Drawing Shows How the Tension is Maintained and Illustrates the Gearing That Causes the Belts to Travel at Different Speeds

designed for hulling small grains. Threshing is accomplished by the attritive action of the canvas bands, which move in the same direction, but at different speeds. They perform the two-fold function of conveying material through the apparatus and removing the coats from the kernels. Instead of being smooth, the faces of the belts are provided, in one case with transverse, and in the other with longitudinal, welts which increase the rubbing effect. The rollers are staggered so that the belts are held in proper contact at all points. This arrangement also causes the lower roller at the intake end to project, and the upper one at the opposite end to overhang and effect the downward discharge of the material. Proper longitudinal tension is maintained by screw-and-nut adjustment of the last two rollers at the discharge end. These members do not rotate about fixed axes, and therefore are capable of moving apart in case the material tends to become massed in the machine. The bearings of the middle, or idler, rollers are acted upon by coil springs that provide the transverse tension.

R. H. Bloomer Co.,
600 So. Main St.,
Council Bluffs, Ia.

Stenopaic Optical Co.
437 5th Av., N.Y.C.

278

4508 POPULAR MECHANICS

4561

SPECTACLES TO PROTECT EYES AT THE MOVIES

In order to protect the eyes of those who frequently attend movie shows, a special form of spectacles has been devised. It consists of a pair of opaque disks mounted in regular spectacle frames, each disk having a narrow slit or opening through which the wearer peers at the pictures, while most of the eye is covered by the disks.



The principle is that of an old method of testing the eyes for astigmatism, called the "stenopaic" method, which consisted in trying the patient's vision with spectacles having opaque plates and small central slits somewhat like those of the new protective movie device.

4419 —
GASOLINE GAUGE FOR AUTO TAKES PLACE OF TANK CAP

A new type of gasoline gauge, illustrated herewith, can be installed in any automobile tank merely by substituting it for the regular cap. As the ball-bearing float rises and falls it is turned on its axis by the spiral groove in the side of the cylinder and the indicator which is attached to it moves correspondingly.



Because our facilities for manufacturing Springfield rifles are not adequate to meet the enlarged demands, the Enfield rifle, now made here in large numbers for British troops, will be supplied to our force going to Europe. The ammunition will be interchangeable with that of the Springfield.

Eugene Mfg Co.,
Camden, O.

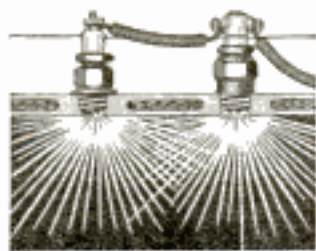
CAR OF POTATO PLANTERS SHIPPED BY EXPRESS

An incident which illustrates how seriously the country is taking the proposal to raise more foodstuffs is found in the fact that in a certain New England district there was such an insistent demand for additional potato planters that the makers sent a \$4,000 consignment of these machines by express. The box car containing the consignment was hurried to its destination attached to passenger trains. The express charges amounted to several hundred dollars.

4357

SUPPLEMENTARY PLUGS FOR AUTO ENGINES

Secondary, or supplementary, spark plugs now on the market are designed to be inserted in the cylinder heads of an automobile engine alongside the regular plugs, the purpose being to make ignition more certain and combustion more complete by providing two points in each cylinder at which sparking takes place simultaneously. The extra plug is connected directly with the regular plug and is so insulated that the current passes through it without being grounded.



4589 —
COMMENCEMENT-DAY ESSAYS ON WAR TOPICS SUGGESTED

Off. Bulletin 5/16/17

As one means of stimulating a widespread and intelligent understanding of the many aspects of the present war a list of about 50 subjects, suitable for commencement essays and orations in schools, universities, and colleges, was issued at commencement time by the Secretary of the Interior. Among the themes suggested were the following: "Autocracy versus Democracy"; a comparison of the governments of the belligerents; "Education and War"; the

INV-Dr. F.C.A. Richardson,
414 W. 120th St.,
N.Y.C.

J.P. Ruffin,
Newark, O.
Superior Motor Power
3-Blading Place,
N.Y.C.
135 St. Apt. 2nd

direct relation between education and industrial efficiency, and therefore between education and war; "The National Food Problem," "Preparation for Peace at the Close of the War," "Wealth of the United States," "Belgium's Wrongs," "Treatment of Our Alien Born," "The President's Reasons for Entering the War," "Women and War," "The Red Cross—Its History and Work," and "The Russian Revolution—a Forward Step in Democracy."

4476

PORTABLE ARMY HUT OF ENGLISH DESIGN

Because the methods of modern warfare call for many shelters more permanent than tents, various portable huts have been devised, one of which—an English invention—is shown herewith. This shelter is of wood and is wide enough to permit two rows of soldiers to lie with their feet toward a central aisle and their heads next to the side walls which slant at quite an angle in such a way as to increase the structure's stability and floor space. Uprights inside the hut help support these walls. The roof is without rafters or purlins, being supported by a trussed ridge girder that rests on the end frameworks. There are racks for the rifles, and windows are provided at



Wooden Hut Made of Sections That can be Quickly Assembled: Its Spreading Side Walls Allow Sleeping Space on the Floor for Two Rows of Soldiers. Rifle Racks are Provided Adjoining the Side Walls

either end. The various wall sections and beams composing the hut can be quickly taken apart or assembled.

1816
GERMANS MAKE DURABLE KNAPSACKS OF PAPER

Woven paper fabric, for which Germany has found several uses as already described in Popular Mechanics Maga-



German Knapsack Made Chiefly of Woven Paper Fabric, as It Appeared after being Used a Year

zine, has proven a good substitute for leather and canvas in the making of knapsacks. Some 2,000 folding cases made of this material were delivered to the German army in 1914 and have given excellent service. They are gray-green in color, and the only leather portions are the broad edge at the top of the knapsack, which rubs against the back, and the inside and outside straps for closing the compartments. The paper substitute used is of a coarse, firm weave, which apparently is especially treated so as to withstand the weather and severe usage.

Our government has recently placed an order in France for 1,800 aeroplanes for use in the army, it is said, because American firms were unable to meet the War Department's requirements, particularly in the matter of time.

Mr. - Ferd. Emil Tagerberg, Niedermad, Frankfurt a/M., Germany.

W. G. Tarant, Lucia Hauer, Byfleet, Surrey, Eng.

RECREATION SUGGESTIONS FOR BOYS AND GIRLS,



Homemade Aerial Tramway in a Roscoe, California, Yard: The Cable, Set at an Incline, Carries the Young Passenger on a Thrilling Glide of About 100 Feet



A Big Harvest of Gopher and Mole Scalps Trapped by Cleland Harris, Aged 16, and His Younger Brother, of Salem, Oregon: The Bounty and Bonus of 20 Cents a Scalp Paid These Two About \$4 Each, per Day



It Used to Be Pins, but in Portland, Indiana, It Was Seven Cans Each That Admitted Children to a Show—a First-Class Movie. The Picture Tells Vividly Why This Town Had One of the Best Clean-Up Days on Record



In Philadelphia They have Started a Big War on Dirt, Rats, Flies, and Germs, in Which Hundreds of Boys and Girls have Enlisted, as was Shown in an Enthusiastic Parade Held Recently

AND WAYS IN WHICH THEY CAN HELP THE NATION



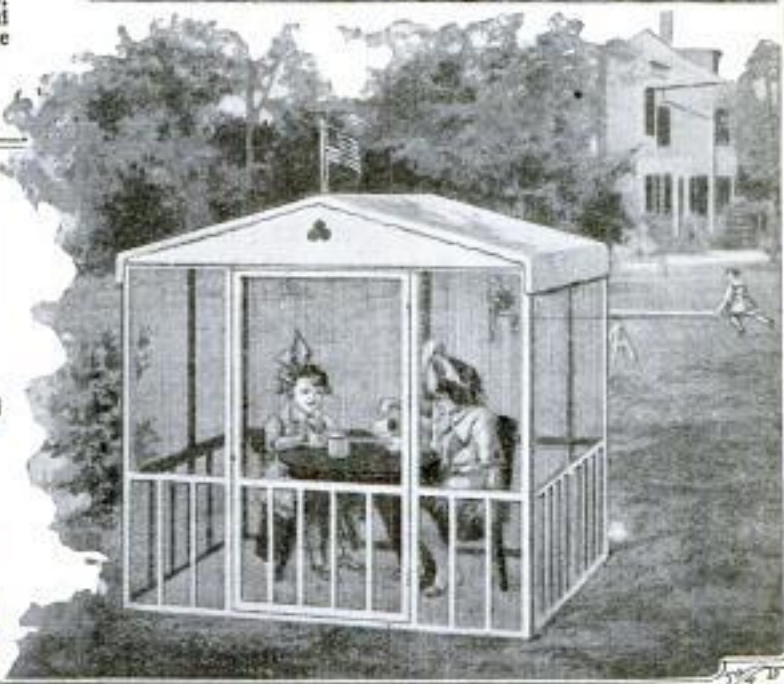
Waste Paper Is Valuable Now: Peoria, Illinois, School Children Collected 52 Tons of It in a Five-Day Contest That Netted \$1,014, One School Averaging 63 Pounds of Paper per Pupil



REPRESENT UNDERWOOD & UNDERWOOD

Flag Raising at Opening of One of New York's Municipal Gardens. Many of Which are being Tilled by Patriotic School Children: The Plots are Guarded by Boy Scouts Who have been Allowed to Camp Close By

A Real Screened-In Summer-house Made Especially for Little Folks: It can be Set Up Anywhere in the Yard and is Furnished with Cute Chairs and a Table, as Shown Below



Valley - 20.00
Table - 3.00
Chair - 1.50
Screen Board - 5.00

The E. J. Burrows Co.
Portland, Maine.

Electric Tire Treading Co.
207 No. Mich. Av., Chicago.

282

4395 POPULAR MECHANICS
Repair
METHOD OF RETREADING TRAVEL-WORN TIRES

Automobile tires that are apparently worn out may have a new tread put on



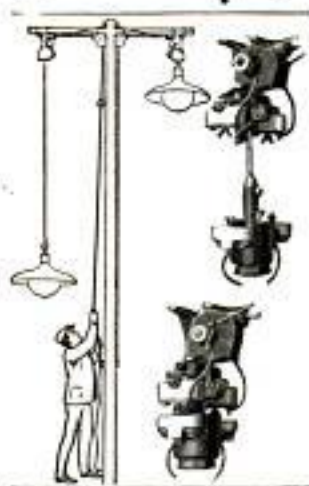
the old casing, by an electrical retreading process recently patented. The cost is said to be about half that of a new tire. The process includes the removal of the old tread and, if necessary, part of the underlying material, after which the exposed fabric is buffed and polished and a layer

of unvulcanized rubber woven with wire is applied, with eight wire terminals left exposed. The new tread is then fitted on, the tire inflated, and the rubber unit electrically vulcanized by means of the eight terminals.

3858

DISCONNECTING HANGER FOR STREET LAMPS

Disconnecting hangers for street lamps of either the filament or arc type, now being introduced widely,



minimize the labor of keeping the lighting units clear because they make the lowering of the lamps an easy, safe matter. With these hangers also, all the wiring is reduced to straight lines. The lowering rope for these lamps passes

from a hook on the side of the pole, up through a pulley at the bracket and through an-

other pulley just above the hanger. It attaches to the lower of the two interlocking parts into which the hanger is divided. By properly jerking the rope the locking mechanism releases so that the lower half, with the lamp and reflector, can be let down. In lowering the lighting unit the forked electric contact, through which the current passes to the bulb or arc, is broken, but is connected again when the lamp is drawn up.

3514

REVERSIBLE WINDOW SASH CLEANED FROM WITHIN

A new window-operating device enables a double-sash window to be cleaned from the inside, thus doing



away with the dangers of the old system of outside window washing with which all housekeepers are familiar. It also has other novel features. By its use the window can be fully screened inside, making it fly and mosquito-proof, and can be

opened and closed without disturbing the screen, curtains, or shade. Each sash is suspended from the top in the window frame, and swings outward from the bottom by the operation of an inside transom shaft connected to a handle, or lever, near the point of suspension. To swing the sash inward for cleaning, it is only necessary to detach the transom from the handle, when the motion of the sash may be reversed and both sides of the window pane can be washed from the inside.

At least six of the former German ships, which were interned in the Philippines, are to be utilized in bringing to this country a quantity of hemp that has accumulated in the islands and is needed here for making binder twine.

Thompson Electric Co.,
5606 Euclid Av.,
Cleveland, O.

W. S. Odell
7422 So. Armande
St. Louis, Mo.



A Submarine Chase in a Display Window

By HARRY MARCELLE

DIPPING in the waves, now submerging, only to reappear and continue the pursuit of the giant liner tossing on a choppy sea, a daring submarine holds the attention of spectators before a novel window display, depicting "Somewhere off the Irish Coast." The endless water stretches out in the background, and the chase continues while the faithful electric motor keeps the "wheels going round." The rolling cardboard waves, and the pitching vessels on the ever-changing scene, produce the effect of a ship attempting desperately to elude its submarine enemy.

A painted background of a marine view, in water colors, or flat oil colors, is set up behind the display. The waves are painted on heavy cardboard, or better still, beaver or compo board, 18 in.

wide, and of a length to suit the size of the window. A strip, 2 in. by $\frac{3}{4}$ in., extends along the bottom of each wave, holding it in an upright position, and forming a base for the wave, when riding on the cams, as shown in detail. Five waves are shown in the illustration, Fig. 1. A stationary one is in the front of the window, to hide the mechanism, which is 2 ft. in width. The other four travel on the cams, mounted

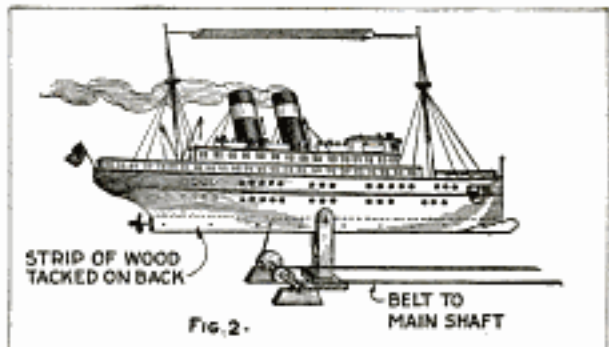


Fig. 2.

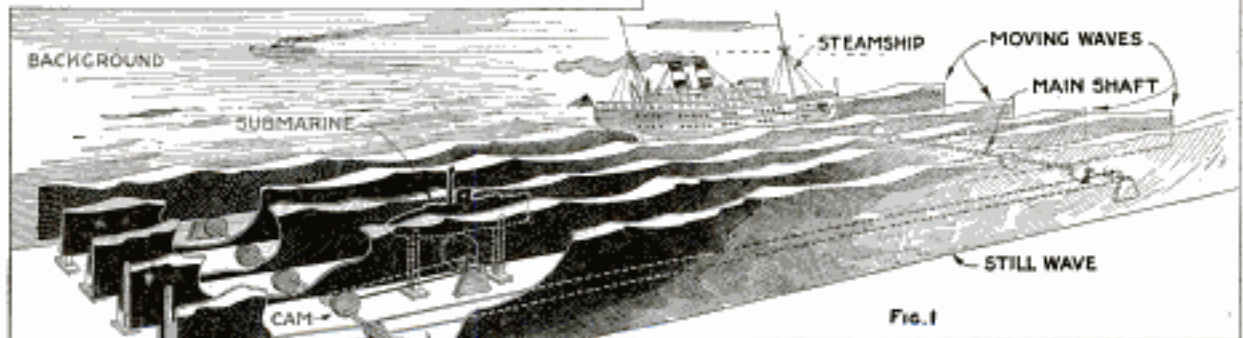


Fig. 1

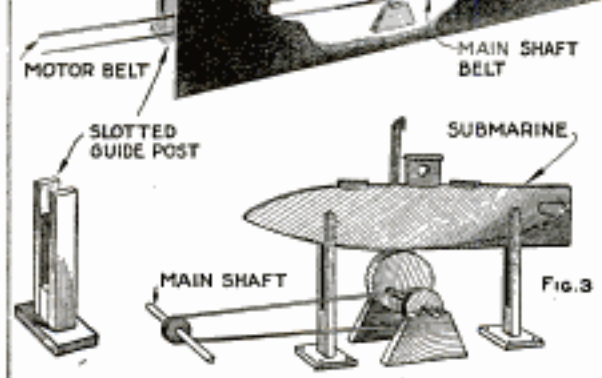


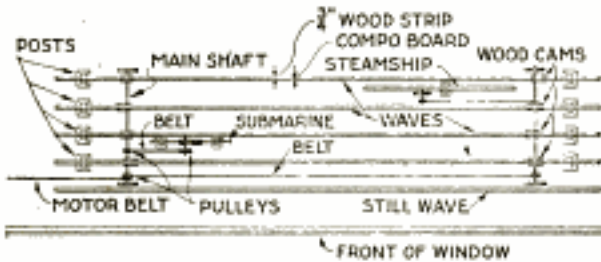
Fig. 3

"Somewhere off the Irish Coast:" The Ocean Liner Has a Pitching Motion, as if Battling the Waves, and the Enemy Submarine Submerges, Only to Continue the Pursuit

on shafts, as shown. The cams are set so that their high points are opposite those of the adjoining cams, to produce alternations in the wave motion. The ship is made of the same material as the waves, is 3 ft. long, and placed in front of the last wave. The ship also

has a strip tacked to the bottom to strengthen it. The submarine is built similarly, and is 24 in. in length.

The wood disks for the cams are cut



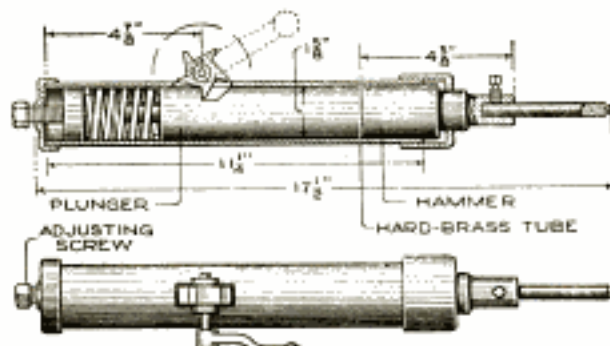
Plan View Showing Details of the Driving Mechanism, and the Relative Positions of the Waves, Boats, and Other Parts

8 in. in diameter, out of 1-in. lumber. Two shafts are provided, and in each disk a hole is drilled, 3 in. from the edge, to fit the shafts tightly, thus making cams of the disks. Seven grooved wooden pulleys, of proportionate sizes, as shown, are also placed on the shafts. Eight uprights, as detailed, are provided, in which the waves ride. One upright is used on the large ship, which is balanced on a nail shaft, placed in the end of the upright support, as

shown. A small countershaft, belted from the main shaft near the liner, oscillates the steamship, by means of a wire crank, as detailed in Fig. 2. The submarine rides on the cam only, and is not pivoted in the center, as shown in Fig. 3. It is also driven from a countershaft. This gives it the effect of being submerged, and slowly rising to the surface. The ship has a pitching motion, as if battling with the sea. A large cam is used on the submarine countershaft, and a small pulley belted from the main shaft, so that the action of the submarine is not as frequent as the tossing and pitching of the steamship. The submarine is placed to the left of the display, between the second and third waves. The display is operated by an ordinary electric-fan motor, and can be driven by various other kinds of power. Of course, much depends upon the artistic and mechanical ability of the maker in painting the background, waves, and boats, as well as in making the parts.

Automatic Hammer for Light Work

Electricians, tinsmiths, gas fitters, and others doing light riveting, chipping, and the like, will appreciate the advantages of this automatic hammer. It can be used in places inaccessible with a hand hammer, it will not split or smash a rivet, and all of them will be



This Automatic Hammer Is Capable of Delivering 300 Strokes a Minute, with One Crank Turn a Second

hammered uniformly. By using form dies, the rivet head may be formed round, square, oval, star-shaped, or in

other designs. It has no valves to get out of order, and no joints to regrind, or glands to pack. As there is no pressure used, save that of a spring, very accurate fits are not essential in its construction, and only a few simple parts are required.

In use, the tool is held in one hand, and the riveting die is pressed against the rivet; then the crank is turned as indicated. The star wheel engages the plunger, and forces it back against the helical spring, compressing the latter. The tooth frees itself from the plunger, and the latter is driven forward by the spring, and strikes the hammer and tool holder, delivering the blow to the rivet. The force of the blow is regulated by tightening or loosening the adjusting screw; the length of stroke is not variable, being controlled by the size and number of teeth on the star wheel, and the depth of the recess in the plunger. On a short stroke a heavier plunger must be used, since the direct weight must be made up in the

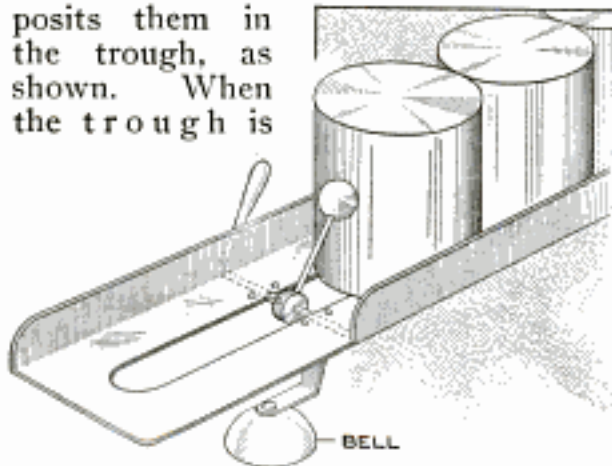
weight of the plunger. The hammer is proportioned for work up to riveting $\frac{1}{4}$ -in. soft-brass rivets.—J. B. Murphy, Plainfield, N. J.

Inclines to Platform Scale Save Lifting

Many shops cannot afford a large built-in scale with a platform on a level with the floor. Such scales save much labor of lifting, since crates or barrels can be pushed or rolled directly onto the platform. An ordinary platform scale can be made to serve as a good substitute if inclines are built up to its side. These inclines, made from wood and well supported, should be portable, so that the scale may be used in various parts of the shop. Barrels, heavy crates, etc., can be moved to the platform with rollers, instead of the block-and-tackle arrangement otherwise required.—F. M. Ball, Kansas City, Mo.

Bell Signal Calls Automatic-Machine Operator

A signal bell is used in connection with an automatic machine which fills cans and deposits them in the trough, as shown. When the trough is

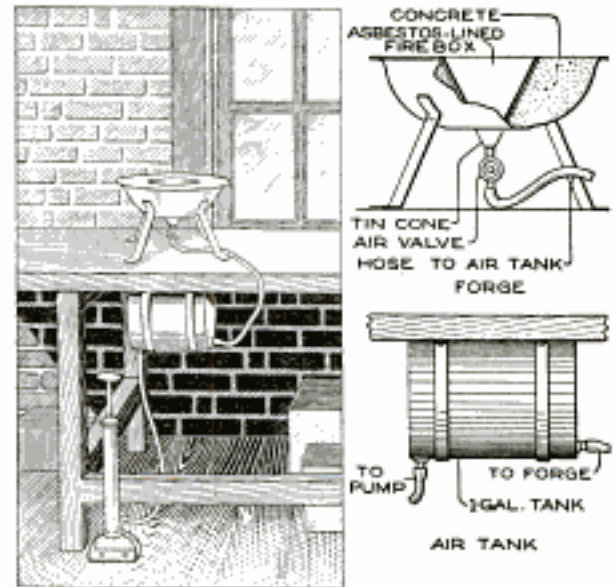


The Clapper is Automatically Tripped against the Bell, Warning the Operator

full, the front can actuates the clapper, which falls through the slot, striking the bell. This calls the attention of the operator, who removes the cans from the trough. The handle beside the trough is used to return the clapper into position for the next batch of cans.

Charcoal Forge Made of Washbasin and Concrete

While engaged in some experimental work at home, I made a small forge,

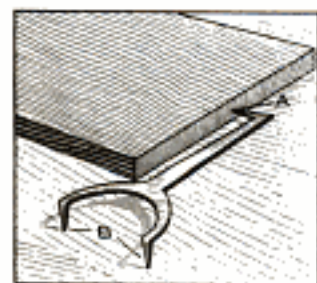


This Concrete and Asbestos-Lined Blast Forge, Made for Temporary Use, Became a Permanent Shop Fixture

and it worked so well that I pass the method on to others. Its construction is very simple. An old granite basin from the kitchen was filled with concrete, and a hole left for the fire box. While the concrete was still wet, a sheet of asbestos was laid around the inside. This keeps the cold concrete from the fire, and makes possible a greater heat. An old fixture from a discarded oil stove was connected to the tin funnel extending to the rubber tubing from the forge, to regulate the air flow. A gallon can, with the proper accessories, was used to regulate the otherwise uneven flow of air from the pump, and to store a pressure supply. The pump was an ordinary tire pump. Legs for the basin were made of strap iron and riveted to the basin, so that it may be more easily handled and the regulating valve underneath reached handily. Charcoal is used in the forge, homemade wood charcoal being prepared with little trouble. The forge melts most of the common metals in small crucibles, and the heat is localized so that it does not heat the room to any considerable extent.—Dale R. Van Horn, Milton, Wis.

A Handy Sheet-Metal Bench Dog

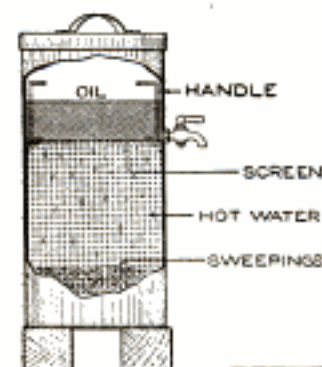
The carpenter's workbench is not complete without a bench dog and a bench stop.



When cutting a mortise, or using a router plane, scraper, or sandpaper, it is often necessary to hold both ends of the board rigid. The bench dog shown is especially handy, being cut from a piece of sheet steel, $\frac{1}{8}$ in. thick. It is 6 in. long, and the points B are 2 in. apart. To use it, place the board on the bench with one end firm against the regular bench stop; then drive point A into the other end as far as necessary, being careful to hold points B close to the top of the bench. Next drive points B into the bench, holding the board perfectly.—John Countermine, Vinton, Iowa.

Can for Recovering Oil from Chips and Sweepings

Around lathes, tapping and milling machines, etc., considerable quantities of expensive oils are used, so that the borings and chips are coated with it. This oil is often wasted, and to save it, I devised this oil-recovering can,

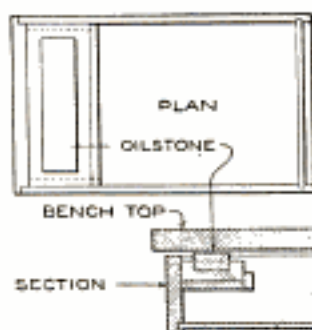


which soon paid for itself. To make the device, get a 5 or 10-gal. can, and provide a cover. Fit in the tray of screen wire, with two handles soldered on, as shown. On one side of the can fit a small drain cock. To use the reservoir take out the tray and fill the can with hot water up to a few inches of the tray. Throw the chips into the water. Put the tray back in place. The oil rises to the top of the water where it can be drawn off. The screen

tray is necessary only when wood or sawdust is mixed with the chips, the screen preventing them from rising in the oil.—M. S. Hay, Denver, Colo.

Whetstone and Strop Kept Handily in Bench Drawer

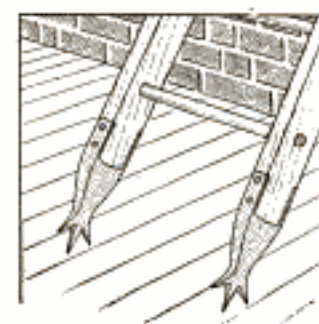
The disagreeable mess often caused by using a whetstone on a clean bench top can be avoided, and the stone made more quickly available, if the latter is placed in a specially constructed drawer in the bench.



The drawer consists of a frame 2 in. deep, having a bottom and sliding on two strips in grooves. The oilstone is mounted in a wooden block fitted inside the drawer snugly, and resting on guide strips. It is arranged so that the top of the stone just clears the bench top and extends slightly above the edge of the drawer front. The stone and block may be removed from the drawer if desired, and sharpening accessories, strop, etc., are also kept in the drawer.

A Nonslipping Ladder End

A large steel mill adopted the non-slipping ladder end shown in the sketch, to reduce the number of accidents caused by the slipping of ladders.



The feet are made of steel and fastened to the ladder ends with rivets. The teeth are filed sharp, and kept well pointed. This type of foot is superior to the common single-prong variety, because at various angles there is always a sharp prong squarely against the floor.—E. B. Hanson, Duluth, Minn.

Small Power-Plant Tractor Made of Engine and Mower

By LUTHER STROSNIDER

*Foot Bros. Gear & Machinery Co.,
213 N. Curtis, Chicago*

BY mounting a 1-hp. engine on a heavy plank, supported on driving wheels obtained from an old mower and steering wheels from a light farm machine, I get much more use out of the power plant than when it was set on a portable carrying frame, or on skids. The outfit is rigged so that it runs under its own power, climbing ordinary hills, and making it practically a small tractor, useful in many ways on the farm. It is guided by the lighter wheels, which are pivoted at the center of their axle, and controlled by the hand lever, as shown in Fig. 1. This outfit has been used for the corn sheller, grindstone, sausage mill, feed grinder, pump, washing machine, and wood saw, and I have used it a few times to draw a wagon, instead of going a considerable distance to get a team.

The old mower wheels and driving gear were set so that the pitman shaft is horizontal, as shown in Fig. 1. An 8-in. bevel gear was set on the end of the shaft, to engage a small pinion set on a second shaft which runs across under the plank, and is bracketed from



Fig. 1. This View Shows the Mower Pitman and the Gearing Connecting It with the Engine, and Also the Steering Lever, Gripped by the Driver

it with heavy strap iron, as shown from the opposite side, in Fig. 2. On this end of the second shaft, a clutch device is arranged, two pins fitting into holes in a pulley, which has a rim to prevent

the belt from slipping off when the clutch is released by means of the slanting rod.

The power is belted from the engine



Fig. 2. The Belting of the Power from the Engine Shaft to the Lower Shaft, Which Connects with the Pitman Shaft on the Opposite Side, and the Clutch-Control Rod are Shown in This View

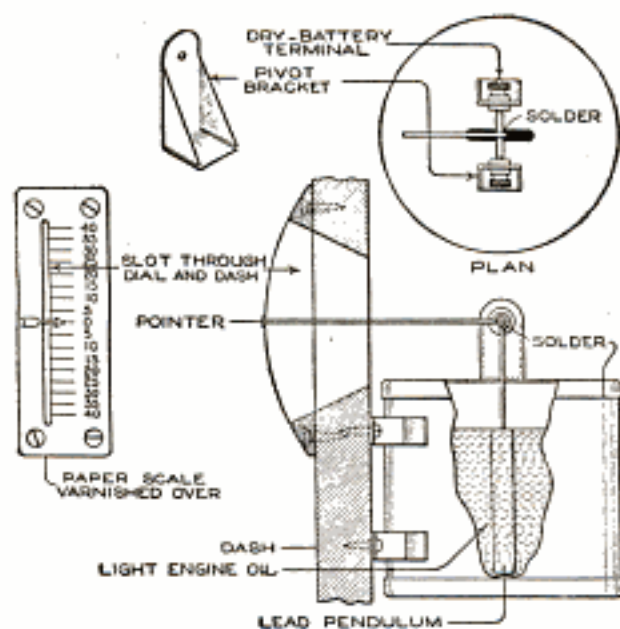
shaft, where a wide pulley is set, to the flange pulley on the lower shaft, as shown in Fig. 2. The lower shaft and pitman shaft are engaged only when moving the power plant. When in use on a saw or other machine, a belt is fitted from the engine pulley to the pulley of the machine being driven. The tools and other equipment for the outfit are kept in the tool box, mounted on the plank.

Liquid Glass Used to Make Asbestos Packing Stick

In setting pipe covering on valves, tanks, and other similar surfaces, it is often difficult to make the covering stick. To overcome this, give the surface a coat of silicate of sodium, known as water glass, and apply dry asbestos by the handful while the surface is wet. The silicate sticks to the metal and retains sufficient asbestos to form a ground for the later coats, applied with a trowel. Wire mesh may also be wrapped around certain forms on which the asbestos will not stick readily, and provides a good foundation.

A Grade Indicator for Motor Vehicles

The construction of a grade indicator suitable for automobiles, for use on railways, etc., is shown in the sketch.



The Pointer Shifts Steadily as the Grade of the Road Changes, Indicating the Percentage

It was made of a baking-powder tin, partly filled with engine oil, in which is suspended a lead pendulum attached to a pivot. Dry-battery terminals form the bearings. The pendulum and pointer arms are of steel wire, soldered to the pivot. The paper scale is glued to a wooden back and is graduated in grade percentages, and not in degrees.

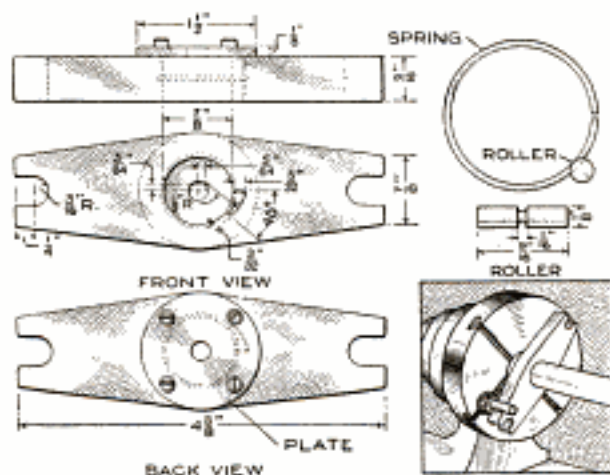
The lengths of the arms and dimensions of the parts are omitted as they may be varied. The spacing for the graduations is varied to suit the radius of the pointer. The arm that carries the pointer is of light material and the pendulum reasonably heavy. The liquid steadies the oscillations of the pointer. When attached to an automobile, the device indicates the proper time to change gears, as well as provides a measurement of gradients. An instrument similar in principle is used on aeroplanes to bring the craft on an even keel, when dropping bombs or other explosives.

The scale is determined by using the following degree indications in marking it, the figures being for grades of

0 to 40 per cent, inclusive, at intervals of five per cent: $2^{\circ} 52'$; $5^{\circ} 43'$; $8^{\circ} 32'$; $11^{\circ} 19'$; $14^{\circ} 3'$; $16^{\circ} 42'$; $19^{\circ} 18'$; $21^{\circ} 48'$. This range is satisfactory for all ordinary gradients that a motor vehicle can make.—G. A. Luers, Washington, D. C.

Steel-Roller Lathe Dog for Making Small Spindles

In turning and grinding small steel shafts it is usually necessary to grip the finished end with a copper dog so as not to mar the work. The steel-roller dog shown in the sketch is superior to this, and for quantity production the making of a set of these dogs was found economical. The dog grips the shaft automatically, and the gripping surface is of sufficient width so as not to mar smooth bearings. The dog is essentially a piece of steel, of the shape and dimensions shown, and having a hole bored through it, the size of the finished shaft on which it is to be used, plus .002 in. A small steel roller fits into an offset at the side of



This Lathe Dog was Found Economical for Polishing Steel Shafts in Large Quantities

the hole, and is free to roll about one-eighth of the circumference. When the dog is placed on a shaft and revolved counterclockwise, the roller is forced against the shaft, gripping it firmly. The roller is held in place by a spring ring, fitted into a groove, as detailed. The dog is made of iron, casehardened, and the roller of tool steel, hardened.—Hubert Kann, Pittsburgh, Pa.

Counting Small Parts by Weighing Them

Purchases of small machine parts, screws, bolts, washers, etc., in large quantities, usually require that they be checked as to number, and counting them is tedious. An ordinary scale, with a scoop pan, was used in counting to great advantage. First the empty scoop was set on the platform, moving the hanging weight along the scale beam until it balanced the weight of the scoop. The parts were poured into the scoop, until a suitable, easily calculated weight, 10 lb. for example, was registered. The parts weighed were counted, and succeeding batches poured into the scoop until the unit weight was registered. Thus, the total number of parts was recorded in form for easy calculation. If especially accurate results are desired, several tests for the number of parts in a given weight may be made, and the number determined by an average.—C. M. Hall, St. Louis, Mo.

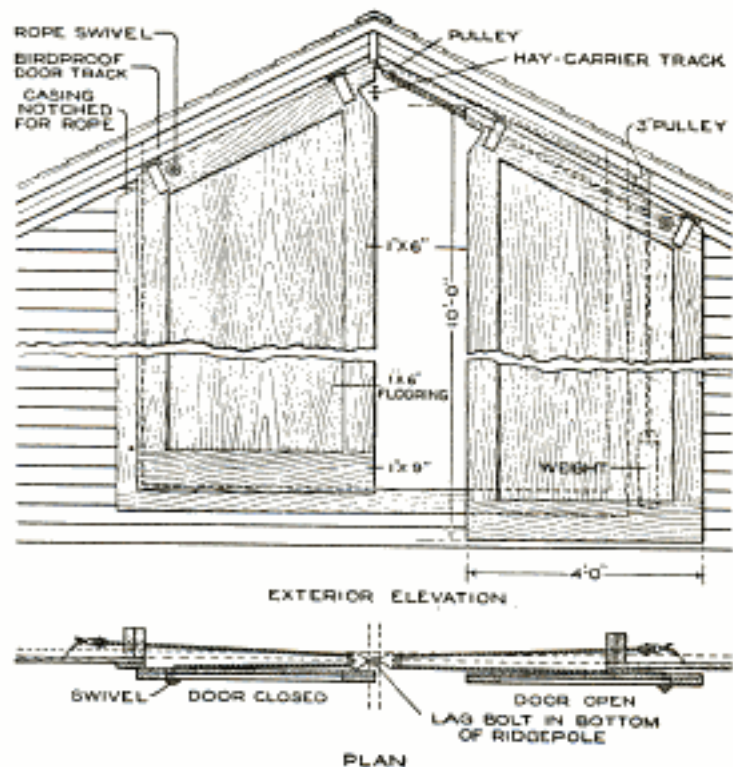
Eyeshade Carried Safely under Shoulder

Frequently it is desired to take an eyeshade from the place where it is ordinarily used, and those who have tried it know how easily the shade is damaged. By carrying the eyeshade under the shoulder, as shown in the illustration, the shade lies flat, fitting the curve of the body. It is entirely comfortable to the person carrying it and not likely to be broken.—H. Chait, New York, N. Y.



Sliding Gable-End Hay Doors Easily Operated

Hay doors hinged in the gables of barns are troublesome when the crop

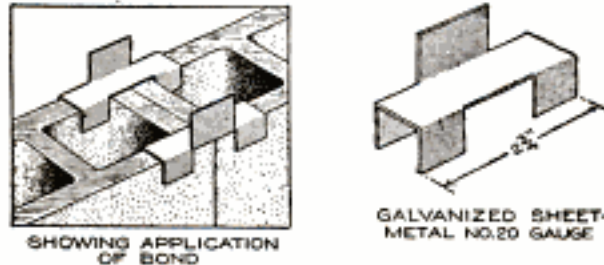
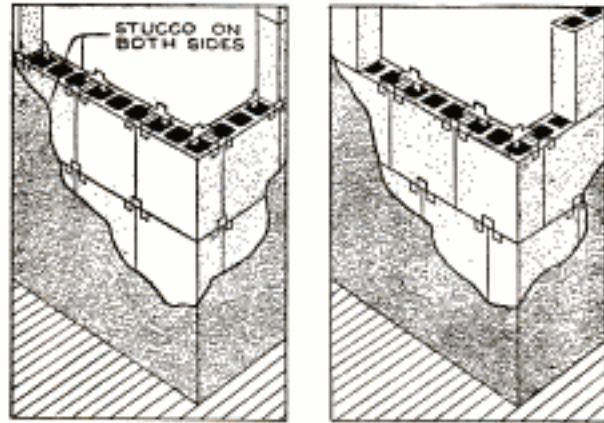


The Doors are Easily Slid into Position on the Inclined Tracks by Reason of the Counterweights

is being hoisted into the mow, and are a constant source of annoyance through damage from the wind or by the weakening of the hinged fastenings. By using sliding doors in the gable, these troubles are easily avoided. Sliding doors, as detailed in the illustration, can be installed easily to operate on the incline of the roof, under the eaves. Provision is made for the usual hay-carrier track, extending under the ridgepole. The doors are strongly framed and suspended on a bird-proof track, from roller hangers, and are counterbalanced by weights suspended on ropes, run over 3-in. pulleys, as shown. This makes it easy to slide the doors into place up the incline. The sectional plan shows the arrangement of the rope counterweight device, and the pulley rigging is also shown in the sketch. By extending the control ropes, the doors can be opened from the barn below.—W. E. Frudden, Charles City, Ia.

Hollow-Tile Wall Construction Using Metal Bonds

Hollow tile is a sanitary material for building purposes, especially adapted for residences. In the ordinary form of



A House was Built of Tile at Much Less Expense and Time, by the Use of Metal Bonds, and Proved Substantial, Not a Crack Developing in Four Years

structure, the tile are laid up in mortar, and most building ordinances require them to be 6 to 8 in. thick. This new wall construction, using tile 4 in. thick, provides a very strong, rigid wall. A metal bond is used, and holds together the adjacent tiles, preventing not only lateral displacement at the joints, but deflection in the wall.

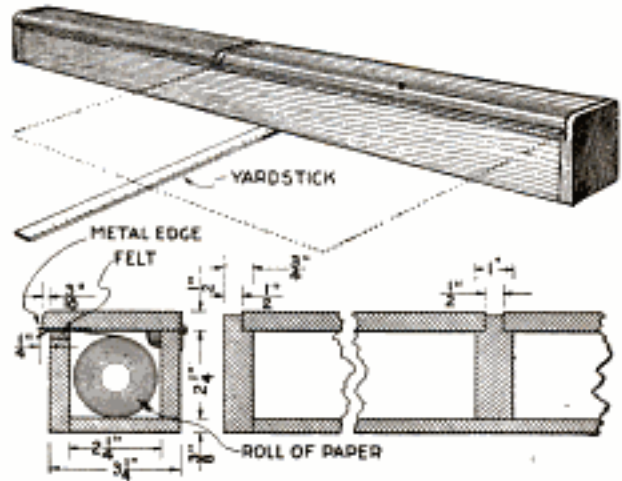
The bonds are made of No. 20 gauge galvanized sheet steel. They are 2 3/4 in. long, and of such size in cross section that the side wings will clasp the web of two abutting tile. The upper side of the bond has an upward projecting wing, to hold the next tile above. Two bonds are used at each joint, as shown.

The tile can be laid with matched or staggered joints. In a building constructed with the bonds four years ago, there is not a single crack. The building was laid up without mortar, and the stucco, or concrete, applied afterward. Partitions can be run from the walls,

the same bond being used. The bonds cost less than the mortar usually employed, and the cost of putting up the tile was less than half that under the usual method. The mortar or cement forced into the cracks between the tile assures a perfect seating of the tile. This bond without mortar assures perfect seating of the tile as they are laid in, and the stucco or concrete finish on both sides is not necessary to make a rigid wall.

Blueprint and Roll-Paper Box with Sheet Cutter

Frequently in drafting rooms the rolls of prepared paper, tracing cloth, etc., are kept in a cupboard or closet. A more convenient plan is to make a long narrow box, with a hinged top. A strip of heavy felt is glued along the top edge and a strip of heavy tin, or galvanized iron, is nailed on the under side of the cover. A small catch at each end keeps the cover against the felt. When paper is required, pull out as much as desired and tear it off against the metal edge. The box has two compartments with independent lids. A yardstick for measuring the



This Box Economizes Paper and Makes Cutting of Neat Sheets Convenient

sheets is pivoted underneath on a screw, and is swung out of sight when not in use.—John D. Adams, Phoenix, Arizona.

☞ In mixing plaster of Paris, sprinkle the plaster in the water to obtain a smooth mixture.

Pointers on the Use of Valves

An angle valve is generally more satisfactory than a globe or gate valve and an ell, when a valve is required near a right-angle turn in a pipe line. It demands fewer joints to be kept tight, and makes a better-looking job. Less friction is also caused by water or steam passing through the line. Brass or gun-metal valves should be used on pipe lines that convey superheated steam; never use rubber-disk valves for such duty. In taking down valves, especially those of brass, use a wrench that fits the nut portion closely, so that the corners will not be worn off by the slipping of the wrench.

Old Street-Car Gongs Used as Hardware Trays

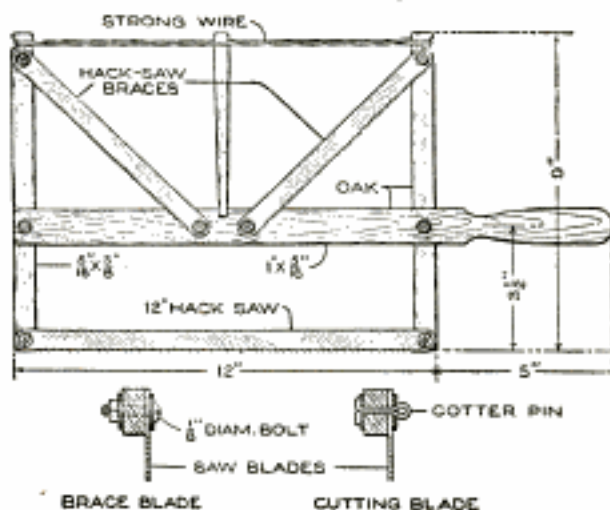
An ingenious use of worn-out and cracked street-car gongs is made by a street-railway company in its shops. The old gongs are utilized in making convenient stands to hold small materials, such as washers, screws, nails, nuts, etc., in the storeroom and the shops. A gong weighted with babbitt is used as a base, and the other gongs, inverted, are fastened by pins on an upright, to form receptacles, as shown. Graduated holes in the pipe upright provides for adjusting the receptacles.—Ralph O. McGraw, Chicago, Illinois.



An Emergency Hack-Saw Frame

On a hurry-up bench job in a machine shop, the only available hack-saw frame broke, and it became necessary to provide a substitute or abandon the job. A satisfactory frame, that has

proved useful as a regular tool, was made in a few minutes, as detailed in the sketch. The main portion of the

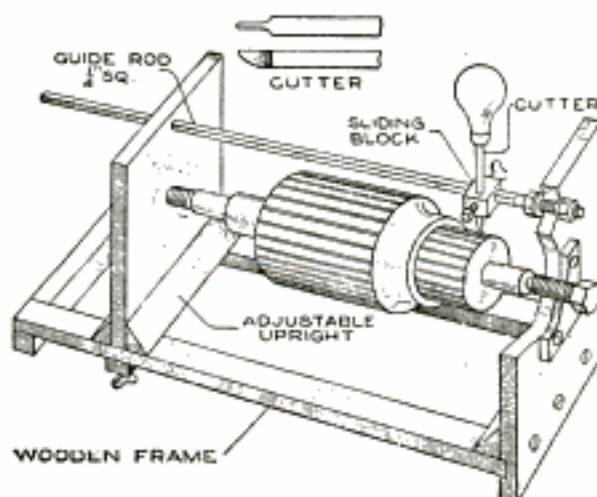


This Emergency Tool Proved so Useful That It was Kept as a Regular Part of the Shop Equipment

frame was made of $\frac{5}{16}$ -in. wood and a handle was cut on the crossbar. The saw blade was fitted into place, as shown in the detail, and braces were made of saw blades. A strong wire, tightened with a tourniquet, braced the frame at the top, and made the cutting blade rigid.—J. C. Marsh, Boston, Massachusetts.

Device for Undercutting Mica on Commutators

The mica insulation between the commutator segments of copper, on



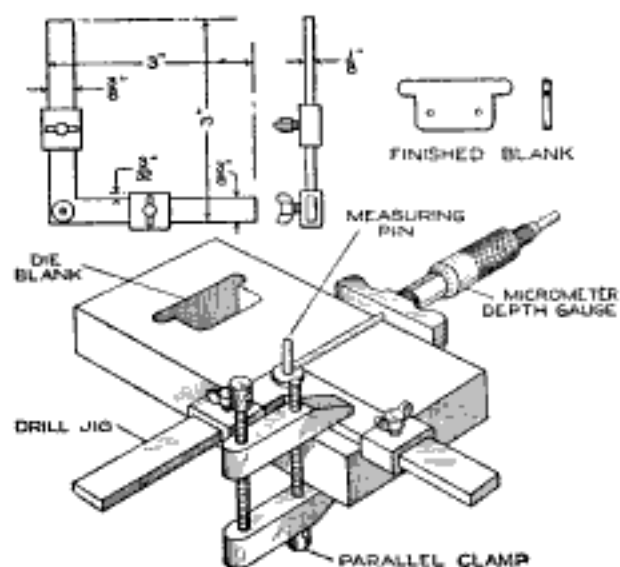
The Mica Insulation between the Commutator Segments is Reduced Uniformly by Means of This Arrangement

motors or similar machines, should be kept below the surface of the seg-

ments. Where a number of small motors are to be cared for, a frame for holding the armature conveniently, and a device for cutting the mica are timesavers. In the arrangement shown, the armature is mounted between pointed machine screws set in metal plates, fastened to the ends of the frame. The latter is adjustable, and the cutting device is made of a piece of drill rod suitably ground and handled, for clamping in a sliding block, set on a guide rod.—R. L. Hervey, Baltimore, Md.

Jig for Piercings on Dies and Machine Parts

A fixture, or jig, for locating piercings can be used to good advantage on follow dies, or dies that blank and



The Piercings on Dies are Located Quickly and Accurately by Means of This Jig

pierce the stock in one revolution of the punch press, in which the die is held. That shown in the illustration consists of a 3-in. right-angle square, made of $\frac{1}{8}$ -in. flat, cold-rolled steel, or ground stock. Two adjustable sliding stops of machine steel are fastened with thumbscrews. The bushing at the corner of the square is of hardened tool steel and set with a drive fit. The center hole in the bushing can be of various desired sizes. A number of different-sized bushings are convenient. A small pin fits the bushing, and is used

as a measuring point, as shown. The fixture is placed on the die to be drilled, and set so that the center of the bushing is in about the position in which the piercing is to be drilled. The stops are then set, and the fixture is clamped to the die. With a micrometer depth gauge, the fixture is set precisely in position.—William E. Jewett, Jersey City, N. J.

Economy by Use of Government-Size Letter Paper

While trying to stow away in my files an $8\frac{1}{2}$ by 11-in. sheet of 20-lb. folio bond paper, now selling around 40 cents a pound, I wondered why more persons do not save paper by using the 8 by $10\frac{1}{2}$ -in. size, weighing one-fourth less in folio weight, and nine per cent less because of its size. A typical sheet of this size is equivalent in weight to 16-lb. folio stock—17 by 22 in.—but in cutting four sheets out of a paper 16 by 21 in., I get nine per cent more sheets, by weight, for the same money. This size sheet is satisfactory for letters and manuscripts, and often saves postage. The government has used it for years, and many of the government sheets are only half this size.—J. Cecil Alter, Cheyenne, Wyo.

Grinder as Winch for Hoisting Countershaft

Supporting a piece of machinery against a ceiling while bolting it in place is often a trying and difficult job. Two boys had such a job in the shape of a countershaft and shifter for an emery-wheel grinder, the part being too heavy for them to handle. Two block pulleys were attached to the ceiling timbers. Two pieces of rope were tied to the lower parts of the countershaft, the other ends being attached to the grinder shaft, which was turned by a wrench, making a crude winch. The grinder was bolted to the floor. The countershaft was safely raised, and held in position, while the lag screws were tightened.—E. H. Post, Pittsburgh, Pa.

A Homemade Hydraulic Ram

By B. FRANCIS DASHIELL

THE hydraulic ram is used where considerable flow of water with a moderate fall is available, to raise a small portion of the flow to an elevation. The principle upon which it operates is as follows: An outflow of water falls through a pipe; when the lower end is suddenly closed, the movement is arrested, and the momentum of the current in the pipe forces a small portion of the water, through a check valve, into an air chamber, and out into the delivery pipe. When the momentum is down to normal pressure the outflow valve drops open of its own weight, and the delivery check valve closes, as shown in Fig. 1. The cycle repeats itself about 40 times a minute. Thus, the water is elevated by a succession of impulses.

A hydraulic ram, as detailed in Fig. 2, is easily built. The diagram, Fig. 1, shows the operation of the ram, the water being drawn from a reservoir, or spring, through the inclined drive pipe A to the ram. It overflows through the vertical check valve B. When the velocity of the water through the pipe reaches a certain pressure, the valve is closed. The extreme pressure in the pipe at this moment is great enough to force open the check valve C, and drive some water into the air chamber D, and thence out of the delivery pipe E.

In Fig. 2 the parts are shown assembled. The ram should be set in a

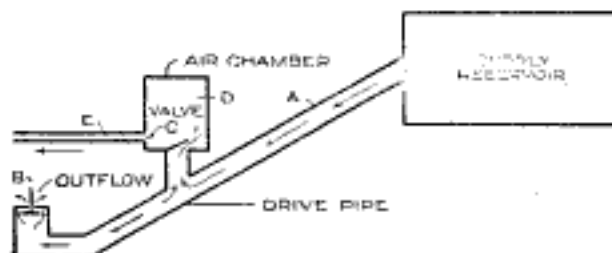


Fig. 1. Diagram Showing Operation of the Hydraulic Ram

vertical position. The supply pipe should be 1 in. inside diameter, and the delivery pipe $\frac{1}{2}$ in. Set the ram

about 5 ft. below the level of the supply dam, or reservoir, and not over 60 ft. away. The supply should have at least 8 gal. a minute to give good re-

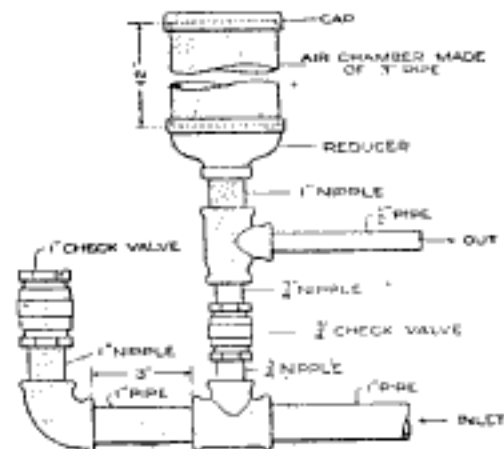


Fig. 2. Assembly Drawing of the Pipes and Fittings of Which the Ram is Made

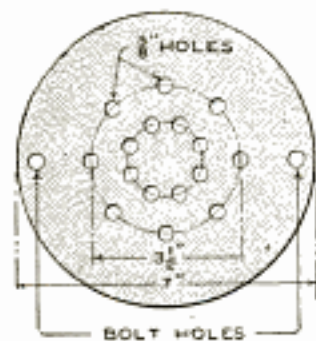
sults from the delivery. It will lift water over 20 ft. above the ram, and 200 ft. away, but, of course, the farther away the water is to be delivered, the less will be obtained, owing to the considerable resistance of $\frac{1}{2}$ -in. pipe. Fix a strainer over the drive-pipe intake to keep dirt from getting into the ram, and preventing the valves from seating properly.

Engine Nut Recovered with Pill Box on Stick

I removed a castle nut from my motorboat engine pump, and it dropped from my greasy fingers through several openings to the engine bed. None of the openings near it were large enough to permit inserting pliers or similar devices. Here I was, 50 miles from a good machine shop or other source for obtaining a like nut. I finally used soap, as burglars sometimes do. I tacked a small pill box on a stick, and filled it with soap. I inserted the stick into the engine pit, and there was the castle nut imbedded in the soap.—Egbert A. Clark, Washington, D. C.

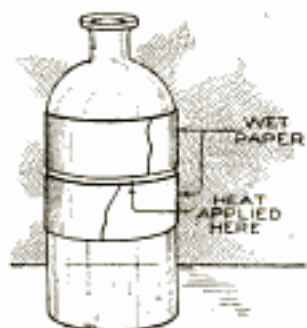
Stove Lid Used to Repair Forge

The bottom of a portable forge burned out and a thoroughly satisfactory repair was made by bolting an old 7-in. stove lid into the bottom of the fire pit. Holes were drilled for the free passage of the air blast, and similar holes for the fastening bolts, and the lid was bolted into the forge.—Oscar Dzois, Tilbury, Canada.



Cutting a Glass Tube or Bottle

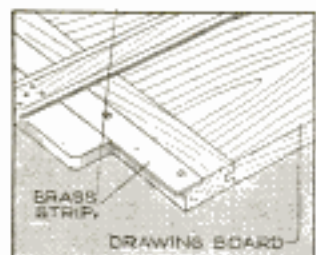
To break a bottle, or similar glass receptacle, smoothly around it, wet two strips of paper and wrap them about the bottle, as shown, a narrow margin intervening. Nick the glass carefully with a file and



apply a hot flame on this line, while turning the bottle.

Brass Guide Strip for T-Square

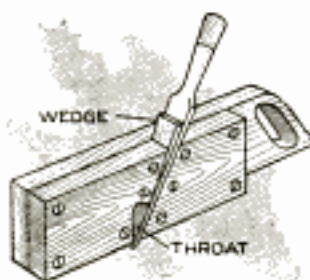
Draftsmen know what an annoyance it is to have the working edge of a drawing board warp, or wear, so that the head of the T-square does not fit snugly against it. I have overcome this difficulty by fixing a metal edge on the board. I fastened a strip of aluminum—brass will serve— $\frac{3}{32}$ by 1 in., to the working edge of the board with small screws, rabbeting it in flush with the top. The metal projects $\frac{3}{16}$ in., and fits into



the groove in the head of the T-square, holding it firmly in place, yet permitting it to slide freely.—Guy E. Waite, Ottawa, Ill.

A Homemade Rabbet Plane

In making skis it was necessary to groove them, and I made a rabbet plane for the purpose. Two pieces of 1 by 4-in. board were cut, 12 and 14 in. long. Two bored holes, and a few cuts with a key-hole saw effected a handle on the



longer piece. The short piece was cut in two, at an angle, and the pieces fixed to the longer piece with screws, leaving a slot for a $\frac{1}{4}$ -in. chisel, and a wedge. A throat was cut, as shown, for the shavings. A slight tap on the chisel at each complete stroke permitted the cutting of the groove to the desired depth.—Victor Pare, Gladstone, Mich.

Pencil Sharpener with V-Groove Made from Files

An efficient pencil sharpener may be made from two files and a block of wood, 2 by 3 by 5 in. long. In the top surface cut a 45° groove, as shown. Break the files to two 5-in. lengths, fit them in the groove, and glue them in position.

The rough surface of the files holds the glue nicely. The block is held in the left hand, and the pencil point rubbed, with a twisting motion, in the file-lined groove, with the right hand, sharpening the pencil in a few moments. By holding the pencil at different angles, various degrees of fineness of point are obtained.

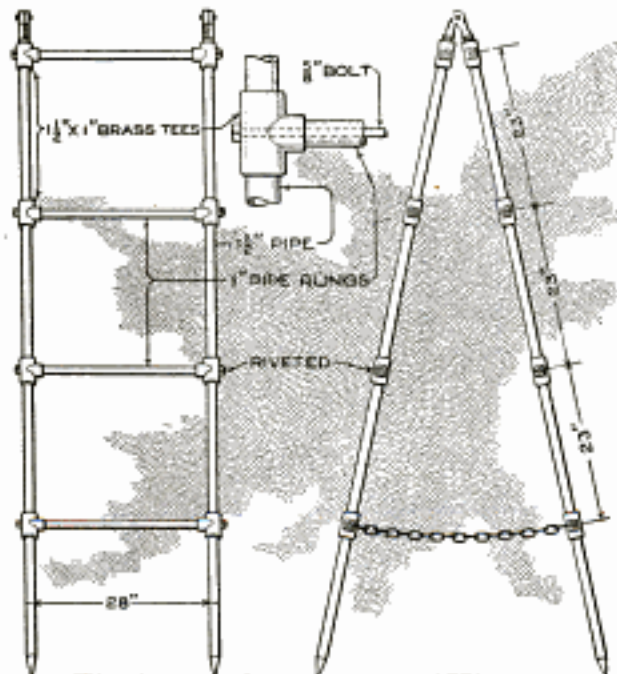


Revolving File Cabinet on Double Desk Saves Time

A revolving file cabinet, mounted at the center of a large double desk, solved the problem of making the files readily available to two clerks in an office where space was valuable. A cabinet was provided, with short filing drawers, and compactly and lightly built. It was fixed to the center of the desk top by means of an iron pedestal, provided with a center shaft, around which the cabinet turns.

Shop Ladder Made of Pipe and Fittings

In a railroad repair shop where ordinary ladders were found bulky when made strongly enough, ladders built up of pipe and fittings, reinforced, were made and used with satisfaction. They were built of $1\frac{1}{2}$ -in. pipe joined with tees, and bolts were passed through the tees and rungs for further strengthening. The ladders being 28 in. wide,

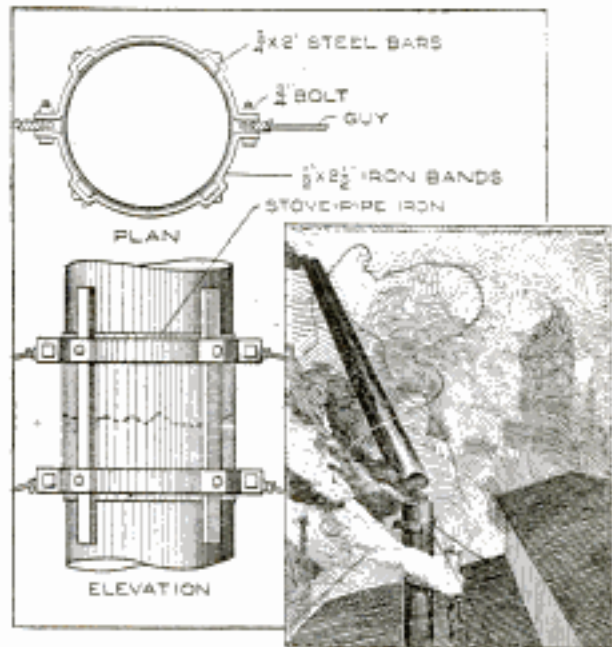


This Strong Ladder was Designed for Use in a Railroad Shop

it is possible to pass planks at any of the rung levels. The ends were pointed to give a secure footing.—Joseph K. Long, Renovo, Pa.

Reinforcing a Blown-Down Iron Smokestack

One of the guy wires running to the top section of a 60-ft. iron smokestack broke during a high wind, and the



A High Wind Blew Down the Smokestack, and It was Quickly Repaired at Little Expense

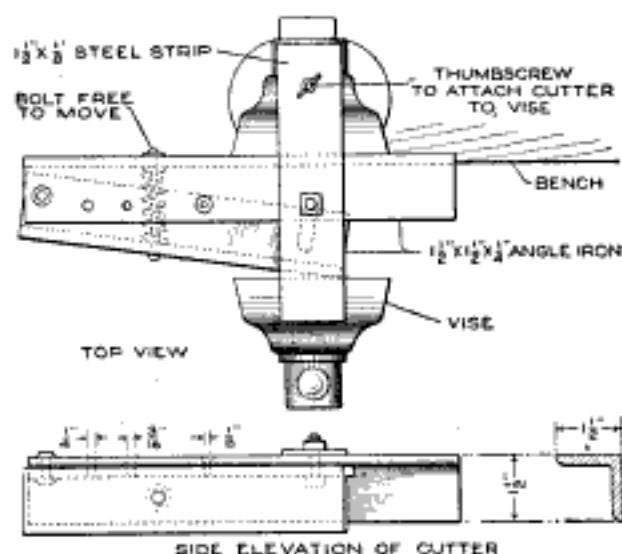
stack broke off just above the ring to which the lower guys were fastened. The loss of time to get a new stack would have been great, and the old one was, therefore, patched up and proved satisfactory for continued use. The broken-off section, which remained intact, was hoisted back in place, and kept in line by guys and a set of clamps and bars made for the purpose, as shown in the detail sketch. Guys were run from the clamps on each side of the break, and the stack was made rigid. Around the break, two thicknesses of stovepipe iron were wrapped, before the clamps were put on, to stop leakage.—Donald A. Hampson, Middletown, N. Y.

Wire Mesh for Rough-Surfacing Concrete Walk

Concrete walks can be made with a rough surface, when a regular rough-surfacing roller is not at hand, by applying wire mesh, pressing it firmly on the surface, while the concrete is slightly soft.—H. K. Capps, Stahl, Mo.

A Shear of Angle Iron for the Vise

A useful piece of apparatus for the workshop is a vise shear, easily made out of two sections of $1\frac{1}{2}$ by $1\frac{1}{2}$ -in.



Rivets, Lengths of Small Rod, and Similar Stock can be Cut Quickly with This Homemade Vise Shear

angle iron, riveted together as detailed, and fitted with a stiff spring, on a bolt, which opens the cutter when the vise is released. Holes, the size of the rivets or rods to be cut, are drilled through both pieces of angle iron, when they are in position, as shown in the top view. Both pieces are casehardened around the holes. A metal strap is fastened to the stationary angle iron by bolts, to hold the shears in the vise. A hole is drilled and tapped in the vise to take a thumbscrew, which steadies the shears. The stock to be cut is placed in the hole of the same size diameter, and the vise is tightened to shear the stock. When one requires a number of rivets of a particular length, this device cuts them quickly. By using a slotted plate to hold the rivets, which are fed into the shear steadily, quicker work can be done.—B. E. Dobrée, Battleford, Sask., Canada.

ⒸEspecial care must be taken in protecting oak from various kinds of oil used on machinery, as this wood is easily spotted black by the combination of the tannin and products from crude oil.

Pointers on the Care of Auto Tires

Every autoist has his share of tire troubles, which usually start with punctures, and then casing troubles. Half the joys of automobiling can be destroyed if the tires are not properly looked after; so the following hints may be the means of avoiding difficulties and displeasure.

The first rule to be observed is to keep the tires properly pumped up to the pressure specified by the tire manufacturer. A good rule is to make it a point to try the pressure in the tires once a week; a pressure gauge is necessary and should always be carried in the car. Jack up the axle once a week and turn the wheels round and look for cuts, nails, stones, etc., that are likely to injure the casing without causing a puncture. Tacks and nails that have penetrated only the outer rubber may be removed to prevent blow-outs on the road. When a small cut has been made in the casing, it should be vulcanized before dampness or sand has time to work in. Dampness soon rots the fabric, and sand will work in between the fabric and rubber, causing them to separate, and make a boil. Then, undue wear on the rubber is caused and very quick destruction of the tire follows.

There are many gums and fillers sold for filling up cuts in the casings, but vulcanizing is probably the best remedy. Efficient vulcanizers are inexpensive, and convenient for home repairing. If the tire has a bad gash or blow-out, it is best to take it to a vulcanizing shop. The best method to make a temporary repair for a cut or blow-out that has gone through the fabric, is to put an inside blow-out patch inside the casing, being careful to get the edges pinched under the beads of the tire so that the patch will hold in position when the tire is inflated.

Sometimes the fabric of the tire is broken without cutting the rubber. This will cause a blow-out in time, and the only safe way is to take it to the shop and get it repaired; for

a blow-out patch inserted will not last long as the continued friction caused at the break in the casing will crack the patch open. Inner linings help a badly worn casing, but they are a poor substitute for a good vulcanizing job.

The only satisfactory way to repair inner tubes is to vulcanize them, and this may be done in the home garage. Cold patches are desirable in emergencies, but when driving for any length of time on macadam, asphalt, or concrete roads, the tires get very warm, and these patches are likely to loosen up, causing a leak. Vulcanizing all punctures at the first opportunity is the best practice in the long run.

When the hole is larger than an ordinary nail hole, the following method of repairing is good: Cut out a regular-shaped hole in the tube, and scrape the inside of the tube, all around the hole, for $\frac{3}{4}$ in. on each side. Cut a piece of old inner tube, large enough to allow a margin of $\frac{3}{4}$ in. around the hole. Apply cement to this on one side, previously cleaned, and also on the inside of the tube. When both are tacky slip the patch into the tube, and see that it adheres well all around the inside of the cut. After preparing the outside in the usual way, the patch may be vulcanized. The patch inside will form a good backing for the soft vulcanizing, and when it is clamped up a perfect weld is made.

If there is a slow leak in a tire, before taking the casings off, test out the air valve by holding a drop of water over it; if air bubbles come out, replace the valve. Dirt is blown into the valve seat, causing a slow leak and much trouble; frequently this is the cause of leakage attributed to a supposed puncture. Summing up, the automobile equipment is not complete without a vulcanizer and material for it, an air-pressure gauge, a blow-out patch, extra air valves, and extra tubes.—F. S. Korb, Detroit, Mich.

ⒸA section cut from a cotter pin is useful for replacing buckle tongues.

Apple-Packing Table Mounted on Wheels

A table for sorting apples to be packed for shipment was made of odd ends of lumber, and mounted on discarded wheels, as shown, making it



The Table is Moved as Required, and the Culls Placed in the Chute

readily portable. The handiest feature of the rig is a chute from the top, on which the apples are sorted, for culls, leaves, etc., which might get into the barrels. The slats of the table extend lengthwise, and the chute opening is across the top. When the chute opening is wanted wider or narrower, the slats around it are moved.—M. Glen Kirkpatrick, Des Moines, Iowa.

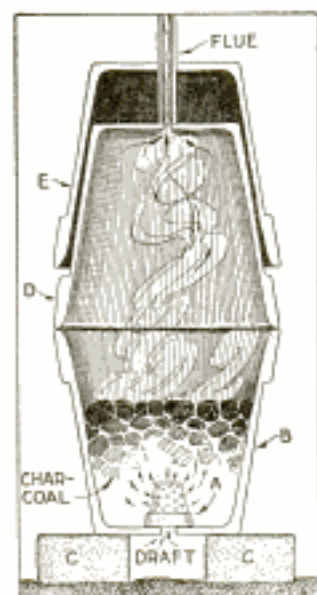
Fitting a Handle to a Pick

A quick and thorough method of fixing handles in the heads of picks is as follows: Put the head on the handle, as shown, and pound the butt on a solid foundation, until the edge of the pick eye cuts its way nearly to the end. Reverse the handle and pound the other end to loosen the pick. Cut off the slivers, insert the handle in the proper way, and pound the butt on the iron or base to a solid fit. If carefully done, the handles will not loosen even in great changes of weather.—James M. Sherman, Columbia, Mo.



Charcoal Heating Stove Made of Flowerpots

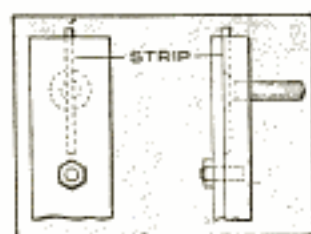
A small stove that was made originally for taking a chill from winter



hotbeds, and which can be used for various purposes throughout the year, was made from several clay flowerpots. A small pot, A, was drilled with small holes, as indicated. A 12-in. flowerpot, B, was set on bricks, C, with the small flowerpot inverted over the hole at the bottom. The charcoal fire is made in the flowerpot B, which is covered with a similar pot, D, and over this is another pot, E, which retains the heat. A flue, made of a piece of 1-in. pipe, carries off the smoke and gas. Soft coke may also be used, and the pots will hold heat and fire about 24 hours if pot B is filled three-fourths full.—R. S. Matzen, Fort Collins, Colo.

Device for Holding Screws While Threading Them

It is often desired to rethread screws which have become burred, and in the tool room many odd sizes of screws are required. It is difficult to hold a screw in a vise while threading it, and the device



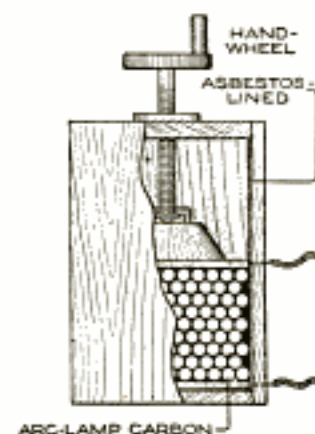
shown in the sketch was made to overcome this. The screw is inserted in the hole and the small strip of steel in the slot prevents it from turning. A small bolt holds the two pieces of the device together, so that it may be clamped in a vise.

Gauge Determines Diametral Pitch of Gears

The simplicity of this gear-pitch kink, that I have worked out, will appeal to a large number of mechanics, and others who have occasion to send a helper to get the pitch of a gear, in a position where it cannot readily be measured or taken down. Obtain a piece of sheet metal, about .008 in. thick, $\frac{1}{2}$ in. wide, and 3.1416 in. long, and bend it to the circumference of the gear on the pitch line. The teeth between these two points will be the diametral pitch. The explanation is that the diametral pitch is the number of teeth to each inch of the diameter of the gear; therefore, if a gear has, for example, four teeth for an inch of diameter, those four teeth cover a space on the pitch line of 1 in. multiplied by 3.1416, and that is the length of the gauge.—Robert D. McElvany, Norfolk, Virginia.

Rheostat Made from Old Arc-Lamp Carbons

A simple rheostat was made from discarded arc-lamp carbons, as shown in the sketch. A wooden box, 12 in. high and 6 by 6 in. inside,



was used as a container, and lined with asbestos, to guard against overheating. A metal plate was fastened to the bottom of the box, and several dozen arc-lamp carbons laid in. The more carbons used, the greater the range of resistance. A second plate was placed on top of the carbon pile. By employing a hand-screw device the pressure on the carbons between the two plates may be varied. When electrical connection is made to the two plates, the resistance varies inversely with the pressure.

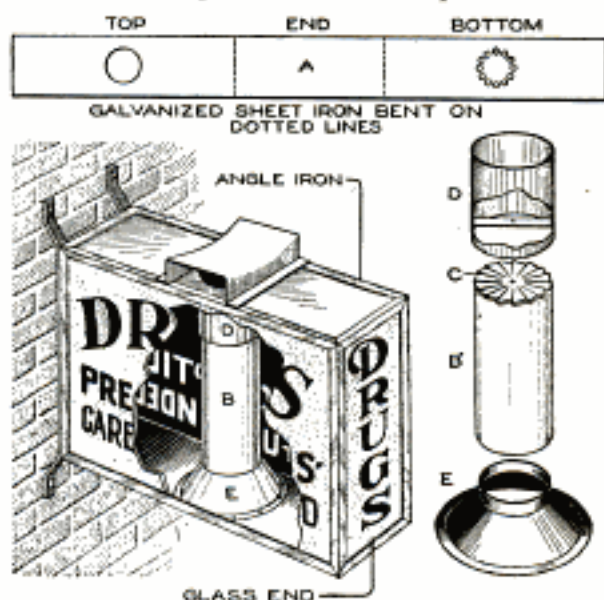
An Inexpensive Color-Changing Sign

Color-changing signs are effective as advertising devices, and the box sign shown is so simple in construction and operation that it has a wide use. An angle-iron frame is made up to the desired size. The four corner uprights are riveted to the bottom. The top is fastened to the uprights with screws, to permit its being removed for the insertion of the mechanism and glass sides. The front and two sides are of glass, with the desired advertisement painted on one side of each, and the inner side frosted, to obscure the mechanism. The back, top, and bottom are cut from one piece of galvanized sheet iron, A, with a circular opening cut near one end, and a circle of holes near the other. It is then bent to shape and fastened in place.

The inner mechanism consists of a cylinder of celluloid, B, fastened to a revolving air vane, C, which is made of thin metal, preferably aluminum, with the blades bent at an angle of about 25°. This cylinder is large enough to revolve freely around an upright electric-light bulb. A cylinder of sheet metal, D, is next made, slightly larger in diameter than the celluloid one, and serves as the upper part of the air shaft. A strip of metal is fastened across the inside, and supports the revolving member. The bearing is a glass-head pin inserted in the center of the vane and fastened to the cross strip.

The lower air shaft E is made $\frac{1}{2}$ in. smaller at one end than the celluloid cylinder, and extends 1 in. up into the same. The other end flares out to inclose the air holes in the bottom of the sign. The upper and lower air shafts are then fastened in position, at the galvanized sheet iron which forms the top, bottom, and back. A weather-proof electric-light receptacle is mounted within the lower air shaft, so that the electric bulb will be in the center of the sign. The wires, protected, are led from the socket through a hole in the bottom of the sign, and properly insulated in tubing. A hood,

riveted over the circular opening in the top, keeps out the rain. The celluloid cylinder can be painted in broad, vertical stripes with transparent col-



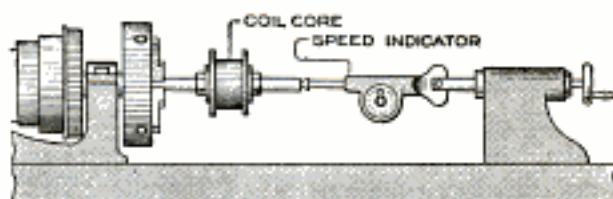
The Draft through the Cylinder Operates the Fan. Various Novel Effects can be Devised Readily for This Homemade Sign

ors. The angle-iron frame is given an oxidized-copper finish by sandpapering in spots, and applying a solution of copper sulphate. This will give only a light deposit, and can be protected with a heavy coat of lacquer or shellac.

The expense in operating this sign is for the electricity consumed only, as the motive power is furnished by a draft of air formed through the air shafts.—George Niederhoff, St. Louis, Missouri.

Speed Indicator Counts Turns on Wire Coil

Desiring to rewind a field coil on a form, an electrician placed the form on an arbor and fastened the arbor in the



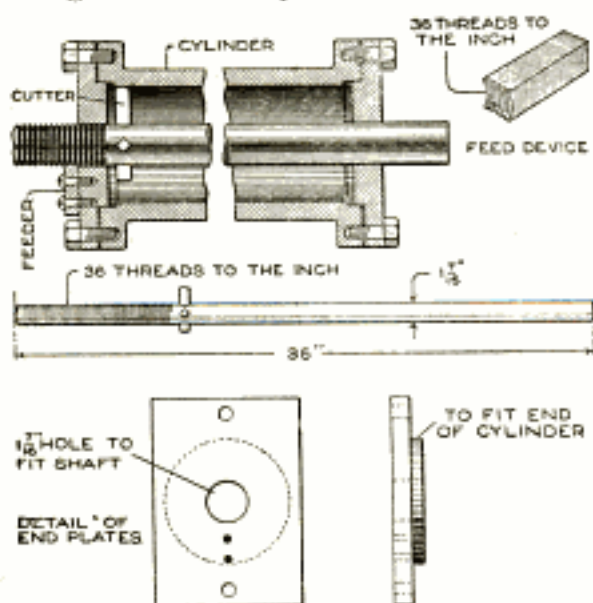
The Number of Turns of Wire Wound on a Coil Core was Recorded by the Use of a Speed Indicator

chuck on a lathe. In order to record the number of turns wound on the form, a speed indicator was rigged up as shown. A taper arbor fitting into

the tailstock was notched out to receive the handle of the indicator, and a small pin put through to hold it in place. The tailstock was then run up until the rubber tip of the indicator fitted into the center in the arbor. The number of turns was recorded accurately, and when the wire became crossed, and the form had to be backed up, the indicator automatically subtracted the number of turns unwound.—Earl Pagett, Coffeyville, Kans.

Rigging for Reboring Engine Cylinder by Hand

A high-pressure cylinder on a steam engine was to be bored out, the casting being of such shape and size as to re-



The Engine Cylinder was Bored Out Accurately and Smoothly by Hand

quire much rigging to fasten it in a lathe. I bored the cylinder by hand with the arrangement shown, getting a satisfactory job. The boring bar is a shaft of cold-rolled steel, $1\frac{1}{16}$ in. in diameter, threaded as indicated, and fitted with a $\frac{3}{8}$ -in. high-speed steel cutter ground like a finishing tool. A $\frac{1}{2}$ -in. square, cold-rolled steel, threaded feed device, on the end of the cylinder, engages the boring bar, causing it to move in or out when turned. Plates of steel, as detailed, provide bearings for the shaft, which is fed in by a crank made of a wrench.—Hermann G. Kroeger, Louisville, Ky.

Large Wheelbarrow Saves Time in Cleaning Wood Shop

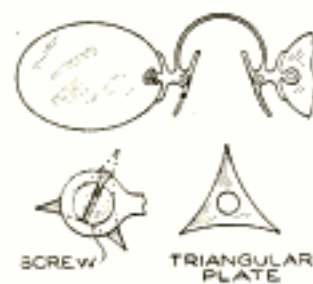
After watching a man cleaning up shavings and hauling them out in an ordinary wheelbarrow that enabled him to take only about one-third as much material at a trip as he should, I had a large hopper made for his barrow, to permit the hauling of a good load each trip. The hopper was supported by a frame of round iron, 36 in. square at the bottom and widening toward the top. The frame was covered with heavy canvas, and the hopper was lifted from the barrow like a basket when emptying it.—M. C. Webster, St. Louis, Mo.

Wafer Razor-Blade Device for Scraping Paper from Glass

Show windows are often stuck up with posters, playbills, etc., the corners of which are frequently securely pasted to the glass, and removed with difficulty. A tool with which to scrape these off can be made of a wafer razor blade, fastened to a wooden handle. The blade is held by screws, through the holes in the blade, or under the lugs at the end. Kept near the window, this scraper will be found a handy tool.—L. B. Robbins, Attleboro, Mass.

Device Prevents Loosening of Eyeglass Screws

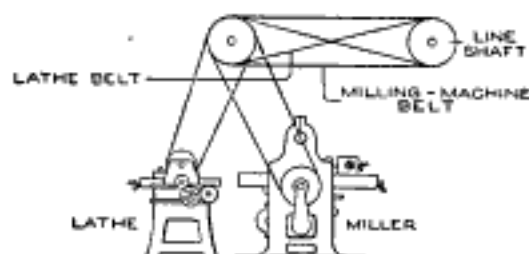
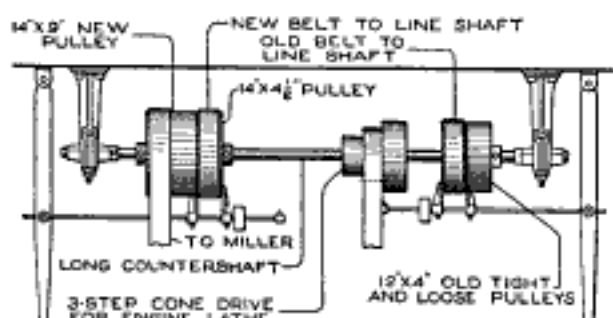
A defect in many eyeglass frames is that the wings which hold the lenses, and through which screws pass, are so thin that the screw soon strips the threads, loosening the lens. A thin, flat piece of suitable metal, three-pointed, as shown, provides a remedy. It is placed beneath the wing, and after the screw is driven home, the points are turned over, one of them in the slot in the screw head, preventing the screw from turning. In tightening



the screw, the point is raised. This device on a pair of glasses has prevented the slightest turn of the screw for over a year.—J. S. Zerbe, Coytesville, N. J.

Double-Drive Countershaft Arrangement

On a rush order, floor space was at a premium, and a milling machine had to be set beside a lathe, in constant use. To get the miller going in good time, and with little expense, I put up a double-drive arrangement. After figuring the pulley diameters, for the required speeds, two 14-in. pulleys, one 9 in. and the other 4½ in. wide, with set collars, were mounted on the countershaft. Both of these pulleys are loose on the shaft, and held in position by the collars. The drive belt from the line shaft runs on the 4½-in. pulley when the miller is not running, and is shifted over on the 9-in. pulley when



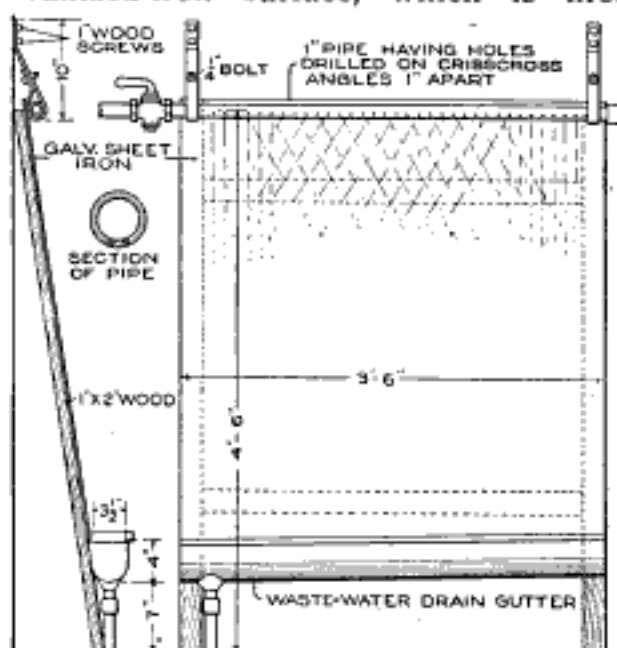
An Old Lathe and the Newly Installed Miller were Driven from the Same Countershaft

the machine is started. This drive has given no trouble, and does not interfere with the running of the lathe.—Joe V. Romig, Allentown, Pa.

ⒸCircular areas of crosshatching, scratched into triangles near their corners, prevent them from slipping too easily on the drafting board.

Washing Rack for Blueprints

In using this blueprint-washing rack the prints are spread over the galvanized-iron surface, which is first



The Blueprints are Spread on the Moistened Surface and Washed Until Developed

sprayed with water, causing the paper to adhere. The water is then turned on as desired, and the paper sprayed until it is thoroughly developed. The water is turned off, the paper is removed, and placed on the drying line. The water-supply pipe is supported by strap-iron brackets, and the washing surface is built over a wooden frame, as indicated. A galvanized-iron drain gutter carries away the excess water.—J. M. Morse, Brooklyn, N. Y.

Clip Holds Door of Terminal Boxes during Tests

A kink that I have found very handy while working in electrical-terminal and test boxes is the use of a clip for holding the door open, especially in a breeze. It is extremely annoying to have a door of a test box blow shut unexpectedly. This simple holder, which is made somewhat like a large clothespin, slips over the upper or lower edge of the terminal box near the hinge edge of the door, and is set in front of the door, holding it open.—A. Gemmill, Ansonia, Conn.

Size of Objects Photographed Indicated by Background

When making photographs of small objects for catalogs and similar pur-



The Sizes of These Patterns can be Estimated by Comparison with the Two-Inch Squares in the Background

poses, divide the background into squares of equal dimensions, and the size of the objects photographed can be estimated readily in the picture. In the photograph of some small patterns, the copy board was divided into 2-in. squares, by means of black strings stretched tightly from brads driven at intervals on the edge of the board.—R. D. Stevens, Lawrence, Mass.

Raising Shop Desk Increases Its Usefulness

The man in the shop office usually does not care to sit down to write an occasional order or note, and a desk with a chest-high writing surface saves his time. The photograph reproduced shows a raised desk used by a shipping clerk. The arrangement also enables him to get paper, tags, etc., from any of the drawers without undue stooping.



Suggestions on Automobile-Tire Economy

In extremely hot weather it is better to start out with automobile tires a trifle slack rather than pumped up too hard. The heat of running will increase the air pressure several pounds. Never run a tire which shows any pronounced "give" when the car is rocked by hand. The moment the car shows an unusual tendency to swerve, or steers hard, stop and make sure that a puncture is not the cause.

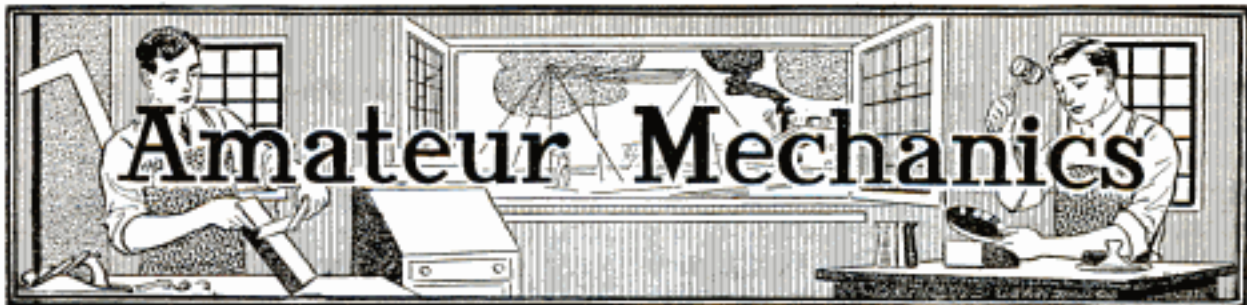
High, Portable Lamp Standard for Shop Lighting

Unless the illumination of a shop is unusually well planned, it will be necessary to employ local lighting at night, and on dark days. The use of the portable lamp standard, shown in the illustration, has been adopted in a large shop. It consists of a gas-pipe standard, 12 ft. long, screwed into a heavy cast-iron base. A high-candlepower, nitrogen-filled lamp is used, providing plenty of light for accurate shop work. The lamp is moved to the work, rather than the work to the light, and suitable electrical connections made.—C. M. Hall, St. Louis, Missouri.



Preventing Typewriter Platens from Becoming Grooved

By using the variable line spacer frequently on a typewriter, or moving the platen slightly from its previous position, the entire surface of the platen is written over, thus preventing its becoming deeply grooved, as occurs when line after line is written, day after day, over the same point on the platen.—John M. Bonbright, Philadelphia, Pa.



A Twisting Thriller Merry-Go-Round

By R. E. EDWARDS

STEP right up; three twisting thrillers for a penny—a tenth of a dime!" was the familiar invitation which attracted customers to the delights of a homemade merry-go-round of novel design. The patrons were not disappointed, but came back for more. The power for the whirling thriller is produced by the heavy, twisted rope, suspended from the limb of a tree, or other suitable support. The rope is cranked up by means of the notched disk A, grasped at the handle B, the car being lifted off. The thriller is stopped when the brakeplate I rests on the weighted box L.

Manila rope, $\frac{3}{4}$ in. or more in diameter, is used for the support, and is rigged with a spreader, about 2 ft. long, at the top, as shown. The disk is built up of wood, as detailed, and notches, C, provided for the ropes. The rope is wound up and the car is suspended from it by the hook, which should be strong, and deep enough so that it cannot slip out, as indicated at H.

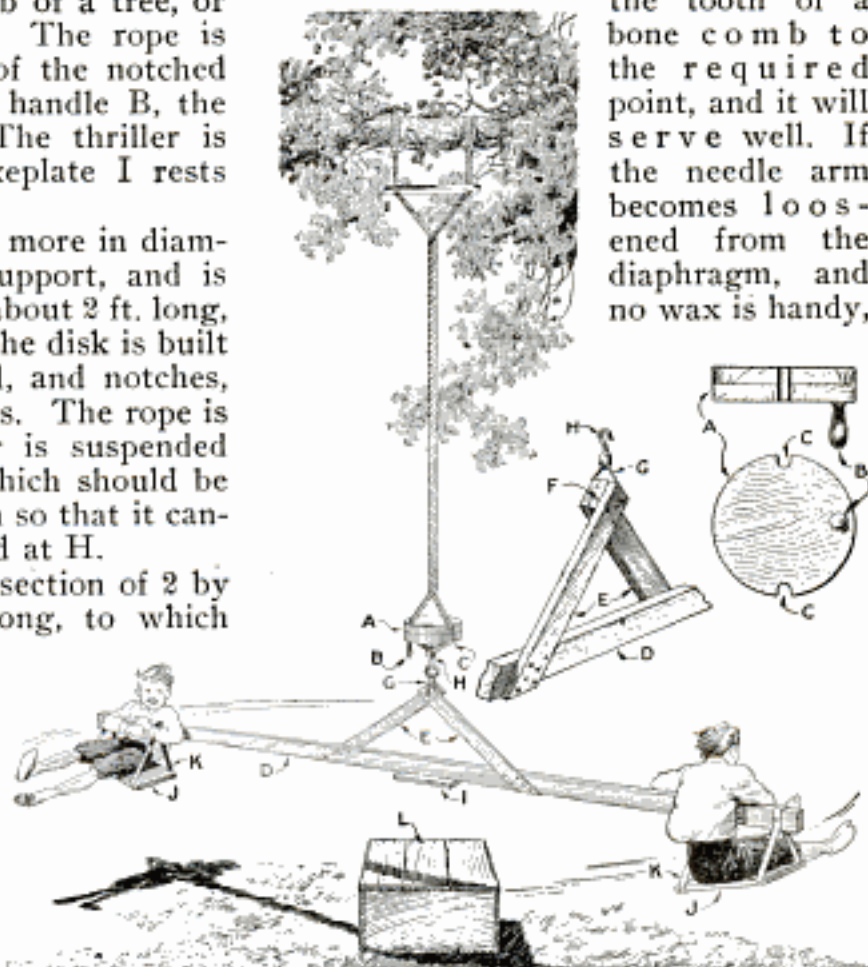
The car is made of a section of 2 by 4-in. stuff, D, 10 ft. long, to which braces, E, of 1 by 4-in. stuff are fastened with nails or screws. The upper ends of the pieces E are blocked up with the center piece F, nailed securely, and the wire link G is fastened through the joint.

The seats J are suspended at the ends of the 2 by 4-in. bar, with their inner ends lower, as shown, to give a better seating when the thriller is in action. The seats are

supported by rope or strap-iron brackets, K, set 15 in. apart. The box should be high enough so that the seats do not strike the ground.

Kinks for the Talking Machine

When short of fiber needles or when the jewel needle has broken, file down the tooth of a bone comb to the required point, and it will serve well. If the needle arm becomes loosened from the diaphragm, and no wax is handy,



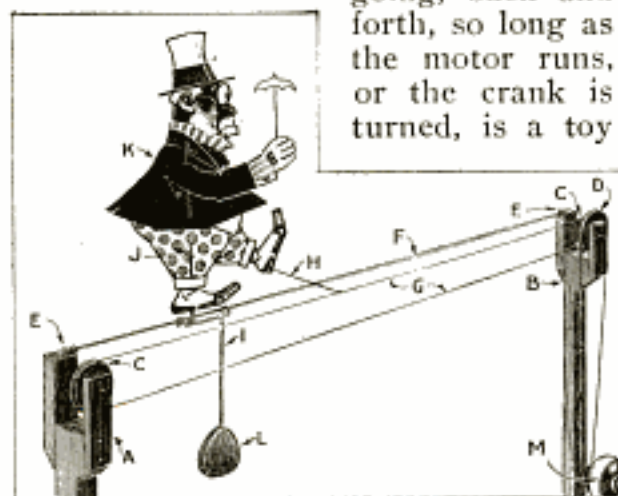
The Supporting Ropes are Wound Up at the Disk A, the Car is Hooked into Place, and the Passengers Take Their Seats for a Thrilling Ride, Until the Brakeplate I Rests on the Box

a bit of soft chewing gum makes an excellent temporary repair. Use a

magnet to pick up steel needles from the receptacles on the machine, to save time and avoid punctured fingers. If the machine is too loud for the room, placing a piece of loose cotton in the tone arm, directly behind the reproducer, is more effective than muffling the sound at the horn end.—L. B. Robbins, Attleboro, Mass.

A Wire-Walking Toy

A daring wire-walking performer who, unmindful of the fact that a misstep may mean destruction, keeps on going, back and forth, so long as the motor runs, or the crank is turned, is a toy



Adapted to Window Displays, This Amusing Toy Has an Advertising Value

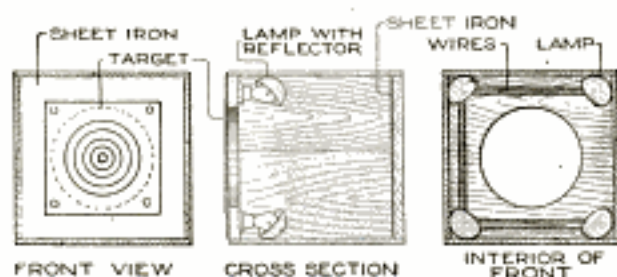
that boys can make easily. The wire is stretched, not across Broadway, but between two 1 by 1-in. standards, held upright by guy cords, or fixed to a baseboard. They are fitted with forked tops, at A and B, and pulley wheels, C and D. A wire, F, is fastened to two of the prongs, at E, and a black thread, G, runs over the pulley wheels. A carriage, I, is formed from a 12-in. length of stiff wire, and weighted, at L, to balance upon the tight wire. The figure K is cut from stiff paper, and made to turn upon the carriage upright J, and braced with thread, at H. Thus the figure is always drawn forward, revolving on the support J at the end of each trip. Power to turn the thread is transmitted from a hand crank or motor, M, by means of the double pulley wheel at D.—Edward R. Smith, Walla Walla, Washington.

Double Roofs Provide Ideal Shade for Poultry Coops

Having no native shade in our city chicken yard, we noticed one summer that the hens, especially those in the low brooder coops, became droopy and exhausted from the excessive heat. We studied the construction of the U. S. Weather Bureau thermometer shelter, which usually stands out in the sun, and is no larger than our brooder coops. It has a double roof with free air-circulation space between the roofs, hence the inclosed thermometers are exposed to a true-shade temperature. We then placed an extra roof on each of the brooder coops, leaving a 6-in. open air space between, the top roof being supported at the corners only. The arrangement proved so effective that the hens sought the coops, against the heat of unventilated inclosures on quiet, hot days.—J. Cecil Alter, Cheyenne, Wyo.

An Illuminated Indicating Target Box

The joys of target practice are often hampered by the delays in the settlement of hits. It takes time and is annoying to be constantly advancing to the target to examine it. To do away with this, an illuminated target was constructed that enables the shooter to locate every hit without leaving his post. To make the device, a square wooden box of convenient size is obtained. In one side of this, cut a round hole as large as the largest ring on the targets used. The side opposite this is



The Location of Hits is Recorded by a Beam of Light Streaming through the Hole Shot in the Paper Target

fitted with a piece of sheet iron to stop the bullets. Paint this iron and the interior white. Inside the box, arrange

four electric lights so their rays will be thrown on the hole, as shown. Candles may be used, if necessary. The lamps must be out of range of the bullets, that hit the target, and protected by an iron plate. The targets, painted on thin paper, are fastened over the front of the hole, and the lights are on, while shooting. Each shot punctures the paper, and the light streaming through the hole will show the location of the hit.—Thomas W. Benson, Philadelphia, Pa.

Kinks in Washing Photographic Negatives and Prints

Photographic defects, spots, stains, etc., are often due to inadequate washing. In the common method of washing negatives or prints under the tap, in a dish, the water is not changed quickly enough. If the negatives are placed film downward and supported at the edges, the washing is quicker and more thorough. Films as well as glass negatives are in the same class in the matter of washing. Films should not stick together, and the sharp edges must not be permitted to cause scratches.

Bird House Made of an Old Straw Hat

A bird house of an old straw hat is a practical and easily contrived affair. Cut a hole in the crown of the hat. Then nail the hat against a board of proper size. To protect the hat against the rain, put a roof over it, as shown. A perch is also provided. Such a bird house can be hung against the trunk of a tree, or nailed against a wall. Leaving the hat in its natural straw color, and painting the rest a dark brown, produces a satisfactory effect.—C. L. Meller, Fargo, N. D.



Camp Shelter Affords Protection from Mosquitoes

When it is undesirable to stay in a camping tent, on warm nights or during the day when a siesta is taken,



Lite Branches Cut in the Woods are Used for the Framework, Which is Covered with Mosquito Netting

a mosquito shelter can be made of materials readily available at most camping places. The arrangement, as shown, is made as follows: Procure a number of pliable switches, about $\frac{3}{4}$ in. in diameter, and 8 or 10 ft. long, willow or similar growths. Sharpen the butts, and force them into the ground in two rows, $3\frac{1}{2}$ ft. apart. Bend the tops together, and tie them in arches of the same height, as indicated. Next, tie a ridge binder the entire length. Cover the frame with mosquito netting, providing an entrance at one end. The shelter shown is for one person, but may easily be made larger. The fly, supported on a rope between posts or trees, affords shade.—J. T. Trammell, Milwaukee, Wis.

☞The annoyance of a chair rocking on a bare floor, especially a child's rocking chair, may be overcome by tacking sections of garden hose along the curved rockers. If properly done this also adds to the comfort of the chair.

A Miniature Fighting Tank

That Hurdles Trenches

By EDWARD R. SMITH

AMONG the engines of war in action on land, probably none has created greater interest than the now famous "fighting tank," which, according to reports, pours out missiles of destruction on the enemy from armored turrets, and crawls over trenches, shell craters, and similar obstructions, like a fabled giant creature of prehistoric ages. The tank described in this article, while not as deadly as those on the battle fields of Europe, performs remarkable feats of hurdling trenches, and crawling over obstructions, large in proportion to its size. The model, as shown in the heading sketches, is full-armored, and has a striking resemblance to these war monsters. The turret is mounted with a magazine gun, which fires 20 projectiles automatically, as the tank makes its way over the rough ground. The motive power for the tractor bands is furnished by linked rubber bands, stretched by a winding drum and ratchet device, on the rear axle, as shown in Fig. 1. When the ratchet is released, the rear axle drives the fluted wheels on it, and they in turn drive the tractor bands, as shown in the side elevation, Fig. 6. The wire-wrapped flywheel conserves the initial power of the rubber-band motor, and makes its action more nearly uniform.

The tank will run upward of 10 ft. on the rubber-motor power, depending on the size and number of the bands used. The gun is fired by a spring hammer, actuated by a rubber band. The trigger device is shown in Fig. 1. The pulley A is belted, with cord, to the front axle. Four pins on its inner

side successively engage the wire trigger, drawing it out of the gun breech B, and permitting another shell to drop into place. As the pulley revolves, the trigger is released, firing the projectile. This process goes on until the motor runs down, or the supply of shells is exhausted.

The tank is guided by the pilot wheel, shown in Fig. 1. The sheet-metal armor, with its turret, is fitted over the mechanism, and can be removed quickly. It bears on angles bent up, as detailed in Fig. 2, to fit on the ends of the wooden center cross-piece of the main frame, and is held by removable pins at the ends of this frame. While the rubber motor is easy to make and install, the range of the tank can be increased by using a strong spring motor, the construction otherwise being similar.

The construction is best begun by making the wooden frame which supports the armor. The perspective sketch, Fig. 1, used in connection with the working and detailed drawings, will aid in making the latter clear. Make the frame C, as detailed in Figs. 5 and 6, $\frac{3}{8}$ by $1\frac{3}{4}$ by 11 in. long, with an opening cut in the center, 1 in. wide, 1 in. from the rear, and $1\frac{1}{4}$ in. from the front end. Make the cross-piece D $\frac{3}{8}$ by $1\frac{3}{4}$ by $5\frac{7}{8}$ in. long; the gun support E, as detailed in Fig. 4, $\frac{3}{8}$ by $1\frac{5}{16}$ by $6\frac{1}{4}$ in. long. Shape the support E as shown. Fasten the frame C and the cross-piece D with screws, setting the piece D $5\frac{3}{4}$ in. from the front, and its left end 3 in. from the side of the frame, as shown in Fig. 5. This is important, as the fitting of the

made also. Cut the stock for the front support J, for the rubber motor, $4\frac{1}{8}$ by $3\frac{3}{4}$ in. long, and shape it as shown in the detail, Fig. 6. Make the support K from a piece of sheet metal, in general shape similar to that used for support H, the dimensions being made as required, and no spring arrangement being provided. Drill these metal fittings, as indicated, for the points of fastening, and mark the places for the holes in which shafts or axles run very carefully.

The driving mechanism can then be made, as shown in Fig. 1, and detailed in Figs. 5 and 6. The driving shafts and their parts, as well as the pulleys, can be turned in a lathe, or made from spools, round rods, etc. Make the front axle L, and wheels, joined solidly, $5\frac{3}{4}$ in. over all, the grooved wheels being $\frac{3}{4}$ in. thick, and $1\frac{7}{16}$ in. in diameter. Wires are used as bearings for shafts for the driving axles. If the rear axle is turned in a lathe, it is cut down to the shape indicated, thinner at the middle, to provide a place for the cord connected to the rubber motor. The grooved pulley and the fluted drive wheel at the winding-key end, shown in Fig. 5, are then cut loose; the drive wheel on the other end is cut loose, forming three sections, mounted on the wire axle, one end of which is the winding key. Ratchet wheels, M, are fitted between the ends of the center section and the adjoining pieces, the ratchet wheels being nailed to the center section and soldered to the wire axle. Pawls, U, are fitted to the inside of the two end sections, as indicated in Fig. 1 and in Fig. 5. When the rubber motor is wound up on the drum, the tractor bands are gripped until it is desired to start the tank on its trip. Then the power is communicated from the drum, or center section of the axle, to the drive wheels by means of the ratchet wheels, acting on the pawls.

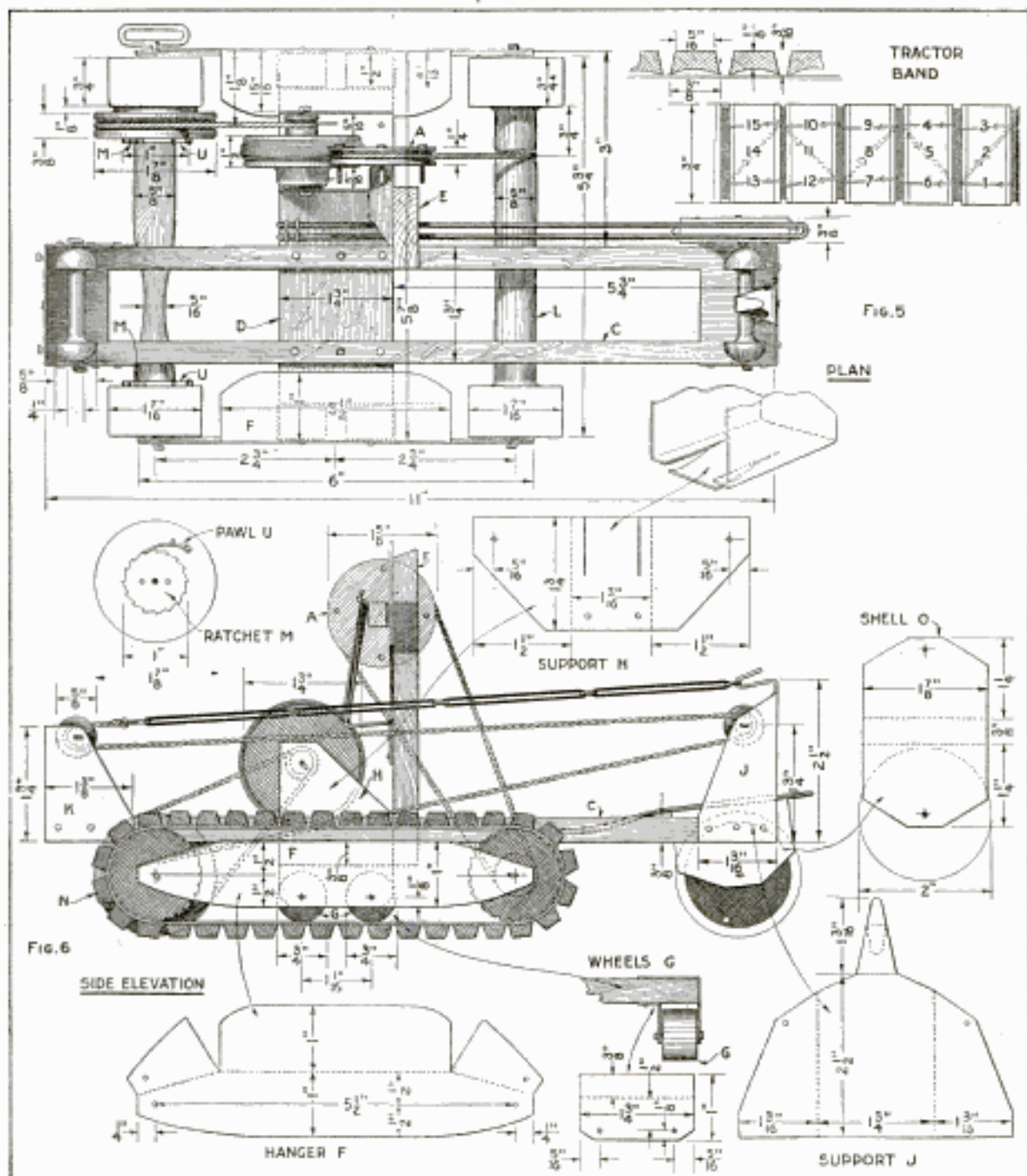
Mount the hangers F on the center crosspiece D, fitting the axles of the drive wheels into place. Make the weighted flywheel, and mount it on its shaft, as shown, lining it up with the pulley on the rear drive shaft. Fit the

supports J and K into place, setting spools for the rubber-motor cord in place, on wire axles. Arrange the belt from the flywheel to the drive shaft, and connect the rubber bands for the rubber motor as shown. Fasten one end in the hook of support J, and pass the winding cord through the spools, and fix it to the drive shaft. The device can then be operated with the fluted drive wheels, bearing on strips of wood for tracks.

The tractor bands N are fitted over the drive wheels, as shown in Fig. 6. They are built up of canvas strips, on which wooden shoes are glued and sewed, as detailed in Fig. 5. The stitches which reinforce the gluing are taken in the order indicated by the numerals. The pilot wheel is 2 in. in diameter, and sharpened at its circumference. Make a metal shell, O, for it, as detailed in Fig. 6. Solder the shell to the double wire, which supports the wheel and gives it a spring tension to take obstructions nicely. The wire is fastened to the crosspiece D, as shown in Fig. 5.

The gun and its mechanism can be made handily before the support E is fixed into place at the front of the crosspiece D. Shape the magazine P from sheet metal, making it $2\frac{5}{8}$ in. high, as detailed in Fig. 4. Make the gun Q from a piece of sheet metal, as detailed, cutting the metal to the exact dimensions indicated. Mount the magazine and the gun, and arrange the wire hammer R, and the rubber band that holds it. Fit the pulley A into place on its axle, supported by a small block of wood. Belt it to the front drive-wheel axle, as shown in Fig. 5, after the gun support is fastened into place with screws. Make the projectiles of wood, as shown, and the fighting tank is ready to be tested before putting on the armor.

The armor is made of one deck piece, S, Fig. 3, into which the covered turret is set, and two side pieces T, as detailed in Fig. 2. Make one left and one right sidepiece, allowing for the flanges all around, to be bent over and used for riveting or soldering the



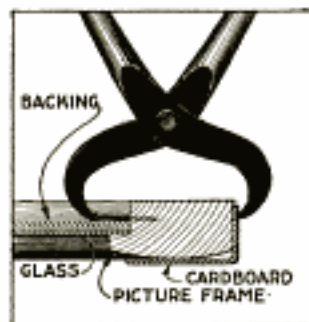
Plan and Side Elevation of the Interior Mechanism, with the Armor Removed, and Details of the Metal Fittings, the Ratchets, and the Tractor Bands

armor together. The bottom extension on the sidepieces is bent double to form an angle, on which the armor is supported, where it rests on the top of the hangers F. The turret is fitted to the deck by cutting notches along its lower edge, the resulting strips being alternately turned in and out along the point of joining, as shown in Fig. 3. When the armor is completed, it is fitted over the main frame, the gun

projecting from the turret. Small pins hold the ends of the armor solid against the ends of the main frame C, so that the armor can be lifted off readily. The various parts of the fighting tank can be painted as desired, care being taken not to injure the points of bearing, on the axles and pulleys, which should be oiled. Silver bronze is a good finish for the exterior of the armor, which may be decorated with a coat of arms.

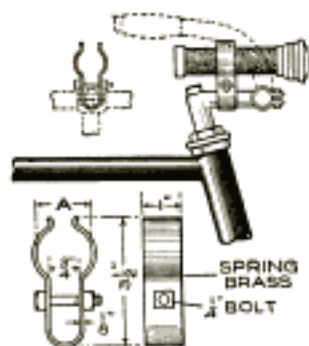
Plier Drives Nails in Backing Picture Frame

The fastening of a picture into a frame by the use of brads, or tacks, driven into the frame behind the backing is often done carelessly, because it is difficult to do a neat job with an ordinary hammer. A much better way of driving in these nails is to use a plier, as shown. Protect the edge of the frame with a layer or two of cardboard, and start the nail carefully, forcing it in by steady pressure on the plier handles.



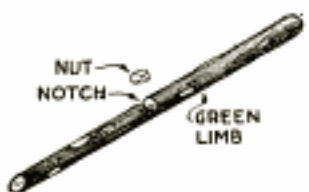
Clip Holds Flash Lamp on Handlebar as Headlight

An ordinary pocket flash light makes a satisfactory headlight for a bicycle if fitted to the handlebar with a suitable clip. The arrangement shown makes it possible to remove the light quickly for use in the usual manner. The clip, as detailed, is of spring brass and is clamped over the post of the handlebar.—P. P. Avery, Garfield, N. J.



A Backwoodsman's Nutcracker

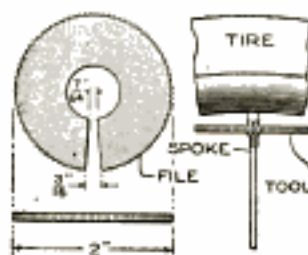
Most persons know what a difficult job it is to crack hickory nuts, unless provided with a suitable hammer, or other tool, for the purpose. When nut hunting, such tools are usually not at hand, and a method used by an old backwoodsman will be of interest.



First he cut a hickory limb, about 2 in. thick and 3 ft. long. In the center of the limb, he cut a square notch, about halfway through, and just large enough to admit a nut. Then placing one end of the limb on the ground, the other end held in the left hand, he placed a nut in the notch, and bent the limb slightly. This brought the edges of the notch closer together, and cracked the nut neatly.—C. M. Vaiden, Portland, Ore.

Handy Tool for Tightening Wire Spokes in Wheels

The wire spokes in bicycle and similar wheels often become loose, and a small pocket device for tightening them on the road is handy. A satisfactory one can be made quickly from a washer, 2 in. in diameter, cut as shown. A tapering slot is cut to the center of the washer to engage the nipples of various-sized spokes. The outer circumference of the washer is filed with a triangular file to provide a good finger grip.—H. E. Randell, Boston, Mass.



Bottle Economizes Spray Liquid in Atomizer

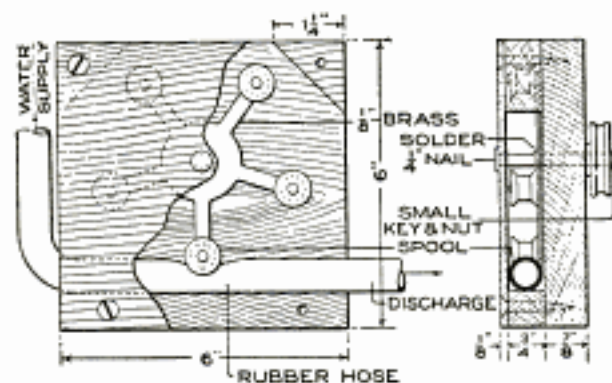
Atomizers are sometimes provided with delivery tubes the lower ends of which are $\frac{1}{4}$ in. or more above the bottom of the reservoir, thus rendering useless considerable of the spraying liquid. To overcome this waste, in the case of expensive sprays, a small homeopathic vial was filled with the liquid from the bottom of the reservoir, and lowered into the bottle, as shown. The delivery tube of the atomizer was



set into the vial, and the cap screwed on. By this means almost every drop of the spraying fluid was utilized.—Carl L. Hartshorn, West Haven, Conn.

A Small Rotary Pump Easily Made

This small power pump is made from a block of wood, a piece of rubber hose, and a 5-arm rotor of brass, with small spools attached to it. The base of the casing is 6 in. square, and of $\frac{7}{8}$ -in. wood. A $\frac{3}{4}$ -in. triangular block is set at each corner, and a $\frac{1}{8}$ -in. cover of wood, fastened at the four corners with screws. A large nail is used as a shaft for the rotor, which is cut from brass, $\frac{1}{32}$ to $\frac{1}{16}$ in. thick. Small spools are mounted on the arms of the rotor, and the small pulley wheel is fixed on the end of the axle. The action is simple: As the rollers on the arms revolve against the hose, the force of the stream at the discharge end is increased, the



The Rotating Spools Press against the Water Hose and Force the Water from It at Increased Pressure

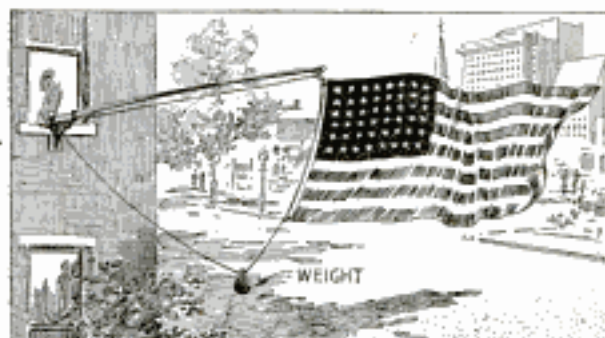
device acting as a pump. Such an arrangement was used for moving targets in a rifle range, and can be built on a larger scale if desired. A small water, or electric, motor is used to drive the pump.—S. A. Hardy, St. Paul, Minn.

Cleaning Type Cases with Bicycle Pump

Type cases can be cleaned easily by using a bicycle pump, which will blow the dust out. Typewriters and other small machinery can also be cleaned this way. A long hose used with a foot pump is often preferable to the hand pump.

Weighted Rope Holds Flag Upright

A householder devised a simple and effective method of keeping the flag upright when displayed from a nearly



This Weighted Rope Permits the Flag to Fly in Its Natural Position

horizontal flagstaff. The cord which held the flag was run through pulleys, as indicated, and weighted with a pulley weight.—M. T. Kanary, Chicago, Illinois.

Homemade Gate Sign with Metal Letters

Needing a permanent sign to be mounted on an iron gate, I made one of metal, which is more durable and better-looking than most wooden or other common signs that the home mechanic can make. I used sheet metal and marked out the letters to cut them from the smallest possible strip, by reversing some of them. They were cut out with snips and chisels, and the edges filed smooth. The letters were then soldered to heavy wires, which

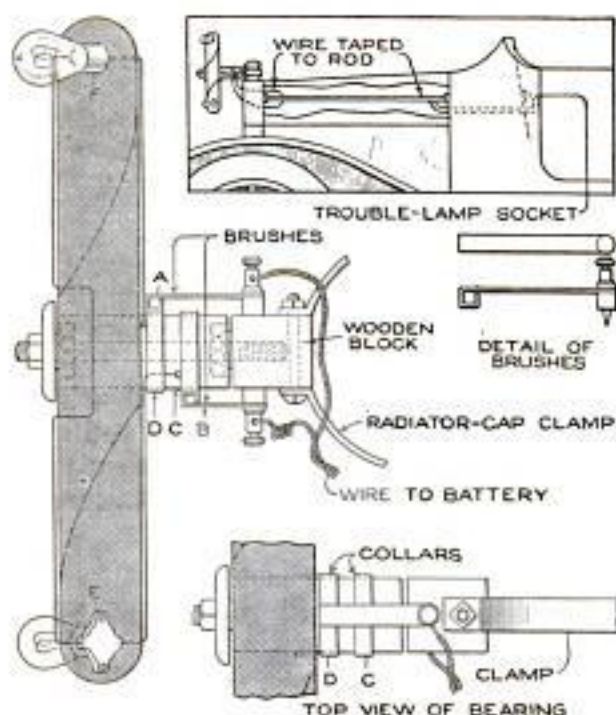


The Metal Letters were Quickly Made and Are Durable as Well as Neat

were bolted to the gate by means of sheet-metal straps and bolts, as shown. The letters should be polished from time to time, especially if made from brass or copper.—Hugo Kretschmar, Brooklyn, N. Y.

Lighted Whirling Fan Used as Radiator Ornament

An ornament for the automobile-radiator cap that attracted a great deal of attention at night was made by



Homemade Ornament for an Automobile Radiator Revolves with the Bulbs Lighted, Attracting Attention

attaching two incandescent lamps to the blades of a small propeller, which is whirled around by the wind. By using the shaft on which the wheels of a roller skate revolve, ball bearings were provided. One end of this shaft is held rigid in a block of wood.

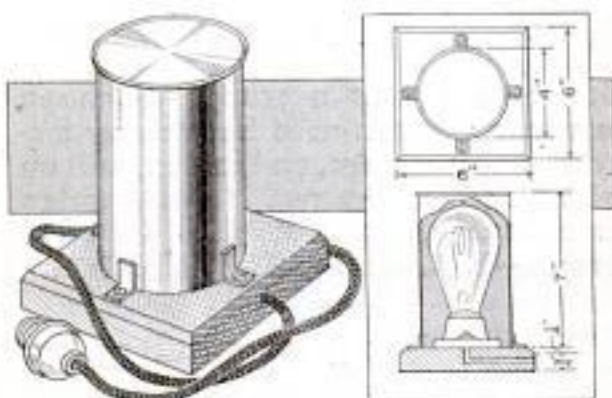
The wires which lead from the propeller are run under the hood, and attached to the socket for the trouble lamp. They are taped to the rod that braces the radiator, to avoid a short circuit, and then out from under the hood at the radiator cap, and connected to the brushes A and B. The incandescent electric-light bulbs are attached to the ends of the propeller blades and connected in series. The wire is run from one side of the socket E to the collar C, and soldered to the latter. The wire from the other side of the socket is connected to the other lamp F. The other wire from this lamp socket at F is soldered to the other col-

lar D. The brushes are made by bending a strip of copper into the shape shown in the detail, and fastening it to the wooden block by means of screw binding posts, soldered to the strips.—F. Lloyd Adams, Jersey City, N. J.

A Fifty-Cent Electric Stove

Few persons realize what an intense heat may be developed when the globe of an ordinary incandescent lamp is tightly inclosed, largely eliminating the loss of heat. When the lamp is inclosed, the temperature will increase until the rate of radiation is equal to that at which the heat is generated. A good reflector is a poor radiator, hence, when the metal wall surrounding the lamp is bright and shiny, both inside and out, the heat is reflected inward.

To make a small stove that will keep liquids warm, melt paraffin, dissolve glue, etc., procure an ordinary 16-cp. carbon lamp, a porcelain receptacle, and a bright, clean tin can, about 4 in. in diameter and 7 in. long. Thoroughly blacken the bottom on the inside, and then solder on four small brackets, cut from sheet brass or copper, so that the can may be held down firmly, when inverted on the base. The latter should preferably be made of hard wood, with the upper edges beveled, as shown. Next bore the hole for the wire or flexi-



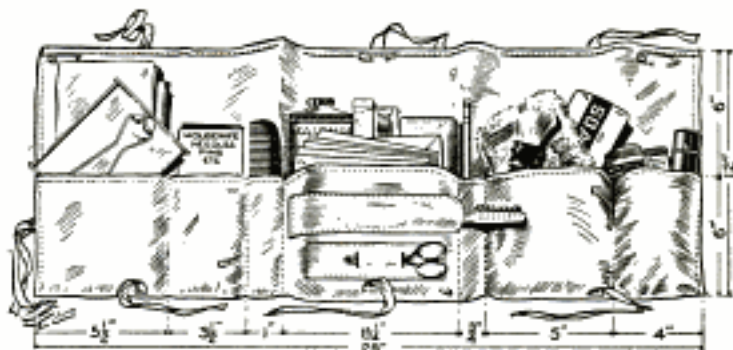
A Handy Electric Stove can be Made at an Outlay of 50 Cents

ble cord. Fasten down the porcelain receptacle, connect the wiring, screw in the globe, and screw down the tin can; the stove is then ready for operation.—John D. Adams, Phoenix, Ariz.

A Soldier's or Traveler's Kit for Sundries and Toilet Articles

A soldier's kit approved by a colonel of the national guard because of its compactness, can be made easily of a band of khaki cloth. The kit, including the "housewife," requires cloth, 27 in. wide. Cut 12 in. from one end for the housewife, which is 12 by 5 in. wide. To make the housewife, fold under the edges $\frac{1}{4}$ in., and fold one end over $2\frac{1}{2}$ in. and the other $1\frac{1}{2}$ in. for pockets. In the larger center pocket can be placed court plaster, adhesive tape, photographs, letters, etc. Bind the edges $\frac{1}{4}$ in., and form other pockets, as shown. The entire kit weighs $1\frac{1}{4}$ lb. and can be carried by the soldier in his army blanket. The housewife, if necessary, can be removed and taken

to the firing line. Handy articles to be fitted in the kit are mirror that can be hung up, comb, box of talcum powder, cold cream, tooth paste, pencil, wash cloth, soaps, shaving brush, toothbrush, and scissors. Three safety pins



The Soldier Appreciates a Handy Folding Kit, Especially If the Girl He Left Behind Made It

at the top of the bag enable it to be hung up in the tent. Strong binding tapes are sewed to the bag, and it can be folded handily in three sections.—Kate Thomen, Topeka, Kans.

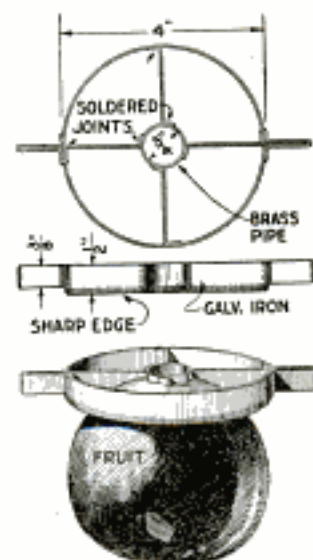
Cooling Foodstuffs with a Moist Rag and a Draft

It is not always necessary to keep milk and butter, or other foodstuffs, in refrigerator temperature to preserve them, for 50 or 60° will often serve quite as well where the articles are to be consumed within a short time. To accomplish this slight degree of cooling, wrap a moist linen cloth, single thickness, snugly about the dish or package, and place it in a shallow pan of water, in an open window, out of the sun. The brick of butter should be placed on a support to hold it out of the water. The cooling is due to evaporation from the moist cloth. Not infrequently on a warm summer day, a thermometer with a bulb, wetted as suggested, will be 20° cooler in a breeze, than a dry-bulb thermometer.

CA table of decimal equivalents, or other information can be mounted in shellac, at an angle to be easily read, at the head of a T-square, and is quite convenient.

Device Quarters and Cores Apples and Other Fruit

To provide a simple homemade device for cutting apples and other fruit into quarters and at the same time removing the core, the arrangement shown in the sketch was made. The circular frame is built up around a ring, $\frac{3}{4}$ in. in diameter, and the ribs and handles are soldered to it. A strip of galvanized iron, $\frac{1}{2}$ in. wide, was used for the cutting portion, and the lower edge was filed sharp, and then finished with a small oil stone. In use, the cutter is set over the fruit, as shown, and by pressure on the handles, it is cut neatly.—L. N. Brown, Baltimore, Md.

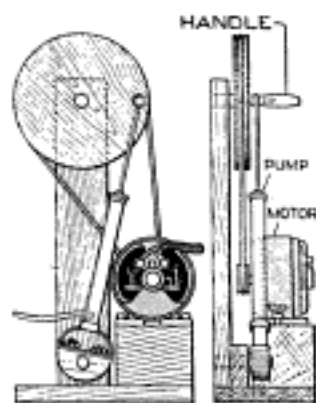


Detachable Motor-Driven Tire Pump Made of Foot Pump

To make this motor-driven pump, which I use with considerable success,

I fitted a bicycle foot pump to a stand, arranging it to be detached quickly. A 4-in. wooden disk was cut in two, and one-half bolted to the stirrup of the pump. A wheel, 14 in. in diameter and 2 in. thick, was

mounted on a 2 by 6-in. support, as shown. A crankpin at the outer edge of the large wheel was connected to the plunger of the pump. The latter may be run with an electric motor, belted as indicated, or with other power. I use a small homemade water motor described in "Shop Notes," with excellent results.—R. S. Matzen, Fort Collins, Colo.

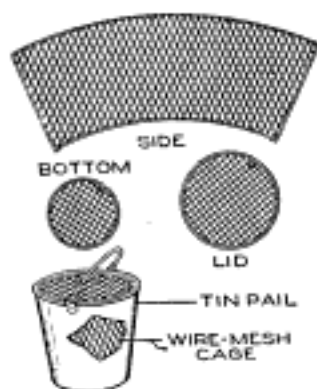


Fisherman's Pail with Wire-Mesh Cage

Oftentimes the fisherman takes a pail along on a fishing excursion so that

he may bring back his catch alive, to put it in a water tank, or to keep the fish fresh. The water in an ordinary pail soon becomes stale, and the fish may die before he reaches home. They should be kept in

the water of the lake or stream until the fisherman goes home. A good means of caring for them, superior to the common string, is to make a wire-mesh container, to fit inside the water pail, as shown. The mesh form can be lifted out, carrying with it all of the fish in the pail, and be set in the fresh water.—Dale R. Van Horn, Milton, Wisconsin.



Reinforcing a Strained Auto-Truck Frame

The side member of an automobile-truck frame was overstrained, and started to sag. To replace it with a new channel piece was out of the question, so it was decided to repair the trouble. A piece of $\frac{3}{16}$ -in. plate steel was cut to the proper length, in a truss-shape, wider at the middle than at the ends, to carry the load properly. It was riveted to the strained member by means of $\frac{5}{16}$ -in. round-head rivets, and prevented further sagging.

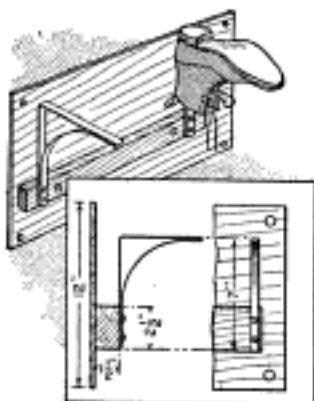
Drying Rack for Shoes and Rubbers

Footgear is injured when not properly dried out after use in water

or in rough weather, and to care for the shoes, rubbers, etc., I made a rack fitted behind a stove on which they are dried out quickly and thoroughly. The rack consists of a row of brackets

made of strap iron, bent as shown in the sketch, and the shoes are slipped on them. The brackets are mounted on a strip of wood, which is fastened to the wall with screws. A thin piece of board or sheet metal protects the wall.

—Edgar Morgan, Robbinsdale, Minn.



Keeping Scissors Blades Apart Lengthens Their Service

Scissors will wear better and keep their cutting edges longer, if they are kept hanging up with the blades apart when not in use. The better-grade scissors, especially the longer pairs, are made with each blade slightly bowed, so that in cutting, the edges cross at an angle near the cutting point. Keeping them closed tends to weaken the springiness of the blades, and the points are worn by contact under tension.—John M. Bonbright, Philadelphia, Pa.

Making Lead Soldiers and Similar Small Castings

By E. R. GARFIELD

THE boy who likes to play games in which the lead soldier and other features of imitation warfare have a part, can make his own lead soldiers, and other castings, by the use of a plaster-of-Paris mold. If he cannot undertake this work alone, the process is interesting for his older brother, or even for "daddy." A mold of plaster of Paris, as shown in the illustration, is used for the casting box. The hollow impression of the soldier is filled with the molten lead, which is poured in through the sprue hole at the top. When the lead cools, the mold is opened, the casting removed, and the process repeated. An entire army can thus be made with a single mold.

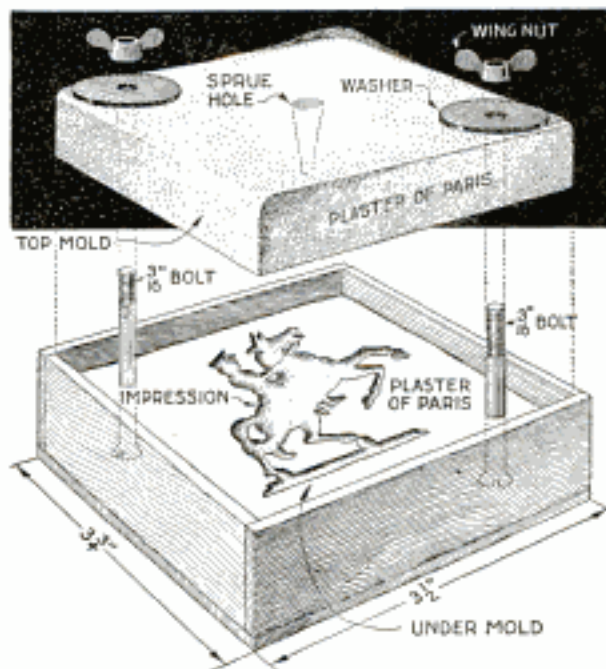
First obtain a small lead soldier, and coat it with shellac. Make a box somewhat larger than the pattern for the soldier, as shown in the sketch. Make it about $1\frac{1}{2}$ in. deep, and set bolts near the corners, as shown, pouring the plaster around them. Fill the box half full of plaster of Paris. While still soft, press the pattern into the center of the plaster so that half its thickness is imbedded. Permit the under mold to dry, and remove the pattern. Shellac the surface of the plaster and the impression. Wrap a layer of oiled paper around the bolts. Replace the pattern in the impression and fill the remaining half of the box with plaster, and permit it to dry.

Also make a small wooden plug, and set it in the center, its point touching

the pattern, and pour the plaster around it. When the mold is dry remove this plug, thus forming the sprue hole, through which the molten lead is poured into the mold.

When the second part of the mold is dry, lift it carefully from the under mold, and remove the pattern. Shellac the surface of the top mold, cleaning away any small bits of plaster around the edges. Trim down the box so that the top mold projects over it about $\frac{3}{8}$ in., making it easy to drop the top mold into place over the bolts. To use the

mold, make certain that it is clean inside and set the top into place. Fasten down the wing nuts at the washers. Be very careful that the mold is dry, as hot metal poured on a wet surface may cause a dangerous splash. Repeat this process, and if care is taken, about 300 castings can be made with one mold. The soldiers can be painted suitably and even sold in sets. The process can be adapted to



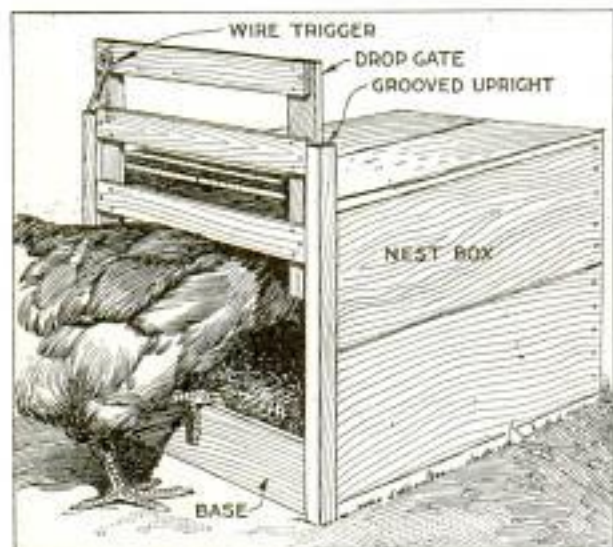
Lead Soldiers, and Many Other Small Castings, can be Made by the Use of This Plaster-of-Paris Mold

many forms of other small castings, using other suitable metals, or wax, where the casting is to be molded into shape further.

A Trap Nest for the Poultry House

Poultry raisers find a trap nest useful, and one can be made quickly by fitting an old packing box with a suitable sliding gate. In the arrangement shown, the gate is raised slightly as the hen enters the nest box, releasing the spring and causing the gate to drop.

The gate and spring can be adjusted to various-sized breeds of poultry. The two grooved uprights can be cut

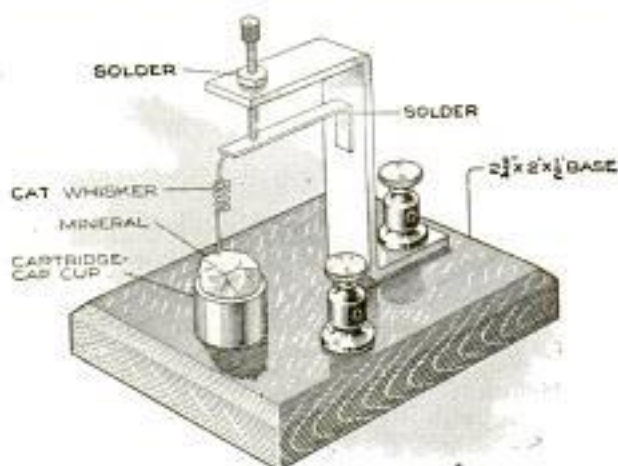


The Trap Nest Automatically Closes as the Hen Enters the Nest Box, Releasing the Trigger

from flooring and the other wooden parts made from laths or wooden strips. The trigger is made of wire.—A. J. Call, Hartsville, Mass.

A Simple Wireless Detector

A cheap and serviceable wireless detector was made from odds and ends such as any amateur can obtain. The base was made of wood, saturated in paraffin. The mineral cup is a brass cap from a cartridge fuse. The upright was



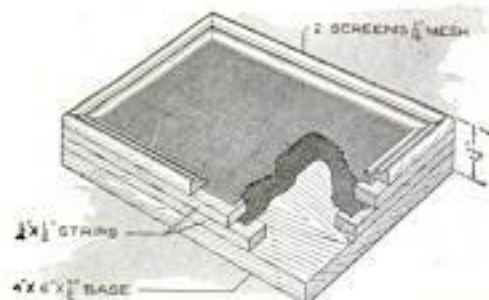
This Neat Wireless Detector was Made of Materials Easily Gathered in the Boy's Workshop

made of a piece of copper, $\frac{1}{2}$ by $4\frac{1}{2}$ in. long, and is fastened to the base by an old-battery binding post. The spring which supports the cat whisker is made

of a strip of copper, $\frac{1}{32}$ in. by $\frac{3}{16}$ in. wide. The cat whisker is soldered to the spring, and the spring is bolted to the upright. The setscrew, which regulates the pressure of the cat whisker upon the mineral, works in a nut, soldered over a hole in the top of the upright. The cat whisker is made of No. 22 gauge bare copper wire. The connection between the cup and the battery binding post, at the front edge, is made on the under side of the base.—Charles Brinkmann, Chicago, Ill.

A Wire-Screen Pincushion

Pins placed in a pincushion like that shown automatically arrange themselves vertically, head up, so that they may be removed handily when needed. The pincushion is durable, and a useful device for the desk. It is made by binding two layers of ordinary screen wire between wooden frames, mounted on a wooden base, $\frac{1}{4}$ in. thick, $2\frac{1}{2}$ in. wide,



Pins Placed in This Durable Desk Pincushion Arrange Themselves in Vertical Position, Head Up

and $3\frac{1}{2}$ in. long. The frame can be finished neatly, and made of hard wood to match other desk fittings.—D. J. McKean, San Francisco, Calif.

Straightening Sheets of Paper

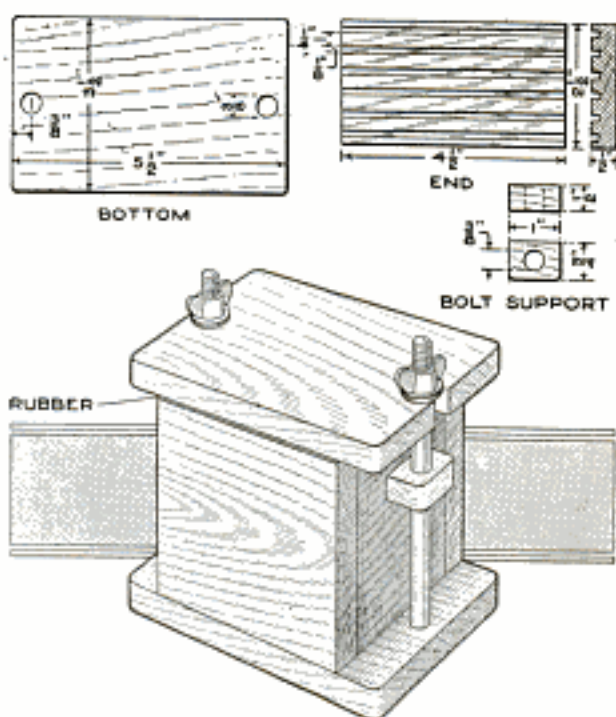
When a sheet of paper, a drawing, or a blueprint becomes curved or warped, it is annoying to use the sheet unless it is straightened. An easy method of doing this is to lay the sheet flat on the edge of a drawing board or table and draw it down over the edge, the hand pressing down on the paper, stretching it out. This, repeated several times, will soon smooth a much-curved sheet.

A Reversible Photographic Developing Tank

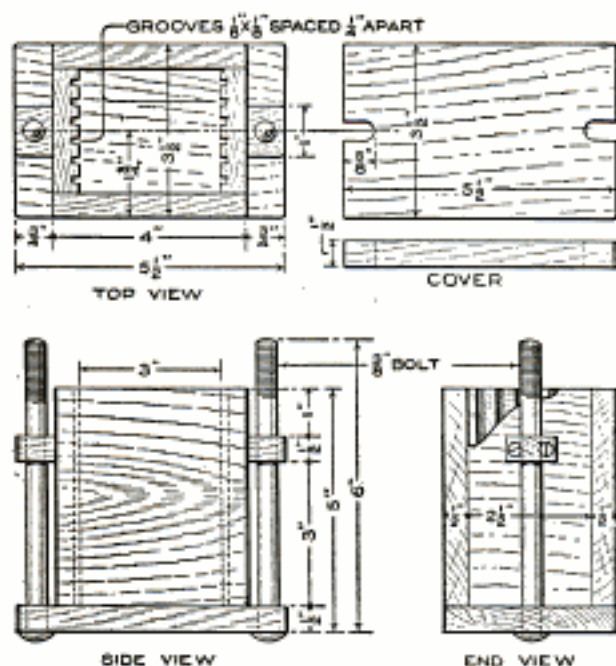
By LAWRENCE F. CAMPBELL

ONE of the chief difficulties in developing plates in a nonreversible developing tank is that irregular development takes place, because the developer tends to settle more or less, depending on the time necessary for complete development. The construction of a reversible tank is a simple matter, and the cost is slight. The tank described is $3\frac{1}{4}$ by $4\frac{1}{4}$ in. in size, but the dimensions can be varied for other sizes of plates. The tank is a box having grooves in opposite ends for the plates. By placing the latter back to back, 12 can be developed at a time. Sheet rubber is fitted between the cover and the body of the tank, and the cover, upon being screwed down, makes a water-tight compartment of the box. The asphaltum paint used is not affected by the developer, and preserves the wood. Fixing and developing may both be done in the one tank, but it is preferable to use the tank for developing only.

and extending the length of the piece, which is $\frac{1}{2}$ by $2\frac{1}{2}$ by $4\frac{1}{2}$ in. long. The grooves can be made either on a



The Finished Tank, and Details of the Bottom, Ends, and Bolt Supports



Assembly Views, Showing the General Construction and Detail of the Cover

The two sides are plain pieces, $\frac{1}{2}$ by 4 by $4\frac{1}{2}$ in. in size. The end pieces have $\frac{1}{8}$ by $\frac{1}{8}$ -in. grooves, $\frac{1}{4}$ in. apart

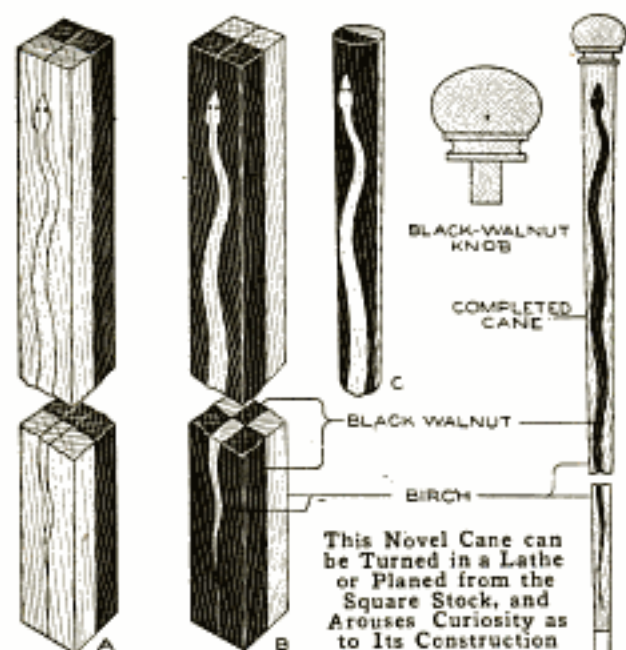
power saw, or by chiseling them out by hand. The bottom piece is $\frac{1}{2}$ by $3\frac{1}{2}$ by $5\frac{1}{2}$ in. in size, with two $\frac{3}{8}$ -in. holes bored to receive the bolts. The two bolt supports are $\frac{1}{2}$ by $\frac{3}{4}$ by 1 in., and are also bored $\frac{3}{8}$ in. to receive the bolts, and are nailed to the end pieces. The cover is $\frac{1}{2}$ by $3\frac{1}{2}$ by $5\frac{1}{2}$ in. long, with a slot in each end for the bolts, which are $\frac{3}{8}$ by 6-in. carriage bolts.

The parts are assembled with screws, and the tank is given two coats of asphaltum paint. Care should be taken, before assembling the parts, to insure that the plates fit the grooves.

Turned Cane with Snakes Inlaid

The making of a cane is a favorite job for the home craftsman, especially the veteran who finds himself in need of such a support and has the leisure to make it. A novelty in constructions of this kind is a turned cane built up of

dark and light-colored woods with snakes inlaid. That shown in the illustration was made of black walnut and birch, with a walnut knob. It is made as follows: Glue up a piece of walnut



and a piece of birch, $\frac{7}{8}$ by $1\frac{3}{4}$ by 3 ft. long, as shown at A. Mark out the snake on the birch surface, and cut it out very carefully on the band saw, or with a fine hand turning saw. The snake portion will drop out and is then separated into a walnut and a birch strip, making two similar snakes. Bore holes for the eyes and plug them with the opposite kind of wood. Replace the snakes in opposite positions, the one of birch in the walnut side, and the walnut one in the birch side. Glue them carefully into place, removing a small portion of the wood at the ends of the sawed pieces to make a close fit.

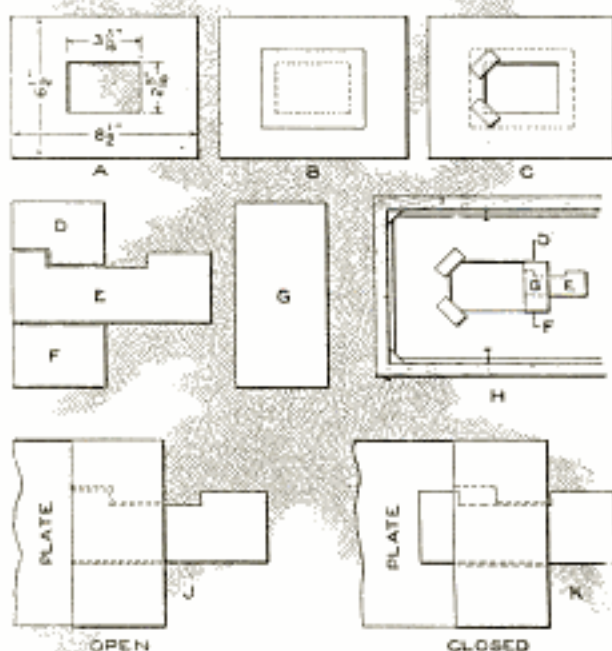
The stock then appears as at B, and is ready for turning in the lathe. If desired, circles may be laid out on the ends of the stock, and the piece planed down to the rounded and tapered form of a cane. This is a more tedious job, but if carefully done with sharp tools will give good results.

Turn down the shaft to the desired thickness, as shown at C, the upper end being about 1 in. and the lower end $\frac{1}{2}$ in. in diameter. Turn a knob of walnut as suggested, and after sandpapering the work carefully, finish it with

shellac. Tip the bottom of the cane with a suitable ferrule.—E. K. Wehry, Cedar Rapids, Ia.

An Inexpensive Dry-Plate Kit

Wishing to use some $2\frac{1}{4}$ by $3\frac{1}{4}$ -in. plates in a $6\frac{1}{2}$ by $8\frac{1}{2}$ -in. camera, I made kits that proved satisfactory, as follows, the method being adaptable also to other sizes: A piece of cardboard the size of the camera plate was procured. A rectangle, as at A, was cut in the center, $\frac{1}{16}$ in. larger each way than the plate. Paste, over the back of the cut-out rectangle, a sheet of tough, thin paper, B, and glue two small pieces of cardboard, as at C. Cut cardboard pieces D, E, F, and G, proportioned as at H, and glue them into position, G being over the others, the piece E sliding. If a dry plate is placed in the rectangle and E is slid toward the plate, it will hold the latter in position. The plate holder is loaded with the kit, and to prevent warping, a couple of pins are driven into the plate holder, as at H. Figures J and K indicate the open and closed positions. The



This Dry-Plate Kit is Made of Cardboard and Serves the Purpose Admirably if Carefully Fitted

ground glass is marked to correspond with the rectangle, so that one can tell where to focus the image.—L. L. Llewellyn, Piedmont, Calif.

Emergency Tension Weight Used on Typewriter

If the band that draws the typewriter carriage should break, the operator can continue to write until proper repairs are made by a temporary substitute for the spring tension. Tie a string to the carriage, where it will not become entangled in the mechanism, and attach a weight, about equal to the pull of the spring, to the string. Let the weight hang over the edge of the desk, to the left of the machine. It will pull the carriage along, as does the usual tension device.

Improved Penholder Made with Pencil and Clip

An ordinary pencil clip can be used to make a practical penholder by sliding it to the end of the pencil, as shown, and inserting the pen under it. The tension of the clip holds the pen firmly, and provides a serviceable holder, for emergency use, or even for permanent use, where a pen and pencil combined are desired.—Raymond B. Rogers, Portland, Ore.

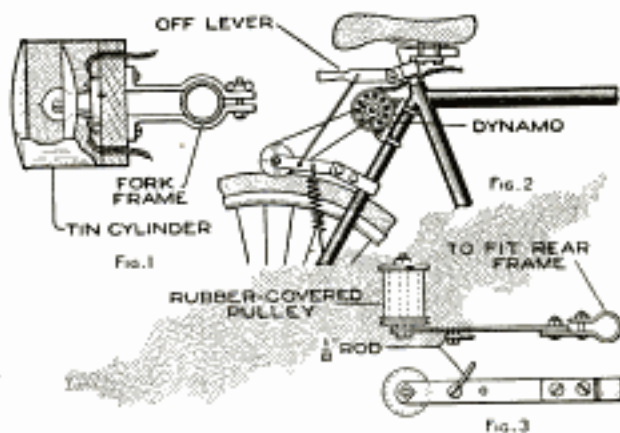


Generator Attachment Provides Current for Bicycle Lamp

Rigging up a small dynamo on the bicycle is a simple job, the dynamo being belted from a friction pulley, making connections with the rubber tire of the rear wheel, as shown. Fig. 1 shows the make-up of the head lamp. It is composed of a tin cylinder, grooved at one end to hold the lens; at the other end of the cylinder is fastened a 3/4-in. wooden disk, to which the lamp socket is fixed. Clamp straps hold the lamp on the fork frame. The small lamp, inserted in the socket, holds the reflector in place.

The dynamo-driving arrangement is shown in Fig. 2, and detailed in Fig. 3. A leather belt fits in the groove side of

the wooden pulley. The swinging pulley arm supports and clamps the driving arrangement. A spring holds the friction wheel against the tire, and to

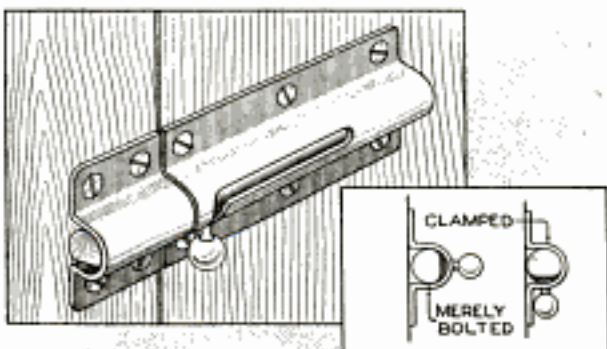


The Dynamo is Operated by a Belt Arrangement Connected to the Rear Wheel, and Supplies Light, and, if Desired, Operates a Horn

release it, the "off" lever is used. A small direct-current dynamo serves well, and may also be used to operate the horn and whistle.—G. F. Thompson, Pittsburgh, Pa.

Eccentric Drawbolt Stops Rattling of Door

A simple method of preventing a bolted door from rattling, by forcing it against the doorstop, or a weather strip, by means of an eccentric filed on the socket end of the bolt, is shown in the sketch. The bolt is fitted closely to the door and casing, and, when the



The Eccentric End on the Drawbolt Holds the Door Firmly, Preventing Rattling

bolt is turned so that the eccentric end is in action, the door is forced firmly against the doorstop.—C. H. Chambers, Schenectady, N. Y.

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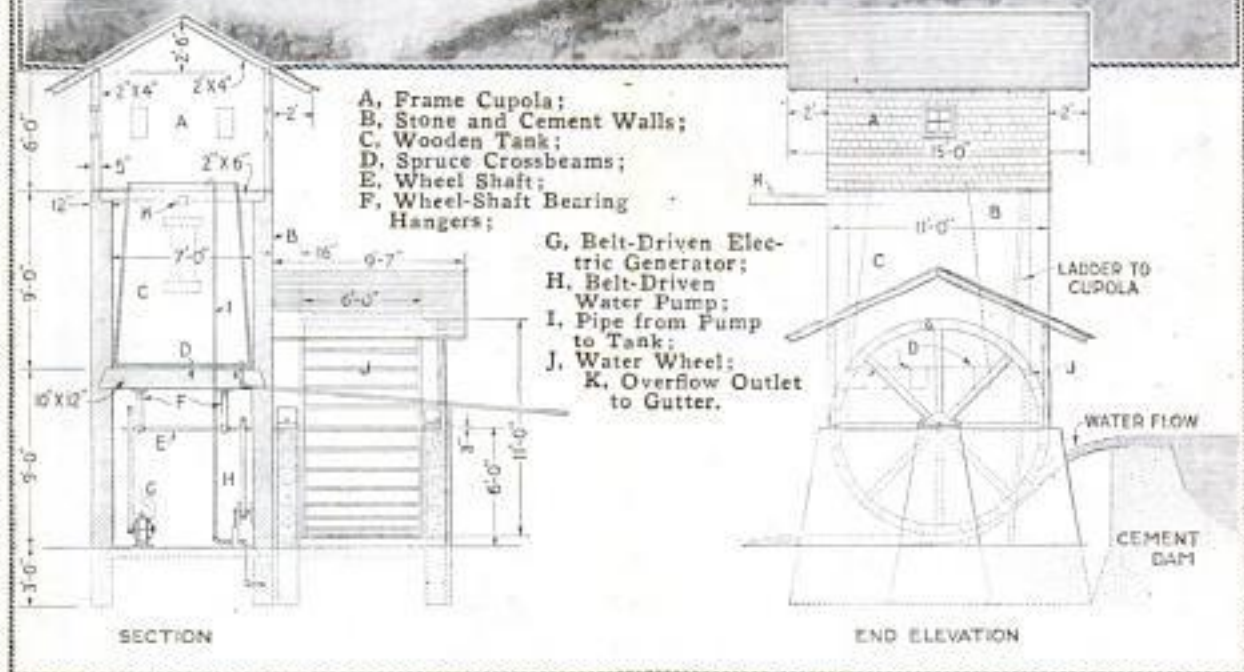
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POWER AND PUMPING HOUSE FOR COUNTRY HOME

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at
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THOSE who desire to utilize the water power available at their country places, may receive a helpful suggestion from an artistic little structure not far from Paterson, N. J., that houses pumping and generating equipment for an adjacent residential establishment. It stands at one end of a concrete dam crossing a branch of Saddle River, and was erected and outfitted at a cost of about \$700. The photograph reproduced at the top of the page amply illustrates the exterior appearance of the building, while the drawings explain many of the details of its construction and the arrangement of its simple equipment. As is made clear diagrammatically, the water wheel drives a pump and electric generator; the one lifting water to an elevated tank that supplies the house piping, and the other developing current for lighting purposes. It will be understood that storage batteries are provided to take up what surplus energy is produced, and reinforce the system when emergencies arise. Obviously, modifications would adapt this type of plant to varied local conditions.

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\$756 for this 6-Room ALADDIN



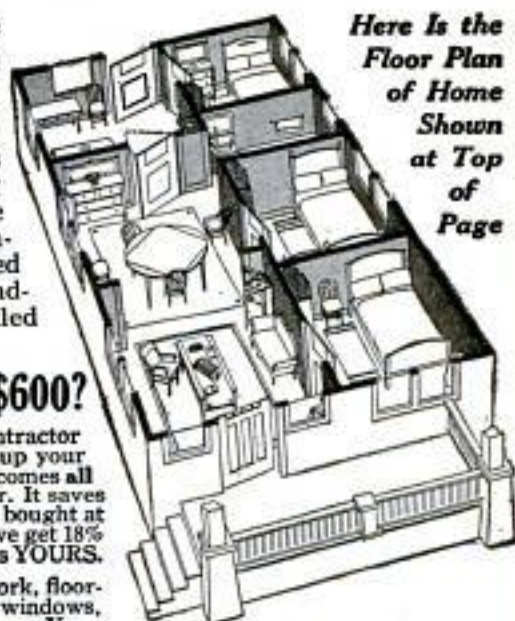
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Floor Plan
of Home
Shown
at Top
of
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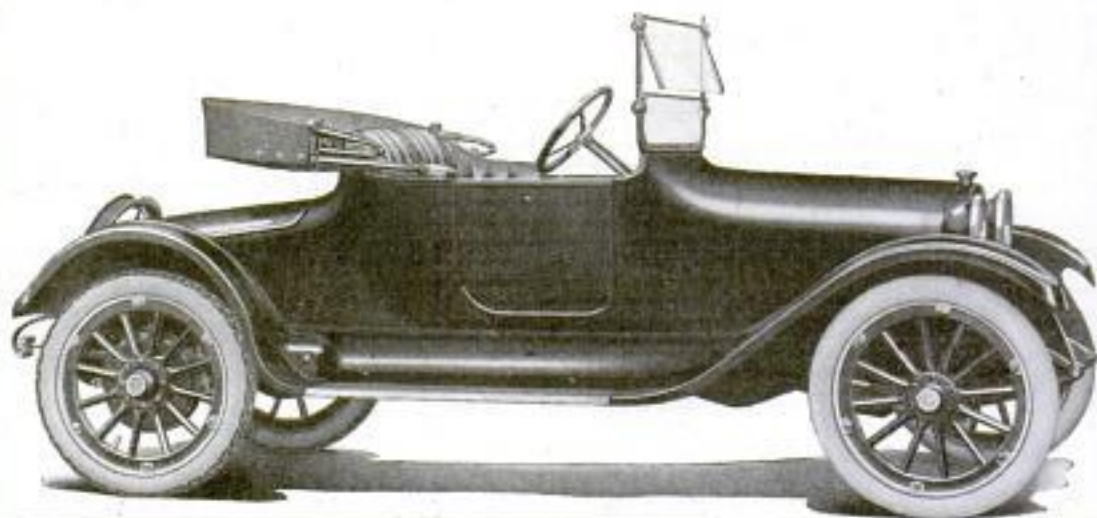
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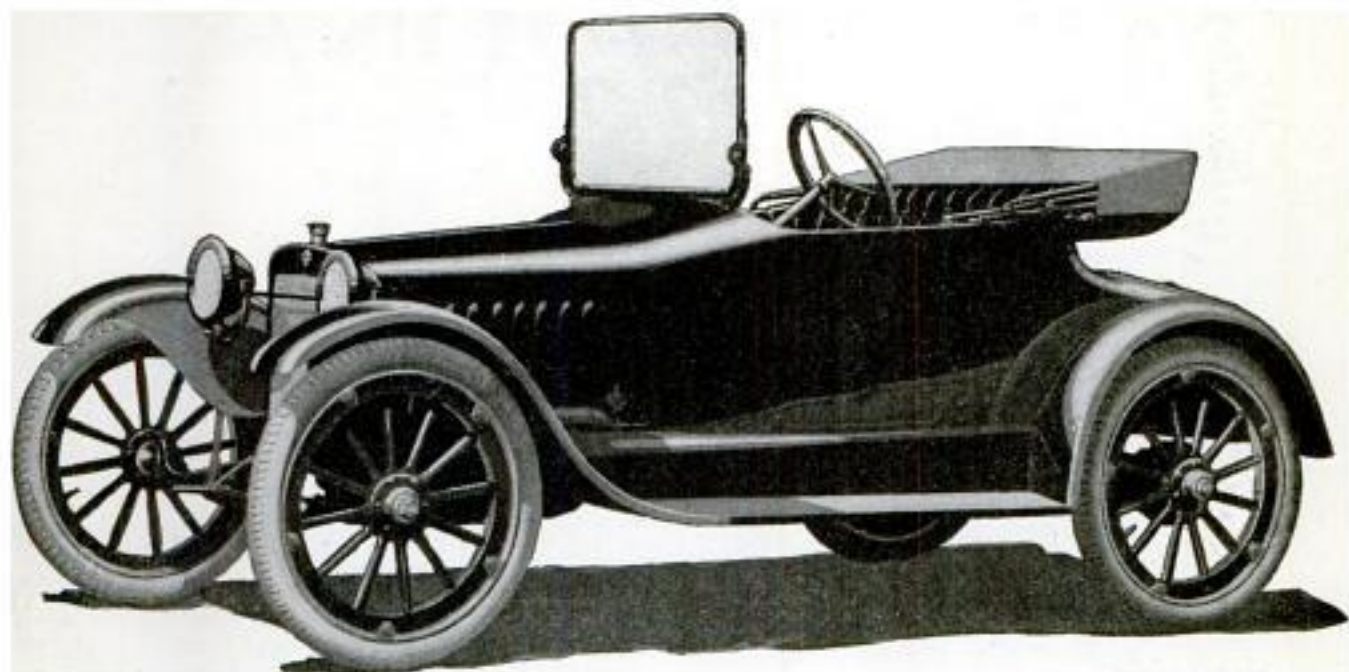
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Williams'

PAT EN TED Holder Top Shaving Stick



IS your beard the wiry kind that grows forty ways for Sunday? Is your skin the tender kind that looks upon a razor as its deadly enemy?

Then try Williams' Holder Top Shaving Stick and see what its rich, soothing, softening lather will do for you. Ask for it by its full name—Williams' Holder Top Shaving Stick—then you will get the firm, dry, metal grip for your fingers; a convenience you will appreciate more and more as the stick grows less.

Send 12c in stamps for trial sizes of the Stick, Powder, Cream, Liquid, and then decide which you prefer. Or send 4c in stamps for any one.

The J. B. Williams Co.
Dept. A.
Glastonbury, Conn.

Add the finishing touch to your shave with Williams' luxurious Toilet Powder.

Liquid

Powder

Cream

Three other forms
of
Williams' Shaving Soap

Please Mention Popular Mechanics



WAR-TIME WATCHWORDS

—Economy
—Efficiency

Accuracy, definite knowledge, saving of time and speeding up of energy are of utmost importance today.

The American Adding and Listing Machine meets these exacting requirements. It combines efficiency and economy for every business no matter how large or how small.



The American Adder
Adds and Lists
Up to One
Million Dollars . . . **\$88**

In operation, the American is simplicity itself. Seven keys do the work of 81 or more. And they are all within the span of one hand.

Machine-Made Totals and Calculations In Your Own Business

Do you have them? They mean unvarying accuracy—they mean definite knowledge—they mean saving of time—and they mean security from loss of money through mistakes.

Crowd mechanical adding and calculations into every possible department of your business. Where efficiency is, mechanical adding and calculating must be.

Money Cannot Buy Better Material

Every part of the American Adding and Listing Machine, excepting the moulded base, is made of selected steel—the same special stock that is used in all expensive adders, typewriters, etc.

"Mail Order" Coupon—Clip and Send Today

AMERICAN CAN CO., Dept. 304
Adding Machine Division, Chicago

Express one American Adder on terms as indicated by cross in square.

Will pay \$4.00 herewith—\$7.00 per month, for 12 months.

Will pay cash in 30 days, less 3 per cent.

Order cancellable in 15 days after delivery, with return of any money paid without argument if machine is not entirely satisfactory.

Name.....

Address.....

Please Mention Popular Mechanics

2 SPARKS TWIN FIRE



The only spark plug of its kind on the market. Fires two separate, distinct sparks at same time—each independently of the other. Double intense sparks on same current as ordinary plug consumes.

Fires two-series sparks. Saves gasoline, reduces carbon and laughs at soot and oil. If one point clogs, the other continues to fire—hot explosions soon clean fouled point. Go to your dealer today. Twin Fire plugs only cost \$1.00. If he cannot supply you, send direct to

Twin Fire Spark Plug Company
660 Woodward Ave., DETROIT, MICH.



Ordinary plug dead when even one point clogs.

DEALERS:
Thousands of motorists are buying Twin Fire Plugs. They're easy to sell. Write or wire for proposition.

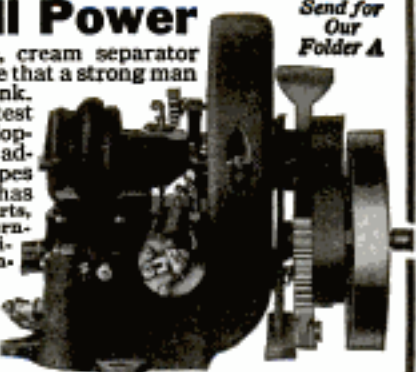


Twin Fire always fires—one point cleans the other.

For Small Power

The wash machine, cream separator or any other machine that a strong man can drive with a crank.

This is the very latest small engine development and a great advance over other types for the purpose. It has no exposed moving parts, is automatically governed, cooled and lubricated. It is even furnished with a combination countershaft and starter. Any woman or child can operate it on gas or gasoline in the house with no inconvenience or danger.



Send for
Our
Folder A

THE ELGIN GAS MOTOR CO.
149 Brook Street ELGIN, ILLINOIS

Teach ^{your} Family to Shoot



They need it in these troublous times. No racket—no disturbance—no sore shoulders. Boys—girls can learn quietly in no time. Big folks too. It's great fun. Make yours a silent rifle for practice or outdoor sport with a

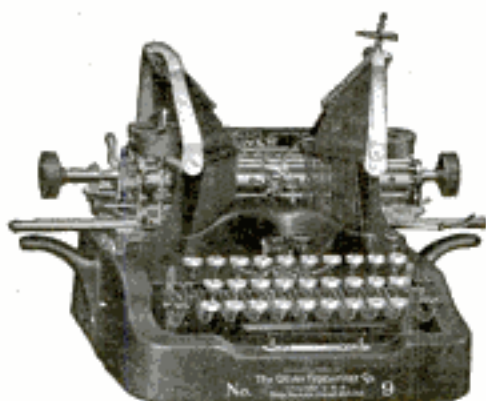
MAXIM SILENCER

Jolly booklet telling of sportsmen and the Maxim Silencer—free. Write today. **FREE BOOK**
The Maxim Silencer Co. 93 Homestead Ave. HARTFORD, CONN.



FREE TRIAL

Keep It
for \$3.00 per Month



Or Return It
At Our Expense

The Oliver Typewriter—Was \$100—Now \$49

A \$2,000,000 Guarantee that it is the Identical Model

Be your own salesman and earn \$51. It used to be that 15,000 salesmen and agents, office rents in 50 cities and other expenses demanded 50 per cent of the price. But all that is ended. You get the identical typewriter formerly priced \$100—not a cent's alteration in value. The finest, the most expensive, the latest Oliver Model. Old methods were wasteful. Our new plan is way in advance. It is in keeping with new economic tendencies. It does away with waste. Inflated prices are doomed forever.

Brand New—Never Used

Do not confuse this with offers of earlier models or second-hand. Note the signature of this advertisement. This is a \$2,000,000 concern.

We offer new Olivers at half price because we have put typewriter selling on an efficient, scientific basis.

You now deal direct—sell to yourself, with no one to influence you. This puts the Oliver on a merit test. No middle men—no useless tolls.

You Save \$51

This is the first time in history that a new standard \$100 typewriter has been offered for \$49. Remember, we do not offer a substitute model, cheaper nor different. But the same splendid Oliver used by the big concerns. Over 600,000 Olivers have been sold.

We ship direct from the factory to you. No money down—no C. O. D.—no red tape. Try the Oliver Nine at our expense. If you decide to keep it, send us \$3.00 per month. If you return it, we even refund the shipping charges. You are not placed under the slightest obligation. That's our whole plan. We rely on your judgment. We know you don't want to pay double. And who wants a

lesser typewriter? You may have an Oliver for free trial by checking the coupon below. Or you may ask for further information.

An Amazing Book

All the secrets of the typewriter world are revealed in our startling book entitled "The High Cost of Typewriters—The Reason and the Remedy"—sent free if you mail the coupon now. Also our catalog. Order your free trial Oliver—or ask for further information at once.

THE OLIVER TYPEWRITER CO.
109-B, Oliver Typewriter Bldg., Chicago

NOTE CAREFULLY—This coupon will bring you either the Oliver Nine for free trial or further information. Check carefully which you wish.

Mail
This Coupon
Now!

THE OLIVER TYPEWRITER CO.
109-B, Oliver Typewriter Bldg., Chicago, Ill.

Ship me a new Oliver Nine for five days' free inspection. If I keep it, I will pay \$49 at the rate of \$3 per month. The title to remain in you until fully paid for.

My shipping point is.....

This does not place me under any obligation to buy. If I choose to return the Oliver, I will ship it back at your expense at the end of five days.

Do not send a machine until I order it. Mail me your book—"The High Cost of Typewriters—The Reason and the Remedy," your deluxe catalogs and further information.

Name.....

Street Address.....

City..... State.....

Oxy-Acetylene Welding and Cutting

The Nation's Scrap Pile is Conservation's Worst Enemy

IN ordinary times scrap pile waste costs American business millions of dollars annually.

Today, conservation is a matter of national necessity. It is imperative that you help to stop this waste.

Analyze your scrap pile. You'll probably find conditions such as our research men are finding in many industries—months' supplies of valuable materials easily available for use by oxy-acetylene welding.

There are thousands of instances where oxy-acetylene welding has made wonderful savings from discarded parts and materials.

Prest-O-Lite engineers have been among the pioneers in welding research. For years they have studied and investigated the uses of the oxy-acetylene process in American industry. All the fruits of this work are yours for the asking. Let us help analyze your scrap pile.

Stop this waste in your business

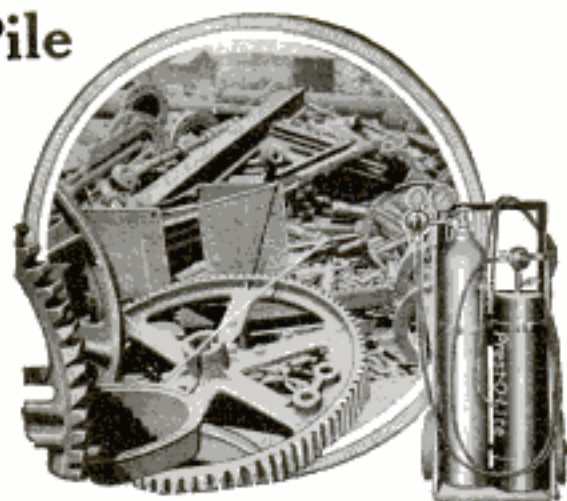
Get a list of the broken and worn parts in your scrap pile today. Let us tell you where welding by the Prest-O-Lite Process will enable you to take certain discarded parts out of scrap and reclaim them at trifling cost.

Our illustrated literature describes hundreds of possible savings—many of them directly applicable to your own problems. Write for it.

Solving problems in production

Oxy-acetylene welding as a production process is manufacturing war munitions, railway supplies, boilers, ships, agricultural implements, delicate surgical instruments—

In fact, wherever two pieces of metal are to be joined, this simple portable process is saving time and materials—giving increased



strength, simplicity and neatness to the product. It is rapidly displacing the bolt, rivet and threaded joint.

Prest-O-Lite PROCESS

High-grade welding apparatus costs but \$75 (Canada \$100); acetylene service at additional cost. Adaptable for oxy-acetylene cutting by the addition of special cutting blow-pipe. Thorough instructions furnished free to every user of Prest-O-Lite—any average workman who understands metals can learn the Prest-O-Lite Process quickly and easily.

Good profits in job welding

Repair shops and service garages are making big profits and saving money for customers by using oxy-acetylene welding to make broken or worn parts good as new.

Job welding offers an unusual opportunity for enterprising mechanics to get in business for themselves. The cost of necessary equipment is low. The big growing demand for job welding insures continuous profits. Write today and get full details.

The Prest-O-Lite Co., Inc.

U. S. Main Offices and Factory
516 SPEEDWAY, INDIANAPOLIS

Canadian General Office
Dept. U TORONTO, ONT.

59 Branches and Charging Plants



World's Largest Makers of Dissolved Acetylene

The Dominant One-Ton Truck Unit



\$350 and Up
F.O.B. Chicago

will convert a Ford or other car into a One or Two-Ton Dearborn Truck that has the Quality, Stability and Carrying Capacity of a Standard Truck costing \$1500 to \$2500 or more.

Dearborn Universal One or Two-Ton Units

are now made to fit ALL makes of Cars—the same sturdy, extra heavy construction throughout that characterizes ALL Dearborn Truck Units, the same care and attention to detail, material and workmanship forces recognition of their superiority in daily service in nearly every line of business—cheaper to operate than a team and wagon.

\$350 and up **DEARBORN** **\$350** and up
One or Two-Ton
Truck Unit

All Dearborn Truck Units are designed so that 90% of the load is carried on their heavy Dearborn Rear Axles, Heavy Springs and Heavy Pruden artillery type Rear Wheels, with guaranteed hickory spokes and felloes. Bock Heavy Duty Roller Bearings, Baldwin Roller Chains, Baldwin Steel Sprockets, Jack-Shaft Hangers and Back-Rod Hangers HOT riveted to frame—not merely bolted.

We Want an Exclusive Dealer in Every Locality

Dearborn Truck Units are built in our own factory under our own supervision by expert auto mechanics and are guaranteed. It is the Biggest Seller in the truck field today and our Dealers are making Big Money. Territory is being rapidly taken under our liberal, exclusive agency plan. It will pay you to write TODAY for particulars and territory desired.

Dearborn Truck Co., Manufacturers
1244-1264 So. Campbell Ave.
CHICAGO

A MONEY MAKER FOR ALERT DEALERS.

Please Mention Popular Mechanics

EXCEPTIONAL-MEN WANTED

Tire Repairing Revolutionized!! Motorists To Save Millions in Tire Expense

A new scientific method of Tire Repairing has been originated—the only Scientific Tire Repair Service known. It strikes a new chord in tire economy. It is done on a standard of efficiency. It saves tires—increases mileage. It lasts. It has required years of experience to develop it. Practical tests have proven it. Its excellence and superiority is acknowledged—accepted by those who know, as a **Triumph**.

30 Million Tires to Repair!

Haywood Stations are to be established at once throughout the country. We want capable, energetic, ambitious men in charge of each—men who are dependable—competent. **You can have this opportunity**—share in the Haywood success—become a link in a mammoth chain of a country-wide, thoroughly efficient Tire Repair Service.

Make \$3,000 a Year or Better!

You Own Your Own Business! Keep Your Own Profits!

Haywood equipment is sold outright. We teach you Haywood Scientific Tire Repairing in our Laboratory especially equipped for this purpose. Here you learn all about tires—the inner mechanism of construction—how to repair **scientifically** every tire injury. This training is thorough—practical and equips you to give Haywood Service of the standard we advertise nationally and are so careful to maintain—the Service that saves motorists millions of dollars in tire up-keep.

A Wonderful Opportunity!

The coupon below—your name and address, brings full particulars. How to start. How to tie up with the Haywood Service. We'll give inside facts and figures about costs and profits. Explains in detail our co-operative plans which mean your Success. Write today without fail. Learn how you can start at once.

Haywood Tire & Equipment Co.
646 N. Capitol Ave.
Indianapolis, Indiana

Mail
This
Coupon
Today

OPPORTUNITY COUPON

Haywood Tire & Equipment Co.
646 N. Capitol Avenue
Indianapolis, Ind.

Gentlemen: Please send full particulars of your Scientific Tire Repair Service and details of your co-operative plans.

Name _____

Address _____



This
Man
Makes

Big Money
Repairing
Tires

Scientifically

Please Mention Popular Mechanics

"Bristol" Steel Fishing Rods Meek and Blue Grass Reels

More people, especially expert fishermen, are buying "Bristol" Rods this year than ever before. Nearly twice as many people are buying Meek and Blue Grass Reels as ever bought them in the past. "Bristol" has won national and international fame by a constantly increasing volume of victories under everyday fishing conditions. There is a model for every kind of fishing. Meek and Blue Grass Reels mean the most perfect reels that have ever been produced—most perfect in material, in design, in workmanship and in operation.

Write for FREE "Bristol" and MEEK Catalogues

THE HORTON MFG. CO. 196 Horton Street, BRISTOL, CONN.

BUILD THIS CAR OR BUY IT COMPLETE Lowest Priced Car in the World



Very fast. Economical. Seats 2 full grown persons. Not a toy. Complete Detailed Drawings, 35c. Catalog 10c. Cycle Car and Light Car parts at low prices. Discount to Agents.

Tribune Engineering Co., Dept. P, Owego, Tioga Co., N. Y.

World's Best Shoe Value \$3.95

Ruthstein's Scientific Shoe for Men made of selected Gun Metal Calf, leather sole; Goodyear Welt finish; comfortable, roomy last; Blucher Lace style; D to EE widths. Money back if examination proves otherwise.

200 OTHER SHOE BARGAINS FOR MEN, WOMEN, BOYS AND GIRLS

Big, New, 1917 Scientific Footwear Catalog shows how to save 20 to 50 per cent on shoes—FREE.

RUTHSTEIN SCIENTIFIC SHOE CO. We Retail at Less Than Wholesale Shoe Prices Dept. 640 RACINE, WIS.

\$3.95

A Baseball Jersey



Be the First in Your Club

School, City or Town, to wear this pure, all wool sweater, double collar and cuffs. Your choice in colors. This jersey was selected by 10,000 of my customers for last season. Your chum will recommend it. Send for my big illustrated catalogue. Write me and learn my offer for your club's order. Popular Prices. Best Grade Sporting Goods—Baseball, Basketball, Tennis, Golf, Football, etc.

WRITE ME NOW.

JACK SHANNON CO., Dept. 46, 54 E. Monroe St., Chicago

Russel Internal Gear Drive Axle



The most serviceable and economical motor truck axle made. Write for convincing reasons why your truck should be equipped with the Russel Axle.

RUSSEL MOTOR AXLE COMPANY, Central Ave., North Detroit

ERECTOR THE TOY LIKE STRUCTURAL STEEL

BOYS: Write for facts about the Big Prize Contest and get Erector Tips, the boys' magazine, FREE. THE A. C. GILBERT COMPANY, 104 Fox St., New Haven, Conn.

UNI-LECTRIC Light and Power for the farm and summer home. Operates on same principle as city electric plant. 110 volt, direct current. No belts—no batteries. Uses standard lamps and fixtures. CATALOG ON REQUEST.

Waterman Motor Co., 182 Mt. Elliott Ave., Detroit, Mich.



Engine User-Agents Wanted

Men wanted in every county to USE, demonstrate and sell "BIG BEN"—wonderful new 4-cylinder engine for every work. Big demand. Liberal profits. Free details and introductory offer. C. Bensinger & Sons, Department 611, Hamilton, Ohio.

Prest-O-Lite for Motorcycles



Photo by Kadel

& Herbert, N. Y.

Photo shows motorcycle squad of first Armored Motor Battery N.G.N.Y. engaged in sham battle.

Under Fire!

Here's a motorcycle machine gun squad of the New York National Guard in action. Note that the machines are equipped with Prest-O-Lite—the only practical light for motorcycles.

U. S. Government has chosen Prest-O-Lite for motorcycle squads simply because it is the most efficient, reliable and economical light.

Prest-O-Lite makes night riding safe. It gives the rider perfect vision of the road ahead—shows up "chucks" and stones clearly. Prest-O-Lite never fails in an emergency—gives safe, sure, penetrating light **under all conditions**.

The choice of Uncle Sam should be your choice.

Equip Your Motorcycle with Prest-O-Lite

and get the greatest lighting service and satisfaction at lower cost.

No matter what make of machine you have or buy, you can have it equipped with Prest-O-Lite. See your dealer. He can supply you with "A Prest-O-Lite, a good lamp and horn" at an attractive price.

Get real information on motorcycle lighting now. Our special booklet gladly sent you on request.

The Prest-O-Lite Co., Inc.

U. S. Main Office & Factory, 265 Speedway, Indianapolis.
Canadian General Office, Dept. N8, Toronto, Ont.

Prest-O-Lite Exchange Agencies Everywhere

The World's Largest Makers of Dissolved Acetylene

Please Mention Popular Mechanics



Do You Like to Draw?

Whether your ambition is to become a second Bud Fisher or whether you draw merely for your own amusement—you will find lots of inspiration in

CARTOONS MAGAZINE

It contains each month the cream of caricature, and cartoon art the world over. The foremost American cartoonists are represented, together with the most famous of the Parisian artists and cartoonists of Berlin, London, Petrograd, and Rome.

Either as an art student or a student of current events you will enjoy seeing how cartoonists are portraying world history in the making. "Cartoons" is a monthly review, but doesn't take itself too seriously.

There are pictures by Ethel Plummer, stories by Helena Smith-Dayton, comics by King, Webster, and others, and Parisian sketches by the artists of Fantasio and La Baionnette. It also tells what the big fellows in the cartoon world are doing.

A two-bit piece together with the following blank filled out, will bring you post haste a sample copy.

CARTOONS MAGAZINE,
6 North Michigan Avenue, CHICAGO

Enclosed find 25 cents for which send me a sample copy of your magazine.

Name.....

Street and No.....

City..... State.....



The Western Front at a Glance

Just off the press, this new war map is designed to satisfy those who desire a complete, large-scale map of the Western Front; scale 10 miles to one inch; size 28x36 inches. Shows forests, fortifications, altitudes, aircraft depots, wireless stations, etc. It contains upwards of 5,000 place names which can be readily located by means of the complete index which accompanies the map.

Paper, \$1 (money refunded if dissatisfied); Cloth, \$2 postpaid
POPULAR MECHANICS BOOK DEPT.
6 N. Michigan Ave., CHICAGO

YOU WILL NEED

Our New 1917 Handy Reference

Catalog of the Latest and Best Books

on Mechanical, Electrical
and Industrial Subjects

128 Pages. More than 400 good books described.
Free upon request. Write for your copy today.

Popular Mechanics Book Dept.
6 N. Michigan Ave., Chicago

The New York Metropolitan Museum of Art had 295,904 visitors in 1916 as against 707,890 in 1915. The falling off is attributed to the lack of notable special exhibitions during the year.

LITHOGRAPHIC MODELS IN COLORS

show and name every part of the following: Mallet Compound Locomotive—Atlantic Type Locomotive—Automobile—Steamship—Steam Engine—Steam Turbine—Dynamo—Gas Engine—Wireless Telegraph. Size 10x14 in.
PRICE 50c EACH. Set of Nine Models \$4.00 Postpaid
POPULAR MECHANICS BOOK DEPT., 6 North Michigan Ave., CHICAGO

Stop Eating Poison! Wrong food combinations are poisonous and destroy health—right combinations build health. Eugene Christian's 24 lessons in Correct Eating tell how to eat for health, strength and efficiency. Send for Free Trial No Money in Advance offer. Write today. **Corrective Eating Co., Dept. 50, 443 Fourth Ave., New York City**

Encyclopaedia Britannica "HANDY VOLUME" ISSUE Printed on India Paper

FREE Beautiful Book About Taxidermy

Learn at home by mail to mount birds, animals, tax skins. Be a taxidermist. Delightful art easily learned by men and women. Decorate home and den. Make big profits. Wonderful new art. Intensely interesting. Investigate. Write Today For This Wonderful Free Book, and our attractive offer. Send TODAY. N. W. School of Taxidermy, 4119 Elwood Bldg., Omaha, Neb.



POP-CORN FRITTERS MAKE BIG MONEY



Perrine, Cal., says: "One day's sales \$380.00." Start in safe, easy, profitable, fascinating business. Everybody likes fritters—everybody buys. Think of fortunes made in 5-cent pieces. Get full particulars—reports from others. HURRY. WRITE A CARD NOW.

1350 High St. W. Z. LONG CO. SPRINGFIELD, OHIO



The Legend of Charlemagne's Table Cloth

tells how the Emperor of the West astounded his warrior guests by flinging into the fire the cloth from the table, later withdrawing it unburned. What passed for black magic then is today almost a commonplace. The one-time costly curio of kings is now the servant of mankind. You know it as

JOHNS-MANVILLE Asbestos

Resistant to heat,

water, wear and weather

—the natural paradox which neither alchemy of old nor modern science has duplicated. Where wood burns, Asbestos is unchanged; stone crumbles—Asbestos defies erosion; steel rusts—Asbestos is immune. Fire, time, nor all the ele-

COVERS
THE CONTINENT

ments seem to affect its structure. Johns-Manville has called into play these marvelous properties—has taken this rock and fashioned it into a long list of J-M Products. This is Johns-Manville's contribution to progress—Asbestos in useful form.

H. W. JOHNS-MANVILLE COMPANY
New York City
Branches in 54 Large Cities

Asbestos Fabrics, Packings, Roofings, Shingles, Brake Linings, Building Materials, Electrical Devices, Heat Insulations, Refractory Cements, Waterproofing.

The Motor Car



The Farm



The Home



Industry



Power Plants



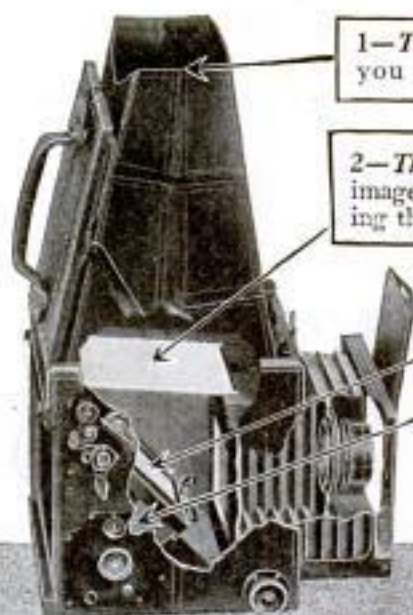
Transportation



Roofings



When you think of Asbestos you think of
Johns-Manville



1—The *Focusing Hood* into which you look to see the picture.

2—The *Ground Glass Screen* where you watch the image full negative-size—focusing it exactly, adjusting the composition up to the instant of exposure.

3—The *Swinging Mirror* which reflects image in full negative-size onto the ground glass screen.

4—The *Focal Plane Shutter* gives not only a wide range of speeds but also FULL-timed, uniform exposure of the entire plate.

GRAFLEX Camera



HOW the GRAFLEX shows the object *actual negative-size, in focus up to the instant you snap the shutter*—how it makes the *most of lens-power and exposure-time*—and why you can be certain of **GOOD** pictures even on a rainy day is told on pages 3 to 5 of the 64-page GRAFLEX Catalog. Get a copy from us or your dealer.

**FOLMER & SCHWING
DEPARTMENT**

Eastman Kodak Company
Rochester, N. Y.



Please Mention Popular Mechanics

Have You Got the Bug Yet?

It's not too late yet to fill in the attached coupon and get the beautiful green-gold stick-pin pictured here. Write today.

Meanwhile, call at your nearest dealer and ask him to show you the twelve famous

*United States
Bicycle Tires—*

the Good tires and *Your* tires.

United States Tire Company
1791 Broadway NEW YORK



FILL OUT—TEAR OUT—MAIL TODAY

United States Tire Company, 1791 Broadway, New York

Gentlemen:

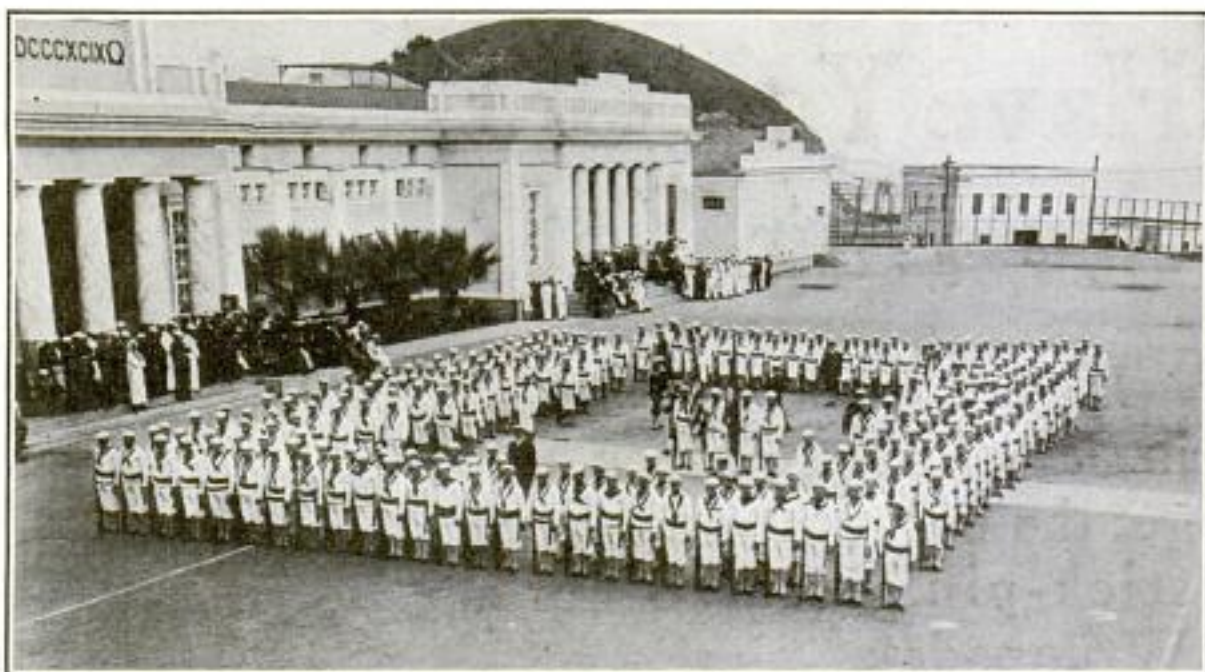
Please tell me how to get one of your beautiful green-gold bicycle bugs free.

Full Name.....

Address.....

Name of Nearest Dealer.....

Address of Nearest Dealer.....



Young Man Your Navy Needs You!

*The first duty of every American
now is to his country and his flag*

The NAVY is the First Line of Defense and offers you an opportunity to see active service. NOW is the time to enlist in order to complete your preliminary training at the earliest practicable date.

Are YOU doing your duty by the country which has protected you and given you the inestimable benefits of American citizenship? If you are not doing your full duty decide to do it **NOW**.

Young men between 17 and 25 years old may enlist for training, and if possessing a Navy trade may enlist if under 35.

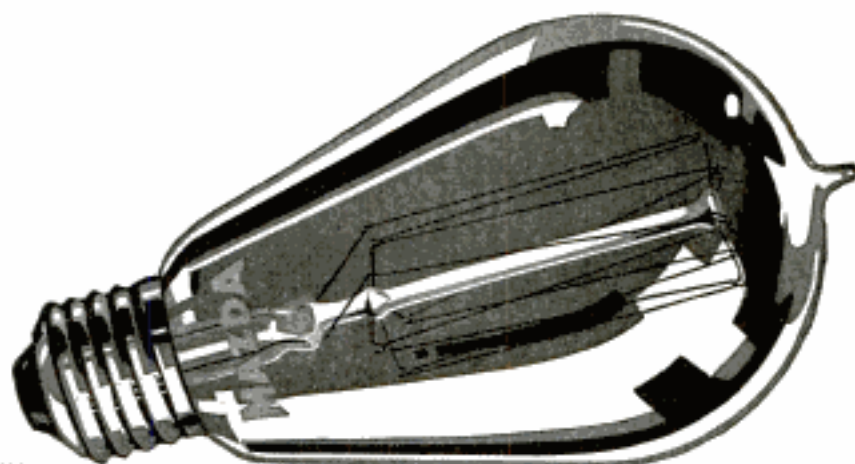
The Navy will pay you well for your services. Congress has recently granted liberal increases in the Navy's pay table for war service. You will be given valuable instruction. You will have exceptional opportunities for advancement and a chance to fight for your country!

The many inducements offered young men in the Navy are fully explained in a handsome illustrated booklet which will be sent **FREE** upon request. It tells all about the instruction at the training stations, the courses at the NAVY trade schools, the different rates of pay, the chances for advancement, the daily routine on board ship, the drills and sports—in fact everything you want to know about the **BEST NAVY ON EARTH**. Send for this booklet, mentioning your age, trade, or experience. Men of mechanical ability especially needed.

Address: Recruiting Division

BUREAU OF NAVIGATION
NAVY DEPARTMENT WASHINGTON, D. C.

Scientific study coupled with practical manufacturing methods — this is the basis of the MAZDA Service that helps lamp-makers produce better lamps.



MAZDA

"Not the name of a thing, but the mark of a service"

The Meaning of MAZDA

MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this Service.

MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York. The mark MAZDA can appear only on lamps which meet the standards of MAZDA Service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.



RESEARCH LABORATORIES OF GENERAL ELECTRIC COMPANY

4638

Please Mention Popular Mechanics

The Santa Fe SHATTERS WATCH PRICES

SEE THIS WATCH FIRST

Don't Send a Penny Examine Watch Free

21 JEWEL \$3.50 A MONTH
"Santa Fe Special"

—the one standard railroad watch "That's Guaranteed for Life," thin model, all sizes, adjusted to positions, adjusted to isochronism, adjusted to temperature, adjusted to the second.

Write for **FREE Watch Book Today** — shows newest watch case designs in 4 colors. Read the so-called Secrets of watch-making. Read how you can save from One-Third to One-Half of your money—Buy "Direct," out out the Wholesale Jeweler's profit.

EASY PAYMENTS TO SUIT YOU — Write Today

Our "Direct-to-You," easy payment plan is explained fully in the Santa Fe Special catalog. Payments are so small you will not miss the money, only \$2.38 a month and you wear the watch right from the start. Sent on Approval Without One Cent Down.

NEW CASE DESIGNS

The new watch book shows all the very latest designs of the world's most talented engravers, each case illustrated in beautiful color combinations, showing three color inlay monograms, engraved monograms, fraternal emblems, French art and special designs.

A postal brings the new watch book

Address Dept. 86
SANTA FE WATCH CO.
Topeka, Kan.

300 Candle Power of Light at a Cost of 1-8c Per Hour Burns Kerosene or Gasoline

This lamp generates and burns its own gas from ordinary kerosene. "QUICKLIT" gasoline lamps can be lit with an ordinary match like city gas.

Write today for illustrated catalog of our complete line of kerosene and gasoline lamps, lanterns and lighting systems. **Agents Wanted**

The Nagel-Chase Mfg. Co.
258 to 270 East Erie St., Chicago

ACORN UNI-LITE

Turns night into day. 300 candle power. Carry as a lantern: use anywhere as a lamp. Weather proof. For house, barn, garage, camp and around the farm. Write for big, free offer. Special opportunity to farmers, Stockmen and motorists. Agents make big money.

FREE OFFER

WRITE TONIGHT for new 1916-1917 offer.
ACORN BRASS MFG. CO., 522 Uni-Lite Bldg., Chicago

Do You Need More Money?

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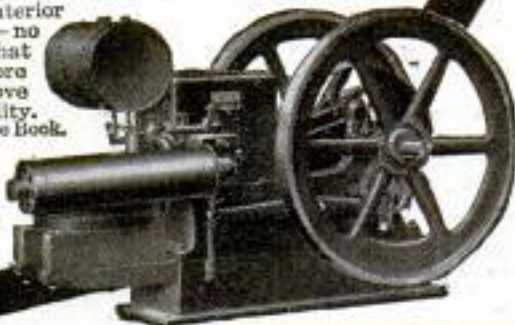
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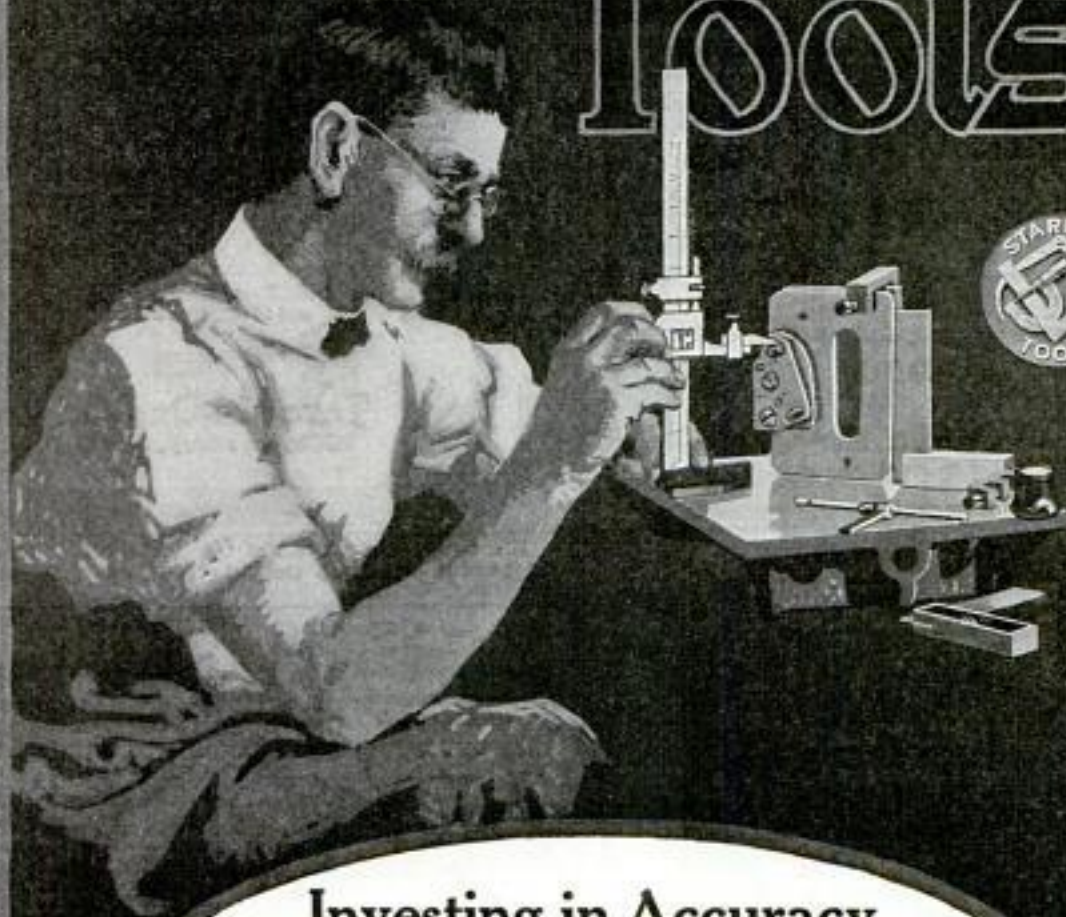
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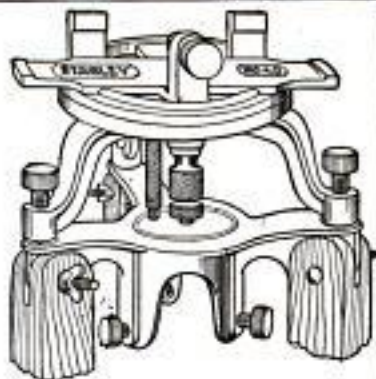
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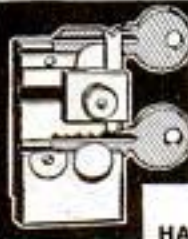
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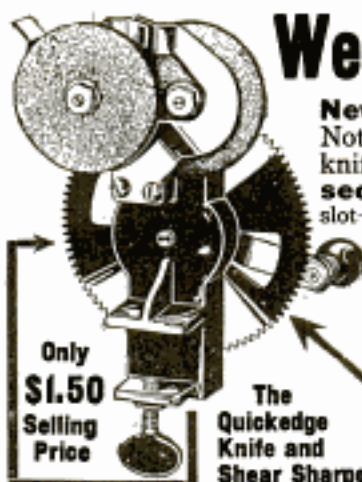
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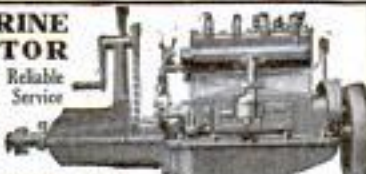
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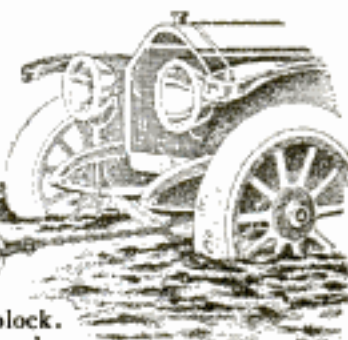
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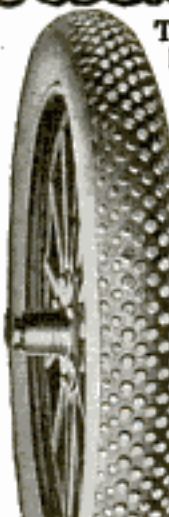
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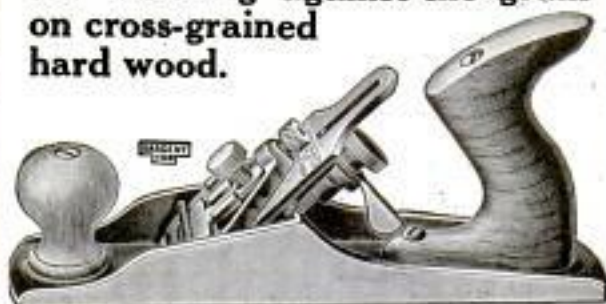
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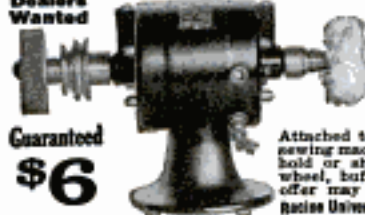
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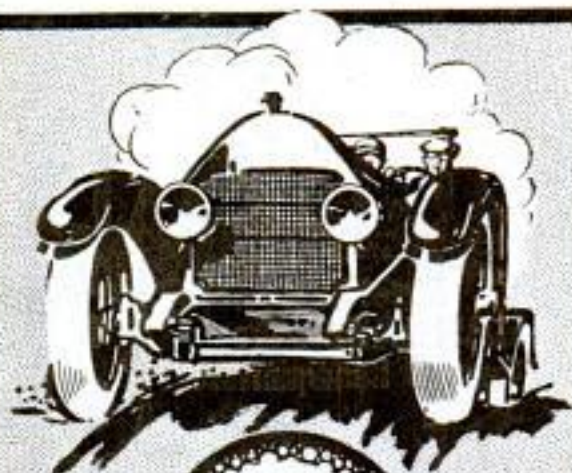
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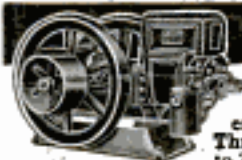
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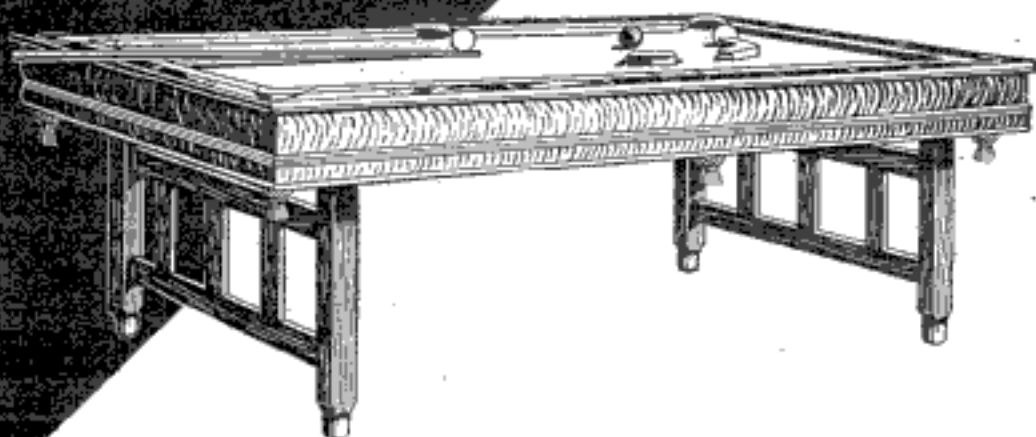
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But I never went thar to see.*

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In my easy chair,
For thar's gold enough
In you chil'en's hair
To make a rich man of me.*

*An' thar ain't no gold
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The ole sun stored
In Velvet to make it ripe.*

*An' no gold that ever
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Is as good as the mellowness
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