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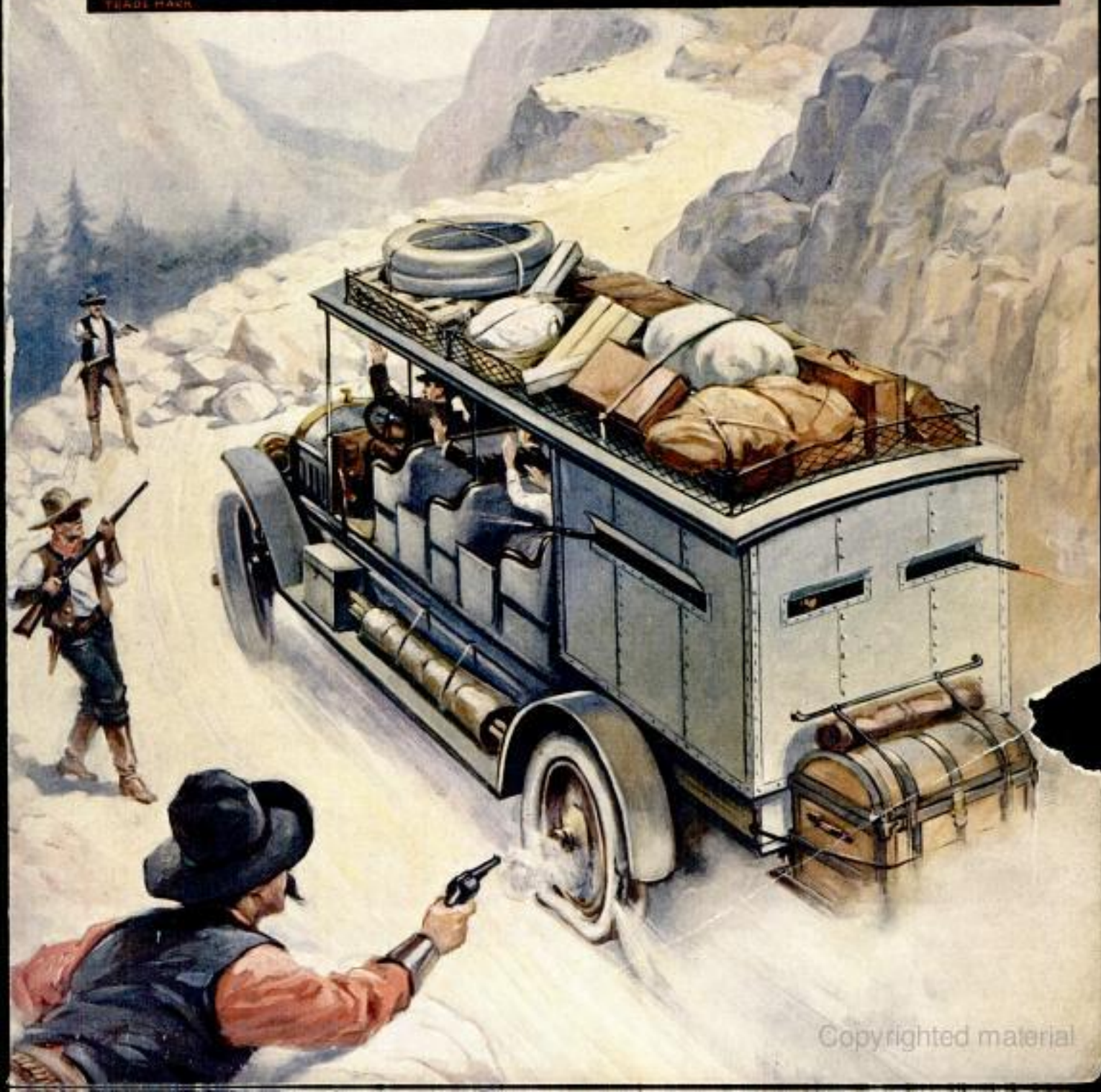
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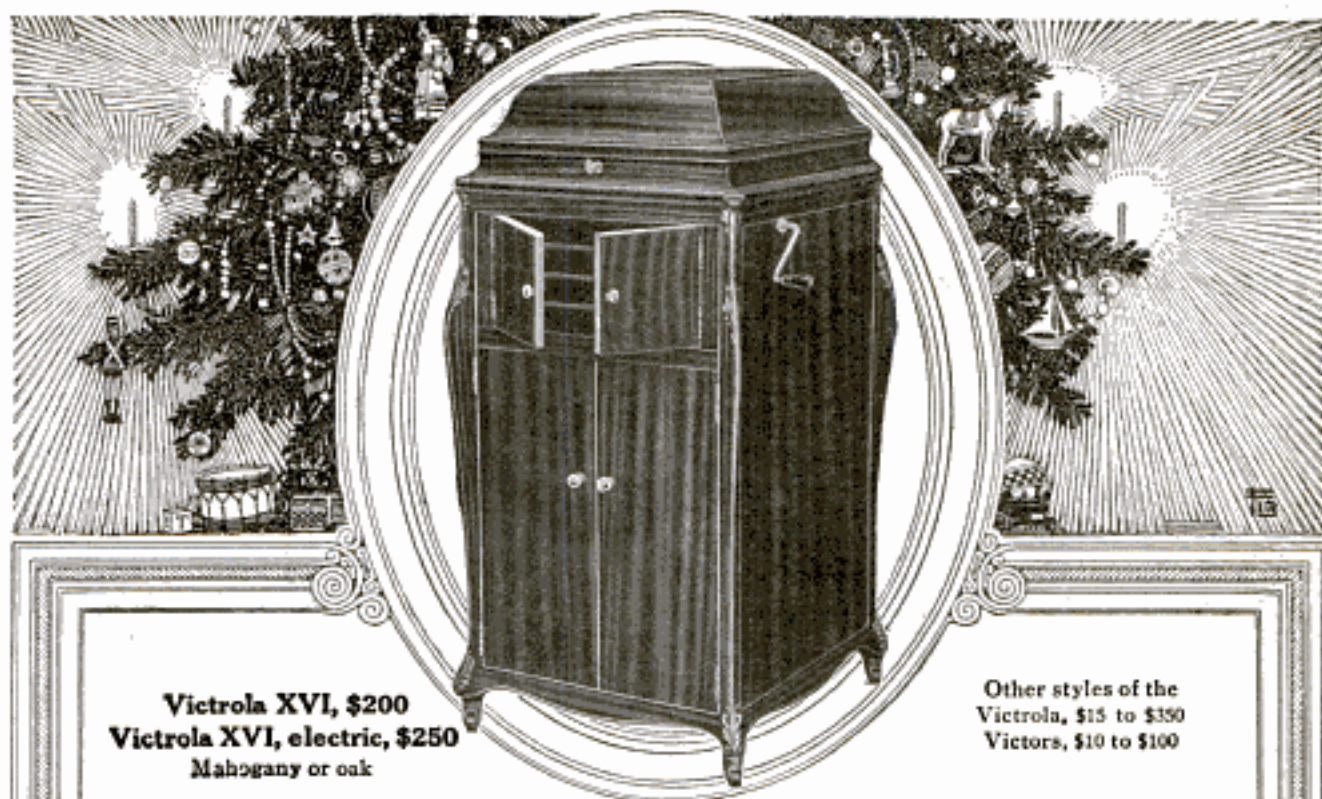
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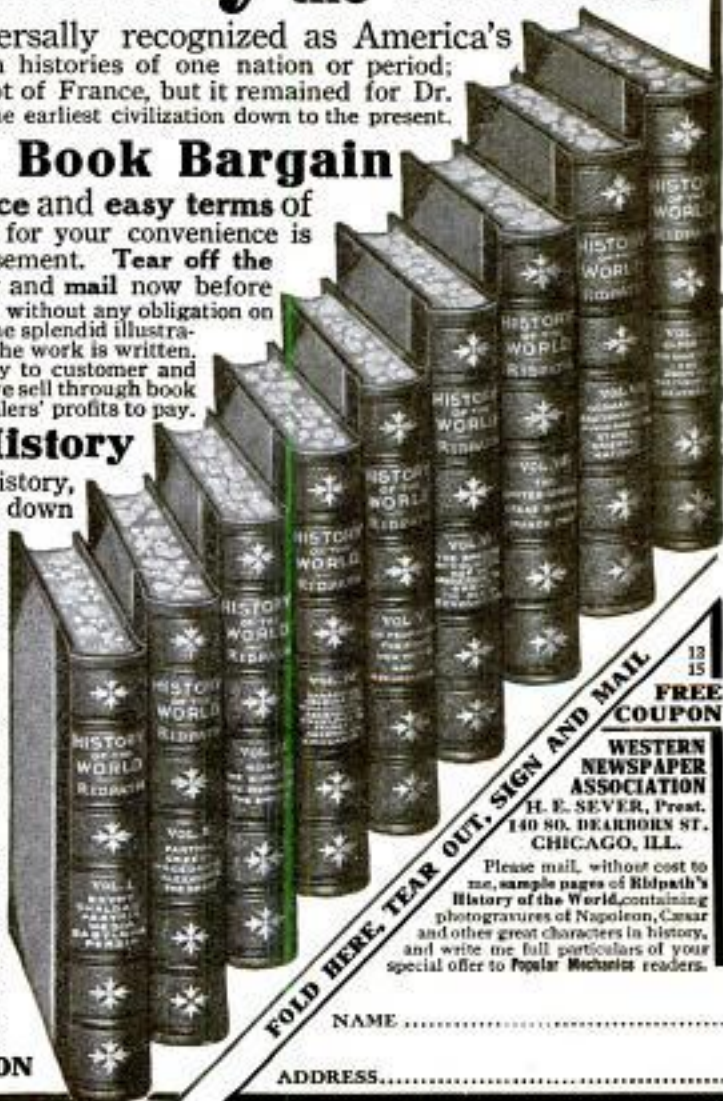
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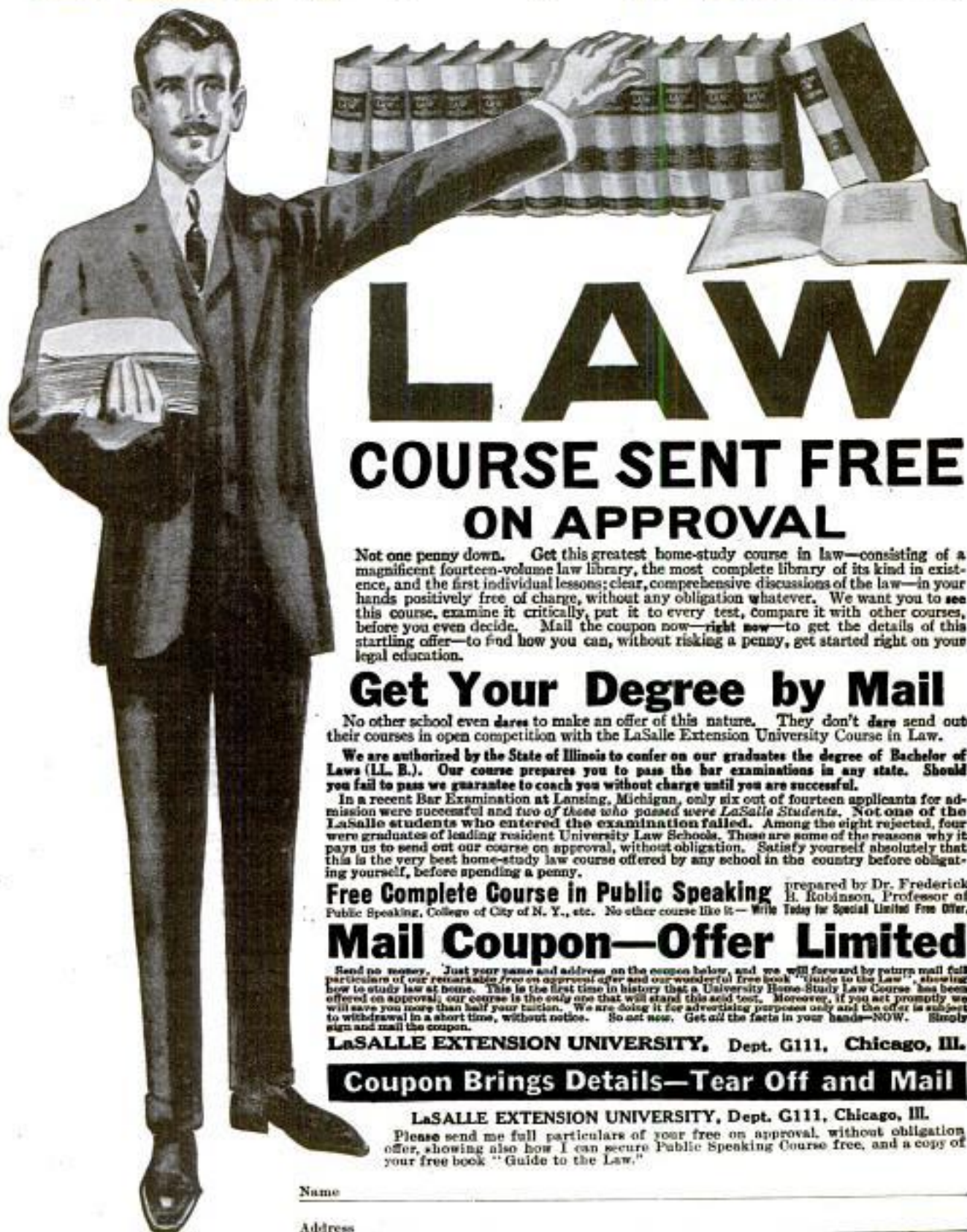
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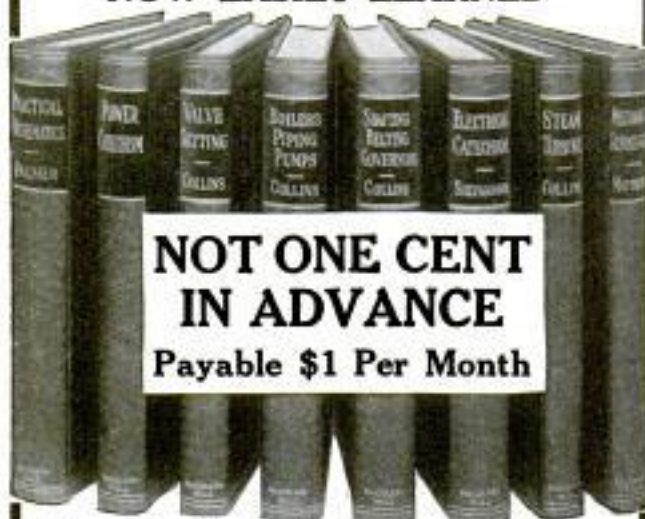
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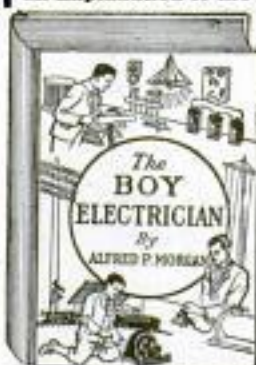
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HOW to Operate a Mail Order Business. 50 Big Profit Plans and year's Mailing service sent for 10c. Mail Dealers' Wholesale House, 521 Fra-Klin Bldg., Chicago.

BUILD a \$5,000 business in two years. Let us start you in the collection business. No capital needed; big field. We teach secrets of collecting money; refer business to you. Write today for Free Pointers and new plan. American Collection Service, 101 State Street, Detroit, Mich.

WRITE Moving-Picture Plays. Good prices. Devote all or spare time. No correspondence school. Details free. Atlas Publishing Co., 3046, Cincinnati.

BARGAINS! Bargains! Send for free magazine, 1,200 bargains, Farm lands, business chances; any kind, anywhere. Our services free to buyers. Western Sales Agency, Minneapolis, Minn.

WE will start you in the cleaning and dyeing business, little capital needed, big profits. Write for booklet. Ben-Vonde System, Dept. C, Charlotte, N. C.

MAKE Jumbo Salted Peanuts, Particulars Free. C. H. Reynolds, State College, Pa.

START Profitable Mail-Order Book Business. Catalogue and further information sent for stamp. Sheridan Company, 417 E. 151st St., New York.

NEW Way to Paint Signs—Our patterns do the work. Complete alphabet 50c. Butts Advertising Co., 15 W. 10th St., Kansas City, Mo.

WANT Big Profits? Learn Tartaric Mirror Silvering. New process opens enormously profitable business. Particulars free. H. Barstow, 514 23rd Street, Oakland, Calif.

WE Start You in Business, furnishing everything; men and women, \$30.00 to \$200.00 weekly operating our "New System Specialty Candy Factories" home or small room anywhere; no canvassing. Opportunity lifetime; booklet free. W. Bagsdale Co., East Orange, N. J.

"SELL Books by Mail." Best proposition for mail-order business; only spare time necessary. Particulars free. M. Metz, 313 East 89th St., New York.

I NEED branch managers for my worldwide mail-order business; operate from your own home in spare time; no canvassing or peddling; experience unnecessary; you should make \$50 weekly. Butler, 510 Factories, Toledo, Ohio.

OPERATE Mail-Order Book Business. Easiest, best paying line in Mail Order Field; everything furnished; folders, wholesale price lists, free. Bollins, Box 5272, Boston.

"HIRE Yourself as Boss." Big corporation will back you in Money-Making Mail-Order Business selling guaranteed Goods. Start spare time. Small capital. No canvassing. Wm. J. Dick, Mgr., Dept. D-10, 20 W. Lake St., Chicago.

WANTED to hear from owner of some good patent right for sale cheap. O. O. Mattson, 201 Andrus Bldg., Minneapolis, Minn.

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.

LEARN the real estate business. Our complete instruction book teaches: listing, appraising, management, salesmanship, insurance, brokerage, advertising, renting agency, forms, etc., 121 subjects, Exceeds \$20.00 correspondence course. Buckeye cover 15c; silk cloth \$1.00, postpaid. Catalogue free. Realty Book Company, 5982 Euclid Ave., Cleveland, Ohio.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhes, Desk C. R., Omaha, Neb.

LET the parcels post help you. Add (\$15 to \$25 weekly) to your present salary or income. Start during spare time and build up a permanent mail-order business of your own. We show you how and help you make good. No canvassing. Experience unnecessary. The Parcels Post makes success doubly sure. Our new ideas and up-to-date plans bring the money. No so-called "Course of Instruction" to sell. We give that free. Write today. Address Pease Mfg. Co., Inc., Dept. A, 70 Broadway, Buffalo, N. Y.

ADVERTISERS, Mail Dealers. Our 1915 Rate Book lists 2,000 Principal Publications, rates, circulation. Includes 30 Mail-Order Plans. Price 10c. Dearborn Advertising Agency, 210 Franklin Bldg., 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.

MAKE Money Repairing. Particulars, stamp. Boulgate, 1010 Cypress, Pasadena, Calif.

LEARN to collect money. Good income; quick results. Send for free booklet, "Skillful Collecting." Collectors' Association, Long Street, Newark, Ohio.

\$500 WEEKLY my income from Collection Business (by mail), started two years ago. Independent managers, district managers and solicitors wanted everywhere. Booklet "My System" free. Geo. Macomber, Box 189, Washington, D. C.

BRYAN Plastographed—plastography instructions with formulas enable you to make life busts of your friends, portraying more delicate lines and shadows than photos or paintings. With it free mold of President Wilson, Lincoln or Victor Emmanuel. Very profitable work, easily learned. Price, \$1. School Plaques made to order. P. P. P. Spahr, York, Pa.

\$25,000—I MADE it in mail-order business. Had \$3 to start. I'll loan you \$5. Free Booklet tells how. Alb Scott, Cohoes, N. Y.

I WILL start you earning \$4 daily at home, silvering mirrors; free instructive booklet. G. F. Redmond, Dept. 206, Boston, Mass.

MISTAKES are expensive—We have indispensable information for anyone in or about to start in the Mail Order Business. Be sure to investigate this before taking up any Mail Order Proposition, Premium Sales Co., 4309 Lincoln Ave., Chicago.

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

PATENTABLE Ideas wanted—Send for 3 free books. R. B. Owen, 30 Owen Bldg., Washington, D. C.

20,000 FORMULAS, recipes, etc. 530 p. volume, alphabetically indexed, \$1 prepaid. "Ideal," 3511-T, Belleplaine Ave., Chicago.

FORMULAS for Gasotonic, and full line Guaranteed Automobile, and latest specialties in all lines. Lists for stamp. Miller, Chemist, Tampa, Florida.

DRY cleaning, scouring, spotting, pressing taught. 15 years' experience. Illustrated book \$3.50. Star Cleaners & Dyers, Allentown, Pa.

25 WORD advertisement in 100 monthly magazines, 3 months, \$1. Quadri Co., 391 East 149th St., New York.

MAKE big money opening safes and setting combinations. Wayne Strong, Box 1430, Los Angeles, Calif.

EARN \$100 weekly managing clean legitimate mail order business. We furnish everything. Right party need not worry about capital. Splendid chance for intelligent, employed person to control independent business on profit-sharing basis, beginning in spare time, evenings at home. Particulars free. Opportunities Exchange, Buffalo, N. Y.

MAKE \$10,000 yearly connecting land buyers and sellers by mail. Dunning System, \$200. Particulars free, Dunning Co., Windsor, N. C.

INVESTMENTS

10 CENTS buys \$100 mortgage. Part of first mortgage on real estate in San Francisco or country, California, paying 6% per annum interest. Guaranteed by oldest, largest mortgage and guaranty company on Pacific Coast. Payments of only 10 cents day. Your interest begins with first payment of \$3. For interesting particulars, Howard H. Hogan, 785 Market St., San Francisco.

TO MANUFACTURERS

"HENDRICKS Commercial Register" of the United States, 24th annual edition, 1503 pages, for buyers and sellers. The standard reference book containing a classified list of all manufacturers, by names, by states and by products, with trade names of products. Write for circulars giving full details of this mammoth undertaking. Address the publishers, S. E. Hendricks Co., 2 West 13th St., New York City.

MANUFACTURERS, we want specialties to sell through agents. Useful articles. Give price, terms, details. Otto Protz, Gen. Del., Toledo, Ohio.

MANUFACTURERS of trust scheme goods send me prices complete outfits, including printing. Box 426, Griffin, Ga.

MAIL ORDER SUPPLIES

SELL Joker's Novelties! 16 samples, 10c. Chambers Works, Plainwell, Mich.

FOR ADVERTISERS

YOUR advertisements placed in 36 different magazines for 3c per word; displayed, \$1.80 per inch; three times for price of two. List, particulars free. King's Magazine, Box 13-P, Little Silver, N. J.

YOUR Thirty-Word Ad in our big post-card magazine, 25c. Inch display, 50c. Elite Exchange, 3694 Milwaukee Ave., Chicago.

BARGAIN—20-word advertisement, one insertion, 35,000 circulation, and one year subscription, 25c; extra words one cent. Digest, Grand Rapids, Mich.

ADVERTISE! Twenty words in 100 monthlies, \$1. Sample Magazine Free. Stanford Agency, Sebring, Ohio.

ADVERTISE—Your 20 word ad in 20 big Sunday papers, \$5. Coppe, St. Louis.

YOUR fifteen-word adv. in our 9x12 magazine reaching 20,000 boys for 25c. Extra words 1c each. Youths' Magazine, 2186 Maiters Bldg., Chicago.

BUSINESS SERVICE

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 1488, Phoenix, Ariz.

DESIGNER and Illustrator. David Ryerson Morford, National Military Home, Ohio.

AGENTS WANTED

MEN and Women Agents: Money talks—how much are you making? If you are earning less than \$200 a month, no matter what your locality, you will positively be delighted with our Sentinel Burglar Alarm proposition. Many agents easily earn \$15.00 daily. Brand new invention. Sells quickly on sight to homes, offices. Patented. No competition. Free exclusive territory. Instantly attached any door knob. Impossible turn knob without ringing bell. No batteries, screws, nails. Handsomely nickel-plated. Retail \$1.05. Provides cheap burglar insurance. It's a big money maker. Let us prove why. If you mean business write today for liberal terms to agents. Marshall Dobbins & Co., Manufacturers, 1422 Marquette Bldg., Chicago.

AGENTS Wanted—No matter who you are, or where you live, or what you do, right now before you turn the page, before you do another thing, send us your name and address so we can send you free our beautiful, heavy sample book, crowded with wonderful bargains in men's made to measure clothes, all the latest fabrics, advance styles, inside prices, measuring chart and everything needed to make \$5.00 to \$10.00 an hour in your spare time. Special offer on your own suit to advertise us. Don't miss this. We pay express and guarantee satisfaction. Send a postal now. American Woolen Mills Co., Dept. 1214, Chicago.

AGENTS make \$5 to \$10 a day on the start. Atkinson writes: "The best proposition I have found in my forty years' canvassing." Permanent work. Household necessity. Saving 80%. Write today for General or Local Agents terms. Free sample. C. H. Stuart & Co., 16 Union St., Newark, New York.

AGENTS wanted—Men Mechanically inclined—to learn sanitary metal tile construction (which is cemented on walls and ceilings) to eventually take our agency. Big profits and a competency for life. Takes a little money to pay for material, all of which will be deducted on future orders. Write for full particulars. Phoenix Metallic Tile Co., 193 Pearl St., Brooklyn, N. Y., only makers of sanitary metal tile in America.

AGENTS: To celebrate our 20th year we are sharing Profits with our agents. To illustrate—write today—you will receive free coupon (\$20 value) towards any Premium in our Profit-Sharing Catalog, all given absolutely free in addition to 150% to 200% profit on sales. Largest manufacturers of Soaps and Toilet Goods, selling exclusively through agents. Our Packages have the class and snap that gets the money. \$25.00-\$75.00 weekly easy. Crew Managers double that. Great Xmas rush now on. Write for our Wonderful Plans. Be sure to ask for that \$20 coupon. Davis Soap Co., P64 Davis Bldg., Chicago.

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. Peas; Die Works, Dept. M, Winchester, N. H.

AGENTS: Kleanol Sanitary Wire Twisted Brushes pay big profits; new low prices; freight paid and delivery guaranteed; quick service; exclusive territory; profit-sharing; full line fast sellers; oldest, largest wire brush makers. Kleanol Brush Company, Inc., Dept. 1, Springfield, Mass.

AGENTS of ability and high character wanted on a new household article. Over 100 per cent profit. Special selling plan that pulls results. Address Merritt & Brock, 59 to 69 Temple Place, Boston, Mass.

HAVE you seen it? What? The newest proposition on the market. The Goodrich Ear Cushion, stops all outside noises. Every telephone user a prospect. Stamped envelope brings proposition, but fifty cents gets a sample outfit—worth 75 cents. Premium Pencil Sharpener, book on Salesmanship and proposition, and a chance of getting a State on it. Show one in an office and sell a dozen. If you don't believe it send for sample, which you can return, but you will not, but will order a dozen and then a gross. Six states gone already. Live ones get busy. Franco Co., Majestic Bldg., Detroit.

WE are the largest manufacturers of twisted Wire Brushes in America. Highest grade goods, best service, largest profits. Our new Auto Specials are winners. Send for catalog. Fuller Brush Company, Hartford, Conn.; Rock Island, Ill.

FREE Samples for Men and Women agents: Deibare's Naptha Washing Tablets; washes clothes without rubbing; cleans floors, woodwork, polishes silverware; send for sample and particulars; not sold in stores. Sold only by Naptha Washing Tablet Company, 716 So. Dearborn St., Chicago, Ill.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 15c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 305 Degraw St., Brooklyn, N. Y.

BIG Profits for You! Manufacture Barley Crisp, New Confection. 5c package costs you 1c. Machine instructions complete \$7.50 prepaid. Send 10c for samples. Barley Crisp Co., 1205 Broadway, San Francisco.

YOUNG Man, would you accept a tailor-made suit just for showing it to your friends? If you live in a town smaller than 13,000, write Banner Tailoring Co., Dept. 214, Chicago, and get beautiful samples, styles and a wonderful offer.

MAIL-ORDER Opportunities: 25 new Propositions. No competition! Make 25c profit on dollar order; complete outfit 10c. Mail Dealers Wholesale House, 521 Franklin Bldg., Chicago.

AGENTS are coinng money selling our big 10c Packages of 26 Assorted Postal Cards. "5,000 Varieties." "Big Profits." Sell everywhere at sight. Sample Packages 10c. Particulars Free. Sullivan Card Co., 1234 Van Buren St., Chicago, Ill.

AGENTS Wanted: Auto heater for winter driving—sells on sight. Write before all territory is gone. Hill Pump Valve Co., 18 E. Kinzie St., Chicago.

AGENTS—We've had 100% sales on "Midgit" American Flags—1/16 inch size. Enamelled in colors. Made in screw-backs. Solid Gold, \$4 dozen; \$30 gross. Sells for 50c. Gold-Plated, \$1.50 dozen; \$13 gross. Sells for 25c. Sample 10c. Philadelphia Badge Co., 172 N. 8th St., Philadelphia, Pa.

WE manufacture an article for house use, equal to, if not superior to, anything of its kind on the market, and which soon pays for itself. Will assign exclusive territory to producing canvassers. Address H-A Mfg. Co., 4951H Wornall Road, Kansas City, Mo., stating experience in house to house work. Good money in it.

AGENTS—New, Big Money-making marvel; Kalomite Laundry Marvel is something new; unexpected; wonderful scientific discovery; different, high class; no disappointments; it is fool proof; Kalomite Laundry Marvel revolutionizes clothes-washing ideas; nothing to compare with it; it's absolutely supreme; positively abolishes drudgery, rubbing, washboards, washing machines, etc.; nature's mighty elements work wonders; women simply delighted; Franklin, Idaho, realizes \$345 in 30 days. \$1,000 guarantee; reputable \$53,000 corporation, inventors and manufacturers; exclusive territory; no experience necessary; credit granted; own a fascinating repeat order business; pocket big profits. Hurry. Write today. Get over-washing proof; all free. Equitable Corporation, Dept. 343, 215 W. Superior, Chicago.

AGENTS Wanted—to advertise our goods by distributing free sample to consumer. 90 cents an hour. Write for full particulars. Thomas Mfg. Co., 362 North St., Dayton, O.

GENERAL Representatives with little capital for Jap Silk nonbreakable Gas Mantle; America's latest invention; throws greater light; outlives others; substantial income assured handling sub-agents and trade. Jules, 209 W. 48th, N. Y.

"RED Hot Seller." "Damascus Razor Strop Dressing." Choice Territory reserved for live agents. Send 25c for sample and full particulars. Brandenburg Chemical Works, Manitowoc, Wis., Dept. C.

TAILORING Agents Wanted. If \$10 to \$50 a week for your spare time interests you, write us quick for beautiful new sample outfit, 60 nifty fabrics, 32 swell styles, wholesale prices, measuring chart, tape line, etc., all free to you by return parcel post. We pay express charges and guarantee satisfaction on all our clothes. Your own suit special to show your friends, made to your measure and the finest you ever saw; new, nifty, stylish and first-class in every way. Write us quick. Even if you can't be our agent, get our proposition on a suit for yourself. Paragon Tailoring Company, Box 1214, Chicago.

TAILORING Agents Wanted—Everywhere. Spring season 1916. Take orders for guaranteed Made-to-measure clothes. "Nelson System, of Special Values." "Four prices only"—\$15, \$20, \$25 and \$30. Agent's profit 30%. Special Raincoat Premium offer. Fine opportunity to earn big money and establish permanent business. Nelson Tailoring Company, 241 W. Van Buren St., Chicago.

AGENTS—Here's the best line of food flavors, perfumes, soaps, toilet preparations, etc., ever offered. No capital needed. Complete outfits furnished free to workers. Write today for full particulars. American Products Co., 3136 Third St., Cincinnati, O.

\$150 PER month and expenses—Salary or Commission—Introducing our King Butter Separator. Produces best grade of butter from cream or milk, sweet or sour, in less than 5 minutes. Retail \$5 up. Write for free sample and salary proposition. De King Mfg. Co., Dept. 13T, Chicago, Ill.

I NEED branch managers for my worldwide mail-order business; operate from your own home in spare time; no canvassing or peddling; experience unnecessary; you should make \$50 weekly. Butler, 539 Factories, Toledo, Ohio.

ELECTRIC and non-electric changeable window signs. Lowest prices. Mandeville, 67 West Schuyler Street, Oswego, N. Y.

AGENTS: New invention!—clothes-washer that fits set tubs or any tub. Won medal at Panama-Pacific Exposition. Sells for \$10, with big profit. Large field. Write for proposition and descriptive folder. Home Devices Corp., 211 Bush Terminal, Brooklyn, N. Y.

EVERYBODY Wants to look into 5 in. Nonparel Novelty Mirror. Mounted on cork with Thermometer or calendars, makes fine present. Agents wanted. Price 50c. Frank R. Hewett & Co., 2250 Aqueduct Ave., New York.

AGENTS—Get newest, quickest sellers direct from makers—full list free. Nat'l Agents Assn., 1122 Michigan Ave., Chicago.

AGENTS: Handle our Home Altar; has music and light; do a big Xmas business. A great seller to Catholics. Inquire proposition. Novelty Altar Co., Stamford, Conn.

DRUNK, Sick or Crazy—Not us, but our plan lets you collect the money and keep it all. We get ours later. U. S. Mfg. Co., Dept. P2, Columbus, Ohio.

AGENTS Wanted—to handle remarkable money-makers, easy to handle, easy to sell, many repeat orders; write quickly. Dora Novelty Co., 500 2nd Ave., New York City.

AGENTS—Our Line of Individual Stationery Embossers a winner. So is our proposition. Samples and particulars free. Millar Sales Company, Lexington, Ky.

GET cash for names, information, ideas, formulas. Turn what you see, hear and know into money. Instructive booklet for stamp. Information Systems, 232 Marietta, Ohio.

AGENTS, or will sell mfg. rights. Best headlight deflector on market. New, patented. A few hundred dollars invested will net you thousands. Write at once, Mitchell De-Ro-Flector Co., 1363 Main St., Los Angeles.

GENERAL Agents—Sanitary Sugar Bowls. Greatest 50c article. Sells everywhere. Territory free. Schoenholt & Pease, East End, Pittsburgh, Pa.

MAKE and sell your own goods. Formulas by Expert Chemists. Manufacturing Processes and Trade Secrets. Formula Catalog for Stamp. B. Mystic Company, Washington, D. C.

NEW \$2.50 pocket adder. Sell 10 daily easy. Excellent profit. Everyone buys. No competition. O. Bassett, 5921 Indiana Ave., Chicago.

AGENTS—We have the best money-making Xmas articles on the market. Let us tell you about them. Lewis Company, 1839 South Leland, Chicago.

I PROMISE any man or woman who will go out tomorrow—call at ten houses, at least two sales, which net \$1.80 apiece. Ten calls—\$3.60 for your day's work. It's that aluminum combination set that you are to offer—aluminum the women are crazy for; at a price they go wild over. Experience in selling or not—doesn't matter. Drop a card and let me post you on my \$3.60 a day offer. Manager, Perfection Products, 1423 Westmoreland St., Philadelphia.

AGENTS—Send for sample "Fretnot"—the wash day wonder. Be continued 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. Motter & Sons, 3213 Warren Ave., Chicago.

AGENTS! Coin Money Selling Christmas Packages. Think of it! An 88 piece package of Post Cards, Tags, Seals, Stickers, Folders, Cut Outs, etc., sells for 10c. Costs you \$4 hundred; \$39 per thousand. Every body grabs them. \$10 a day easy. Send dime quick for samples and particulars. Dealers Wholesale House, 325 S. Dearborn, Chicago.

AGENTS Wanted—Out of town live men can make 15 to 25 dollars weekly evenings or on the side selling my "made to order" men's \$15 and \$20 suits and overcoats, because I am delivering quality, fit and work, so you can build up a future business. Tom Murray, 598 So. Clark St., Chicago.

A PRACTICAL Novelty. An attractive Christmas Novelty. "Dagdex Swedish Pencil Sharpener." No Bittered Flour-cut or soiled fingers. Every bank, office, home, school or individual will buy on demonstration. No competition. Write quick for interesting proposition. W. J. Gibson & Co., Fisher Bldg., Chicago.

OUR Line-finding Copy Holder for Stenographers is a big money getter. Entirely new. Over 100% profit. Field unlimited; business houses order in quantities. Write at once for exclusive territory. Lineguide Mfg. Co., 160 North Fifth Ave., Chicago.

NEW Invention, Sharp-Shod Overshoes for Horses. Guaranteed to prevent slipping on icy streets. Buckled on over old shoe in a minute. Every horse owner wants them: big money for agents. Our new patent Auto and Truck Skid Chains are the fastest seller out. Write for particulars. Herman Mfg. Co., Desk No. 3, Penna. Ave., Washington, D. C.

OUR Reporters always welcome—Big Money, easy, distributing California Bungalow lots as Premiums. Send for starting details today. The Pilgrim Magazine, 1531 Westminster Bldg., Chicago.

ROBE Rail Lock (New). Unlimited Territory. Bonanza for Agents. Write for particulars. Inventors Sales Company, 101 Main St., Smithport, Pa.

EGG Insurance is what our agents offer their customers. Big money with this new specialty. - Particulars free. Sample 15 cents. Standard-A, 4 West 118th St., New York.

100% PROFIT handling polishing cloths for silverware, brass, pianos, furniture, etc. Globe Chemical Co., 220 South New Jersey, Indianapolis, Ind.

YOU can make big profits selling our Pure Aluminum Kitchen Utensils—Guaranteed for 20 years. Our specialties are not sold in stores, and they get the business for you. \$200,000 firm and liberal credit plan backs you. We have an attractive General Agency offer. Wm. J. Dick, Manager, Dept. D-21, 20 W. Lake St., Chicago.

AGENTS—Sells itself—millions will be sold—household necessity with premium—big profit—write quick. Glock, 180 Woodward Ave., Buffalo, N. Y.

33% PROFIT selling our 25c Sheet Music at 5c. Particulars Free; 3 samples 10c. Keller, Robson & Munk, 36 W. 118th St., New York.

\$32.84 PROFITS on each full order daily—sells every home. Amazing invention. Brilliantly lights home. Something new. Everybody pleased. Demonstration outfit 35c. Plans free. International Mfg., Dept. 527, Toledo, Ohio.

BIG Money easily made selling Jules Folding Portable Electric Lamps, containing 10 ft. concealed extension cord automatically lengthened or shortened. Other features. Demonstration insures sales. Homes, Offices, Factories, Hospitals, Students. Rose-Strauss Co., 215 W. 48th, N. Y.

\$1.50 WEEKLY introducing and selling a new gas light burner for kerosene lamps. Beautiful light. No chimney. No mantle. Perfectly safe. Simple in construction. Nothing to get broken or out of order. Will not burn out. Durable. Will last for years. Low price. Easy to sell. 200 per cent profit. Experience not necessary. Sample free. Why not try one on your lamp? Beware of imitations. No branch offices. Luther Manufacturing Co., Dept. 128, Cincinnati, Ohio.

AGENTS Wanted—Agents make 500 per cent profit selling "Novelty Sign Cards." Merchants buy 10 to 100 on sight. 800 varieties. Catalogue free. Sullivan Co., 1234 Van Buren St., Chicago, Ill.

We start you in the mail order business and show you how to succeed; attractive 61-page catalogue of 200 novelties, with your imprint; exceedingly reasonable; all goods wholesale. Send for my plan and particulars. Cunningham Co., Stamford, Conn.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Photo Plates, Pennants. Refects credited. Prompt shipments; samples and catalogues free to agents. 30 days' credit. Jas. C. Bailey Co., Desk R-6, Chicago.

AGENTS—Fast-selling Household Specialty. \$2.53 Premiums with each \$1.98 sale and 70 cents profit for Agent. Free Selling Sample. Caldwell Specialty Company, Lenoir, N. C.

AGENTS—Make and sell your own preparations. Tested formulas, complete instructions for making, labeling, packaging. Stamp for list. B. W. Baker, 100 Ross St., Brooklyn, N. Y.

AGENTS—Something new—Fastest sellers and quickest repeaters on earth. Permanent, profitable business. Good for \$50 to \$75 a week. Address, American Products Co., 3135 Third St., Cincinnati, O.

AGENTS Make quick sales, large profits. Sample and terms 10c. C. Lutz Manufacturing Co., York, Pa.

AGENTS—Make big "Clean Up" selling our Xmas Specials. Quick sales. \$25.00-\$75.00 weekly a cinch. Write for colored circulars and immediate appointment. E. M. Davis, President, K64, Davis Bldg., Chicago.

BEST 25c Repeat Seller made: 200% profit. Reese Sales Co., Mount Pleasant, Pa.

AGENTS are making big money selling our raincoats; sales are easy; satisfaction guaranteed or money refunded. Address Reliance Rain Coat Co., The Temple, Chicago.

AGENTS—If you want to "Clean Up" on most wonderful invention of age, send 10c for samples. Sells everybody—Stores, Offices, Homes, No Fake. The Edison Company, Dept. 51, 1709 Michigan Ave., Chicago.

SELL Washclean: Abolishes rubbing. Steam bubbles blow out stubborn sifting-grit. Leads everything. Won Gold Medal in actual tests. Only washing preparation using steam bubble principle. Biggest profits. More value. Sample and particulars free. Washclean Co., W. 7th, Pittsburg, Kansas.

AGENTS—Salary or commission. Greatest seller yet. Every user pen and ink buys on sight. 200 to 500 per cent profit. One agent's sales \$520 in six days; another \$32 in two hours. Monroe Mfg. Co., X8, La. Crosse, Wis.

AGENTS wanted to sell men's hats direct from factory. Send for style book. Guarlin Bros., Dept. A, Hat Manufacturers, Orange, N. J.

AGENTS—Here's a money maker. New Low-Price Portable Oil Gas Stove. Light in weight, compact, practical. Every home a possible customer. Cooks, bakes, heats, sells both in summer and winter. Write today for our Money Making Proposition. The World Mfg. Co., 6398 World Bldg., Cincinnati, O.

SELL Christmas Packages! Everybody buys them, 200% profit. \$10 day easy. Send dime for samples and particulars. Get busy now. International Distributing House, 5238 Larkin, Chicago.

NEWEST wonder of the age! Silveron, the polish that silver-plates. Actually rubs on sterling silver. Used everywhere. Sells on sight. Repeat orders. Big profits. Protection. Send 10c for sample and introductory offer. Carisa, 157 Cedar, New York, Dept. D.

OWN your own business. Make \$500 monthly, carry no stock, just sample. S. O. S. Electric Pulser, new, powerful, making agents rich. Write quick for big special proposition. Commonwealth Mfg. Co., 460 Kaito, St. Louis, Mo.

INVENTIONS sold on commission. Advertised free. No advance fee. Patent News, A. Washington, D. C.

MARVELOUS Expanding Cuff Button. "Fresto" slip cuffs over elbow without unbuttoning, pull them down they close automatically; invisible. Reduces laundry bills, combines utility with convenience. Endorsed and demanded everywhere. They never tarnish nor blacken and last forever. Thomas, Sheboygan, Wis., sold 750 pairs in 10 days, profits \$315. Fast Holiday seller. No money required, just take orders. High grade agents wanted everywhere. To eliminate triflers, enclose red stamp for particulars, none others considered. Flexo Links, Sheboygan, Wis.

AGENTS to sell latest household specialties. For catalogue and prices, address Richebunch Supply House, Oregon, Ill.

"SHINE-Rite" absolutely new combination device. Men, Women, \$5 daily. Every home; everybody. Useful gift. Shine-Rite Co., LaCrosse, Wis.

AGENTS make big profits handling our "Fast Selling Holiday Post Cards," "Novelty Signs," "Holiday Decorations," "Pennants," etc. 5,000 varieties. Demand unlimited. Write today for Free Catalog. Hinton Co., 6142 40th Ct., Chicago.

ACT Quick! Automobile Gasoline going up. Sell Gaso-Tonic. Equals gasoline at 3c a gallon. Eliminates Carbon. Dollar an hour profit. Sales Guaranteed. White Mfg. Co., Dept. M, Cincinnati, Ohio.

ADVERTISE—20 months in 100 months \$1; 3 months \$2. Cope, St. Louis.

\$5.00-\$8.00 DAILY selling our household necessities; particulars Free. Summer Specialty Company, X-5446 Augusta Street, Chicago.

SELL Changeable Signs. \$10 Daily. Excellent Sideline. Write Powell Bros., 4150 Madison St., Chicago.

GET rich profits—own a business. Big Kansas company offers fast selling Mail Order Line. Factory prices. Unique selling methods pull quick, big paying business. No canvassing. Spare time. We furnish everything. Copyrighted prospectus free. Eystone, Pres., 401 W. 7th, Pittsburg, Kans.

RELIABLE people wanted to place our Eggine in Stores and appoint sub-agents. Takes place of eggs in baking and cooking, at less than be dozen. Package and particulars 10c postpaid. Morrikey Co., 4443-5 Madison St., Chicago.

TREMENDOUS seller, big profit. German silver tea forms. Sample sent for 10c. H. Fenton Company, 1084 Amsterdam Avenue, New York.

\$12.00 DAILY till Christmas. Wonderful everlasting plants in brass jardiniere. Sample, prepaid, 25c. Rodolph, 464 North-Western Building, Chicago.

DON'T be an Agent—Own your own business. We furnish complete, practical, low-price outfits for plating in Gold, Silver, Copper, Nickel, etc. We furnish recipes, formulas, trade secrets. Work easy, profit enormous. Send today for particulars. Gray & Co., Plating Works, 944 Gray Bldg., Cincinnati, O.

200% PROFIT. You can't beat it. Sells everywhere. Free pocket sample. Our goods get the orders. Wm. J. Dick, Mgr., Dept. D-4, 29 W. Lake St., Chicago.

WONDERFUL Opportunity—Start as our agent, become manufacturer. Everyday necessities. Fastest repeat sellers. Marvellous profits. Proposition worth at least \$10 weekly. Samples free. Frederick Loid Company, 328 Warren St., Boston, Mass.

CHRISTMAS and New Year Post Cards, Booklets, Fancy Cards, Tags, Seals, etc. Samples free. Gross Guard Co., 2147 Arthur Ave., New York.

AGENTS—Get particulars of the best Self-Heating Iron on the market. Low in price—absolutely practical. Three sales a day means \$40 a week profit to you. Send postal today. C. Brown Mfg. Co., 4708 Brown Bldg., Cincinnati, O.

A MIRACLE. We have a preparation that will absolutely keep steam and frost from windows, mirrors and eye glasses. Leaves no dust or dirt. Wanted by all stores, offices, doctors, dentists, opticians, etc. Almost every call a sale. \$30 to \$50 weekly easily made. Write, Vivace Company, Dept. P, 3157 Broadway, Chicago.

FIND out how easy it is to make big money taking orders for brushes needed in every home. Our representatives are averaging \$15 to \$50 a week. We have a few open territories. Write, naming county wanted. J. I. Holcomb Brush Mfg. Co., 5110 Draper, Indianapolis.

SLICKEST Needle Threader you ever saw, 10c. Stovers, Millersburg, Pa.

MEN to refinish lighting fixtures, brass beds, etc. All or spare time. No capital or canvassing. Experience unnecessary. Information free. Gummel Co., Dept. G, Decatur, Ill.

AGENTS—Household articles, 50 fast sellers. Catalog free. Kimo Sales Agency, 359 Aylesford, Lexington, Ky.

GREAT Side-line for active canvassers. Premiums free with every sale. Goods light. Big money establishing subagents. Klittredge Co., 40 East Tamkhanock, Pa.

MECHANICS to sell sliding calipers; liberal commission. Ernst G. Smith, Tampa, Fla.

50c BOOK free, "1,000 Christmas Suggestions." Craft, Printer, Dallas, Texas.

AGENTS—Sell up-to-date household specialties. Big profits. Particulars and samples free. S. V. Phillips, Box 17, Minneapolis, Minn.

ENERGETIC agents manufacture. Greatly increased profits. Write for plans. Eastern Exchange, Bridgton, Maine.

\$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 first 12 hours. \$1,200 cold cash made, paid, banked by Stoneman 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., 4137 Allen Bldg., Toledo, Ohio.

YOU can make \$888 as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, 113 Becht St., Newark, N. Y.

MEDALLIONS—300% profit. Make up your own goods and be independent. Catalogue free. Resag Co., 1205 Randolph St., Chicago.

500% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 408 N. Clark St., Chicago.

AGENTS make \$100 monthly selling our 500 handy household articles. Catalogue free. Scheff Company, DesPlaines, Ill.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Refunds credited. Prompt shipments. Low prices. Send for latest catalogue and prices. Adam J. Kroll & Co., 692 Blue Island Ave., Chicago, Ill.

AGENTS—\$50.00 weekly. The only knife sharpener made on correct principles. Wonderful seller, 129 to 300% profit. Simply demonstrate. No talking. General agents, \$150.00 week. Particulars free. 50c sample by mail. 25c. Thiele Co., 5 Austin Ave., Chicago.

SELL Dry Goods Remnants. Greatest bargains on earth. Remnant Store Co., Cincinnati, Ohio.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

KEROSENE Gas Burners in Cook Stoves or Ranges stop use of wood or coal. Recently patented. Money-Maker for Agents. The Vapor-Gas Burner Co., Desk 8, Columbus, Ohio.

AGENTS—Air Cell Washing Machine. New, marvellous invention. Exceeds work of washers costing \$25.00 and up. Sells only \$1.00. No wonder every home buys. Exclusive territory free. Nearly 200% profit. Write today. Air Cell Washer Co., 3057 Detroit Ave., Toledo, Ohio.

DON'T hesitate—Get our new catalogue; contains Six Corking Propositions. Each a winner. Berg & Beard, Inc., 61 Fleet Place, Brooklyn, N. Y.

AGENTS—Average \$5 to \$12 daily selling astonishing Anzac massage machine. New. Just patented. Different. No electricity or water power required. Nothing complicated. Affects exhilarating massage without cent expense. Lowest priced, but best outfit. Retail \$2.50 allowing you big end of the profit. Particulars and "beauty" folder free. Anzac Remedy Co., Dept. 132, Toledo, Ohio.

AGENTS—Make \$30 to \$60 weekly selling our 300 candle power gasoline table and hanging lamp for homes, stores, halls, churches; no wick, no chimneys, no mantle trouble; costs 1c per night; exclusive territory; we loan you sample. Sunshine Safety Lamp Company, 925 Factory Bldg., Kansas City, Mo.

AGENTS—Coin money selling self-filling fountain pens for \$1; 150% profit; sell on sight. Sample 25 cents coin. W. Hurley, Box 512, Longbe, California.

"STEAM-NO-MORE" for eye glasses. Everyone who wears glasses buys. Live agents 200% profit. Send 10 cents for 25c sample. Gray's Sales Agency, Port Huron, Mich.

AGENTS—Here's a brand new article, just ready for market. Make over 100% profit, with satisfied customers. Every mechanic needs one, sells quickly on sight; no competition. Our proposition is a winner. Don't wait. Write for it now. The Security Aluminum Rule Pocket Co., Ivanpah, Calif.

ACCEPT no agency until getting offer on Ho-Lo-Co Skin and Scalp Soap and Toilet Articles. Our plan new and different. Territory limited; write today. Rothco, 209 N. 2nd, St. Louis.

AGENTS send for prices on our quality Photographic Portraits. Myland, 2125 Front St., Philadelphia, Pa.

EVERY household on farm, in small town or suburbs, where oil lamps are used, needs and will buy the wonderful Aladdin Mantle Lamp. Burns common coal oil (Kerosene); gives a light five times as bright as electric. Awarded gold medal at San Francisco Exposition. One farmer cleared over \$500.00 in six weeks; hundreds with rigs earning \$100.00 to \$300.00 per month. No cash required. We furnish capital to reliable men. Write quick for wholesale prices, territory and sample lamp for free trial. Address nearest office. Mantle Lamp Co., 517 Aladdin Bldg., Chicago, Ill. Mantle Lamp Co., 517 Thermo Bldg., New York City.

BIG Textile Mills will employ everywhere reliable people to take orders for dress fabrics, hosiery, underwear, sweaters, waists and skirts from samples. Factory prices. Spare or all time. No experience. Permanent. Many making over \$50.00 weekly. Steadfast Mills, 30 Renssen St., Cohoes, N. Y.

MAKE your own Extracts and Perfumes. H. Lake Co., Adair, Ill.

VACUUM Cleaner Men: You all know Hugro. Biggest Vacuum factory in world. Best and latest models. All styles. Blue bird indoor and outdoor clothes reela. Lowest factory prices. Hugro Mfg. Co., Warsaw, Indiana.

AGENTS—Large Manufacturer wants reliable men, women, to sell guaranteed Hosiery, Underwear, Shirts, direct to homes. Write for free Samples. Madison Mills, 585 Broadway, New York.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, N. Y.

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

AGENTS—Brand new specialty Aluminum Triplicate Sauce Pan with detachable handle. Cooks 3 different foods on one burner. Saves gas. Lasts lifetime. \$100 to \$300 per month easy. Send for our catalogue of 400 other specialties. American Aluminum Mfg. Co., Div. J. 10, Lemont, Ill.

SOAP Agents—Our Vegetable Soap, Toilet Goods, Remedies, Flavorings, Excel—Outsell. Sample Free. F. A. Buchanan & Co., Dept. 51, St. Louis, Mo.

AGENTS—Biggest hit ever! Eberon-piece Toilet Article Set, selling like blazes at \$1; with \$1 Carving Set Free! Enormous profits! Tremendous sensation! Experience unnecessary. Eagle made \$51.00 first week. Write quick! Pierce Co., Dept. F, 906 Lake St., Chicago.

OUR line of brushes is a winner. So is our proposition. We want live brush agents everywhere. United Brush Company, 622 W. Lake St., Chicago.

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.

ENDLESS Neckties—Something new, twelve ties in one; costs no more than old style; man made \$70 three days; woman made \$92 week; write for special agents' offer. Endless Necktie Mfg. Co., Dept. 10, Kansas City, Mo.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 702 North St., Dayton, Ohio.

JUST show them—The new adjustable floor and wall mops, dustless dusters and sanitary brushes sell themselves. Big line. Big profits. Agents write Silver-Chamberlin Co., Dept. M, Clayton, N. J.

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.

\$15.00 MADE first day by 13-year-old boy with Shomescope. Woman made \$8.00 first hour. Particulars free. Shomescope Mfg. Co., 523 W. 13th St., Kansas City, Mo.

MEN and women earn up to \$3,000.00 yearly distributing Guaranteed Hosiery from mill to wearer. All or part time. Repeat orders insure permanent increasing business. No capital or experience needed. D. Parker Mills, 2738 No. 12th St., Philadelphia, Pa.

NEW 1915 Model—Send no money, just your name on a postal card, and learn by return mail how to get the best Vacuum Cleaner made, without costing you one cent. Shipped direct from factory, guaranteed for 5 years. Reliable, live agents wanted. The Warner Company, Dept. Z, Muncie, Indiana.

AGENTS—Sell the Primus, genuine Swedish wickless, coal-oil stoves. Smokeless, odorless. Twice the heat of gasoline at one-eighth the cost. No danger of explosion. Big profits. James Anderson & Sons, Sidney, Ohio, American distributors.

AGENTS make big money and become sales managers for our goods. Past office sellers. Fine profits. Particulars and samples free. One Dip Pen Company, Dept. 2, Baltimore, Md.

READ the Agents Magazine and make more money. 2 issues 10c. Agent's Magazine, Chicago.

AGENTS—Sell rich-looking imported 30x 65 Rugs, \$1 each. Carter, Tenn., sold 115 in 4 days. Profit, \$57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post pre-paid. 6c. Condon, Importer, Stonington, Maine.

AGENTS—150 per cent profit selling new, easy wringer mop; every home buys; Martin sold 131 in 2 days; Handel sells 18 in 4 hours; Baker made \$9 in 2 hours; one man's orders \$2,450 in one month; get details, U. S. Mop Co., 323 Main St., Toledo, O.

AGENTS and Painters—New gold and silver letters. Any one can put on. Free samples. Flexible Metal Letter Co., 1642 Division St., Chicago.

MAKE More Money—Making Your Own Goods. I supply Original, Guaranteed Formulas.—Trade-Secrets for Latest Specialties in all Lines. Latest Lists for Stamp. Liscombe Miller, Chemist, Tampa, Florida.

BIG profits, selling Clothes-Line Fastener, eliminates knots, adjusted quickly, tight grip, everybody wants it. Write for sample. Gregory O'Kelly, Manufacturer, Old Colony Building, Chicago.

MAKE Money Today. Make Dollars Tomorrow. Secure exclusive sales rights for Leswerk Laundry Tablets which repeat and repeat after introduction; sold to stores they yield permanent increasing income without personal canvass; guaranteed satisfactory or cost refunded. Send 10c for whole month's supply and Tried and Proved Sales Plan, Leswerk Manufacturing Company, Richmond Hill, New York.

WONDERFUL New Invention—Our "No Talk" system guarantees sales. Sample 25c. Reinhardt Sales Co., 1337-39 Hull St., Baltimore, Md.

HEATLESS Trousers Press. Guaranteed to press trousers in 5 minutes without labor or heat. Big profits, \$1.00 prepaid. Patented Goods Co., Dept. P, 116 East 63rd St., New York City.

AGENCIES WANTED

FIRST Class good articles wanted from Mfg. Co., only. Samples and catalogs required, send particulars. Frank Stahl, Mogollon, New Mexico.

SALESMEN WANTED

WANTED, Salesmen—To represent manufacturer. Must be wide-awake, energetic and able to produce. Excellent opportunity. Exclusive territory to right man. Box 150, Station C, Cleveland, Ohio.

SALESMEN wanted everywhere selling new patent automobile device, \$10.00 per day summer and winter. Acmeo, 1410-12 W. 53rd St., Chicago, Ill.

SALESMEN Wanted—Pay biggest commission ever received. Sell Oil land near Beaumont, Texas. New proven territory. Box 160, Stowell, Texas.

SALESMEN: Acquainted with merchants. Large demand. Lib. comm. Pocket samples. Write Salesbook Co., Chicago.

SALESMEN Wanted—Salesmen and Manufacturers' Agents to represent us everywhere among the Superintendents, Engineers and Purchasing Agents of manufacturing plants. Federal Graphite Mills, Cleveland, Ohio.

WANTED—Traveling Salesmen who will accept clothes made to their measure in payment for placing with merchants "The Line That's Different," an all-wood tailoring line, quoting six special prices; no extra charges. Write for particulars. J. W. Jones & Sons, 379 Midcity Bank Building, Chicago.

GREAT opportunity for General Agents selling New Specialty to merchants. Retail \$5, \$10, \$15 each. Your profit 200%. No competition. Exclusive territory. Free samples. Sayers Co., 408 Wainwright, St. Louis, Mo.

WANTED—Representatives everywhere. Exclusive territory. Gold sign letters for stores and office windows. Any one can put on. Write today for free sample. Metallic Letter Co., 405 N. Clark St., Chicago.

SALESMAN. Sell beautiful 28x58 Artz-kraft felt rugs for \$13.50 per doz. Your profit, \$3 per doz. Kelso, Battle Creek, Mich., sold 30 doz. last week. His profit, \$90. Write for exclusive territory and selling plan. Prepaid sample, \$1.50, refunded on first order. H. Condon, Mfrg., Stonington, Maine.

HELP-A-PHONE. Salesmen make \$100 weekly. Write Edward, 415 Belden Ave., Chicago.

SALESMEN—Get our plan for Monogramming Automobiles and Motorcycles by transfer method. Very large profits. Motorists' Accessories Co., Ashland, O.

SALESMEN — Make Big Money on our Convex Portraits 38c, Frames 35c, Glass 20c. Largest house in America. Est. 15 years. Samples Free. The Culver Co., Box 104, Westerville, O.

SALESMEN and agents are clearing \$40 to \$100 weekly with our flashing electric signs. Wonderful opportunity now. Also great side line, no samples necessary. The Telesign Co., 6 N. Clark St., Chicago.

HELP WANTED

LEARN Automobile trade in reliable School. Overhauling, Ignition, Machine Shop Work, Driving, up-to-date cars. Special Exposition rates. Many positions filled. Room and board while learning. Catalog free. National School of Engineering, Los Angeles. Established 1905.

WANTED—Young man, every locality, willing to learn Mechanical Drawing, for Representative. Good Salary. Engineer, 4611 McMillan, St. Louis, Mo.

GO on the Stage. Vaudeville career offered you. Experience unnecessary. Managers endorse my method. Instructive vaudeville book free. Write today. Fred-eric LaDelle, Sta. 10, Jackson, Mich.

CHAUFFEURS get \$18.00 week. Earn while learning. Sample lessons free. Franklin Institute, Dept. D-892, Rochester, N. Y.

EARN \$20 weekly collecting names and information. What you see, hear and know is worth money. Send stamp for instructive booklet. Information System, 231 Marietta, Ohio.

BE a Detective—Earn from \$150.00 to \$300.00 per month. Travel over the world. Write C. T. Ludwig, 349 Westover Building, Kansas City, Mo.

RAILWAY Mail Clerks Wanted. Commence \$75.00 month. Sample examination questions free. Franklin Institute, Dept. D-21, Rochester, N. Y.

WANTED—Circular Distributors send 10c for a Contract Magazine. Oliver A. Barkley, Mount Pleasant, Pennsylvania.

MANAGERS wanted, small Capital required; Merchandise in your possession is your security. Harrison Co., Worcester, Mass.

I NEED branch managers for my worldwide mail-order business; operate from your own home in spare time; no canvassing or peddling; experience unnecessary; you should make \$50 weekly. Butler, 511 Factories, Toledo, Ohio.

WANTED—Railway Mail Clerks. \$75 month. Examinations coming everywhere. Sample questions free. Write immediately. Franklin Institute, Dept. D-21, Rochester, N. Y.

RARE opportunity, start in business; big profits, small cost. Particulars 2c stamp. Ideal Sign Co., 609 McKay Bldg., Portland, Ore.

SILVERING mirrors, Plating tableware, auto-brass. Home booklet plans free. Clarence Sprinkle, Dept. 28, Marion, Ind.

"DOLLARS" yearly in your back yard. No ginseng, mushroom dope. New ideas never before published, particulars free. Metz, 313 East 89th St., New York.

\$75.00 MONTH paid Railway Mail Clerks. Examinations announced Jan. 15th. Sample questions free. Write immediately. Franklin Institute, Dept. D-21, Rochester, N. Y.

GET a Government Job! See ad on page 14. Write now—today! Patterson Civil Service School, Rochester, N. Y.

BE a Traffic Inspector; We Teach You; a New Profession. \$4 a Day to Start. Unlimited Opportunities for Travel and Advancement. Positions Now Open. Frontier Prep. School, Dept. A3, Buffalo, N. Y.

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MEN, women, common schooling, desiring Government positions, \$70 monthly, write for list \$12 immediately. Philadelphia Civil Service School, Philadelphia.

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FIREMEN and brakemen; \$100 monthly. Experience unnecessary; hundreds needed by the best railroads everywhere. Particulars free. \$10 Railway Bureau, East St. Louis, Ill.

INVENTIONS sold on commission. No advance fee. Patent News, D, Washington, D. C.

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THOUSANDS Government Jobs Open to Men, Women. \$75 month. Short hours. Steady work. Common education sufficient. Write immediately for free list of positions now obtainable. Franklin Institute, Dept. D-21, Rochester, N. Y.

OUR 49 article premium mail order catalogue tells you how to make extra money in spare time. Both sexes. No canvassing. No capital. Vulcan Co., Dept. 1, 101 S. 5th Ave., Chicago, Ill.

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IF salary of \$100.00 per month and commissions, with liberal expenses, interest you, address Dept. N. Y., 2907 Indiana Ave., Chicago.

BE a detective; earn \$50 to \$100 weekly; travel all over the world. Write Dept. A, United States Detective & Adjusting Agency, Chemical Bldg. St. Louis, Mo.

MEN; co-operate and become Detectives; experience unnecessary; particulars for stamp, W. A. Brouk, 1821 Ave. A, New York.

SPARE time money-making business. Started without capital. Success proven. Instructions free. Norman Co., 157 East 47th Street, New York.

MOTORMEN—Conductors; \$80 monthly; Interurbans everywhere. Experience unnecessary; qualify now; state age; Booklet free. Electric Dept., 750 Syndicate Trust, B., St. Louis, Mo.

U. S. GOVERNMENT wants clerks. Men—Women, 18 or over, \$73.00 month. Vacations. List of positions now obtainable free. Write immediately. Franklin Institute, Dept. D-21, Rochester, N. Y.

GOVERNMENT Examinations. Most thorough preparation, \$5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

WANTED—An Idea! Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write for "Needed Inventions" and "How to Get Your Patent and Your Money." Randolph & Co., Patent Attorneys, Dept. 144, Washington, D. C.

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FIREMEN, Brakemen Wanted, all railroads; \$120 monthly. Experience unnecessary. Railway Association, Dept. 208, Brooklyn, N. Y.

BECOME Detectives. Large salaries; easy work. Write Chief Wagner, 1248 Lexington Avenue, New York.

YOUR services are needed as Topographic Draftsman at excellent salary. You can learn from us soon. Get particulars, Columbia School of Drafting, McLachlen Bldg., Washington, D. C.

WRITE Moving-Picture Plays. Good prices. Devote all or spare time. No correspondence school. Details free. Atlas Publishing Co., 2045 Cincinnati.

MEN wanted to make Toy Soldiers, Indians, Cowboys, etc. Germany's great industry. War stopped importation. Big demand. Greatest homework proposition. Big business on larger scale. Coming complete with pedestals, about 100 per hour, from the casting form. Complete outfit \$2.00 up. Tools, experience unnecessary. We buy soldiers all year at fixed prices. Booklet, pattern-sheet, payroll free. Toy Soldier Manufacturing, 32 Union Square, New York.

500 MEN wanted, 20 to 40 for electric railway motormen and conductors. \$60 to \$100 monthly, experience unnecessary. No strike. Write for application blank. National Railway Training Association, Dept. 47, Kansas City, Mo.

LADIES you can earn a beautiful decorated china dinner set by working for us an hour or two. For particulars address, Ha-Wa-Co Specialty Co., East Liverpool, O.

EARN \$100 weekly managing clean legitimate mail order business. We furnish everything. Right party need not worry about capital. Splendid chance for intelligent, employed person to control independent business on profit-sharing basis, beginning in spare time, evenings at home. Particulars free. Opportunities Exchange, Buffalo, N. Y.

SALE OR EXCHANGE

WILL exchange Moving Picture Outfit now in use for second-hand Automobile in good condition. W. L. England, Lenoir, N. C.

UPRIGHT Piano to exchange for diamond or stamp collection. Raymond Stiles, Schenectady, New York.

COINS, Notes, Stamps, Indian Relics, Guns, Pistols, Knives and all kinds of curious things exchanged for United Profit Sharing coupons. Booklet for stamp. Coin Exchange, New Rochelle, N. Y.

LIVE prospects to sell or trade anything anywhere. Write for plan. Mathews Rauch Publicity, 393 Mailers Bldg., Chicago.

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15-LIGHT Acetylene Gas Plants, Generator, Fixtures, Chandeliers, Pipe, Cheaper than Electricity. Fully Guaranteed, easily worth \$60.00. All complete for \$31.50. Write Daniel Zimmerman, Magley, Indiana.

ONE 80-Ton 42' Rebuilt Fairbanks Track Scale with 18" 55 I-Beams, thoroughly refitted, \$250.00. F. O. B. Cars, St. Louis, Mo. Howe Scale Co., 409 No. 4th St., St. Louis, Mo.

FOR Sale—Ohio Corliss engine, 250-h. p., heavy duty type, in perfectly good working condition. Faultless Rubber Co., Ashland, O.

FOR Sale—W. Z. Long's Crispette machine with rotary popper. H. Hamilton, 1817 S. State, Syracuse, New York.

\$150.00 BECK, London, Research Binocular Microscope, complete equipment. Price \$275.00. Wall, 307 E. 61st Street, Chicago.

SLOT Machines, Mills Operator Bells, \$10. Floor Venders, \$14. Each to close out quick. Auto Vending Co., Minneapolis, Minn.

TYPE and Printing Material at bargain prices. Now is the time to buy. All sizes rebuilt Job Presses very cheap. Catalogue free. Philadelphia Printers' Supply Co., 14 So. Fifth St., Philadelphia.

FIELD and Marine, Day and Night Glasses, with beautiful case, 25-mile adjustment; \$30 value, only \$7.50. Money back if not satisfied. Well's Curiosity Shop, 20 S. Second St., Philadelphia, Pa.

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FIREARMS—Old-time and modern. Buy, sell, exchange all sorts. Stephen Van Rensselaer, 49 Front St., New York City.

TEMPERING Gun Springs, coils, etc. Perfect system, \$2. C. M. Becker, Gunsmith, Port Rowan, Canada.

FLOUR & FEED MILLING MACHINERY

SPECIAL bargains in second hand Attention mills, burr mills, crushers, corn shellers, bran dusters, dust collectors, purifiers, reels, double, single, 2 and 3-pair high roller mills, sieve bolters, reciting separators, scourers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncie, Pa.

MACHINERY, TOOLS AND SUPPLIES

ENGINE Lathe, swings 3/4 in., takes 25 in. between centers. Complete set gears cutting all size threads 3 in. to 40 in., \$43.50. Grammes & Sons, Allentown, Pa.

"RED Devil" Mechanic's piler (drop forged steel). Most efficient. 5" size 60c. Style 50. Tool booklet free. Smith & Hemenway Co., 161B Chambers Street, New York City.

OTTO Stationary Gasoline Engine, 60 h. p., fine order, self starter, \$450.00. A. Stainforth, Winthrop, Mass.

FOR Sale—Berlin Double Surfer. Good condition. Willingham Sash & Door Co., Macon, Ga.

FOR Sale; New Power Hack Saw, capacity 4"x4", \$15.00. New 10" Sensitive Bench Drill Press, complete with chuck, capacity 3/4", \$15.00. Passman Bros., 30 S. Green St., Chicago, Ill.

PULLEYS, Gears, Sprockets, Shafting, Hangers; see page 164. W. A. Jones Foundry & Machine Co., Chicago.

ENGINES, MOTORS AND DYNAMOS

EIGHT Electric Motors practically new, from 1/2 H. P., 110 volts, to 1 H. P., 110 volts, from \$25 to \$85. Three of them have reversible starting boxes for lathe work—direct drive. Write for descriptive list. C. H. Lang, 1704 Michigan Ave., Chicago.

ELECTRIC light dynamo—use your spare power, and save half your lighting bills. Easy monthly payments. Hobart Bros., Troy, Ohio.

GREAT bargain. Sell or trade. Complete vertical Nash 3-cyl. 75-H.P. producer, or natural-gas power plant for Electric motors. Wolters Bros., Fremont, Mich.

FOR Sale—50-H.P. Atlas engine \$75. 4-ton gasoline motor, new. Address Box 125, Muncie, Ind.

FOR Sale—25-H.P. steam engine and boiler with all the equipments. One New 3-H.P. Olds Gasoline Engine. Write H. Murray, Goodland, Ind.

STORAGE Sale—Small motors and dynamos, all new, 110 volts. 3/4 H. P.—A. C., \$13.50; 1/2 H. P.—A. C., \$13.50; 1/2 H. P.—D. C., \$6.50; 8 light dynamo, \$12.00; motor generator sets, \$35.00. Other sizes, all voltages less than half price. Johnston, Evans Ave., Ingram, Pa.

ALTERNATING current, rebuilt motors. Reliable makes only. General Electric, Fort Wayne, Emerson, Wagner, Westinghouse. 1/2 H. P.—\$13.00; 3/4 H. P.—\$15.00; 1 H. P.—\$18.00. Direct-current bargains. Satisfaction guaranteed or money refunded. Write for illustrated list supplies and motors. Hyre Electric Co., 613L South Dearborn St., Chicago.

1 1/2, 2 1/2 AND 18 hp. gasoline engines cheap. J. T. McCarthy, Waukesha, Wis., R. Number 4.

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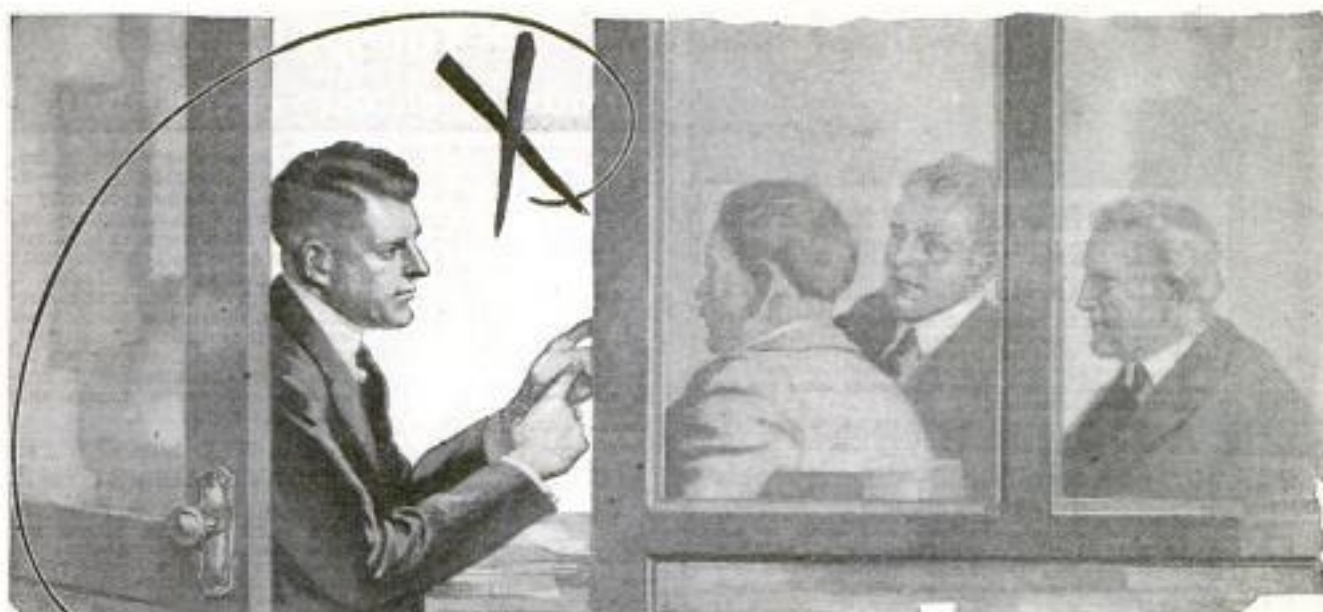
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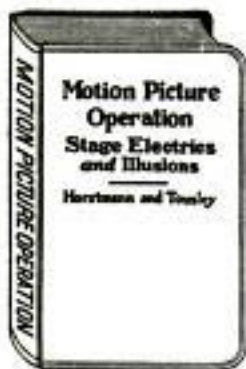
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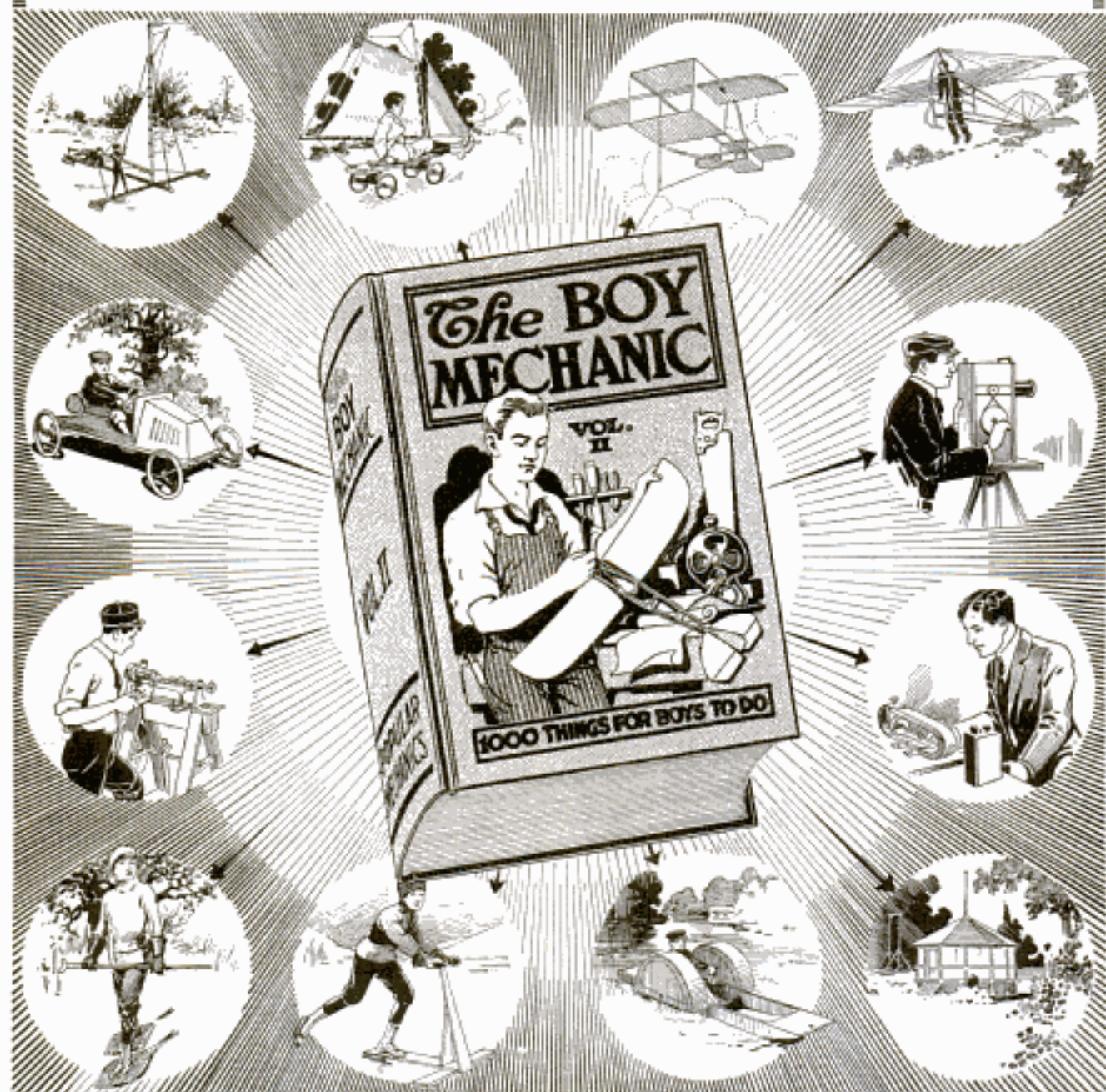
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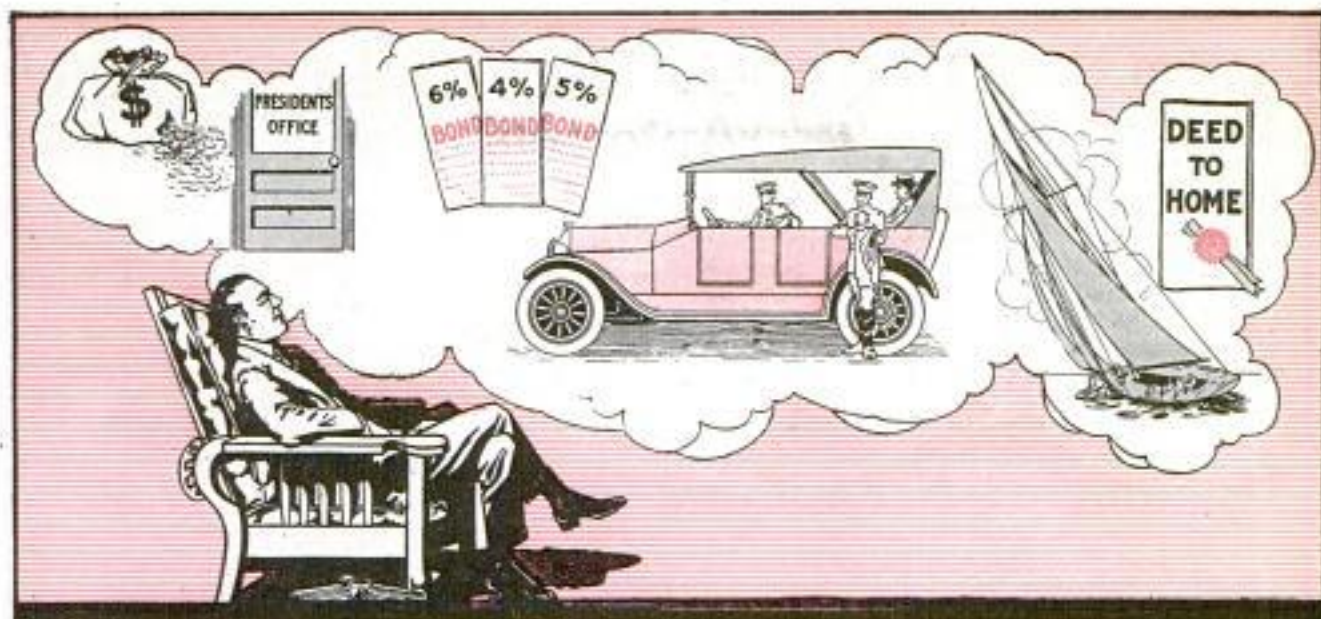
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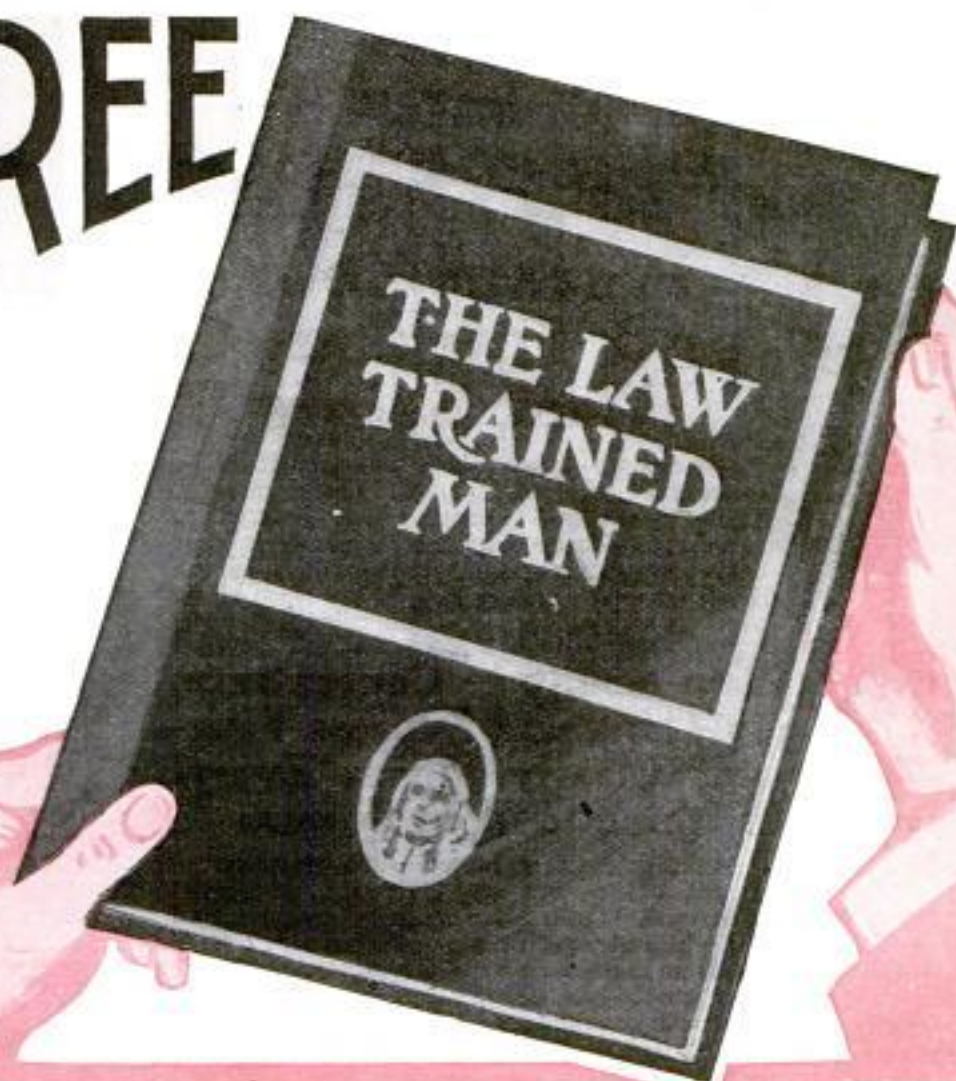
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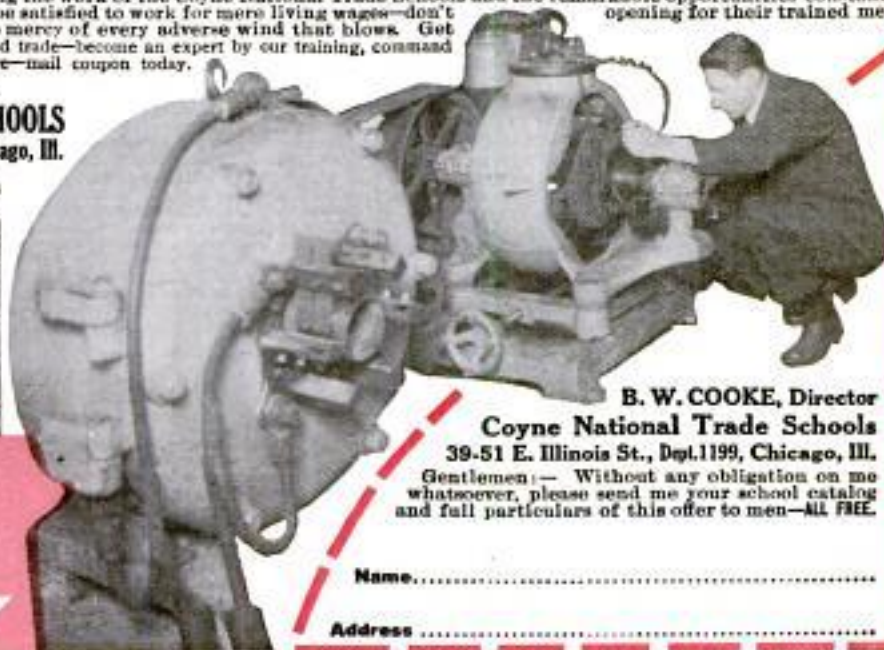
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FRANK GOTCH



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the automobile center
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10 road testers, 20 garage repair men, final assemblers. Maxwell Motor Co., Inc., Oakland Ave. Plant.

40 Drivers—Come ready to work. Maxwell Motor Co., Inc., Oakland Avenue Plant.

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Has Studebaker and Maxwell Agency
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Yours truly, (Signed) O. C. HILL.

Starting Garage of His Own, Couldn't
Accept Position We Offered

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Gentlemen:—I thank you very much for the information sent me and am very sorry because I cannot accept the position as I am busy at the present time, putting up a garage. I am going into the business for myself and was compelled to turn down the position offered me. I am thankful that I went to Detroit to learn the auto business and wish the School the best of success. Sincerely yours, (Signed)
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W. C. Garden, Tenn., is Chauffeur at \$25 a week and expenses. E. Livingston is head of government garage at Toronto. Hundreds of others in good paying positions.

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Michigan State Auto School

..... I expect to leave here about.....
for Detroit.

..... I would like to see your new pictorial
catalog. (just out) and the Auto School
News and will let you know later what I
expect to do.

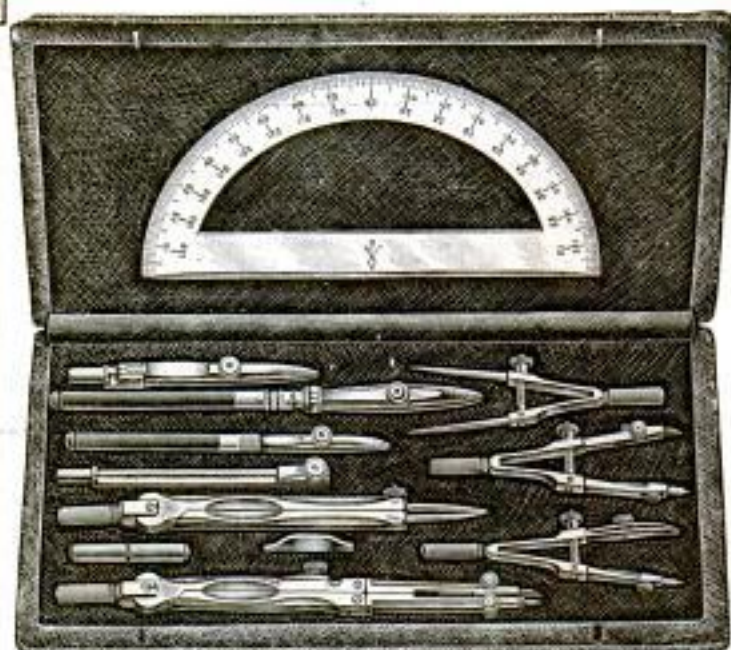
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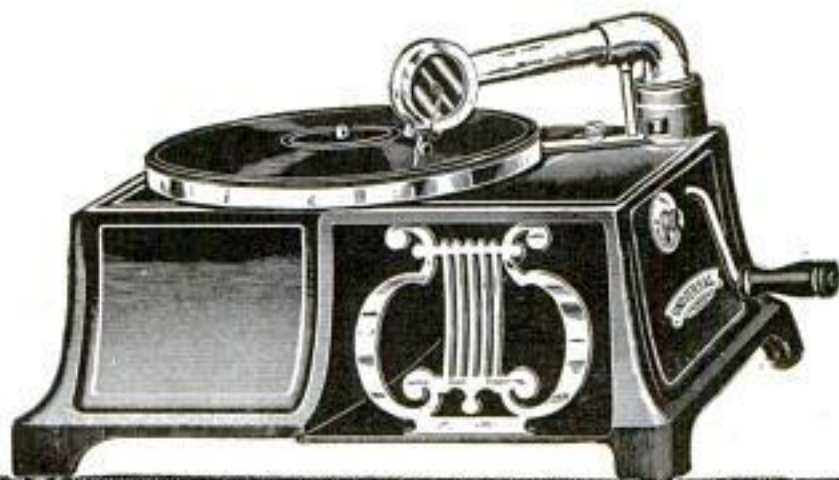
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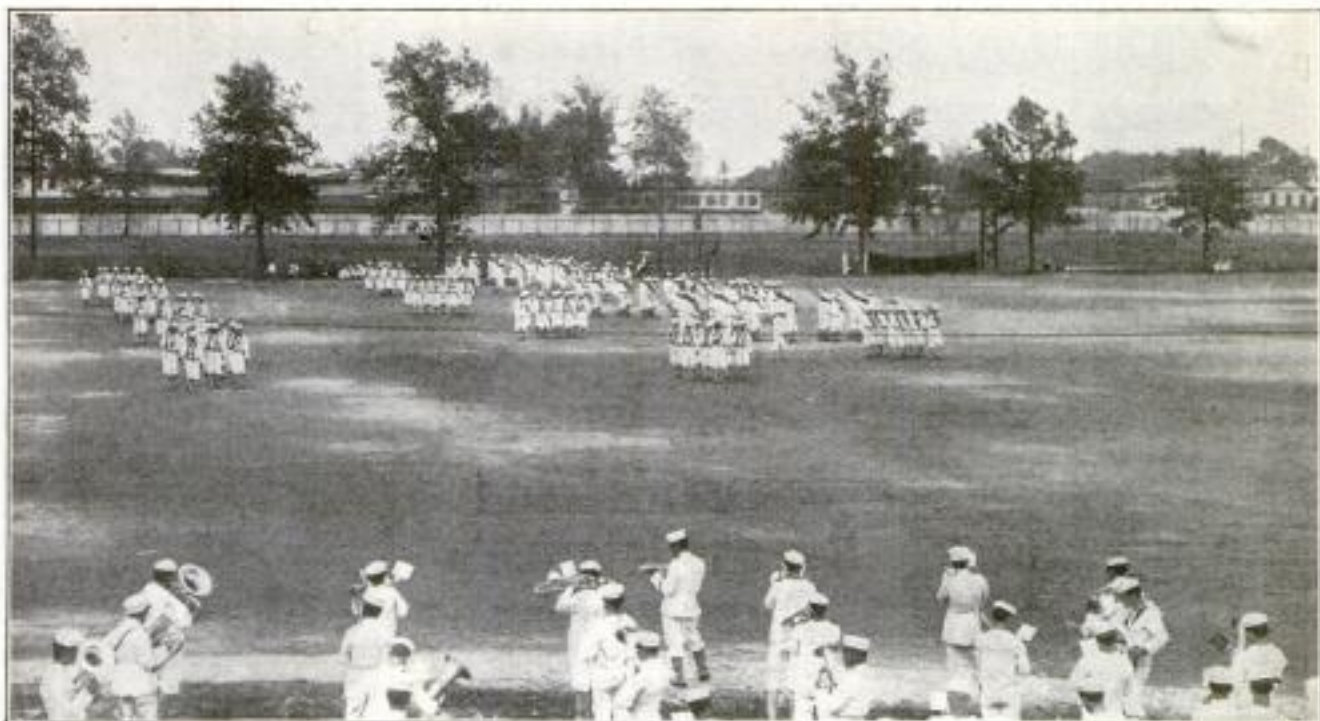
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☐ The sea has always possessed a fascination for adventurous young men, and this fascination has nowise lessened by the modern equipment of the dreadnaught, with her powerful radio, her excellent messing arrangements, her shower-baths, her steam laundries, and countless other improvements for the comfort of the enlisted men.

You'll be interested in knowing more about the Navy. Recruiting stations are located in nearly all the cities. Look up the address in the want columns of the daily papers, visit the nearest office, and have a talk with the men there. Or write to—Box 65

BUREAU OF NAVIGATION
NAVY DEPARTMENT WASHINGTON, D. C.



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Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 24

DECEMBER, 1915

No. 6

Good Horsemanship Shown in Odd Hurdling Event *657H*

DURING the course of a fashionable horse show recently held at an eastern city, the spectators were surprised by the introduction of a strikingly unusual hurdling event. It was a distinct innovation and a contest fraught with tenseness, both for the onlookers and riders.

A long, rectangular table, painted white, spread with linen and set with china and glassware, as if for a formal dinner, was placed on the far side of a hurdle. The position of the table made it difficult for the horses to see the additional obstruction until they were in the act of leaping. It was so placed that it was also necessary for them to take both the hurdle and table at the same time.

There were six entries in the event. The rules provided for the award of a prize to the trio which should simultaneously take the hurdle and table at one jump without upsetting any of its dishes or decorations. The requirement that each group negotiate the hurdle at the same time obviously imposed an additional handicap for the horses and huntsmen alike. Either a slight tendency to drag the hind feet, or a premature forward movement of the limbs for recovery, by any one of the animals would undoubtedly end in a mishap and the disqualification of the trio. This is precisely what occurred in one instance. The other group hurdled cleanly and captured the honors.



Winning Trio of Horses Taking Hurdle and Dining Table Simultaneously during Unusual Contest

*G. H. Davis Jr. 15 Putnam Ave.
Braintree, Mass.*

801

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CYCLING CLUB USES ROAD MARKER

A sticker on which is a diagram representing every possible crossing, fork, or turn in the road is being used



by a cycling club in St. Louis, and is proving of the greatest value in connection with club tours over unfamiliar roads. These stickers are posted in a conspicuous place at the intersections by some one in the leading division familiar with the road, who marks the figure with the route taken, the names of those comprising the division, and the time when the division passed. In this way, those following lose no time in inquiring the road, and are able to determine whether or not it is possible to overtake the division preceding them.

679 ——— DETROIT GETS GOVERNMENT FOREIGN-TRADE OFFICE

The fourth branch office of the United States Bureau of Foreign and Domestic Commerce is shortly to be established in Detroit, through the efforts of that city's board of commerce. The three other cities having a similar foreign-trade bureau are Cleveland, Cincinnati, and Los Angeles. The Great Lakes states will therefore have three out of the four existing bureaus.

Emily Comstock
9-29-15

558H LIFE-SAVING APPARATUS FOR LOCOMOTIVE CREW

In an attempt to provide a means of safeguarding locomotive engineers and firemen against serious injury and death in railway accidents, a southern inventor has developed a mechanical apparatus which has elements of novelty and interest, even though the practicability of all its features may be contested in some degree.

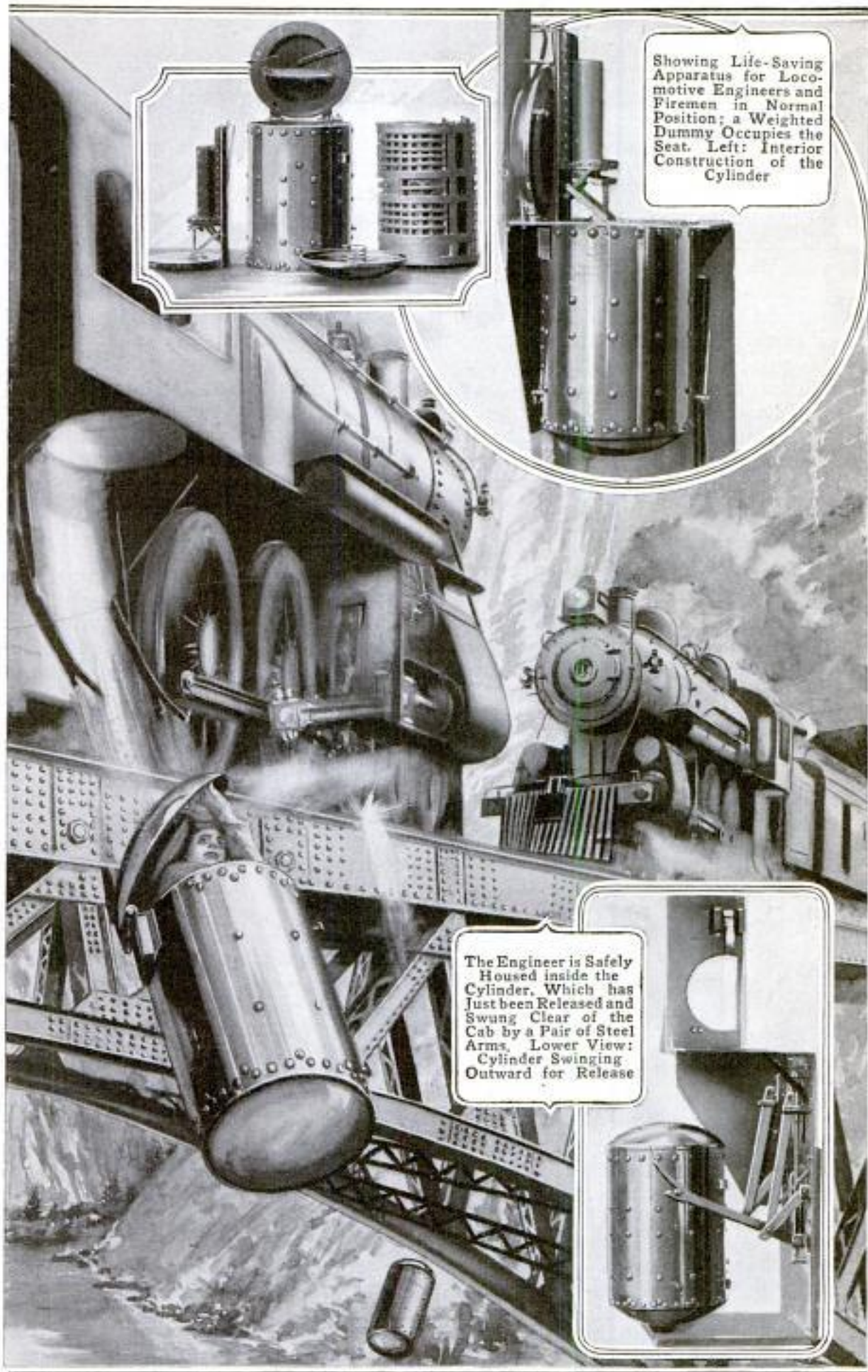
Under the usual conditions the members of an engine's crew are afforded two alternatives when a collision is seen to be inevitable. They may jump, and probably be killed in so doing, or they may stick with the locomotive and take their chances. Providing the new appliance works as it is intended to do, the life of an engineman, in such an instance, depends upon a brief warning of impending danger. Not infrequently a wreck occurs entirely without warning, and in such a case the present invention is worthless. Given ten seconds, or possibly even less, in which to act, however, and the safety apparatus seemingly affords a good opportunity for an engineer and fireman to save themselves.

Primarily the contrivance consists of two large steel cylinders mounted in a frame attached beneath and at the sides of an engine cab, immediately under the seats. The cylinders are made of boiler plate reinforced on the inside with a series of channel irons that enable it to withstand a crushing force of as much as 500 tons. By pulling a lever, the seat upon which an operator is sitting is released. This drops him, seat and all, into the cylinder, which is then closed mechanically and thrown free from the train.

The interior of the tank is lined with coil springs heavily upholstered with pneumatic cushions. This prevents the injury of the occupant, so far as shocks, bruises, and the possibility of laceration are concerned. In addition there is a thick lining of asbestos insulating the compartment against fire and heat.

If a heavy locomotive should fall on one of the cylinders, the impact would

Inventor: W. A. Utz 2109 Jennings Ave. Ft. Worth, Texas
58

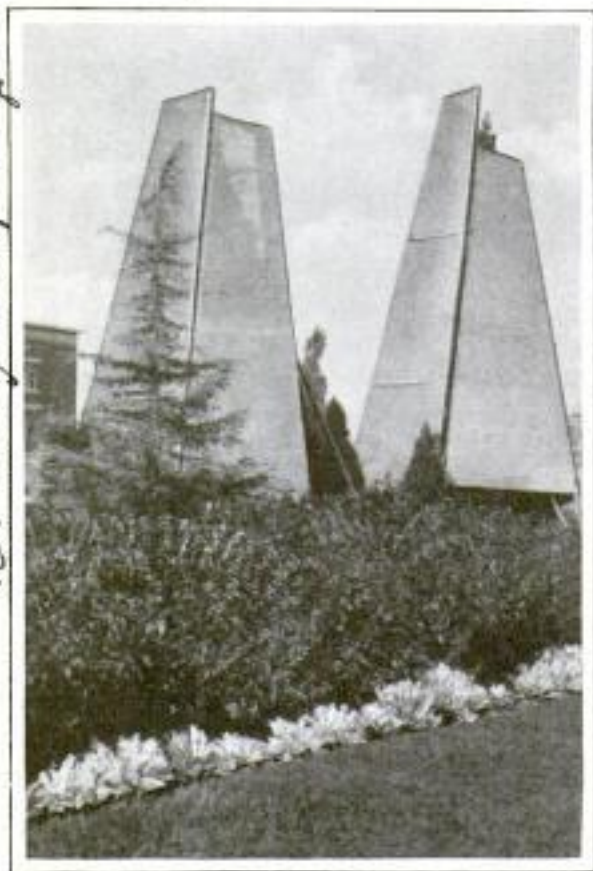


not be sufficient to crush it. Neither could escaping steam, boiling water, nor hot coals from the fire box penetrate it. Should a wreck occur on a trestle over water, or a train go through an open bridge, the occupant would not be drowned, for the cylinder will float and sustain a burden of 600 lb., according to the inventor's claims. Asphyxiation is guarded against by air valves which may be operated from the inside. There is also an oxygen tank for use in the event that submersion makes the valves incapable of action. Space is provided for carrying an electric flash light, a life belt, and an emergency medicine chest. The device may be opened from either the inside or exterior.

649

SHROUD EVERGREEN TREES TO PROTECT FROM SUN

The park superintendent of a southwestern city undertook a short time



Recently Transplanted Evergreen Trees were Covered with Hoods as a Protection against the Hot Southwestern Sun

Besides offering an engine crew an avenue of escape, the apparatus performs the duties of both the engineer and fireman after they have abandoned a locomotive. In this way the welfare of passengers aboard a train is looked after. When, in order to save his life, an engineer draws back the lever that drops him into the cylinder, the action simultaneously throttles the engine, applies sand to the rails, sets the air brakes, dumps the fire, and pours extinguishing agents upon it.

The cylinders vary in size. One type is 5 ft. in height, has a diameter of 36 in., and weighs approximately 2,000 lb. The equipment, which includes two of these devices for each engine, costs between \$500 and \$600.

ago to transplant several large evergreen trees. The trees did very well for a while, but the hot September sun seemed to be too much for their impaired vitality, and a general wilting resulted. In an effort to tide the trees over to the cooler weather later on, the superintendent had large portable hoods, or shields, made, which he placed bodily over the trees. These have proven a success, and the trees will be able to hold out until the winter rains come and give them a firm hold on life.

653

CORD LAYERS AID TIRE TO WITHSTAND HARD USAGE

A single-tube bicycle tire has lately appeared on the market which the manufacturer claims to be of especially durable nature, due to its being built up of corded layers. The inner tube of black rubber is surrounded with a spiral winding of cotton cord, over which a second layer of rubber is placed, covered with another spiral winding. Over the outside a thick layer of white rubber is molded, forming the tread. Such construction is claimed to possess greater resiliency and strength than tires built up of cloth layers.

Koscoma Rubber Co.
10th St. Koscoma, Ind.



Left: The Slender Mast as It Appeared on the Day Previous to Its Collapse. Right: Ironworkers Racing down the Great Framework after Unfurling Flags at the Top

Lower View: A Section of the Twisted Steelwork after Toppling Over in the Wind; It Fell Directly in the Path of an Approaching Express Train, as Shown Above

WIRELESS MAST IS WRECKED BY HEAVY WIND

On the day following its formal dedication, a 300-ft. wireless tower under construction at Tufts College, Mass., was completely wrecked during a severe windstorm. The upper section of the steel mast was inadequately steadied by temporary guy wires which snapped on the windward side during a 38-mile gale that blew the structure across an adjacent railway track in front of a speeding express train. The locomotive was derailed, but without serious results.

The tower was $3\frac{1}{2}$ ft. square and was built of 3 by 3 by $\frac{1}{4}$ -in. angle-iron uprights having horizontal and diagonal bracing members, the former spaced 4 ft. apart in the vertical. There were to be three sets of permanent guys, each consisting of three cables held by concrete anchors set 120° apart and about 150 ft. from the base. These wires were to be secured to the mast at intervals of 100 ft. The lower sets, which were already in place, had a diameter of $\frac{5}{8}$ in., while the top

ones were to have been $\frac{3}{4}$ in. in cross section.

Although it was torn from the ground, a reinforced-concrete base on which the mast was anchored was not injured. This block is $5\frac{1}{2}$ ft. square and 1 ft. thick and remained firmly fastened to the steelwork. In falling, the tower twisted somewhat, but did not buckle.

An interesting feature in connection with the dedication of the mast was a scaling race indulged in by three structural ironworkers. Each competed in climbing the framework and fastening a flag at the top. The first to reach the ground after accomplishing this feat was declared the winner.

The reconstruction of the mast will be commenced immediately. It is believed that about a third of the steel in the wrecked structure can be used in this work. When completed, the plant will have a sufficient radius to permit an interchange of messages with European stations. The mast will hold an antenna of the umbrella type and it is planned ultimately to carry it to a height of about 500 feet.

*Geo. H. Davis Jr. 15 Putnam Ave., Braintree, Mass.
Inter. News Service, 238 William St. N. Y. C.*

Engineering Record 7-19-15
Engineering News 8-12-15
Chicago Record Herald 9-21-15

POPULAR MECHANICS



PHOTO BY CHICAGO HERALD

708 CHICAGO'S MUNICIPAL PIER NEARING COMPLETION

BY the time that navigation is opened on the Great Lakes next spring, Chicago's new municipal pier, designed for steamship and recreation purposes, will be ready for use. The completion of this work will mark an important step in carrying out the city's plan for a comprehensive outer harbor. The pier, also, will be the longest municipally owned one in this country and will represent an expenditure of approximately \$4,000,000.

It is situated a short distance north of the mouth of the Chicago River and extends 3,000 ft. into Lake Michigan. The approach on the shore side includes 21 acres of filled land, which will eventually be used for commercial purposes.

The pier has a width of 292 ft., and carries, at the rear of a large head house, which serves both as an entrance and administration building, two parallel, double-decked sheds, each 2,335 ft. in length. These long structures are separated by a central driveway that is flanked on either side by railway tracks. At the extreme end of the pier a space, 665 ft. long, is reserved for recreation purposes. All freight will be handled on the lower level, while the second deck of each shed will be used for the accommodation of pas-

senger traffic. By this arrangement freight may be unloaded onto the docks and taken through the sheds to cars on the same level in the areaway. Likewise passengers will be discharged from the main decks of steamers onto the upper level and into street cars on the court side.

Steel and concrete have been used throughout in the construction work. The head house is faced with brick, the sheds are inclosed in glass set in steel sashes, and roofed with reinforced-concrete slabs covered with a composition surfacing material; the freight houses paved with wood blocks, and the passenger sheds finished with cement floors. Broad, winding concrete ramps replace stairways in the head house. At either side of this three-story building is a massive, octagonal tower, housing a steel tank of 60,000 gal. capacity, which is connected with the freight-house sprinkling system. Extending along the water side on the top the entire length of each shed, is an 8-ft. board walk, terminating on the roof of the recreation pavilion. This provides a delightful promenade more than a mile in length.

The recreation building at the far end of the pier will be used purely for



General View of Chicago's Municipal Pier: A Part of the City's Scheme for a Comprehensive Outer Harbor. Below is shown the Switching and Warehouse District on the Lake Front, the Arrow Indicating the Relative Location of the Pier

pleasure purposes. One of its principal features is a hall, 140 by 140 ft., which will be open to the public for dancing and other entertainments. There is also a large concert stand, and the design of this gives the end of the building a semicircular form. A generous open space surrounds the structure and is concreted and terraced. This will give access to the extreme end of the pier, where small pleasure boats will dock, and will be provided with comfortable seats and benches. In the terminal building, joining the two sheds immediately back of the recreation building, will be a restaurant with accommodations for several hundred persons. An emergency hospital and large concourse are also provided in this structure. Two ornamental towers, each 100 ft. in height, will grace the end of the pier.

The massive structure is carried on a pile foundation independent of the fill. In a period of nine months, approximately 17,000 piles were driven,

1,000,000 cu. yd. of earth filled, and $1\frac{1}{4}$ miles of concrete dock constructed. The greater part of the work has been completed.

LARGE COASTWISE STEAMERS 712 ARE TO BURN OIL

Announcement has been made that the steamships "Kroonland" and "Finland," engaged in passenger and freight service between New York and San Francisco, via the Canal, are to be equipped with low-pressure, fuel-oil burning systems. This is to be done in order to increase the speed and efficiency of the vessels as well as to reduce the cost of their operation. Each is 580 ft. in length and has a 22,000-ton displacement. When the installations have been made, these vessels, it is claimed, will be the largest merchant ships thus equipped. It is estimated that by burning oil, the fuel cost will be cut 40 per cent, and the fire-room staffs perhaps 80 per cent.

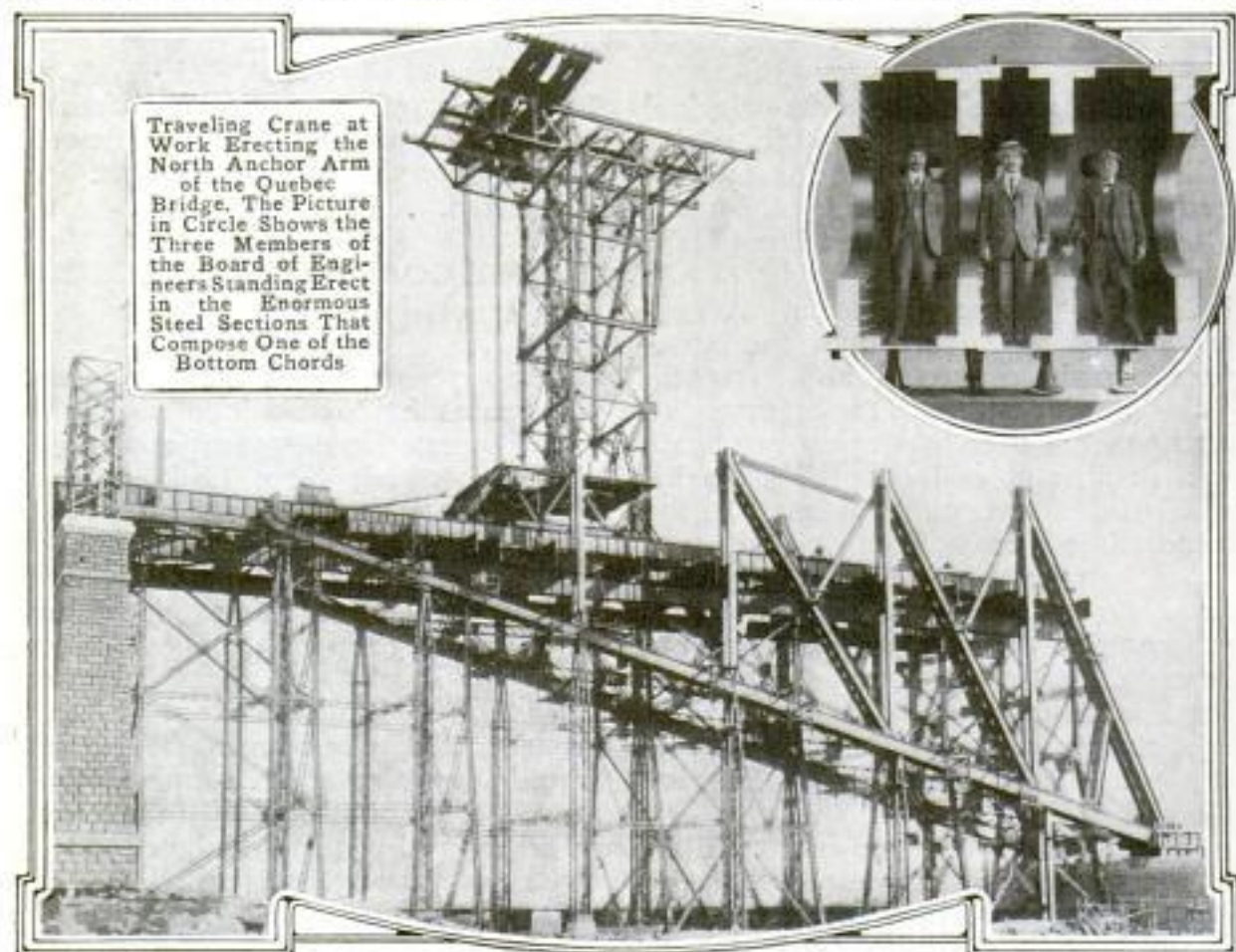
*"White" Mechanical Fuel Oil Burning System
Mfd. by: Washington Engine Works, Washington & Leroy Sts.
New York.*

566 BUILDING QUEBEC BRIDGE A COLOSSAL TASK

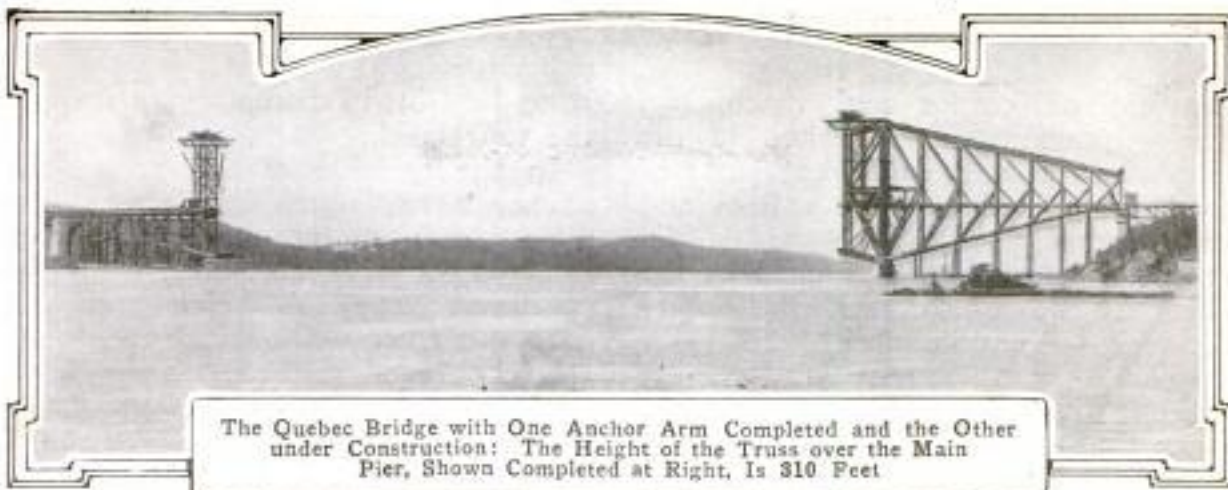
IN its general dimensions as well as in the enormous size and weight of the structural members composing it, the Quebec bridge, now in an advanced stage of construction, surpasses any other structure of the kind ever erected. The one bridge structure in the world that approaches it in magnitude is the famous Firth of Forth bridge in Scotland, the main-channel span of which is nearly 100 feet shorter than that of the Quebec bridge. Both structures are of the cantilever type. The channel span of the Quebec bridge, measured between centers of towers, is 1,800 ft. The design and fabrication of the steel for the structure therefore presented engineering problems for which no precedents existed, and the first attempt to build the bridge, made by a private company, resulted in 1907 in a collapse of the structure in which many lives were lost. Following that catastrophe, the Dominion government

took over the work, and a year later undertook the construction of the bridge. The present bridge is on the same site as the original structure, but owing to an increase of 21 ft. in the width between trusses and to a considerable increase in the weight of the superstructure, new piers were necessary and these were built immediately south of, and adjacent to, the original piers. The two main piers alone contain approximately 60,000 cubic yards of masonry, and cost in the neighborhood of \$1,500,000. One of these piers goes to a depth of 60 ft. below the bed of the river, and the other to a depth of 80 feet.

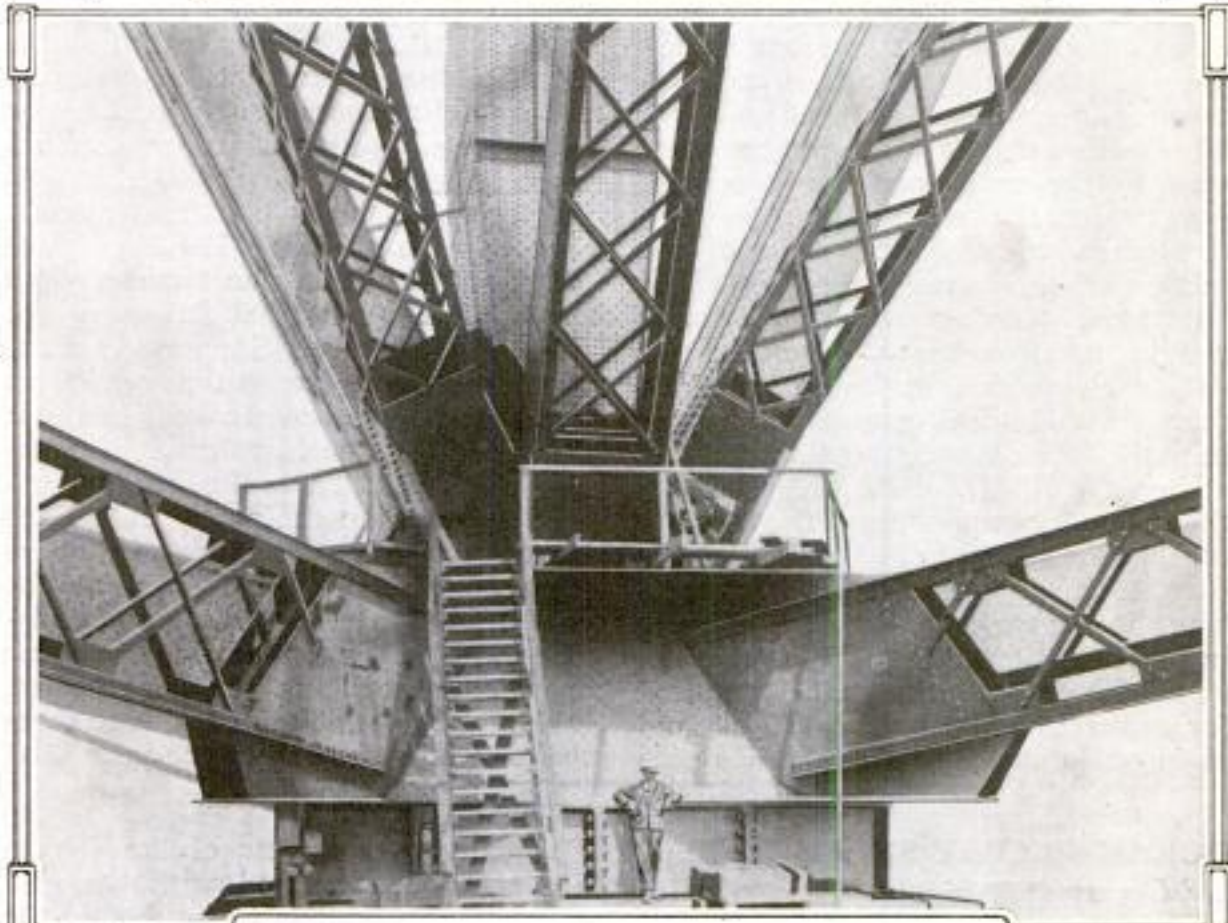
Owing to the fact that the principal members of the bridge were larger than any ever before made, it was necessary to erect a special plant for the fabrication of the steelwork. This plant was installed at a cost of about \$1,000,000 and is equipped with the



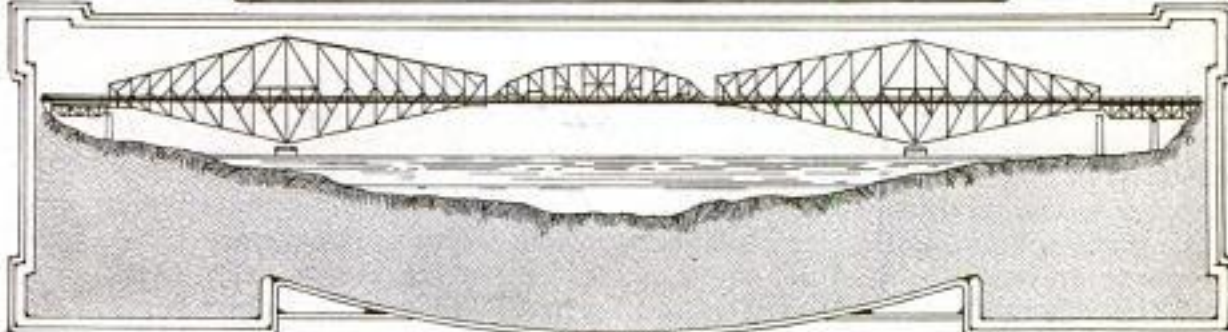
H. P. Borden, 709 new Birke Bldg.
Montreal, Canada



The Quebec Bridge with One Anchor Arm Completed and the Other under Construction: The Height of the Truss over the Main Pier, Shown Completed at Right, Is 310 Feet



In This Photograph are Shown Ten Truss Members Where They Come Together over One of the Main Piers. Their Enormous Size can be Appreciated by Comparison with the Man Shown in the Picture; the Steel Shoe on Which These Members Rest Weighs 400 Tons and was Made and Shipped in Seven Sections. The Bridge as It will Look When Completed is Shown in the Picture Below



heaviest of cranes and machinery. Every precaution was taken in the manufacture of the different parts of the bridge, and all field splices and connections were drilled to fit accurately before being shipped to the site. An idea of the task confronting the designers and builders of the bridge is given by the dimensions and weights of some of the principal members. The posts that spring from the main piers and form the central feature of the gigantic cantilever structures are each 310 ft. high and 10 ft. square at the base. The making and erecting of these four posts cost nearly \$1,000,000. The bottom chords of the bridge adjacent to the main piers are approximately 86 feet apart, and are 7 ft. high and 10 ft. wide. The weight of one section of the bottom chord is about 400 tons. Owing to its size and weight, it was necessary to make and ship each section in four pieces and then assemble and connect the pieces in place. The longest tension member shipped is 137 ft. in length. Each of the shoes for supporting the structure on the main piers is 21 by 26 ft. at the base, 19 ft. high, and weighs 400 tons. The shoes were each made and shipped in seven sections. Pins 30 in. in diameter, with 45-in. bushings, are required for connecting the bottom chords and main posts with the shoes, while pins

15 and 16 in. in diameter are used in the top chord.

In the erection of the bridge the anchor arms, which lie between the main piers and the shore, were constructed on steel falsework, while the cantilever arms are being built out over the river without falsework, by the cantilever method. The 640-ft. suspended truss to connect the cantilever arms will be built on shore, floated into position on pontoons, and then raised by powerful jacks and connected with the cantilevers. For the erection of the heavy bridge members two traveling cranes, one working on each side of the river, are used. Each traveler weighs about 1,000 tons and is equipped with two hoisting machines each capable of lifting 100 tons. The principal feature of the travelers is a tower that stands 200 ft. above the floor of the bridge. Supported on top of the tower are cranes through which the lifting lines are worked. All the machinery on the travelers is electrically operated. To avoid bringing uneven stresses on the partly completed structure, similar members on the two sides of the bridge are lifted by the cranes and erected simultaneously. The total length of the bridge between abutments is 3,239 ft. As now planned, it should be possible for trains to cross the bridge by the end of the year 1916.

OCEAN-SURVEY SHIP BUILT AT 680 INLAND LAKE PORT

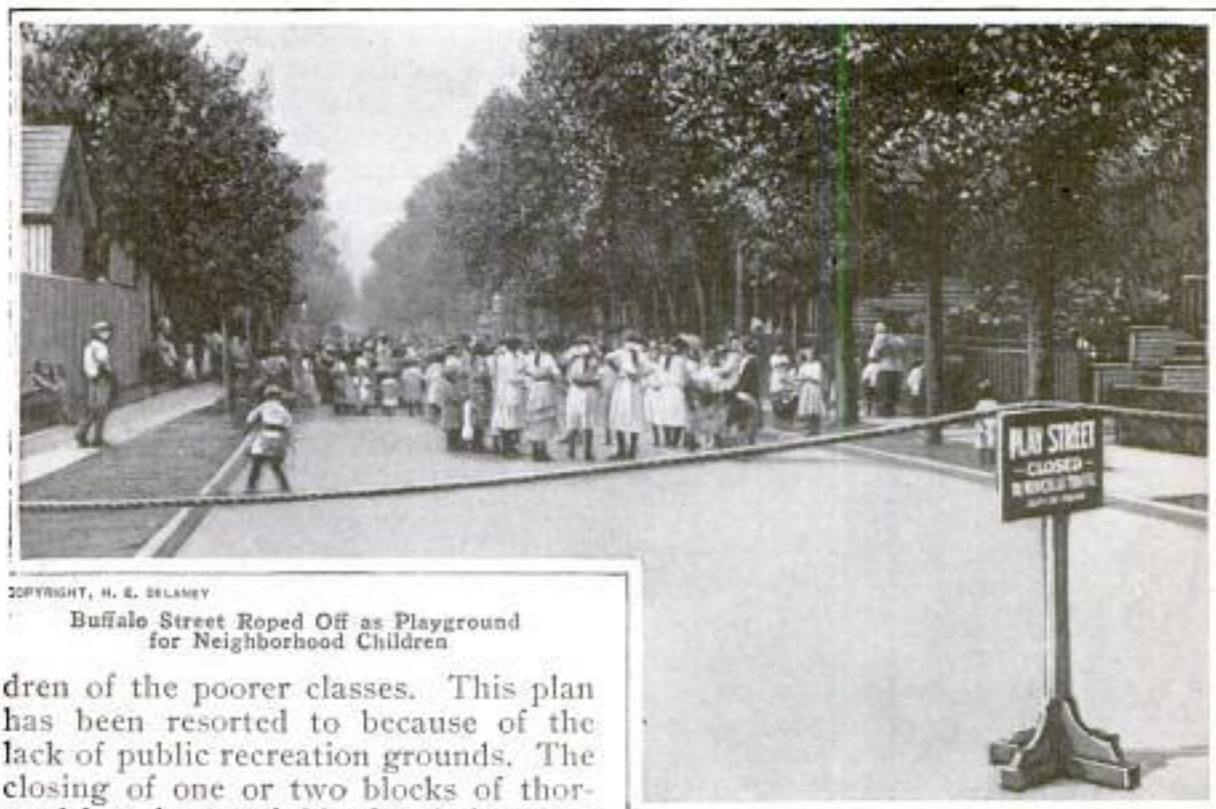
It is unusual, perhaps, for a boat-building firm on inland waters to figure much in construction of ships for deep-sea use. Yet a concern at a Lake Michigan port recently secured a contract to build an ocean-going vessel, which, curiously enough, is not to operate on the Atlantic, the nearest ocean, but far over on the Pacific coast in Alaskan waters. The government desires the boat for coast and geodetic-survey work, and it is to be built strong enough and will carry sufficient stores to cruise three months, or more, at a time through all kinds of weather.

The dangerous waters of the Bering Sea are to be charted with the new craft. The vessel is to be named the "Surveyor," and will be made of steel with 1,000 tons displacement. Crude oil is to be used as fuel, and the engines will be of the triple-expansion type. A crew of 66 officers and men are required to operate the boat.

CITY STREETS ARE CLOSED SO 647 CHILDREN MAY PLAY

In the congested tenement and foreign districts of some of our large cities, certain streets are being roped off for a few hours each afternoon to provide safe playgrounds for the chil-

H. E. Delaney, 35 Garner Ave.
Buffalo, N. Y.



COPYRIGHT, H. E. DELANEY

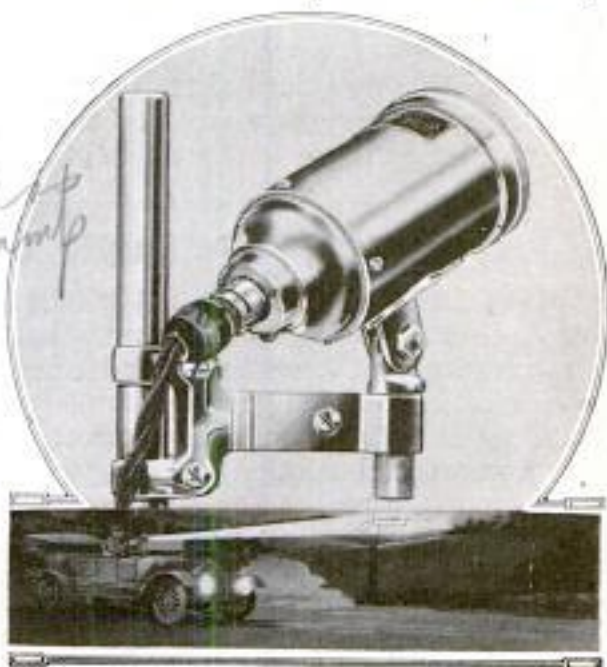
Buffalo Street Roped Off as Playground for Neighborhood Children

dren of the poorer classes. This plan has been resorted to because of the lack of public recreation grounds. The closing of one or two blocks of thoroughfare in a neighborhood does not materially interfere with vehicular traffic, while it does give hundreds of youngsters an opportunity to exercise themselves without danger of being struck by motor cars and trucks. At Buffalo sections of some of the streets are closed from three to six o'clock each afternoon, during which time children from the surrounding neighborhood are allowed to play under the care of a director.

SMALL ELECTRIC PROJECTOR 559 FOR THE MOTORIST

As an accessory for motor cars, a small electric searchlight has been introduced which may be attached to a windshield and used for illuminating turns in a road, or house numbers from a distance. It is tubular in shape, 6 in. in length, and has a diameter of $2\frac{1}{2}$ in. By employing a projecting lens in conjunction with a focusing lens, the necessity of a reflector has been eliminated. Current is supplied either by the regular lighting circuit or a 6 or 7-volt storage battery. The compact housing, and the fact that the lamp may be removed readily from its sup-

porting bracket, makes it convenient when engine or tire trouble develops on the road at night. The lamp is so mounted that it may be turned in any



A Compact Auxiliary Searchlight of Very Small Diameter Designed as Aid to Motorist

direction by a driver when he requires an auxiliary light. Since it is detachable, it may be carried in a tool box during the daytime.

*Pittsburgh Electric Specialties Co.
Pittsburgh, Pa.*

Raymond D. Weakley (Architect)
Central National Bank Bldg.
St. Louis, Mo.

812

POPULAR MECHANICS

THEATER CHAIR DESIGNED

571 TO FIT NEEDS OF CHILD

For the benefit of the children patrons of motion-picture houses, an ad-

This Shows How
Readily the Seat
may be Converted
to Accommodate
a Child



justable theater chair has been invented which may be converted to suit the requirements of either an adult or

a child. The front two-thirds of the seat is attached to a pair of arms which are hinged to the forward ends of the regular supporting members. This permits the fore part of the seat to be raised to the proper position for a child, where it automatically locks. In its normal position the seat is 17 in. from the floor, but when adjusted for a small child it is 24 in. high. As the seat is raised a wooden bar, intended as a foot rest, moves into position simultaneously. By the installation of a chair of this type, a child does not need to sit on the arm in order to get an unobstructed view of the screen.

634

POWER FROM GAS ENGINE IS

LESSENER BY ALTITUDE *out's*

Gas Power
The curious fact has been demonstrated that high altitudes apparently have a marked effect on the power obtainable from a gas engine. Recently one was erected several thousand feet above the sea level, but upon testing, failed to give the desired power. An investigation followed, and the loss in power was attributed to the height at which the engine was operating. The general conclusion was reached that a gas engine loses about one per cent of its indicated horsepower per 1,000 feet of elevation.

745 EXPLOSION OF TANK CAR TEARS HOLE IN CITY

Many business buildings in the heart of Ardmore, Okla., were demolished and more than 50 persons killed when a tank car filled with gasoline exploded recently in a railway yard adjacent to the commercial section of the town. The terrific force of the blast caused the discharge of 400 lb. of dynamite which was stored in a freight station near by. The double detonation damaged structures over a large area, crumbling brick walls, shattering the windows of practically every store in the community and razing an entire block of buildings. Without warning, the roofs of business houses caved in upon their occupants, burying many beneath the debris and injuring more

than 200 persons. The tank car was blown far into the air and flaming gasoline belched out in every direction, setting many of the partly demolished buildings afire and adding to the terror of the city. All business was stopped, and the town virtually placed under martial law. The property damage has been estimated at between \$500,000 and \$1,000,000. The explosion is thought to have been caused by a workman who was endeavoring to repair the tank car, which, it is reported, had sprung a leak. It is supposed that in pounding against the container, a spark flew from his hammer and ignited the gas rising from the volatile liquid that had escaped.

Inter. News Service

Joe Warren, Star-Telegram, Fort Worth, Texas

J. E. King, 202 S. Winnetka, Dallas, Texas

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Section of the Railway Yards at Ardmore, Oklahoma, Where the Explosion of a Tank Car Recently Occurred, Wrecking a Large Part of the Town's Business District and Killing Many Citizens. Immediately Below is Shown the Railroad Station, Which was Practically Demolished. Blazing Gasoline was Spouted in Every Direction, Kindling Several Fires and Adding to the Horror



Great Hole Torn in East Wall of One of the Hotels



Although a Large Part of the Stock in This Dry-Goods Store was Completely Ruined When the Roof Caved In, No One was Injured. Elsewhere, However, Persons were Caught by Falling Debris

Arthur Chapman
2612 Cleymont St.,
Denver, Colo.

MINERS DRILL HOLES IN ROCK
FOR PASTIME

Pounding holes in granite would perhaps not appeal to the average man as an enjoyable recreation, but the miners of Cripple Creek, Leadville, and other Colorado towns, seem to



Contesting for Prizes as Champion Sledge Artists in Colorado Mining Towns

enjoy it as a sport, and at Fourth-of-July and other celebrations are in the habit of getting up contests to see who is the fastest in the driller's art. One man will hold a chisel-shaped drill, and his partner will hit it with a sledge, several such pairs undertaking to pound their way through the same-sized piece of granite at one time. Some wonderful records are made at these contests.

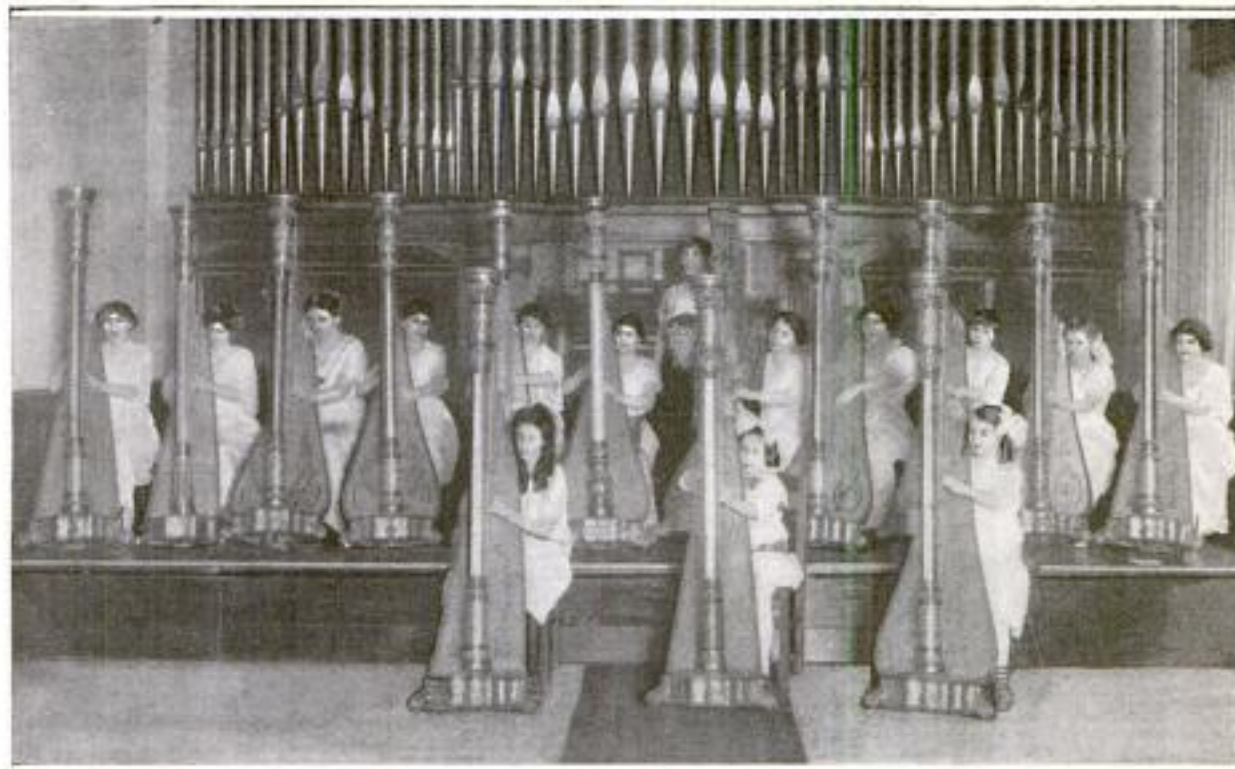
☞ The teaching of chorus music is a new feature in the university extension work of the University of Kansas.

ENGINE DISCARDED AFTER
CENTURY OF SERVICE

An "atmospheric" engine that has been in service hoisting coal at a colliery near Rutherglen, Scotland, since 1809 has just been discarded to make place for a steam engine of a modern

type. During the 106 years that it was in service this interesting relic of the early days of steam is reported to have given entire satisfaction and to have required no renewals other than that of two spur wheels that were broken by accident. The atmospheric engine represents one of the earliest successful attempts to make practical use of steam power. Steam at a pressure little greater than that of the atmosphere was used, and simply performed the work of pushing the piston to the upper end of the cylinder. In this work it was assisted by a weight hung to the opposite end of the walking beam operated by the piston. As the piston reached the upper end of the cylinder the valve was closed,

and the steam in the cylinder was condensed quickly by a jet of cold water. This operation created a partial vacuum so that the piston was forced back to its original position by the pressure of the air, the water being then forced out of the cylinder by the incoming steam at the beginning of the next upward stroke. The engine just discarded at Rutherglen was the oldest engine in Scotland and the only atmospheric engine in service in Great Britain. It is to be installed as a permanent exhibit in a park in the city of Glasgow.



Philadelphia's Harp Orchestra, Possibly the Only Organization of Its Kind in America

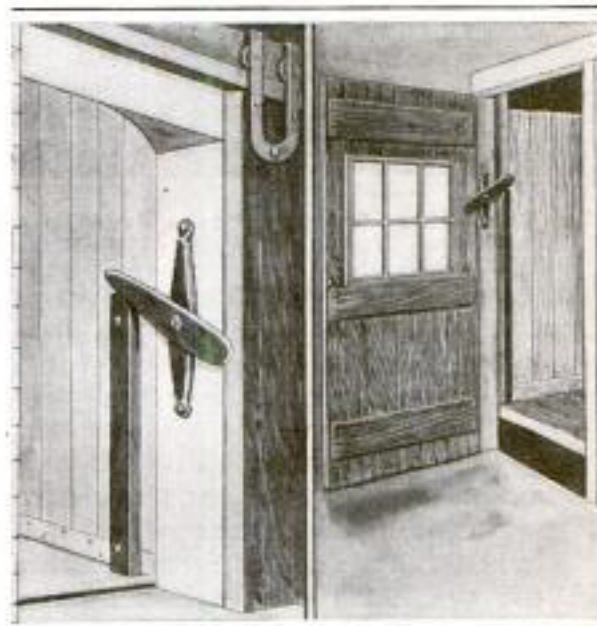
643 HARP ORCHESTRA ORGANIZED BY PHILADELPHIANS

Philadelphia has the distinction of supporting a harp orchestra. A musical organization of this character is doubtless very unusual as a permanent institution, although a band of harps only may have been heard occasionally both here and abroad. The orchestra, consisting of 14 harpists, is composed entirely of women and girl players who have been banded together through the endeavors of a local musical club. Its concerts are strikingly new to Philadelphia and have attracted considerable interest.

251 DEVICE FOR CLOSING DOORS OF LIFTS AUTOMATICALLY

To meet the New Jersey state law which requires that the gates at the entrances of elevator shafts shall be semi-automatic or automatic in their action, a very simple device has been invented which may be used with either sliding or swinging doors. It is a locking arm which holds a self-closing door open until an elevator is started, when it is

tripped, allowing the door to close. As a door slides into place across a shaft entrance, the arm drops into a slot provided for it and locks the former on the inside. The disengagement of this



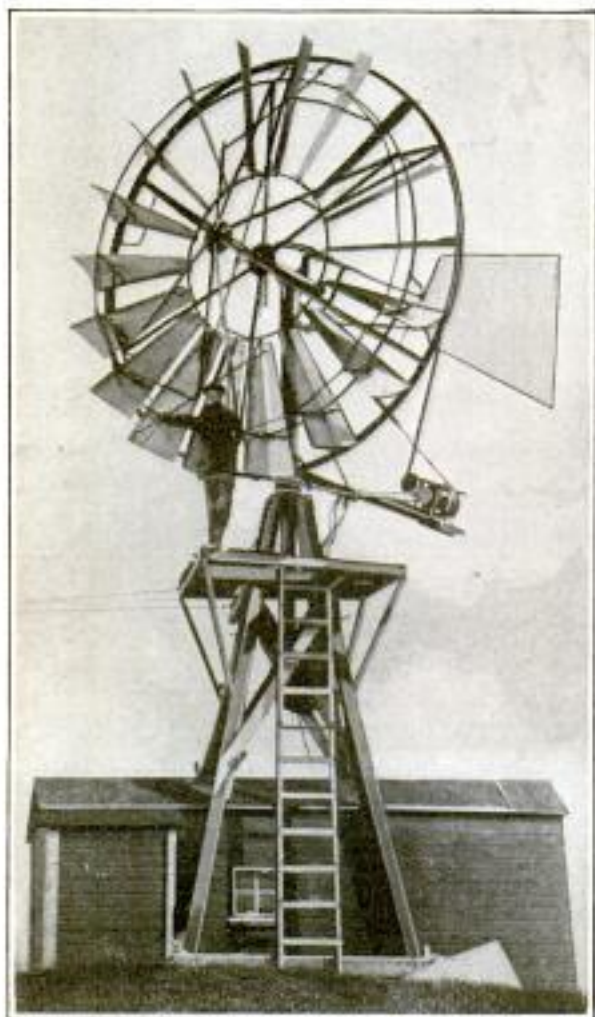
This Shows How the Device may be Applied to Both Sliding and Swinging Doors

pivoted arm is effected by means of a tripping member fixed to one wall of the elevator.

Thomas A. M. Co.
10-18 Cass St.
Newark, N. J.

467
**CONSTANT-SPEED WINDMILL
 RUNS ELECTRIC GENERATOR**

With the idea of extending a windmill's usefulness, a farmer living on the wide plains of North Dakota has



This Windmill and Generator Furnish Power for a Whole Farm. The Wheel Is Self-Governing

harnessed one of the machines to an electric generator. The current from this generator is made to operate a number of machines about the farm, as well as to light the whole place. The generator is mounted on a swinging boom and turns about the central standard along with the wheel and fan when the wind changes direction. In the rear of the wheel is a large pulley over which the belt from the generator runs, thus making a direct connection. The blades are movable about radial axes, and turn more and more edgewise to the wind as it gets stronger, thus keeping the speed prac-

tically constant. A suitable governor controls this function. Storage batteries receive the current when it is not otherwise being used, suitable circuit breakers being cut in on the circuit to keep the batteries from running the generator when the wind dies down below the speed necessary to force current into the batteries against their opposing electromotive force.

689
**DIVIDED BARREL PERMITS
 EASY HANDLING OF FRUIT**

A barrel with two partitions in the middle was recently devised by a Canadian inventor. His object was to provide a safe and convenient container for fruit. The two center partitions of the device were placed close together, enabling a filled barrel to be sawed in two between the partitions if desired, permitting a retail dealer to sell only a half barrel to a customer should that be all the latter cared to purchase. Besides these advantages, the inventor claims that a barrel-shaped container is easier to handle than either baskets or boxes, and that by sawing his type of barrel in two after delivery to a retail store, all the virtues of boxes and baskets are retained. In addition, these barrels may be made of cheap sawed lumber, and shipped in a knocked-down state to the fruit growers' packing plant. *Commerce Reports*

575
**TAKES TWENTY-SIX HORSES
 TO MOVE CASTING**

Twenty-six horses were recently employed in moving a huge mine-hoist casting through the streets of Grass Valley, Cal. Two big logging wagons, coupled together, conveyed the casting, which weighed 23 tons. In making a turn at a street corner on a stiff grade, eight of the horses pulled upon a cable running through a pulley. The greatest difficulty was the tendency of the broad wheels to sink into the asphalt pavement. During a halt at the top of a grade, the wheels sank to such an extent that it was found im-

#Edmund G. Kinyon
 The Morning Union (Union.)
 Grass Valley, Calif.
 Copyrighted material

Invention, Rev. Haristowere Mooreton, N. D.



Huge 23-Ton Mine-Hoist Casting being Pulled through the Streets of a Western Town by 26 Horses

possible to get a new start by horse-power alone. Fortunately the wagons stood close to the track of an electric car line, and it was found practicable to give the needed boost by means of an ordinary street car pushing upon a timber adjusted between its front sill and the rear axle of the rear wagon.

685

GERMANS OFFER MONEY FOR JUNK FROM BATTLE FIELDS

Recent reports indicate that Germany, with characteristic thriftiness, is offering so much per pound for scrap metal gathered up from the battle fields within her territory. Civilians who turn in brass articles, such as used rifle and gun-cartridge cases, and bits of copper, aluminum, and zinc, get about six cents per pound for the collection. For tin cans, and similar articles, about six cents per 10 lb. is paid. Those in the army who do such collecting get only one-fifth the prices paid civilians, thus encouraging the unemployed among the latter to engage in the work.

Engineering
9/17/15

Under an order recently issued, kapok, a vegetable fiber possessing a high degree of buoyancy, will in future be employed as a filling for all mattresses, pillows, and hammock mattresses used in the United States Navy.

COMPACT FIELD-TELEPHONE OUTFIT USED BY FRENCH

Field-telephone equipment for the use of the French signal corps has been reduced to a very compact form and arranged so that all of the necessary apparatus is carried in pockets fixed to a belt worn by the soldier. The paraphernalia is well protected against injury, and fur-



Special Telephone Equipment of French Signal Corps

thermore does not interfere with the freedom of movement of the wearer. At the right side of the belt, as it is worn, is a scabbard in which is carried a long metal spike that is intended to be pressed into the earth when it is desired to establish a ground connection. In a case next to this is fitted a

La Nature 4/17/15

small battery, while in a pocket at the middle is carried an induction coil. The telephone instrument itself is held in a holster worn over the left hip, and when the device is removed from this or returned to it the current is automatically turned on or off. To use the instrument it is only necessary to connect one of its terminals with a wire and the other with the ground.

567
**NEW FORM OF GUTTER KEEPS
 DIRT FROM CISTERN PIPES**

By the simple expedient of using the attraction most liquids have for the surface of the plane upon which they run, an inventor has recently brought forth a device which he claims will keep dirt, leaves, ice, and other undesirable matter, out of eave troughs, and prevent their being carried into cisterns. As can be seen from the cut, he places a metallic cover over the eave trough, the outer edge of the cover being bent inward and down into the trough. Water coming from the roof strikes this cover and follows



Water Sticks to the Cover on This Trough and Runs Inside, while Leaves and Dirt Bound Off

it down into the gutter by a species of capillary attraction. Dirt, leaves, etc., will not follow the surface, but bound off the metal instead of entering the trough.

Record Herald
 British
AMERICAN-BUILT SUBMARINES

690
CROSS THE ATLANTIC

The crossing of the Atlantic by four of the American-built submarines contracted for by the British admiralty is a remarkable feat for vessels of this class. It is also a matter to give a considerable degree of reassurance to Americans, for if we can build submarines like these for other nations we can build them as well, or better, for ourselves. Ten of the submarines were contracted for, and all have been completed. Under a ruling of the State Department the submarines could be designed and the parts made in the United States, but the parts could not be assembled in the form of complete war vessels without violating the neutrality of this country. Accordingly the work of assembling and erecting the submarines was done in Canada. Until all the vessels had been completed, the place where this work was done, now known to be Maisonneuve, near Montreal, was kept secret, and the plant was the most heavily guarded in Canada. Definite details of the voyage of the first four of the submarines from Montreal to Gibraltar, which occurred in the early part of the summer, have been given out, but no information is available as to the present whereabouts of the others. The first four to cross the Atlantic are supposed to be operating in the Dardanelles and are credited with being responsible for the sinking of two Turkish transports in the Sea of Marmora on August 29. Each of the submarines is 160 ft. in length, and is propelled by crude-oil engines when traveling on the surface, and by electric power when submerged. The voyage from Montreal to Gibraltar was made without trouble of any kind and without any great discomfort for the crew. The little flotilla was convoyed by larger warships, and the submarines made the entire trip under their own power, going down the St. Lawrence River to St. John's, Newfoundland, where a stop was made, and then to Gibraltar, where they joined the British naval forces.



Repts. Copyright UNDERWOOD & UNDERWOOD

AMERICAN-BUILT submarines in the river at Maisonneuve, near Montreal, preparing to put to sea: These five vessels are the last of the flotilla of ten submarines contracted for by the British admiralty and made in the United States from American designs, but finally assembled and erected in Canada to avoid a violation of the neutrality of this country. The first four to be completed made the trip, under their own power, across the Atlantic to Gibraltar early in the summer, going finally to the Dardanelles. They are credited with having taken a leading part in the fighting in Turkish waters.

GROUND-LINE DISCONNECTOR SAFEGUARDS LINEMEN

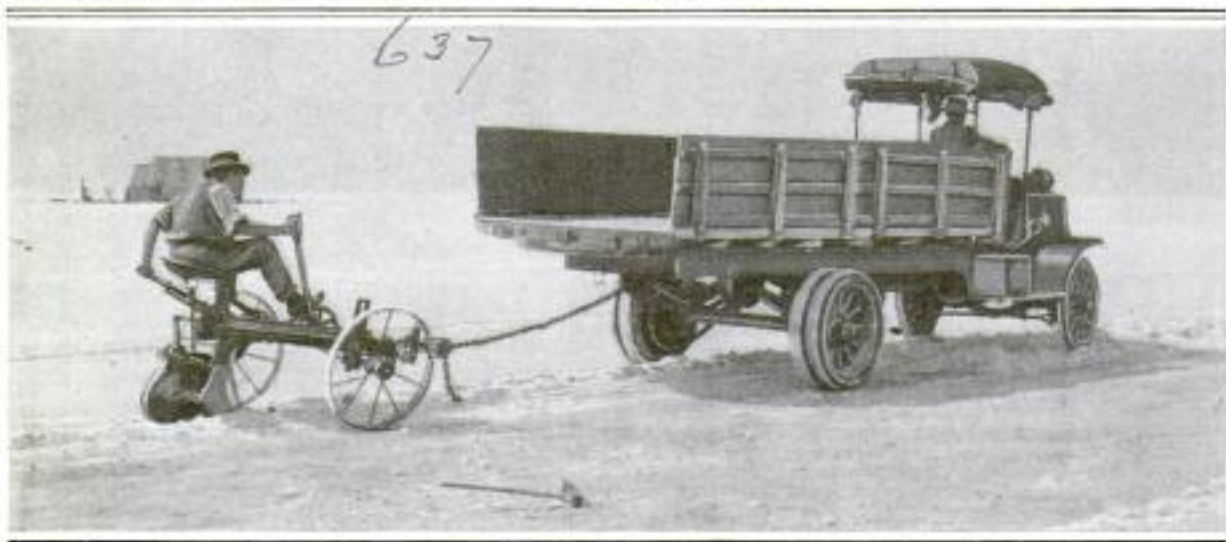
Designed for the protection of linemen, a disconnecting device for ground wires used on electric poles with lightning arresters has been invented. Primarily it consists of a small brass casting which may be screwed to a pole several inches above the customary ground pipe. At the top of it there is a lug into which the wire extending down from a lightning arrester is soldered. A slot is provided in the bottom to receive a split plug connected to a flexible wire which is fastened to a cap in the upper end of the pipe. When it is necessary for a lineman to climb a wet pole, which is thus equipped, he pulls out the plug. This breaks the ground connection and eliminates the danger of his crossing himself with the ground line and a live wire. The latter is a contingency which is always possible during rainy or excessively damp weather.



GARTON-DANIELS

637 PLOWING UP THE SALDURO SALT BEDS

With equipment consisting of a motor truck and a plow the salt beds at Salduro, Utah, which are said to constitute the greatest single deposit of pure salt in the world, are being broken up and utilized as a source of supply for the salt market. The salt in these beds is reported to be 98.21 per cent pure. It is closely packed and is as hard as silica, with a surface as smooth as glass. The beds are about 65 miles long, vary in width from one to 25 miles, and are in places as much as 25 ft. deep. The salt is loosened by an ordinary riding plow attached by a chain to the rear of a motor truck. As fast as the salt is plowed up, workmen with shovels follow and put it into piles. After a sufficient quantity has been made ready in this way, the truck is unhitched from the plow and makes the round of the piles, the salt being loaded into the truck and taken to the refinery. In this way the truck furnishes both the motive power for digging up the salt and the transportation for taking it away. This use of a motor-driven vehicle on the salt beds is in marked contrast with that which made the beds famous in 1914, when an automobile was driven over their smooth and blinding white surface at the record-breaking speed of 143 miles an hour.



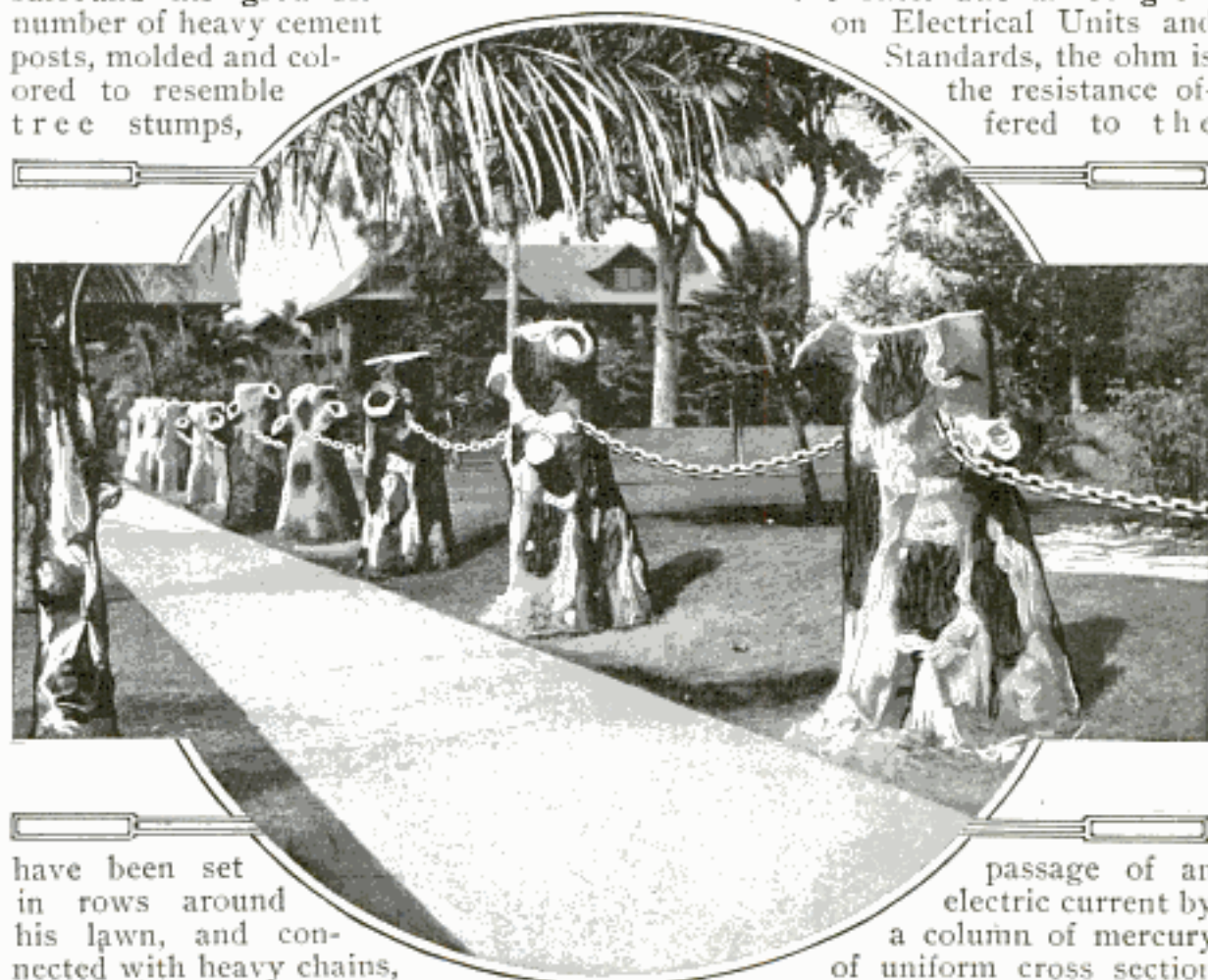
How the Salt is Loosened in the Salduro Salt Beds of Utah: After Furnishing the Motive Power for This Work, the Truck is Used for Transporting the Salt to the Refinery

O. J. Grimes, Snow Apts.
Salt Lake City, Utah.

Chas Alma Byers
**CEMENT TREE STUMPS USED
 607 FOR FENCE POSTS**

The owner of a California estate has hit upon a neat idea for a fence to surround his grounds. A number of heavy cement posts, molded and colored to resemble tree stumps,

standard ohms recently made by the United States Bureau of Standards furnish a good example of the extreme accuracy that can be attained in the making of such units. As defined by the International Congress on Electrical Units and Standards, the ohm is the resistance offered to the



have been set in rows around his lawn, and connected with heavy chains, forming a fence of substantial construction.

Flowers and vines will be permitted to grow in these odd posts, adding a further artistic touch to the fence.

Tree Stumps of Cement Make an Artistic Fence for California Lawn

passage of an electric current by a column of mercury of uniform cross section having a mass of 223.0248 grains and a height of

41.8503 in. For making the measurement, the mercury must be at the temperature of melting ice. In each of the ohms made by the Bureau of Standards the column of mercury is inclosed in a glass tube, and the unit as a whole is made with the highest degree of accuracy possible to modern science. In making measurements at the temperature of melting ice, as required, the ice used is made from specially purified water in order to avoid any temperature uncertainties due to impurities in the ice. When the standards were tested electrically the average deviation of the individual standards from their mean value was found to be less than .00001 ohm.

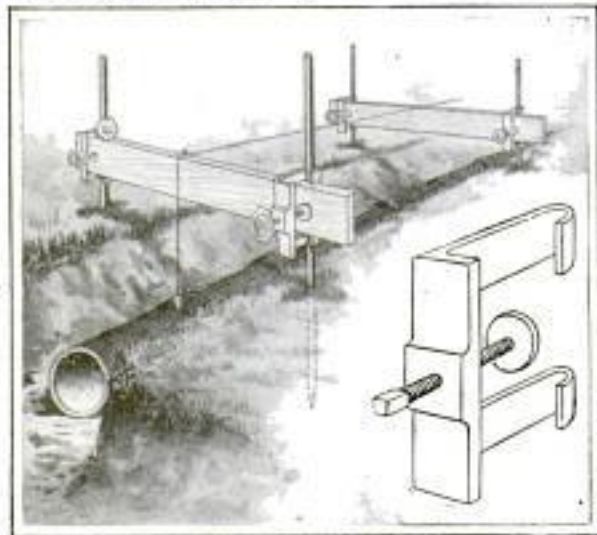
**672 THE EXTREME ACCURACY OF
 ELECTRICAL STANDARDS**

The fundamental units used in computing the amount of electric current consumed are now established and standardized to a degree of accuracy that goes beyond all possible commercial requirements. Three units are in use. These are the ohm, which measures the resistance, the ampere, which measures the amount of current flowing, and the volt, the unit used in measuring the electric pressure. Four

*Information sheet
 Dept of Commerce*

9433
A CONVENIENT CLAMP FOR CONSTRUCTION WORK

A clamp recently invented embodies convenient features. Its principal function is to clamp boards to rods or



The Clamp Is Convenient for Giving Lines and Grades to Sewers, or the Like, as Well as in Heavier Construction Work

stakes driven in the ground. In temporary construction work this is frequently just what is desired, as bolting or nailing parts together often calls for too great an expenditure of time and labor. The tightening wheel which operates the clamp may be removed to prevent unauthorized parties from tampering with the apparatus while in use.

HAVE CLOCKS TO CONTROL GAS STREET LAMPS

An eastern firm has devised a way to rid gas-lighted cities of a large share of the trouble attendant on lighting and extinguishing individual gas lights each night. A small clock is installed at a convenient point on a lamp-post, and this clock is equipped with a dial and mechanism which works a valve on the gas supply. A pilot light burns when the lamp itself is extinguished, and serves in the usual manner to light the latter when a full supply of gas is turned on. The statement is made that one man can easily look after 250 of these clock-equipped street lights, doing all the inspection, cleaning, winding, replacing of mantles, etc.

Automatic Gas Lighting Equipment Co. Boston, Mass.

It is further maintained that the annual cost per light to a city can be reduced from \$24 to \$30 to between \$15 and \$21 by use of the mechanism.

SCALE FOR COMPUTING CONCRETE MIXTURES

With a new computing scale that has just appeared on the market the amounts of the ingredients required for different quantities and mixtures of concrete are read off directly without the necessity for computation of any kind. The scale is made for three different mixtures of concrete. It consists simply of a square piece of cardboard to the center of which is pivoted a cardboard disk. On the lower cardboard are three sets of figures, each set consisting of three circular rows, while outside the whole is a single row of figures giving the quantities of concrete to be mixed. All the figures except the outside row are covered by the disk. The individual figures of each set fall on radial lines so that they can be read through one of the slots in the disk. In using, the slot corresponding to the mixture required



In Using This Scale for Computing Concrete, the Slot Corresponding to the Required Mixture is Set Opposite the Quantity of Concrete to be Mixed, and the Proportions of the Ingredients are Read through the Slot

is set opposite the quantity of concrete to be mixed, and the proportions of stone, sand, and cement are then read directly through the slot.

Inventor: Russell H. Peck & Co. 555 Riverside Drive New York

Harry E. W. Hooley - 12-14 Spinnaker St. New York

NEW ORLEANS SWEEPED BY TROPICAL STORM

720

U. & U.



Wreckage of Buildings at West End of Lake Pontchartrain, Caused by Gulf Storm of September 30, 1915, in Which the Wind Attained a Velocity of 86 Miles an Hour

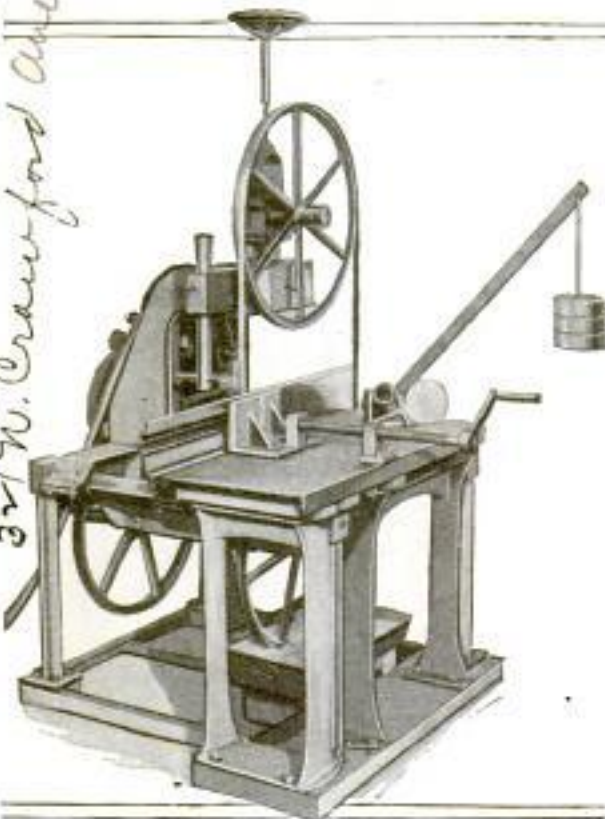
U. & U.



This Photograph Shows How the Shipping was Driven into the Wharves and Wrecked by the Fury of the Storm

BAND SAW FOR CUTTING METALS

For sawing metal a band saw having a number of novel features has been invented and placed on the market.



In This Metal Band Saw the Sawing Mechanism Slides on a Track against the Material, Thus Doing Away with the Moving of Heavy Pieces in Feeding

This machine will cut metal from 1/8 in. to 8 in. square, or of an equivalent diameter, and is particularly adapted to cutting disks. The table carrying the work is stationary, the frame carrying the wheels, with saw and driving mechanism, being arranged to slide on a track on the table. With this ar-

*O.S. Hall
Patenter*

angement it is not necessary to move heavy pieces in feeding. The pressure of the saw is obtained by weights hung

on a slanting arm attached to one side of the frame, and this pressure is varied by taking off weights or putting on additional weights. The blade is tightened by means of a handwheel at the top of the machine. The limit of the length of a cut is 20 in. Since the table stands only 26 in. from the floor it is comparatively easy to handle material to and from the machine.

590

CONCRETE CULVERT MADE IN INTERLOCKING SECTIONS

One difficulty in the making of concrete culverts is that the mixers, forms, etc., have heretofore had to be assembled on the site of each job. Since culverts are ordinarily small jobs, such continual moving around of men and machinery is inefficient and wasteful of time. With the idea of keeping culvert manufacture localized at one place, and assembling the culverts as needed, and at the place of erection, a Chicago firm has recently put a culvert on the market which is made up of separate and interlocking sections.

It is claimed that the new culvert has all the features of the older styles, including expansion joints as a protection against temperature changes, flat bases, straight sides, and a smooth in-



The Ends of This Culvert, as Well as the Intermediate Sections, Have Interlocking Joints



terior. It is easy to make, and of course any number of sections may be assembled to suit the requirements of a given job. Thus long or short culverts may be made with equal ease.

*Schulz & Hodgson
29, 8 Association Bldg., Chgo.
(Eastern Distributors)*

*H. C. Williamson
1840 W. Lawrence St., Chicago, Ill.
3rd W. Crawford Ave.*

(Cookeasy)

RANGE MAY BE REMODELED
618 TO FIT ONE'S FLAT

A gas range having interchangeable parts was put on the market a short

from Lincoln Highway
BEST EXPOSITION FEATURES

669 TO BE PERMANENT Bulletin

A movement is under way to preserve the best features of the Panama-



Same Oven Units, Cooking Top, Burners, and Extension Shelves Made into a Double Oven

Gas Range Presenting Usual Features in the Way of Ovens and Cooking Space

Some of the Left-Over Parts Made into a Convenient Stand



By Adding a Few Parts the Stand is Converted into a Kitchen Table

time ago. With the expenditure of only a few moments' time, a plumber or gas fitter can convert this range into any one of a variety of shapes. For instance, if the owner of the range should happen to live in a house whose kitchen is best fitted for a stove with an oven on the right side, the various parts may be assembled with the oven so placed. If, on moving to another apartment, the oven or other part would be better if differently mounted, the parts can be reassembled to suit. If there is a surplus of parts, sometimes enough can be had to make a handy zinc-topped kitchen table.

**LIBRARY HAS TELEPHONE
INFORMATION BUREAU**

The public library at Seattle has installed a special telephone service for the answering of miscellaneous inquiries and requests for information. All over the city neatly printed notices have been posted inviting the public to make use of this service in their daily work. So often an emergency arises in which a citizen finds it important to know a date or the facts regarding some happening. Any such information this library intends to furnish.

Donald Shumway Rockwell
Seattle, Wash.

Pacific Exposition as a permanent addition to the park system of San Francisco. One of the leading reasons being advanced for so doing is that the Lincoln Highway has its western terminus at that city. Local residents believe that the thousands of tourists who come over it each year should be treated with the best in the way of attractions that the city can provide. This is thought equally applicable to those hundreds who every month come up from the newly opened Panama Canal. The plans at present are said to be to preserve at least the Fine Arts Building, the Avenue of Palms, and the Lagoon, and to secure from the Federal government the use of the bay shore of the Presidio as a park and driveway. Support for the project is said to be coming from all over the whole state of California as well as from San Francisco itself. Thus a valued property will be kept for future generations.

Sale & Kilbuck Co. (Minn)
for sale by
United Gas Improvements Co., Phila., Pa.

600 FOREST-FIRE STATION ON SUMMIT OF MOUNT HOOD

DURING the summer of 1915 an innovation in the work of fighting fires in the national forests was brought about by the installation of a fire observatory on the summit of Mt. Hood, one of the five highest mountains of the Pacific Northwest. Mt. Hood stands 11,225 ft. above sea level, and even in midsummer the weather conditions at the summit are at most times severe. The establishment of the station was largely an experiment on the part of the government, there having been a great deal of doubt before the experiment was tried as to whether an observer could stand, for an entire season, the lonely existence, the high altitude, and the storms. This point was conclusively settled by a mountain guide whom the government employed as an observer. This guide, who had already made 350 ascents of the mountain, succeeded in establishing a camp on the summit and spent the entire summer there in comparative comfort. So successful did the experiment prove that toward the end of the season the government built a wooden observatory building on the summit. This building will serve as permanent quarters for the Forest Service, and in addition to this, will be used as an observatory for the United States Weather Bureau. As a result of the satisfactory outcome of the experiment, plans have also been made for the installation during the year 1916 of a number of other snow-peak observatories.

When it came to establishing the fire observatory on the summit of Mt. Hood, the work of getting the necessary equipment and supplies to the top proved to be a big undertaking. Above the 6,000-ft. level the mountain is continually covered with snow, while the slopes are so steep and treacherous as to tax the resources of the most skillful mountain climber. There are two routes to the summit, one up the south side of the mountain and the other up the northeast side. Just below the summit, on each of the routes, where the slopes are particularly steep

and perilous, a steel cable has been anchored to the mountain side, and it is only with this that the climb can be made with any degree of safety. The cable on the south route is 800 ft. long, and that on the northeast route, 1,800 ft. long. The 4,000 lb. of material required for the camp was taken up the south route. Pack mules were used for transporting it up the mountain side and across $2\frac{1}{2}$ miles of the snow zone to the 8,000-ft. level. From this point the climb was too steep and dangerous for this mode of transportation, and the material was carried the remainder of the way to the summit on the backs of the observer and an assistant. Dangerous crevasses in the area crossed by the cable made the work of transport extremely trying, but after five days of strenuous work the material had been carried to the top without accident of any kind. At the summit there is a scant two acres of fairly level snow-covered ground with little in the way of mounds or depressions to furnish shelter. The daily east winds swinging down from the Columbia River, a short distance to the north, often tear at the peak with the fury of a hurricane, while even in midsummer the temperature sometimes drops nearly to zero. To resist the high winds, the tent, 12 ft. square, was not only securely guyed but was heavily weighted around the sides. It was provided with a double floor. A comfortable bed of Hudson Bay blankets and a sleeping bag, a liberal stock of food, instruments for making observations, and a few books, constituted the living and working equipment of the observer. With the pioneer work done, the transporting of material for the permanent wooden building at the summit was carried out with less uncertainty and danger. An adequate and well-organized force of men was employed, but even under these conditions the transportation of 5,000 ft. of lumber to the summit was a big task.

With the camp established, it was next necessary to bring a telephone



One of the Two Observation Stations on the Summit of Mount Hood, from Which the Forests for Hundreds of Miles in Every Direction are Watched Constantly. When a Fire is Discovered a Sight is Taken with the Instrument Mounted on the Top of the Post and the Bearing is Telephoned Immediately to the Supervisor's Office

Party of Mountain Climbers Working Their Way to Summit with Aid of Cable

Cable and Telephone Line Spanning a Large and Dangerous Crevasse



Extending Telephone Line to 9,000-Foot Level



How the Telephone Line was Carried to Summit



This Tent, in Which the Fire Observer Lived during His Long Watch on the Summit, Is the First Habitation Ever Maintained on a Snow Peak in the United States

line up to the summit. For several years a lookout station had been maintained on the south side of the mountain at an elevation of 6,300 ft., the wires leading from the valley below to this station being strung from tree to tree along the trail after the usual manner of forest-telephone construction. This line was first extended to the 9,000-ft. level, the reels of wire being carried on the backs of pack mules. From this point the wire was dragged to the summit by the observer and his assistant, the last 800 ft. being so steep that the wire was pulled to the top with ropes. Five miles of line was required for connecting the lookout station with the summit. The wire used is of copper and is covered with a rubber weather insulation. No attempt was made to use poles, the wire being rested on the rocks and snow and stretched across chasms as they were met. Owing to its weight the wire sank into the snow from 10 to 14 inches, and with the continual melting and freezing soon became imbedded

and anchored in solid ice. Several times during the summer the ice split in crevasses, breaking the wire, and this caused the rangers a great deal of trouble in making repairs. Next year a heavier telephone cable is to be installed, and, if it is found feasible, poles will be set in the solid rock to carry it.

At the summit there are two observation stations, one being located at the eastern and the other at the western edge of the plateau, and with this arrangement the forests for hundreds of miles in every direction are visible. At each station there is an instrument for sighting on a fire and getting its bearing with reference to the points of the compass. This bearing is reported by telephone to the supervisor's office where it is combined with a bearing taken in a similar manner from some other mountain top, and the exact location of the fire is quickly determined. During the summer the observer on Mt. Hood discovered and reported hundreds of fires.

8769
**CRUDE AERIAL CABLEWAY
 FOR CARRYING WATER**

A crude but efficient aerial cableway is used by a mountaineer living near Asheville, N. C., for transporting water from a spring, located in a deep ravine, to his house, 289 ft. distant, the whole apparatus being operated by a single haulage rope that winds around a windlass at the top of the hill. The cable is simply a strong steel wire on

which runs a bracket with the water bucket suspended beneath. When water is needed, the bucket is let down to the end of the line, where it stops under a spout fed by the spring, and as

The Bucket is Filled at the Lower End of the Cableway and is Drawn to the Top of the Hill by Means of a Windlass



soon as it is filled it is drawn back by means of the windlass.

German farmers have been advised to conserve nuts and fruit seeds, from which the government probably will attempt to extract vegetable oils.

#7. Buckner, Asheville, N. C.

COMMENT AND REVIEW

THE big guns and the gas bombs have been in the spotlight at intervals, but submarines and air craft are unmistakably the star actors in the present war. For the first time each has a record of really practical work and valuable results. In the air, the aeroplane is acknowledged to be the real dependence. As predicted in these pages a year before the war, the dirigible as a war weapon can be counted a failure. True, a few trips have been made in good weather, crossing the English Channel, and dropping a few bombs, which have in the whole year's war killed less than 200 people, and these mostly women and children. For a large fleet, each vessel of which cost \$500,000 or over, this cannot be considered much in the way of result. No battle has been won or even affected by use of a dirigible. It has unquestionably been an awful nightmare to the British, but when the worst it has done and all it has accomplished are summed up, the dirigible to date must be declared more a menace than a real danger, and largely a fiasco. In fact, every German dirigible which has crossed into England has easily recruited 10,000 men to the British colors. Therefore, on account of cost, dependence on good weather, its size as a mark, and small results, it is now fairly well established that the dirigible, as a military weapon, has lost out.

*Submarines
and
Aeroplanes
Star Actors*

The aeroplane, on the contrary, that far-reaching eye that sees over mountains and around corners, has more than justified itself. Within the zone of activities an army can no longer begin any important change of base, or advance, or even start a retreat, without its being almost instantly known to the enemy. The perilous work of the spy, so important a few years ago, is now largely taken over by the aviation corps, for a single aeroplane with one pilot and an observer can in fifteen minutes bring in more accurate information than a dozen spies could secure in twenty-four hours, with the additional great advantage of the report being right up to the minute. And as for bomb dropping, if homes and hospitals and churches are still to be destroyed in so dastardly a fashion, the aeroplane is capable of enough mischief to quite compete with the dirigible. The aeroplane is so small a mark, so hard to see, and can change its course so suddenly and often, that the aerial guns have fallen far short of their expected efficiency.

While the submarine has sent a large number of unarmed merchant and passenger boats to the bottom, it has as yet, perhaps for want of opportunity, shown meager results as against men-of-war. All life is alert to protect itself against attack and destruction. As Burbank says, the cactus had no spines until it was threatened with annihilation by antelopes, and the submarine had free hand until recently. Already means have been devised which tend to limit the possibilities of under-sea craft: They are taken like fish in wire nets; they are set upon by a mosquito fleet of small speed boats, armed with one-pounders, when they show themselves. On the other hand, the submarine has demonstrated most satisfactory abilities for long voyages, as, for instance, one of our own submarines recently made the

voyage from San Francisco to Honolulu, a distance of over 2,000 miles, without once stopping its engines. However, for protection of our enormous coast line, a large fleet of submarines seems inevitable.



BY reason of his past achievements and well-earned renown, the words of Thomas Edison, chairman of the General Science Board, printed on another page, are those of one speaking with authority. When he declares for largely increased arsenals, located at places not easily accessible to an enemy; for machinery of vast capacity, and a supply of raw materials on hand with which to work, he unquestionably voices a sentiment approved by the great majority. All these provisions should be made, and promptly, and a great deal more. He says we are a nation of machinists and hopes to find our defense in machines instead of men.

*War
Machines
Need Men*

But can we? The present war has had at its service all the known means of combat of former wars, as well as aeroplanes, wireless, electric lights, motor cars, submarines, telephones, gas bombs, liquid fire, and high-power, long-range guns. Never were so many mechanical devices employed in any war and never were so many men required to work them; never the fatalities so large.

There is a bit of delusion about labor-saving machinery making labor unnecessary. There never were so many labor-saving devices nor so many occupations for the human hand and brain as today. The labor-saving machine transfers labor, but does not permanently displace it. Hence, however ideal Mr. Edison's hope for invention to supply machinery of defense, machines can never, unfortunately, take the place of large bodies of trained men. The nation with both machinery and men will defeat the nation with men only or machines only.

Let us have all the machinery possible, but let us not delude ourselves by placing too much reliance on machines and motors instead of on mind and muscle.



AT last as a nation we are waking from long years of comfortable, indifferent lethargy, and the cold fact is staring us in the face that our boasted strength is a myth. If attacked today we have, as compared to other large countries, very little in the shape of coast defense. We could be whipped a dozen times while we were organizing for protection. The kind Providence which has watched over us thus far should not be overworked; we must now do for ourselves.

*Prepared-
ness*

The plan for increased army and navy which the President will send to Congress will meet with approval by the large majority of Americans. Such substantial increase in equipment calls for a corresponding increase in men. Privates and sailors can be trained to a fair degree of usefulness in a few months; but officers,

such as this country needs, require several years in the making. At present we have one military school, West Point, and one naval academy, Annapolis.

The present capacity of West Point is about 700, with an average annual graduation of only 130.

During the present war the English have frequently lost in a few days more officers than the entire yearly graduation at West Point. In view, therefore, of the fact that the training a young man receives at the military academy specially fits him for life work of a high order as a civilian, it would seem advisable to increase the number of military academies by establishing one in the central West and one on the Pacific coast. The graduations of all three would in time produce 600 or 800 trained officers per year. Even at this rate, deducting deaths and disabilities, it would require at least 10 years to produce a total of 5,000 officers; and this assumes doubling the capacity of West Point and building two more schools equally large.

In these days, mere courage, of however high an order, will not compensate for lack of training in the officer; and now that armies are spelled in millions instead of thousands, the necessity for officers by the thousand becomes evident.

The United States Naval Academy at Annapolis, established in 1854 and enlarged a few years ago, has a capacity of 1,200 and an average annual graduation of 165. Somewhere on the Great Lakes and on the Pacific coast sister naval academies could well be operated to advantage, providing in time reserves of trained men available when needed, but who otherwise would engage in various industrial, professional, or engineering occupations.



PRACTICALLY all the great powder mills in this country are along the Atlantic coast within easy striking distance by an enemy. Mr. Edison's suggestion that new arsenals of ample size, capacity, and numbers should be erected in the central West will find general acceptance. Most people will go a step farther and, also, in addition to vast stores of raw material, will want generous supplies of the manufactured product ready for instant use.

*Arsenals
in the
Central
West*

In a way, the present war has accomplished for us, automatically, the construction of a large number of machines for producing ammunition and the training of men in their use. At the end of the war it might not be desirable or economical for our Government to purchase such machines as are still in excellent condition; but at least we can do what Germany has done. For years every new lathe which has gone into a German machine shop has been so constructed that it could be quickly changed from its normal use to that of making shrapnel. With their usual thoroughness, the war office knew at all times the location, number, size, capacity, and condition of all these machines. Thus it had at instant command, with trained men to operate them, thousands of machines already organized for service. Our own machine shops may well cooperate with our Government in a like manner to the good of each.

IT is getting to be almost a misdemeanor to possess an American flag in Massachusetts; and Boston, with memories of Paul Revere and Bunker Hill and Lexington and Concord, is the chief exponent of a most absurd law. It is ruled that the use of the American flag as any part of the illustrated front cover of a magazine is a debasement of the flag to purposes of advertising. Even a glass paper weight, devoid of a single word, cannot be sold or given away, if it contains the flag.

*An
Absurd
Law*

During the past few months three excellent magazines, of national reputation, were barred from circulation in Boston, under penalty of heavy fines—and what was the “offense”? On one a group of aged women were portrayed in the diabolical act of sewing an American flag; in another a Fourth-of-July girl had two small American flags in her hair, and the third showed the flag with patriotic quotations from the President of the United States printed below.

In each instance the flag was used in a dignified manner. What more impressive than the bent form of white-haired motherhood fashioning with trembling fingers the stars and stripes? What more beautiful than young womanhood, with all the charm of grace and beauty, espousing the flag which has given more to daughters and mothers than any other flag on earth? What more appropriate than that the momentous words of the commander of the Army and Navy should find expression beneath Old Glory, to honor and protect which he has taken his solemn oath?

At heart we are sound, but in our desire to avoid the semblance of devotion to royalty we have gone to the other extreme.

For fear of appearing sentimental, we reluctantly arise when the national anthem is played; we see its folds break from the peak with covered heads and faint applause. Must we have another scourge of shot and shell to teach us the lesson of its worth?

What we need in this great melting pot of nations is not less American flag but more of it. Let it fly from every schoolhouse, in every state; let it unfurl when our courts of law convene; let its folds drape our pulpits; give it a place in every shop, and office, and home. Let our girls wear it in their hair, and our boys wear it on their breast. Let it not be the emblem of a holiday, but let it find its response from the first words of first-born all the way through life, and with his last breath let him praise its grandeur and bequeath its trust to children's children.

H. H. WINDSOR

November 1, 1915





Motor Stage in Service in Colorado: As a Protection against Robbery, the Mail, Express, and Other Valuables are Carried in the Wire-Mesh Cage at the Rear

699
**MAIL AND EXPRESS CARRIED
 IN BANDIT-PROOF CAGE**

In a section of Colorado that is without railroad facilities there is in regular service a motor stage equipped with a bandit-proof cage for carrying the mail and express and other valuables. The cage occupies the rear of the car, leaving space at the front for 16 passengers. It is made of wire mesh and is so strongly built that it would require much time and labor for a bandit to break into it, and it is on the latter feature that dependence is mainly

placed for the safety of the valuables. While it might be an easy matter to overcome the single armed messenger, who rides in the cage, it is not believed that any bandit would risk spending the time required for breaking through the heavy wire mesh. For service in less thickly populated sections where this consideration might not act as a deterrent, the plan has been suggested of substituting for the cage a heavily armored compartment equipped with loop holes. The car as proposed is shown on the front cover of this magazine.

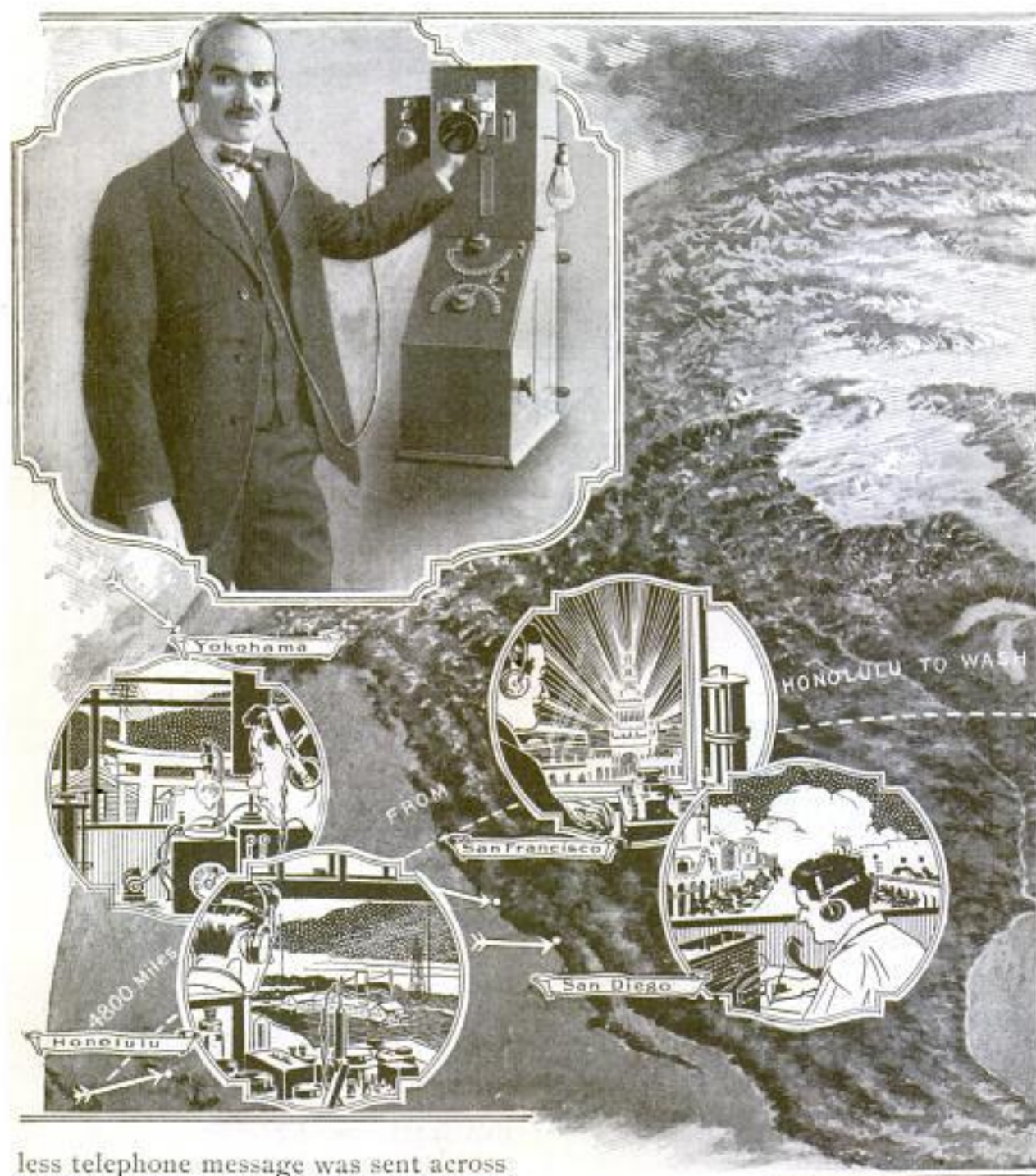
773
TALKING ACROSS THE OCEAN BY WIRELESS

By JOSEPH E. MURPHY

SIX months ago experts were talking of the tremendous obstacles in the way of transmitting the human voice over long distances by means of wireless. This seemingly impossible feat has now been accomplished, and the accomplishment has come with startling suddenness. On September 29, in a test of a new apparatus, the details of which have not yet been made public, a telephone message was transmitted from the wireless station at Arlington, Va., to the navy yard at Mare Island, near San Francisco, a distance of 2,500 miles. Remarkable as

this feat seemed at the moment, the actual accomplishment was found to be tremendously greater than supposed, when, on the following day, a cable message was received from Pearl Harbor, Hawaii, about 4,800 miles from the source of the wireless waves, saying that the conversation had been heard at that point. Subsequently it was found that several other distant wireless stations, among them the one at Darien, Panama, had also picked up the message. Three days later, when communication was established with the Eiffel tower in Paris, the first wire-

Inventor: Dr. Lee De Forest, 159, Sedgwick St.,
 N. Y. City



less telephone message was sent across the Atlantic. This message was also picked up at Pearl Harbor, the voice at Arlington being thus heard at two points about 8,000 miles apart. At the present writing, plans are being made to attempt wireless conversation with stations in China and Japan. As a preliminary to this supreme test communication will first be established with Alaska. A hint as to the revolutionary changes likely to be brought about as a result of these accomplishments is given in a statement credited to the

secretary of the navy, in which it is predicted that as soon as the new apparatus is perfected it will be installed on the ships of the American navy, where it is likely in large degree to supplant the wireless telegraph. In this wireless apparatus, as well as in the new transcontinental telephone line, a device known as the incandescent audion amplifier is an essential part of the equipment.

What is perhaps as striking a feature



as the distance over which the voice was transmitted in the first test, is the fact that the message was started from a telephone in an office building in New York City and made the first lap of its long journey over an ordinary telephone line, the electrical impulses carried over the wires being automatically converted into wireless waves by a transformer at the Arlington station. Such a combination of new apparatus opens practically unlimited possibili-

ties. Sitting at a telephone a thousand miles inland and talking with Europe or Asia, or with a ship at sea, by means of a combination of wire and wireless transmission is a possibility of the immediate future, and is apparently only a matter of building apparatus having the required power.

Simultaneously with these developments in wireless telephony, long-distance telephony by wire has been making enormous strides. One of the fea-

tures of the Panama-Pacific Exposition is a theater in which the audience listens to conversation in New York and to the roar of the surf on beaches of the Atlantic, all this being transmitted over the new transcontinental telephone line. Recently a chorus composed of 5,000 voices in Boston sang "America" and "The Star-Spangled Banner" to an audience in this theater, and both the singing and the applause that it elicited were distinctly heard across the continent.

An added touch of interest is given to these various accomplishments through the fact that they occurred at the same time as the first successful use of the long-distance telephone by Thomas A. Edison, an impossible pro-

ceeding for the famous inventor, on account of his deafness, until the sound amplifier had been placed in service. At the instant the first wireless telephone message was being transmitted to Paris, Mr. Edison was talking from San Francisco with his home in Orange, N. J., and a few moments later the line at Arlington was "cut in" with Mr. Edison's line, and he was informed of the feat. In his first talk across the continent the inventor used a line in which were many relics of the early days of electricity, among them being a short stretch of wire over which Samuel Morse sent his first telegraphic message, and another section of wire used by Alexander Graham Bell in sending his first telephone message.

TO MOBILIZE MACHINERY FOR 785 NATIONAL DEFENSE

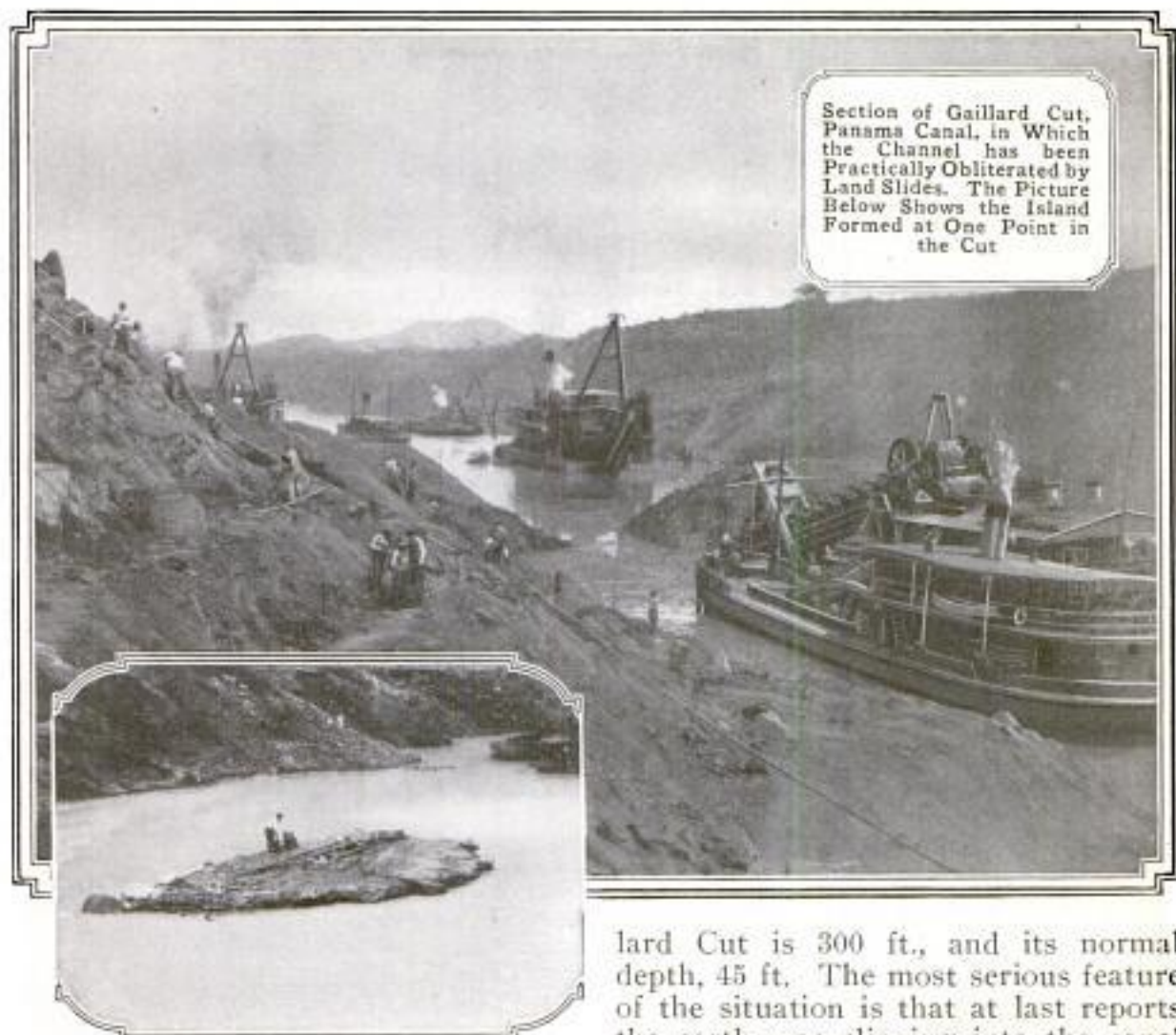
That machines—not men—are to be the determining factor in any future war that this country may be called upon to fight is the opinion expressed by Thomas A. Edison in a recent interview. On the basis of that opinion he believes that the country should depend for its safety, not on a large standing army, but on facilities constantly maintained and ready for instant use, with which the machinery of war could be quickly produced on an enormous scale in case of a crisis. Equipped in this way, a volunteer army is all that the country needs, provided—and this point is emphasized as one of vital importance—there are enough trained officers, ready for service within 48 hours, to lead and drill the new men. This, in a general way, is the inventor's solution of the problem of national preparedness, a problem that is claiming the attention of the American public as never before in the history of the country. In his opinion "the soldier of the future will not be a saber-bearing, bloodthirsty savage, but a machinist."

"Consider the great amount of powder that is being shot off on the European battle front every day," Mr. Edi-

son said in explaining the details of his plan. "I would have great factories built in which twice as much powder as that could be manufactured, and I would locate and have stored away enough material to make up that powder. As to shells, I think it is a wasteful thing to make them on lathes as they are made now. We should get up special machines for making them rapidly and in enormous quantities. Then I would grease the machines and store them away with a great quantity of steel billets ready to be worked up on short notice. In fact, I would make my preparation potential rather than kinetic, and I would do it right away. The problem should not be a military one at all. It should be done solely on a business basis. But I would keep this in mind in preparing to make stores and ammunition: I would prepare to turn out right along twice as much as is being used now on the whole European battle field—then not make it."

"The people of this country are the greatest machinists," Mr. Edison explained further, "and they can invent machinery faster and have it more efficient than any other two nations combined. This is a machine nation—its battle preparations should therefore be with machinery."

Chicago Tribune, Herald, American 10/16/18



Section of Gaillard Cut, Panama Canal, in Which the Channel has been Practically Obliterated by Land Slides. The Picture Below Shows the Island Formed at One Point in the Cut

PANAMA CANAL BLOCKED BY 774 EXTENSIVE SLIDES

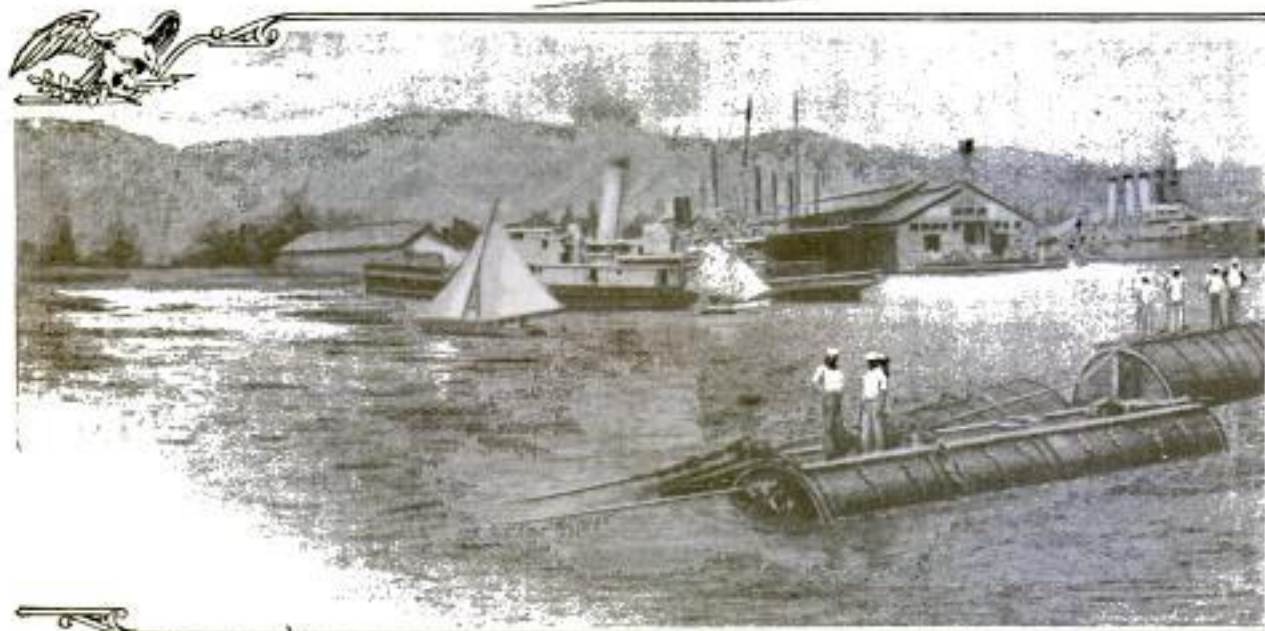
As the result of a succession of slides in the Gold Hill section of Gaillard Cut, that began on Sept. 18, 1915, the Panama Canal is blocked to all traffic and, according to present estimates, will probably remain so until the end of the year. This is by far the most serious incident that has occurred since the opening of the canal more than a year ago, the slides having practically obliterated a 1,300-ft. section of the channel. According to latest reports, about 200 feet of this section has a width of only 25 ft. and a depth of from three to 15 feet. At one point an island has formed in the middle of the canal, leaving a channel on each side in which the maximum depth does not exceed 15 ft. The normal width of the canal through Gail-

lard Cut is 300 ft., and its normal depth, 45 ft. The most serious feature of the situation is that at last reports the earth was slipping into the canal as fast as the dredges were taking it out. Something like 175 acres of land is involved in the slide, and it is estimated that 10,000,000 cu. yd. of earth is in motion. The present rate of excavation is about 1,000,000 cubic yards a month. Before a permanent channel can be opened, all this, and probably more, must be dug out, although the canal can be opened to traffic as soon as a channel 100 ft. wide and 30 ft. deep has been made. The time required to do this is uncertain, since it depends entirely on the future action of the moving earth above the canal prism. One of the measures taken to diminish the cause of the slides is that of blasting away the tops of the hills, thus taking away some of the weight on the affected section and bringing down immediately as much as possible of the loose earth that might cause trouble in the future.

H. R. Jackson, Hospital Steward, U. S. Navy

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HOW THE SUNKEN SUBMARINE "F-4" WAS RAISED



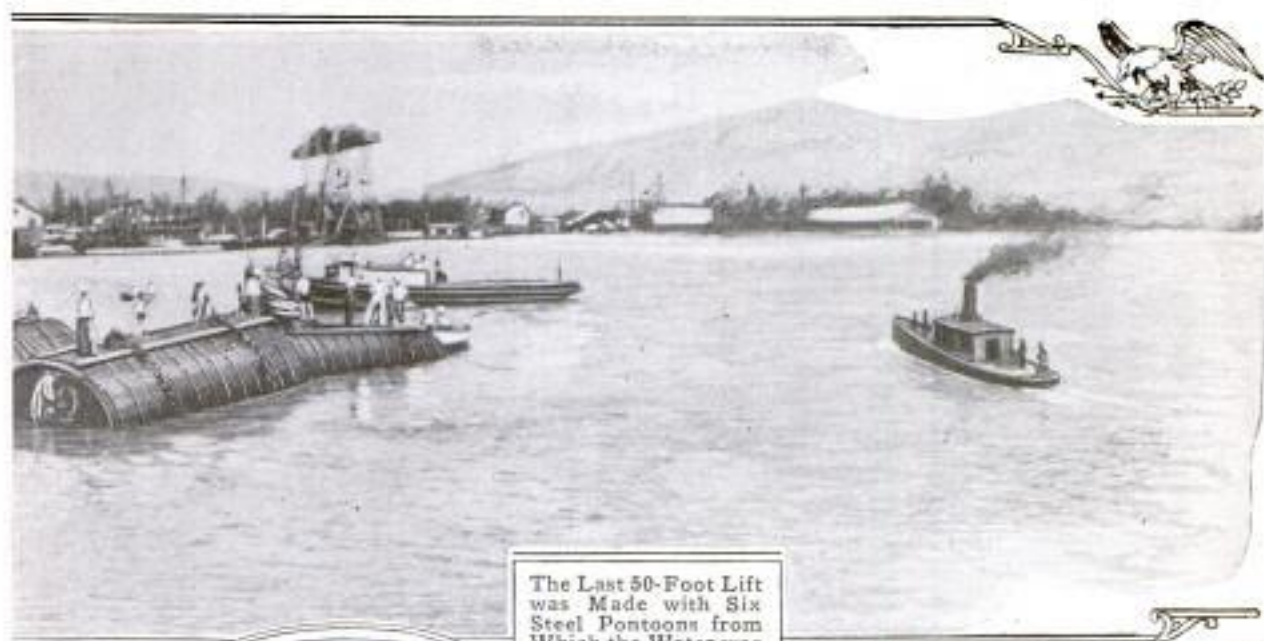
The pontoons at the right are lifting the bow of the submarine, while those just coming to the surface are attached amidships.



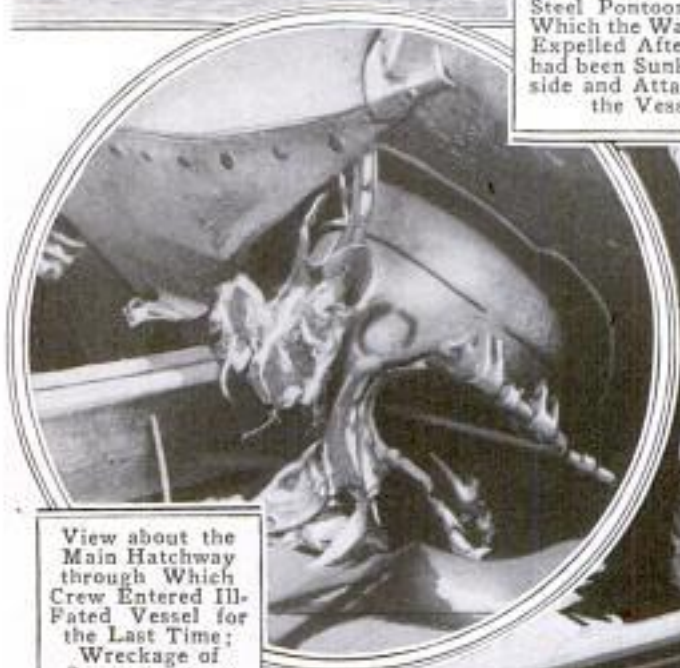
One of the six steel pontoons being filled with water and nearly ready for sinking alongside the submarine.

The automatic torpedo-launching cap removed from the bow of the "F-4" for inspection.

AND MADE READY TO BE TOWED TO DRY DOCK



The Last 50-Foot Lift was Made with Six Steel pontoons from Which the Water was Expelled After They had been Sunk alongside and Attached to the Vessel



View about the Main Hatchway through Which Crew Entered Ill-Fated Vessel for the Last Time; Wreckage of Superstructure was Caused by Salvage Operations

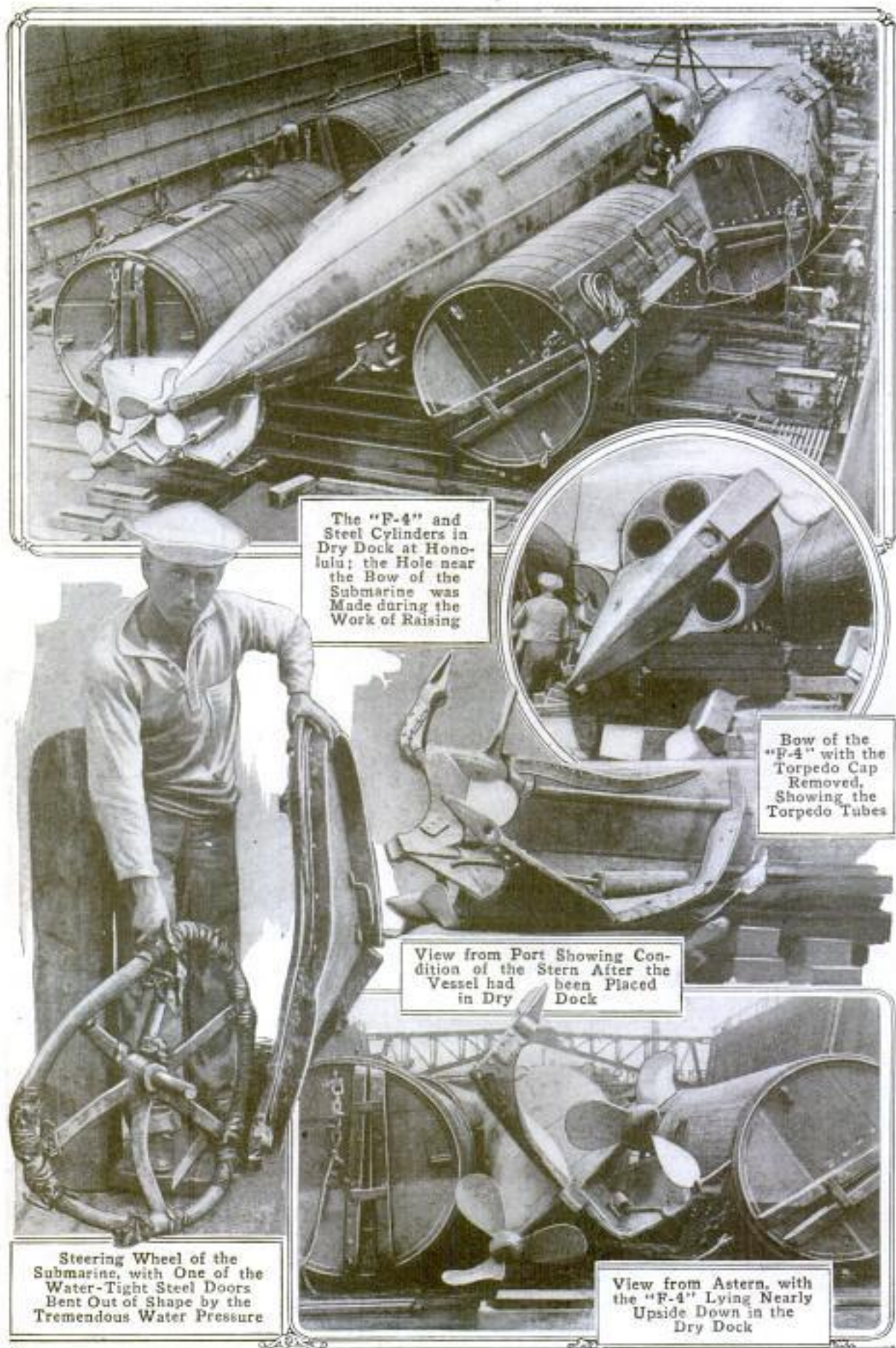


Copy of Honolulu Newspaper Recovered from the Submarine; This Paper is Dated March 25, 1915, the Day When the "F-4" Made Its Last Dive



Deck of Scow with Equipment Used in Forcing Air at a Pressure of 150 Pounds into the Sunken pontoons

THE "F-4" AFTER FIVE MONTHS UNDER WATER



The "F-4" and Steel Cylinders in Dry Dock at Honolulu; the Hole near the Bow of the Submarine was Made during the Work of Raising

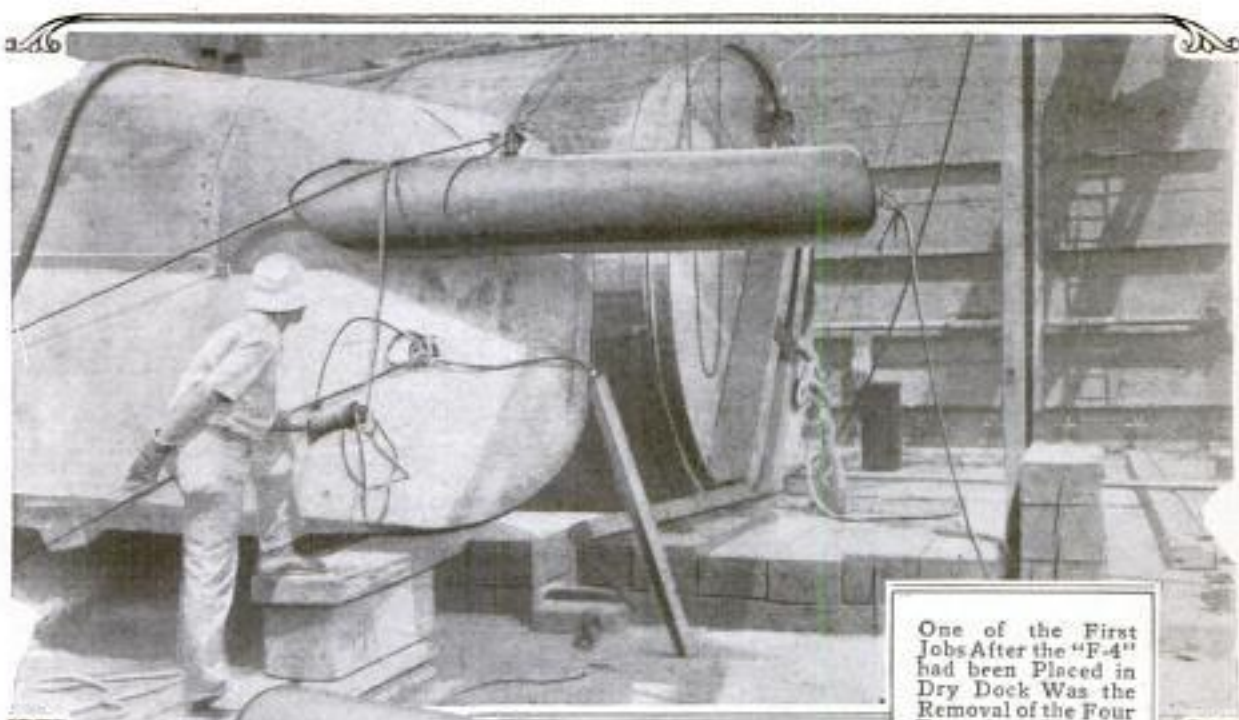
Bow of the "F-4" with the Torpedo Cap Removed, Showing the Torpedo Tubes

View from Port Showing Condition of the Stern After the Vessel had been Placed in Dry

View from Astern, with the "F-4" Lying Nearly Upside Down in the Dry Dock

Steering Wheel of the Submarine, with One of the Water-Tight Steel Doors Bent Out of Shape by the Tremendous Water Pressure

TAKING THE TORPEDOES FROM THE SUBMARINE



One of the First Jobs After the "F-4" had been Placed in Dry Dock Was the Removal of the Four Torpedoes That the Vessel Carried



Divers Who Made It Possible to Raise the "F-4." One of the Men Descended 215 Feet with No Protection but a Helmet

This Was the Condition of One of the Torpedoes When It was Taken from the Submarine



These Torpedoes Were in Good Condition and had Retained Their Full Charge of Compressed Air in Spite of Their Five Months under Water

Hoe Hart Pioneer Press, St. Paul, Minn.

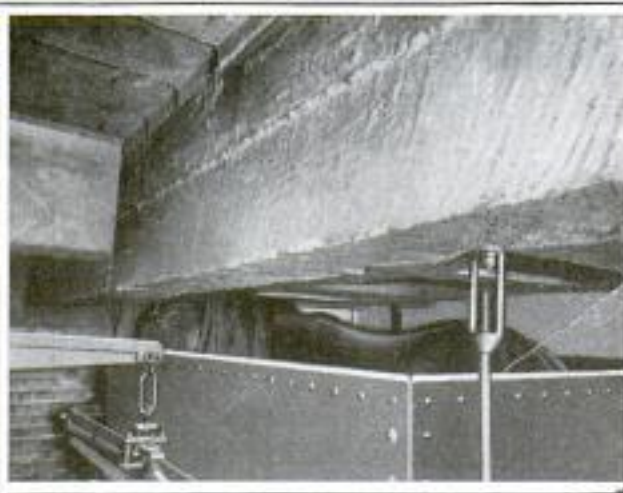
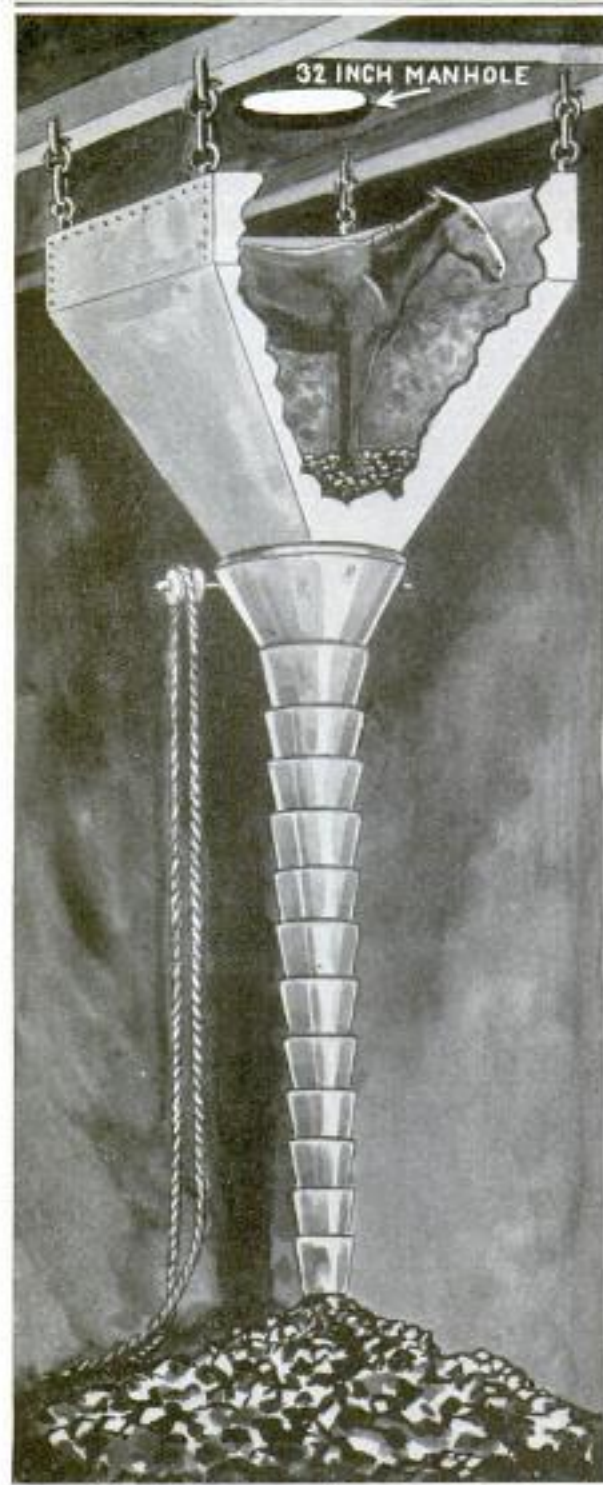
P. Edelman, 1802 Hague Ave. St. Paul, Minn.

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POPULAR MECHANICS

HORSE IMPRISONED BY FALL THROUGH COALHOLE



the sidewalk. This hopper consists of an iron box, suspended in the basement of the structure, in which fuel is automatically weighed before it is allowed to pass into a chute. The coalhole through which the animal fell is 32 in. in diameter, while the only other exit from the hopper is the trap at the mouth of the chute, approximately a foot square. The horse tumbled in hind foremost and in so doing slipped out of his harness. He was uninjured by the accident. The problem of removing him was a vexing one. It was finally solved, however, a day later by tearing a hole through the concrete sidewalk and basement ceiling and hoisting the horse by means of a small derrick, after he had been blindfolded and bound. An unsuccessful attempt was first made to remove the animal by drawing him back through the manhole. The impracticability of this was soon made apparent. While he was imprisoned, food and water were lowered to him through the coalhole.

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ELECTRICITY TO HAUL HUGE TRAINS OVER ROCKIES

The Drawing and Photograph Show Horse Imprisoned in Coal Hopper, and the Manhole through Which He Fell

One of two heavy draft horses hitched to a coal wagon, which was being unloaded at a St. Paul, Minn., bank building recently, became frightened, backed into a manhole, and fell into a large scale coal hopper beneath

During the months of 1916 a curious procession will be making its way across the United States. One by one, and about ten days apart, 42 of the largest electric locomotives in the world are to be freighted cross-country from the shops of an eastern manufac-

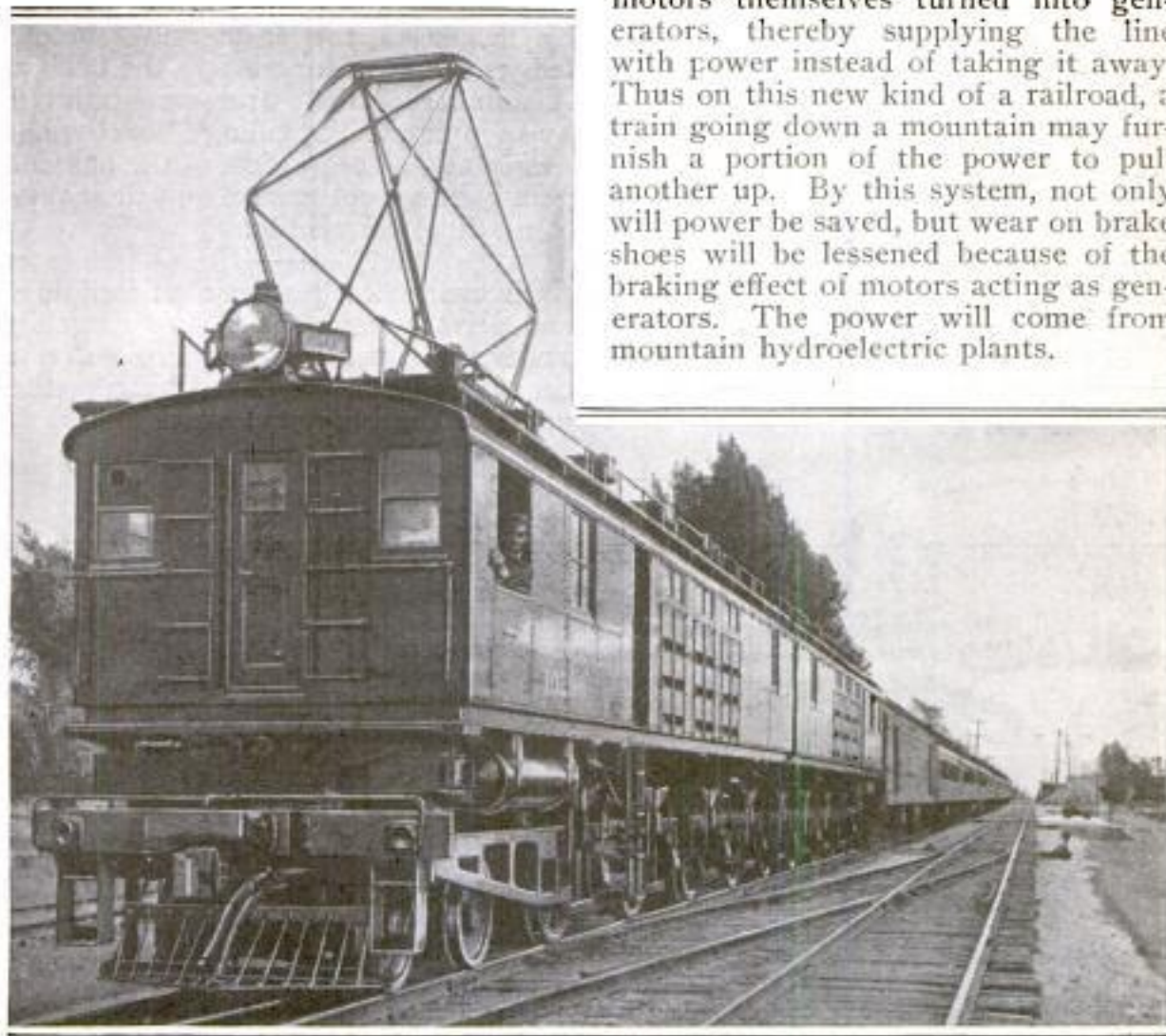
Geo. B. Haynes, N. O. A. C. M. + St. P.
Chicago

turer to the lines of the Chicago, Milwaukee and St. Paul Railway in Montana. - There a stretch of 440 miles of most difficult mountain railroad was recently electrified, and over the long, steep hills of this line these locomotives are to run, oftentimes single-handed, to do the work that the united efforts of two to three steam locomotives can barely accomplish at present.

Direct current at 3,000 volts is to be supplied to the trolley on this new stretch of electric railroad, a new and unusual practice. Eight huge motors, connected to as many pairs of drivers, will propel each locomotive. Because of the high potential from the trolley, the eight motors have to be grouped in four pairs, the two motors in each pair being connected in series so that no more than 1,500 volts can be im-

pressed across each motor at any one time. Each locomotive will be capable of exerting more than 3,500 hp., and those of passenger design are intended to pull an 800-ton train at 65 miles per hour on level track, or the same load at 25 miles an hour up a two-per-cent grade. In external appearance the locomotives much resemble steel passenger coaches, and are divided in the middle to permit easy turning of curves. Each is 112 ft. 8 in. long, which is said to be over 22 feet more than the largest Mallet locomotive now in service.

An additional and unusual feature of these locomotives has been called "regenerative braking." That is, when a heavy train pulled by one of the engines starts down grade, the power to the motors may be shut off and the motors themselves turned into generators, thereby supplying the line with power instead of taking it away. Thus on this new kind of a railroad, a train going down a mountain may furnish a portion of the power to pull another up. By this system, not only will power be saved, but wear on brake shoes will be lessened because of the braking effect of motors acting as generators. The power will come from mountain hydroelectric plants.



One of 42 Largest Electric Locomotives in the World

General Electric Co
Schenectady, N. Y. Copyrighted material

E. D. Keilman % Nationalist
Manhattan, Kans.
Manhattan - Lincoln - Suburban Line

844

POPULAR MECHANICS

**ELECTRIC CAR STOOD ON
END IN SWOLLEN CREEK**

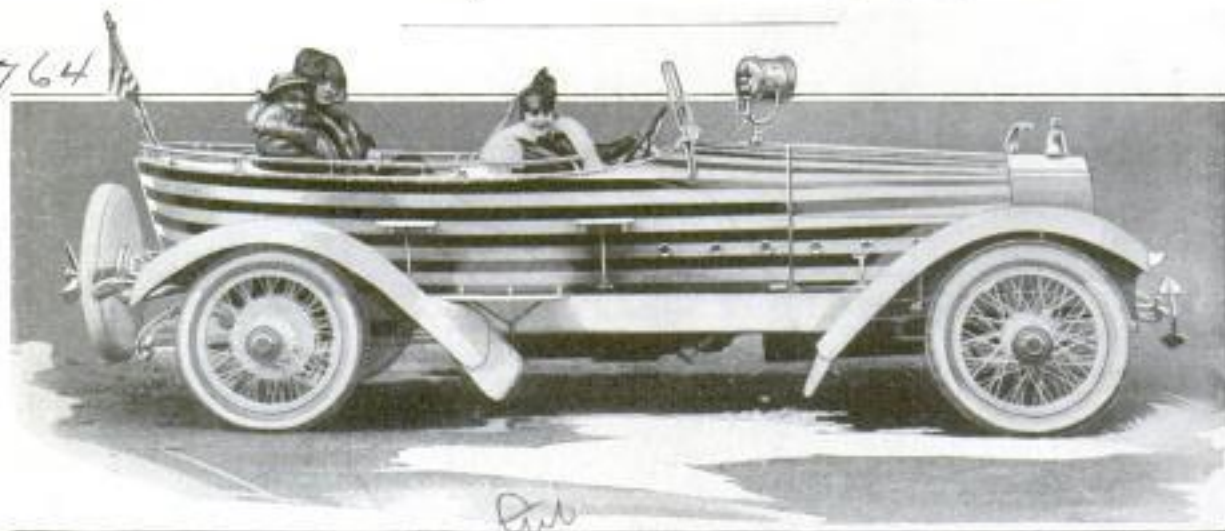
Out of 67 passengers riding in a motor car on an electric line near Randolph, Kan., few escaped unhurt when



Position of Electric Car After It had Plunged through the End of a Washed-Out Bridge

the car, traveling at high speed, plunged through the end of a bridge that had been washed out a few moments before. The washout was caused by a flood in the creek, in which the water rose 4 ft. in a period of two hours. The first warning given the motorman came when the shock caused by the dropping of the forward end of the car threw him through the window of his vestibule. Following this, the car hung for a moment on the end of the bridge. It then toppled and slid forward into the creek and finally stood on end in 12 ft. of water, the passengers being piled in a heap in the forward end of the car. Seventeen of the passengers were killed and 37 injured. A few of the survivors smashed the windows and jumped into the water, but most of them made their escape by climbing up to the rear end of the car by means of the seats and window ledges and then jumping to the bridge. A number of the latter were injured by slipping and falling back when nearly at the top. Most of the passengers were school-teachers on their way to a school convention.

On every hotel, apartment building, and private residence in Los Angeles, under the terms of a new ordinance, a tin tag must be displayed bearing the name of the property owner.

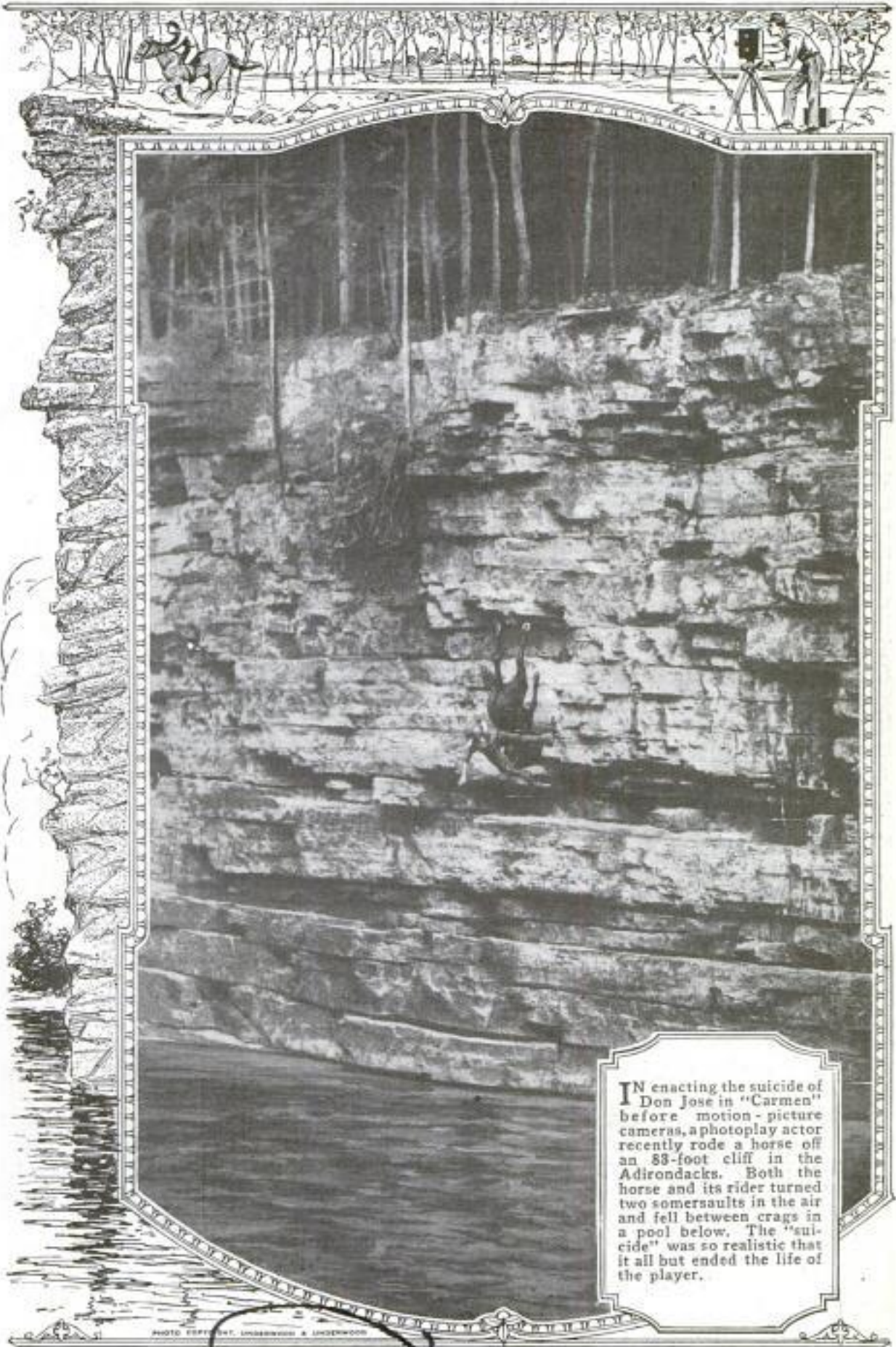


MOTOR-CAR BODY MADE LIKE RIVER LAUNCH

In This Novel Car the Body is Made to Resemble the Hull of a River Launch and All the Fittings are Designed to Carry Out the Nautical Idea. The Boatlike Fittings Include a Ship's Bell Carried on the Radiator and Bumper Irons Made in the Form of Anchors and Oars. The Spare Wheel is Carried in a Cover That is Held in Place by a Three-Bladed Propeller

owned by
Grace Darling (Film Star)

DEFYING DEATH TO PUT REALISM IN MOVIE



IN enacting the suicide of Don Jose in "Carmen" before motion-picture cameras, a photoplay actor recently rode a horse off an 83-foot cliff in the Adirondacks. Both the horse and its rider turned two somersaults in the air and fell between crags in a pool below. The "suicide" was so realistic that it all but ended the life of the player.

PHOTO BY FRANK UNDERWOOD & UNDERWOOD

#Theodore M. R. von Keler,
Bloomfield, N. J.

DETAILS OF THE GERMAN

784 42-CENTIMETER GUN

Although the 42-cm. gun used by the Germans in battering down the fortifications at Liège and Namur attracted world-wide attention during the early stages of the war, the secret of its dimensions and other features has been so jealously guarded that practically nothing has been made public in regard to this monster mortar, beyond the terrible destruction wrought by it. At a recent meeting of artillery engineers at Düsseldorf, Germany, an engineer of the Krupp works delivered a lecture on the making of heavy artillery and particularly on the making of the 42-cm. guns, or the "Big Berthas" as the Germans call them, and an apparently reliable report of this lecture has been transmitted to this country. According to this report, the big gun weighs about 97½ tons, while the base on which it stands when in firing position weighs 41¼ tons. The barrel is 16 ft. long, and the shell fired from it is about 50 inches long and weighs 880 lb. The gun is far too big to be transported on any kind of gun carriage. It is made up of considerably more than 100 pieces, and must be taken apart and loaded on motor trucks, of which 12 are said to be required, when it is to be moved.

Unloading, assembling, and mounting the gun is a big undertaking that can only be done by specially trained workmen, and that requires more than 26 hours of continuous work. A pit of large diameter and about 26 feet deep is first dug, and in this a massive foundation is built of heavy wooden beams. On this the base of the gun is mounted. Within the foundation are placed specially prepared packages of dynamite for blowing up the gun and its accoutrements in case the enemy gains control of the position. For this purpose electric wires are led to a concealed and protected position more than a mile from the site.

Owing to the terrific concussion the gun can only be fired by electricity and from a distance exceeding 300

yards. Even at this distance the crew must wear eye, ear, and mouth protectors, and must lie prone when the shot is fired. There are said to be 25 of these mortars in existence at the present time. A crew of about 200 men is required, and each shot costs about \$2,750.

A large part of the destruction attributed to the "Big Berthas" was in fact caused by the less ponderous 30.5-cm. (approximately 12-in.) Krupp and Skoda mortars. The 42-cm. guns have been fired only a few times, but on these occasions the destruction has been almost unbelievable. The first shot, which was fired at one of the Gruson turrets at Liège, killed 1,700 men, the shell striking about 15 feet in front of the cupola and exploding with such terrific force that the turret and armored chamber below were literally torn to pieces. This shot was fired from a distance of over 13 miles. The second shot fired is said to have killed or disabled more than 2,200 men. No one not connected with the German artillery is ever permitted near the 42-cm. gun when it is in firing position. It is said that no photographs have ever been made of it, the pictures purporting to represent this gun, widely published at the beginning of the war, being in fact photographs of the 30.5-cm. Krupp and Skoda mortars.

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POWER CRAFT SWEEPS WATER AT MILE-A-MINUTE CLIP

After carrying off the honors in the American speed-boat championship races at Chicago, the "Disturber IV," a 40-ft. hydroplane, recently attained the remarkable speed of 62 miles an hour in a trial over a half-mile course in Lake Michigan. This establishes the craft, which was built in 1914 to contest for the British international trophy, as the world's fastest boat.

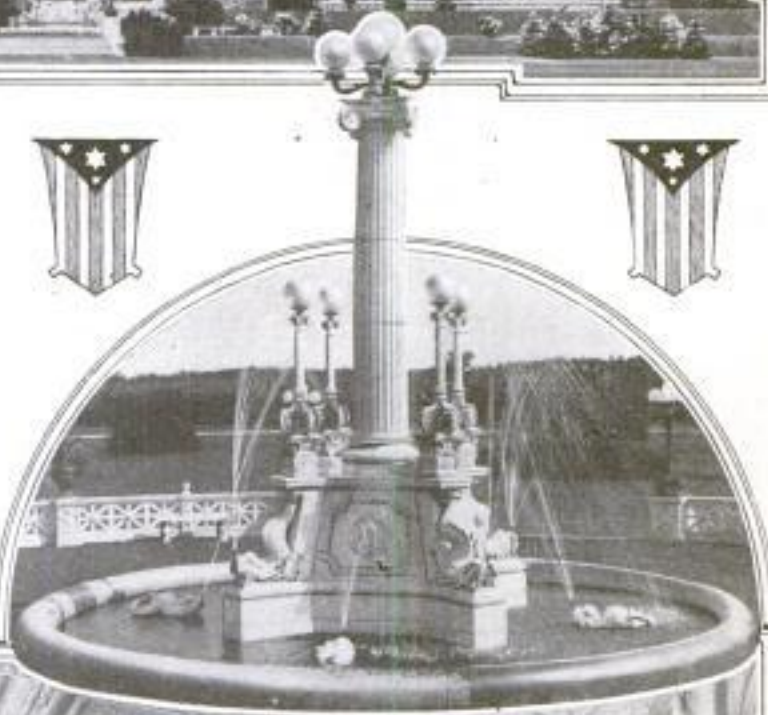
It is equipped with two 12-cylinder motors which develop approximately 1,800 hp. It is considered very seaworthy and rides beautifully on an even keel.

782 - U. & U.

JERSEY ESTATE NEW NATIONAL SUMMER CAPITAL



ACCORDING to unofficial announcements, President Wilson will spend the coming summer with his bride at "Shadow Lawn," a splendid estate at Elberon, New Jersey, near Long Branch. Use of the place was recently tendered the Chief Executive by a special committee which carried a letter of invitation from the governor of the state. "Shadow Lawn" includes a small lake and some 30 acres of lawns and terraced gardens. Above is a front view of the mansion and at the right a fountain that graces its approach. The photograph below gives a glimpse of the interior of the residence.



THE END OF A BETRAYER OF HIS COUNTRY



After the
Betrayal
had Faced
the Firing Squad

Type of
Windmill
Used in
Transmitting
the Signals

IN this grim scene is illustrated not only the swift and certain punishment meted out to spies whenever caught, but also one of the many ingenious methods used for transmitting information across the battle lines to the enemies of the country in which the spy is operating. This case was the particularly aggravated one in which a man betrays his own country. The man, a French miller, had been keeping the Germans informed in regard to the positions of the French forces, using the wings of his windmill for transmitting the signals. A few moments after being detected he had paid the supreme penalty, the story of his double offense being told silently and concisely in the words "Spy—Traitor to His Country," contained in the notice fixed to the post.

As a compensation for this betrayal of his country, the man had received in advance the sum of 100 francs, equivalent to about \$20.

FIGHTERS WITH GAS MASKS ARE WEIRD FIGURES



COPYRIGHT, UNDERWOOD & UNDERWOOD
French Regimental Band Wearing Respirators While at Practice during a Lull in Fighting in Argonne District, Where Gas has been Used Continually



These "Monkeylike" Men Are French Soldiers Equipped with Gas Protectors. The Devices are Made of Aluminum and Filled with a Chemical Which Neutralizes the Chlorine Vapor Used by the Germans

WITH THE ALLIES IN THE CHAMPAGNE DISTRICT



DEAD LITTER THE GROUND AFTER GERMAN DRIVE

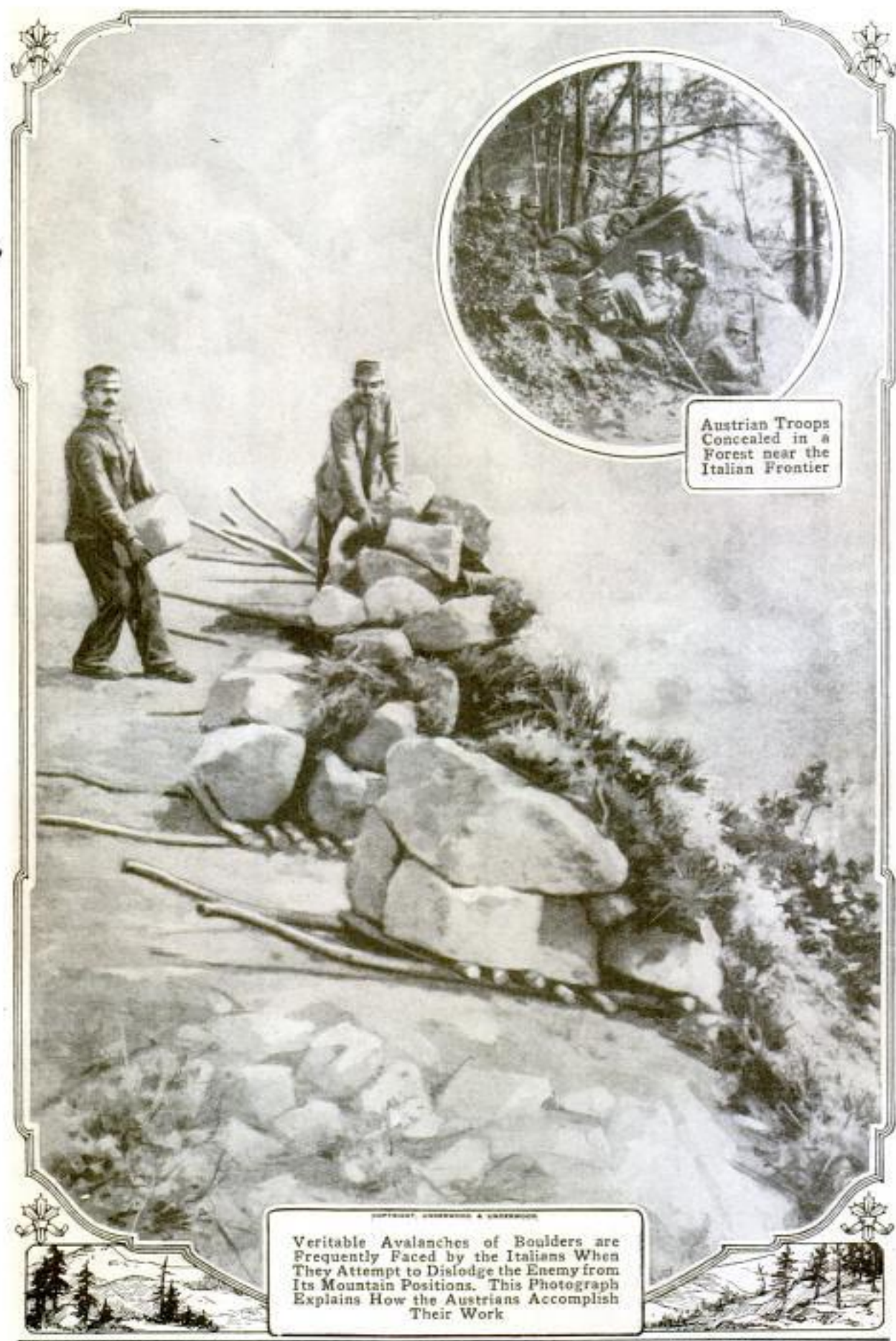


In Front of the Allies' Lines, Showing How the German Dead were Hauled Away for Burial after a Futile Attack was Made against the French Positions near Bois-le-Pretre by the Crown Prince's Forces



PHOTO COPYRIGHT, UNDERWOOD & UNDERWOOD
This Shows What Happened on the French Side When the Germans Made Their Costly Drive with Insignificant Results: The Men Fell While Defending a Strategic Trench against the Severe Offensive Movement of the Enemy

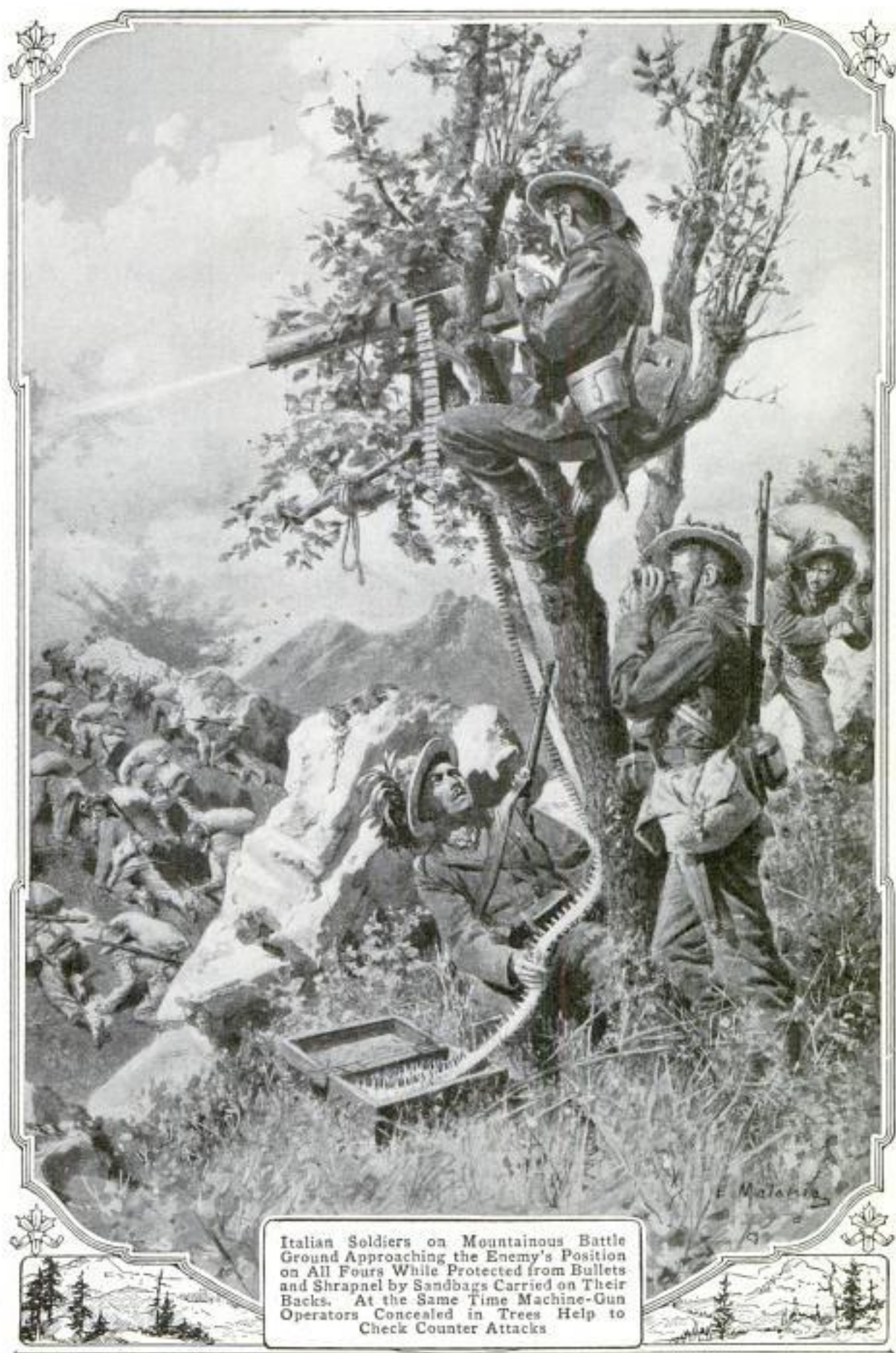
HOW ITALY'S ADVANCE IN THE ALPS IS COMBATED



Austrian Troops
Concealed in a
Forest near the
Italian Frontier

Veritable Avalanches of Boulders are
Frequently Faced by the Italians When
They Attempt to Dislodge the Enemy from
Its Mountain Positions. This Photograph
Explains How the Austrians Accomplish
Their Work

ITALIAN INFANTRY ADVANCING IN THE ALPS



Italian Soldiers on Mountainous Battle Ground Approaching the Enemy's Position on All Fours While Protected from Bullets and Shrapnel by Sandbags Carried on Their Backs. At the Same Time Machine-Gun Operators Concocted in Trees Help to Check Counter Attacks

GAY LONDON RESORT BECOMES WAR HOSPITAL

This Strange-Looking Hospital Is an Emergency Institution Which Has Lately Been Established at Earl's Court, the Famed Recreation Park at Kensington, London. The Resort has Long Been One of the City's Popular Amusement Places and is Locally Known as the "Exhibition." Some 2,500 Beds are Provided Here for Wounded Soldiers



TWO OF THE HOMELESS RACES HARRIED BY WAR

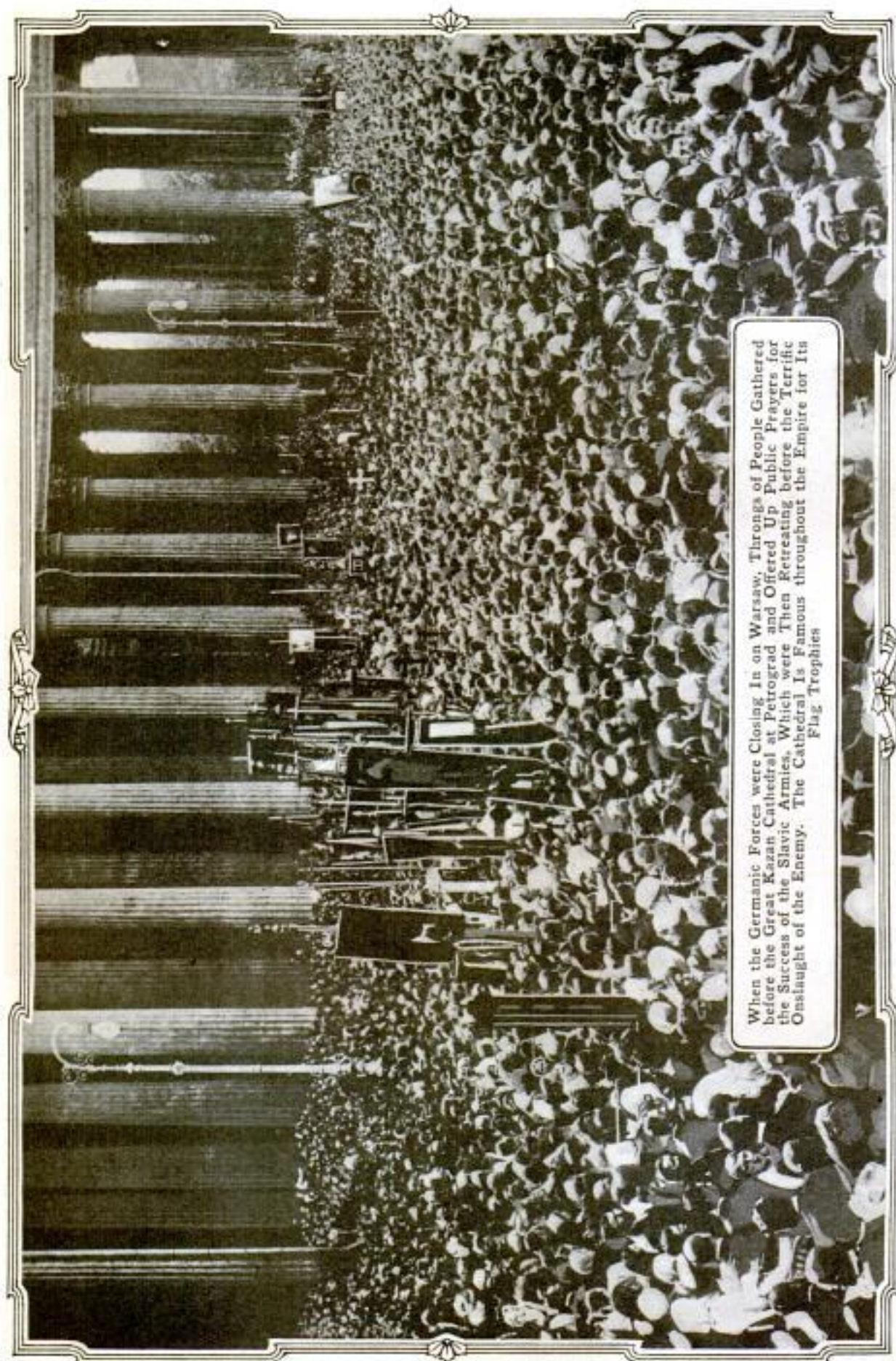


Homeless Jews from Lublin and Its Environs Seeking Shelter within Austrian Lines. In Retreating before the Germanic Allies, the Czar's Troops Destroyed Everything of Possible Value to the Enemy

Armenians, Intrenched Outside of Van, Repulsing a Turkish Attack Previous to the General Massacre of Their Countrymen

PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

WAR DEMONSTRATION IN RUSSIAN CAPITAL

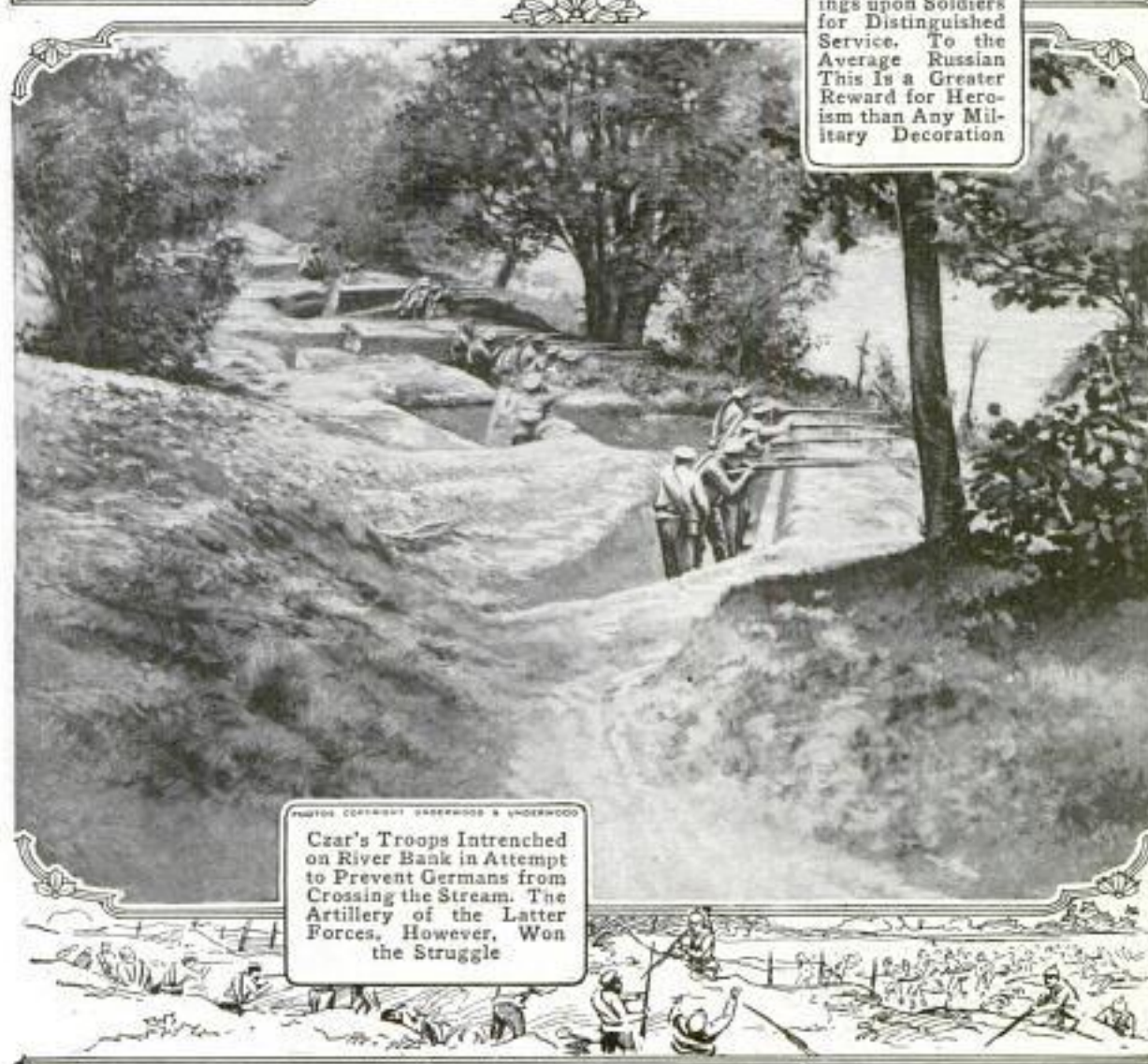


When the Germanic Forces were Closing In on Warsaw, Throngs of People Gathered before the Great Kazan Cathedral at Petrograd and Offered Up Public Prayers for the Success of the Slavic Armies, Which were Then Retreating before the Terrific Onslaught of the Enemy. The Cathedral Is Famous throughout the Empire for Its Flag Trophies

INTERESTING GLIMPSES BEHIND SLAVIC LINES

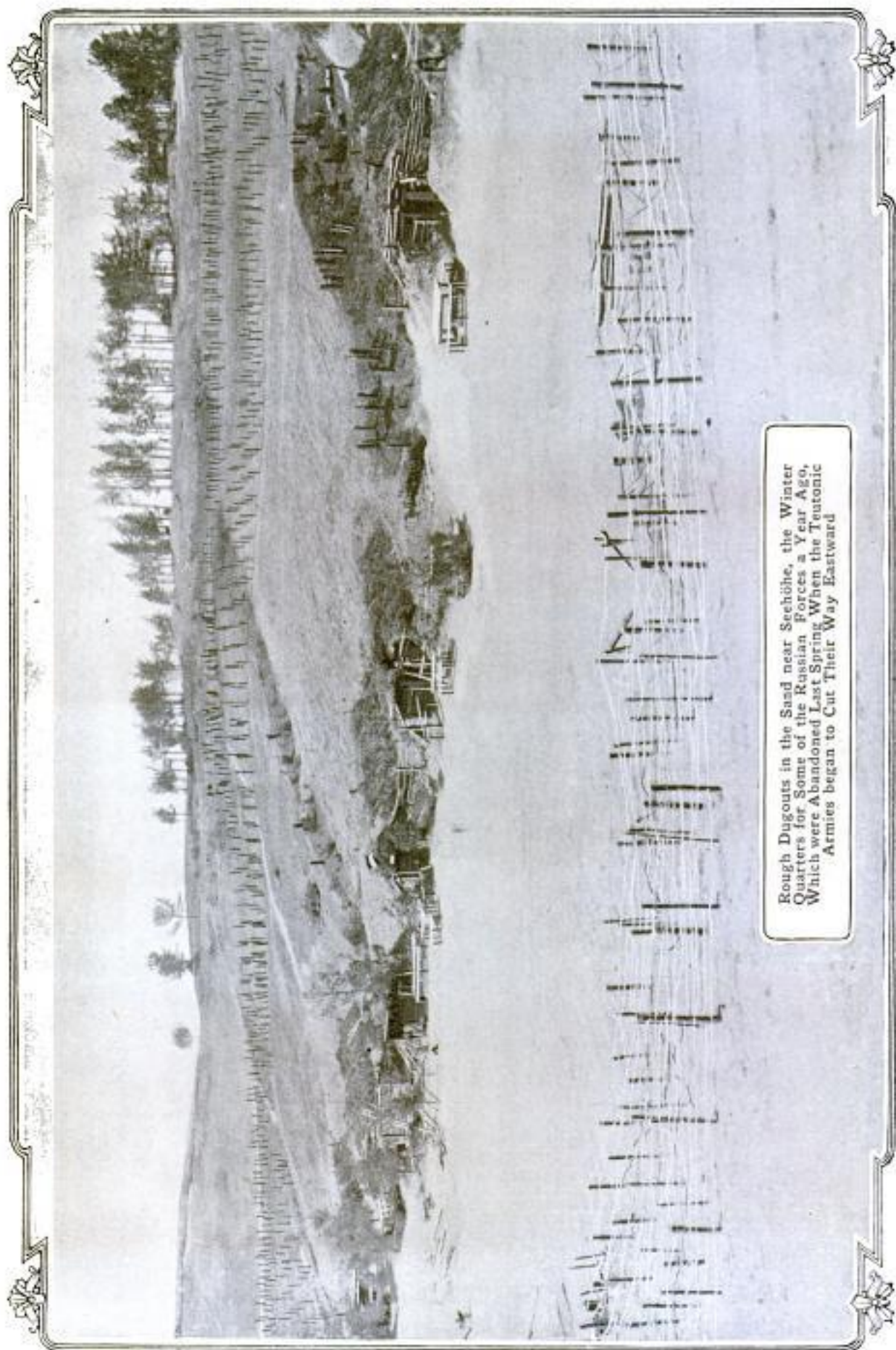


Priest Bestowing Individual Blessings upon Soldiers for Distinguished Service. To the Average Russian This Is a Greater Reward for Heroism than Any Military Decoration



Czar's Troops Intrenched on River Bank in Attempt to Prevent Germans from Crossing the Stream. The Artillery of the Latter Forces, However, Won the Struggle

ABANDONED WINTER QUARTERS OF CZAR'S FORCES

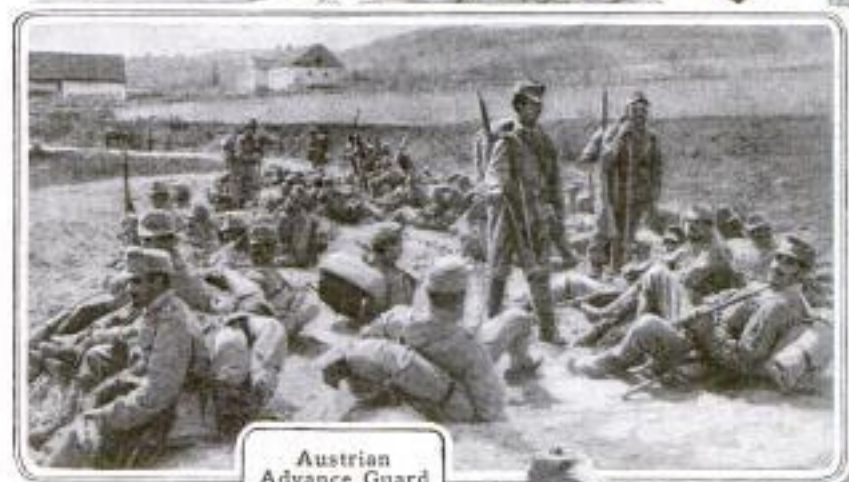


Rough Dugouts in the Sand near Seehöhe, the Winter Quarters for Some of the Russian Forces a Year Ago, Which were Abandoned Last Spring When the Teutonic Armies began to Cut Their Way Eastward

TEUTONS DURING THEIR FIERCE EASTERN DRIVE



Worn Austrian Soldiers on the Russian Frontier Washing and Refreshing Themselves at a Canal after a Long, Dusty March



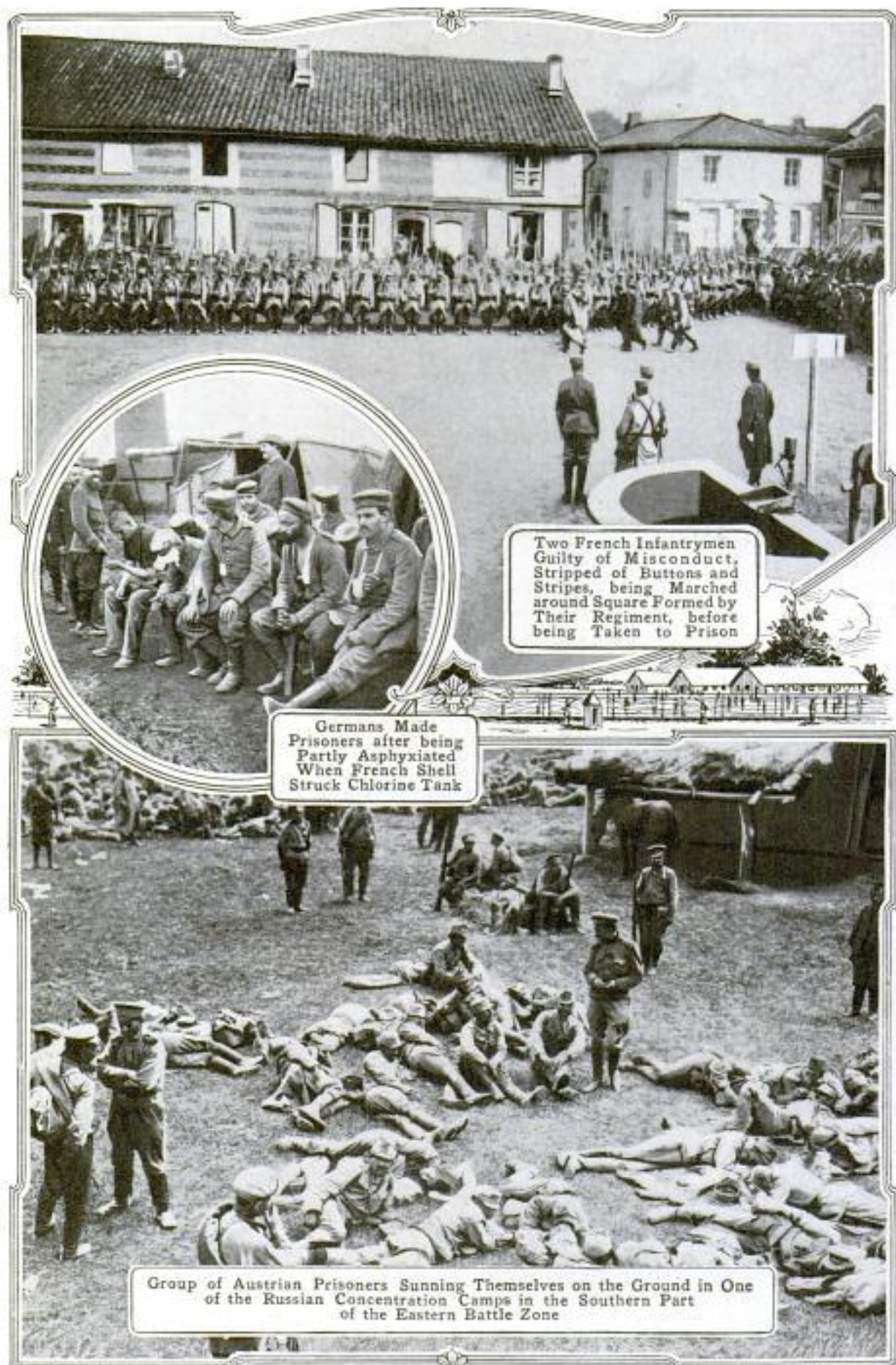
Austrian Advance Guard Resting during Forward Movement to Feel Out Slavs



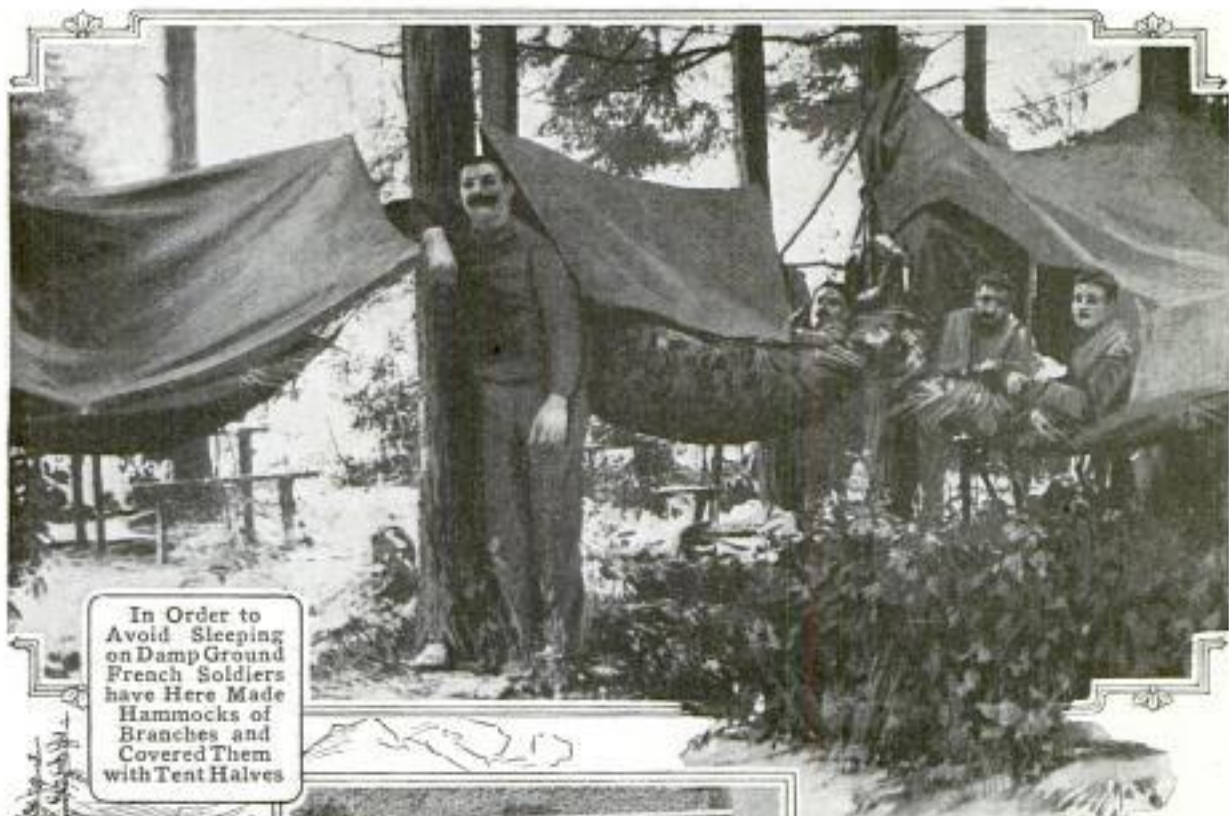
The Bosnians Allied with the Teutons Are Fond of Pets: They Lead Goats, Ducks, and Even Lambs on Their Marches

PHOTOS COPYRIGHTED BY BROWN AND CAWSON

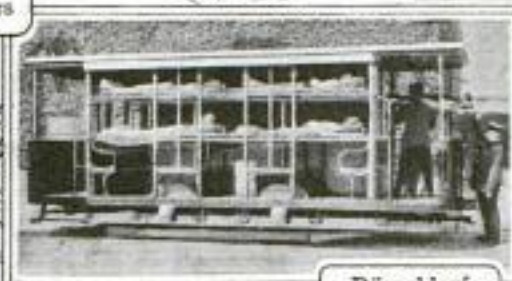
PRISONERS SEEN IN CAMPS OF THEIR ENEMIES



CURIOUS MAKESHIFTS OF WAR SEEN AT RANDOM



In Order to Avoid Sleeping on Damp Ground French Soldiers have Here Made Hammocks of Branches and Covered Them with Tent Halves



Düsseldorf Street Car Converted into Double-Decked Ambulance

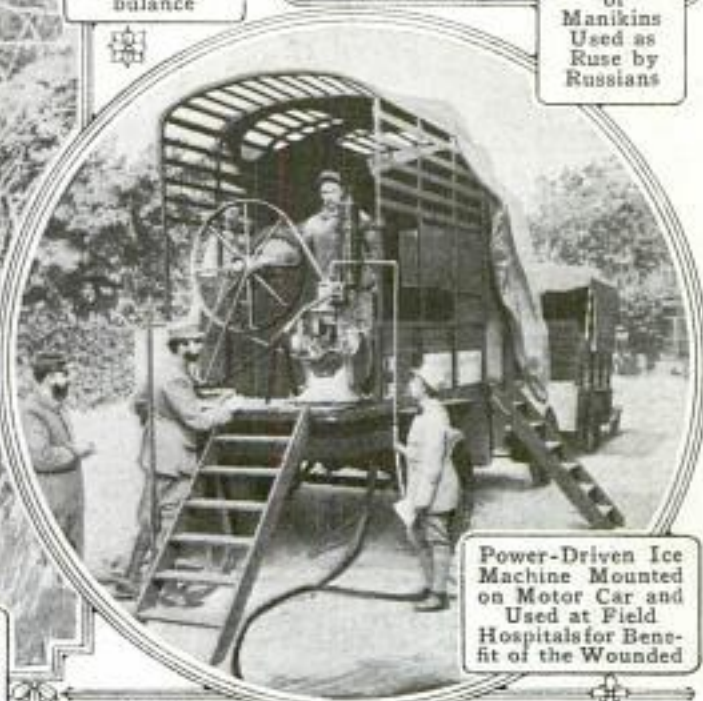


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Trainload of Manikins Used as Ruse by Russians



French Trench Equipped with Barbed-Wire Doors Placed 100 Yards Apart. If the Enemy Gets into the Trench the Doors are Locked to Impede Progress



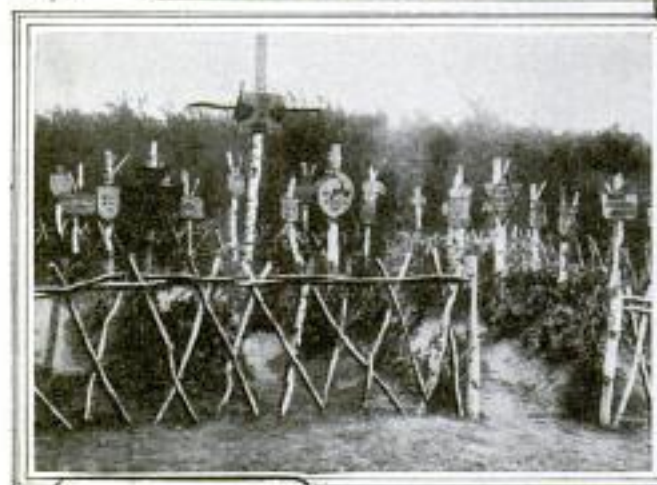
Power-Driven Ice Machine Mounted on Motor Car and Used at Field Hospitals for Benefit of the Wounded

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BURIAL GROUNDS OF EUROPE'S FALLEN SOLDIERS



Military Burial
at the Front,
Showing Deep
Trench Filled
with Dead after
Severe Battle



Germanic Cemetery
on Road between
Przemysl and Lem-
berg in Which Many
Soldiers Who Fell
in the Eastern
Struggle are Buried



This Aerial
Propeller
Marks the
Grave of a
Russian Air-
man Who
Fell in
Galicia



French Farmer Cultivating
Land Dotted with Graves
of Many Soldiers

Utility Sales Co.
Auto Power Co. La Porte, Ind.

Made by ~~La Porte Motor Mfg. Co.~~ POPULAR MECHANICS

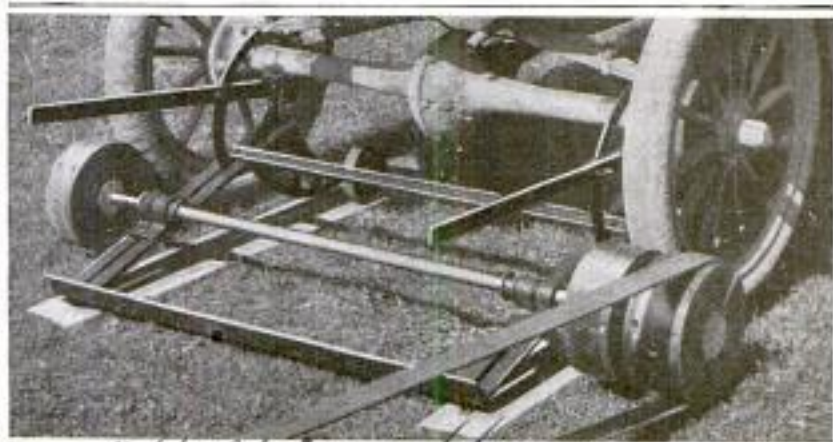
863

DEVICE MAKES AUTOMOBILE
500 INTO POWER PLANT

For Ford Cars

Transforming an automobile into a power plant for operations about the farm, shop, or garage where belt drive is required, is quickly and easily accomplished by the use of a simple apparatus that has just been placed on the market. This apparatus consists of a frame which serves as a lifting jack, on the rear of which is mounted an axle carrying two bearing wheels and a belt wheel. In using, it is placed with the bearing wheels against the rear wheels of the car and with the jacks under the rear axle. The car wheels are then raised clear of the

ground with the jacks, and the levers are clamped, an operation that brings the bearing wheels firmly against the car wheels. In this position the power from the car is transmitted to the belt wheel and through this to the machine



"Helping Henry"
With This Apparatus an Automobile is Quickly and Easily Transformed into a Power Plant for Operations Where Belt Drive is Required

car wheels are then raised clear of the

that is to be driven. The apparatus is quickly and easily placed in position.

67's GREAT SECTIONS OF AFRICA MADE DESERT
BY DRYING UP OF SURFACE WATERS

It has long been known that the two "dry continents," Asia and Africa, were gradually becoming drier, but the rapid rate at which the latter continent is losing its surface waters has only recently been revealed, through a report made public by the Smithsonian Institution. The alarming feature of this condition is that it is in no sense local, but affects practically the entire continent. Within a period of less than 50 years thousands of square miles of once fertile land in widely separated districts have been transformed into desert, the earth having apparently acted much like a gigantic sponge in absorbing the surface waters. So serious is the condition that now exists in Africa that it is enough to give some grounds for the belief held by a famous French astronomer that the continuous drying up of the earth will gradually result in the destruction of all life.

As a result of this increasing dryness some of the biggest bodies of

water in Africa have been seriously affected. Lake Ngami, for example, located about 1,000 miles northerly from Cape Town and once a lake of importance, is now a marsh threatened with speedy extinction, and there is every reason to believe that the surrounding country will soon become hopelessly sterile. About 2,000 miles northeast of Lake Ngami is Lake Rudolph, in British East Africa. This lake, the center of the drainage of the Abyssinian highlands and of a large part of the great equatorial plateau, is shrinking at an alarming rate.

The most serious case of the damage wrought by the increasing dryness of the African continent, however, is that of the Waterberg, a district comprising thousands of square miles in northern Transvaal. The name Waterberg was given this country for the reason that it was copiously watered by lakes, springs, and streams, and was dotted with marshes. It was an exceedingly fertile land and was the last stronghold

Smithsonian Institution
Oct. 2, 1915

of the big game of northern Transvaal. Today, after the culminating drought of 1913, it is practically a desert, with dried-up watercourses and springs, dead orange groves, some of which are over 50 years old, forests centuries old that are now lifeless, and desolate pasture lands that are devoid of cattle, or other animal life. There are few wild animals remaining in the Waterberg, and the fields where fine crops once grew are now parched and dead. Last year there was no running water in the entire Waterberg, while in the north of the district there is a tract comprising 4,000 square miles where not a drop of water, running or stagnant, could be found above the surface of the ground. The great Limpopo River is dry for its entire course through this district, and it is only by digging deep in its sandy bed that drinking water can be obtained.

Over everything in the Waterberg lies the silence of absolute lifelessness, the once fertile land having been taken over, apparently for all time, as a part of the desert. For four and a half hours every day the temperature is never less than 100° F. The heat combined with the absence of moisture has had a striking effect on the habits of such animals as remain. The nocturnal ant bear is forced to search for its food in broad daylight, since the ground has become so hard that the ants cannot be dug out in a single night. Most of the nocturnal beasts of prey hunt during the night as well as the day. Contrary to their habits, leopards on one occasion raided a camp in the early afternoon. Baboons, usually afraid of the dark, seem never to sleep, but prowl about day and night in search of food in any form. Animals not well equipped to dig for water, follow those more fortunate and use their water holes, the wart hogs particularly being followed all day long by a retinue of other animals awaiting an opportunity to slake their thirst. On account of the heat and drought the wild dogs that infest the country have become more savage than ever, driving in packs day and night and attacking all

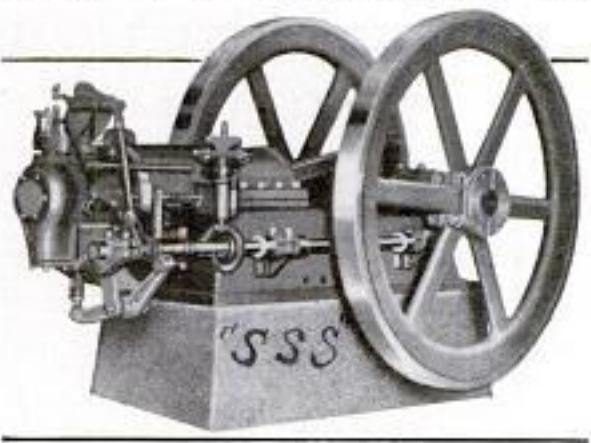
animals. They are even credited with having caught and killed an ostrich, previously an unheard-of thing. A party of travelers digging for water in the bed of a dried-up stream unearthed a living crocodile, also in search of water, more than four feet below the surface. Certain species of white ants are apparently the only kind of animal life not affected by the extreme conditions. Vast numbers of these ants come out of their holes at midday, form in a compact ball and lie in the sun, although the ground is so hot that the bare hand cannot stand contact with it for more than two or three seconds.

One of the things for which the Waterberg was famous was its sweet grass. This is gone, and in its place has come a coarser sour grass that has peculiar drought-resisting qualities. The seed of the sour grass is one of the marvels of plant life, its actions under certain conditions being such as to raise a doubt as to whether it is really a seed or an insect. The body is shaped like a torpedo and is equipped with a long tapering tail. When magnified, the seed is seen to be studded all over with sharp, stiff bristles, set backward, while on the head is a horny spike, sharp as a needle, with a crown of harpoon points at its base. The seeds not only drift about with the wind but cling to the backs of animals, and even penetrate the skins of animals and human beings, causing both discomfort and danger. When water is sprinkled on a bunch of the seeds a curious phenomenon results. The seeds first disentangle themselves. The seed head is next lifted clear of the ground by the tail and the needle point is then thrust into the damp soil by a continuous pressure of the bent tail against the ground, this movement continuing until the seed is imbedded in the soil. The whole operation takes about 15 minutes. Here the seed lies dormant until a little rain falls, which insures the safe sprouting of the plant. Thus equipped, the sour grass thrives in spite of the severe drought against which the sweet grass is helpless.

383
CRUDE-OIL ENGINE WORKS AT LOW PRESSURE

A crude-oil engine that operates on a principle somewhat similar to that of the Diesel engine, but at a lower pressure, has recently been introduced, and is said to be giving satisfaction as a reliable and cheaply operated power plant. In this engine, which is of the four-cycle type, the crude oil is first taken into an auxiliary cylinder where it is agitated and where some of the lighter hydrocarbons are separated from the oil. These light hydrocarbons ignite at a considerably lower temperature than crude oil, and it is the utilization of this condition that forms one of the principal features of the engine. This cylinder has a connection with the main cylinder consisting of a hole about the size of the lead in a lead pencil. During the compression stroke of the piston of the main cylinder a small portion of the air contained in this cylinder is forced through this hole into the auxiliary cylinder, and owing to the resulting compression the light hydrocarbons are fired. The resulting explosion forces the oil, which constitutes the main charge, into the main cylinder where the air by this time is at a burning temperature, and the main explosion takes place. It is said that back-firing and preignition are impossible, and that

2 to 150 ft. - fuel 6 lb. per hour.
 cost about 1/2 cent per H.P. hour.
 weighs 350 lbs. in 75 H.P. size. 250 lbs. in smaller.



New Crude-Oil Engine in Which the Charge is Forced into the Main Cylinder by the Preliminary Explosion of Light Hydrocarbons

the engine can be operated at a cost of approximately one-half cent per horsepower-hour.

546
MARKSMAN TRIMS TALL TREE WITH HIGH-POWER RIFLE

It is approximately 120 feet from the ground to the lowest branches of a giant eucalyptus tree which stands alone, sentinellike in the Santa Clara Valley near San Jose, Cal. The total height of the tree is about 140 feet. Its present form is due to trimming, which was accomplished in a most unusual way. The owner of the ranch on which the eucalyptus stands is



Shooting Off the High Boughs of a Tall Tree

adept in handling a rifle, and this he used in stripping off the branches. A large number of shots were required to sever some of the big limbs, but the feat was ultimately accomplished, as the gaunt tree bears witness.

244
BACK FILLING PIPE TUNNEL THROUGH AUGER HOLES

Interesting engineering work was recently done in completing a section of the new Denver water conduit which connects the north tower of Marston Lake with the city piping system. At Loretto Heights, in order to keep the line at the required depth, it was necessary to place the 48-in. main at a depth of 36 ft. beneath the ground. A tunnel was bored for a distance of

Denver Union Water Co.
 Denver, Colo.

Fred W. Newman, 2618 Durant Ave., Berkeley, Calif.

850 ft., instead of making a cut. This subsequently had to be back filled. To obviate the necessity of drawing the dirt into the passage from the portals and shafts, 8-in. auger holes were bored from the tunnel to the surface of the ground at intervals of about 10 ft. These were then enlarged by workmen and loose dirt filled through them

GRAPE JUICE CONCENTRATED BY FREEZING METHOD

According to a report of the Department of Agriculture a unique method of concentrating grape juice has been discovered in the government laboratories. The process is considered a most important one for the wine industry, and among other things provides a way to improve vintages made from cheap, coarse varieties of grapes. In concentrating it by the new method the juice is first frozen, and the resulting ice crushed into fine pieces and placed in a machine, which by centrifugal force causes the sirup and sugar to be separated from the water. A gallon of liquid is in this way reduced to about a quart of thick sirup, which retains to a remarkable degree the original color of the grapes. The acidity of the juice is also lessened materially, for the cream of tartar is crystallized with the ice. Subsequent sterilization of the product enables it to be preserved indefinitely and used, if desired, for flavoring purposes.



This Shows a Row of the Craters Enlarged from the Auger Holes

into the underground cavity. To pack the earth about the pipe, water was turned into the craters thus formed.

quent sterilization of the product enables it to be preserved indefinitely and used, if desired, for flavoring purposes.

581

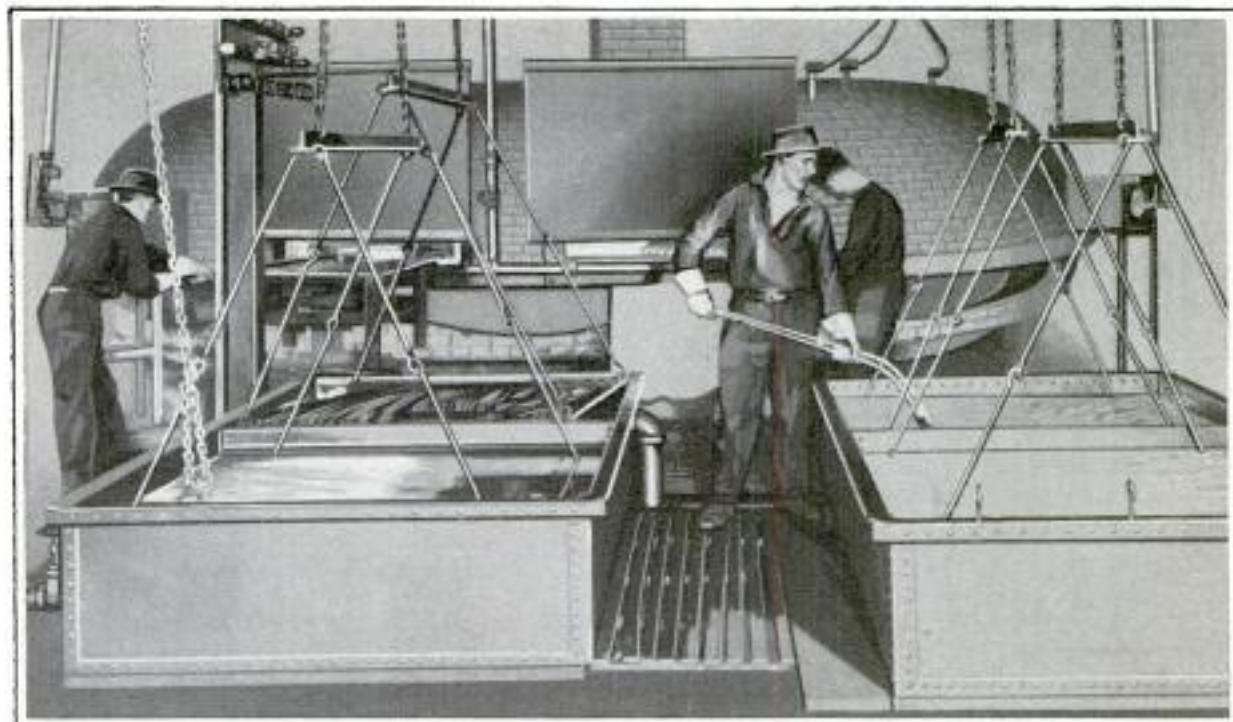
ACCURATE HEAT TREATMENT IN ROTARY FURNACE

To secure a dependable and uniformly tempered steel spring is a troublesome process, particularly with the older types of steel furnaces with their drafty doors and generally uncertain action. One of the chief difficulties, according to furnace men, is to keep the temperature controlled accurately, and to prevent undesired materials from the furnace itself from combining with the steel during the tempering

period. Then, too, the older types of furnaces, besides turning out a product of uncertain composition, present difficulties from a manual viewpoint—it is too hard to get materials into and out of the devices while in action, resulting in limited production.

A new furnace has recently been put in action at the plant of a Detroit company, which is expected to eliminate many of these defects and to turn

*Detroit Steel Products Co.
Detroit, Mich.*



The Rotary Furnace in the Background Heats Automobile Springs Uniformly and Delivers Them at the Proper Temperature for the Oil-Tempering Baths

out products with an accuracy and speed never before obtained. Its specialty is the heat treating of automobile springs. Men place the leaves, or overlapping flat strips, of the typical automobile spring on the hearth at one point, and the whole apparatus turns about a central axis, delivering the leaves to another set of men farther on, hot oil fires within the furnace having in the meanwhile raised the leaves to a predetermined temperature. This usually ranges from 1,450 to 1,575° F., depending upon the particular requirements of a given kind of spring, and 10 electrical pyrometers—that is, thermometers capable of registering high temperatures with the aid of electricity—enable accurate check to be kept on the hotness of the springs at all times. Seven men are required to operate the furnace, and it can turn out 50,000 lb. of steel per day, said to be four times the capacity of the ordinary furnace of the kind. The hearth is 26 ft. in diameter, and revolves once every 20 or 30 minutes.

Approximately 3,000 volumes have been contributed toward the reconstruction of the Louvain University library.

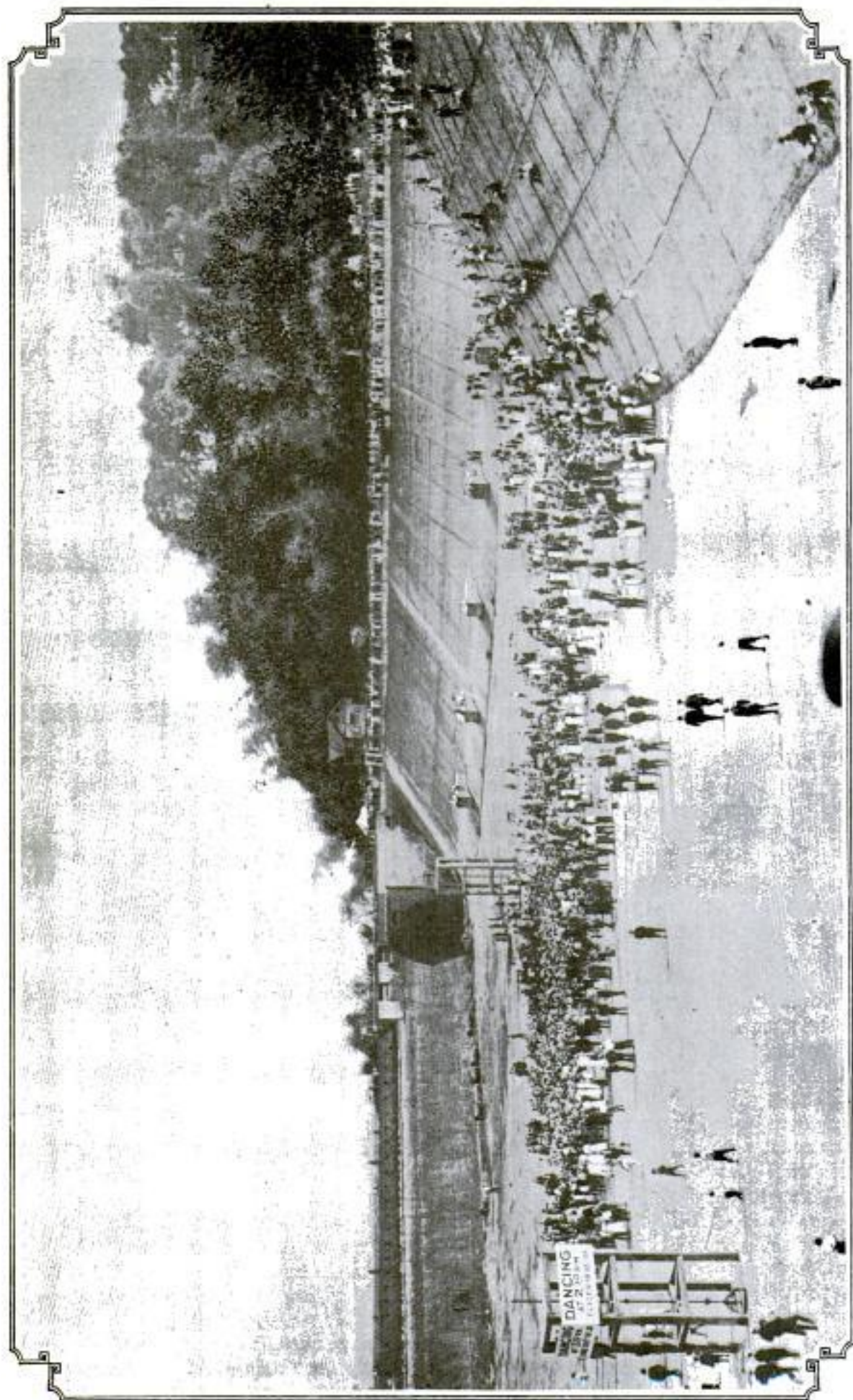
79 MAKING NEW ANODES FROM SCRAP NICKEL

By using the oxyacetylene flame to weld together the pieces of worn-out nickel anodes, which have heretofore been scrapped and sold at less than half the cost of the new material, one company is now producing practically new anodes at a trifling cost. As the anodes are eaten away by the solution they are turned over to an oxyacetylene welder who "tacks" them together, using from two to four pieces, depending on the size and weight of the anode desired. The flame is also employed in removing the brass hooks used for supporting the anode while in the solution. No flux is necessary in the process, and the only new material used is a piece of nickel that serves as a filling rod.



The Prest-o-Lite Co. Inc.

Indianapolis, Ind.



A Dance on the Concrete Floor of This Unused Reservoir Was the Novel Feature of a Municipal Picnic Recently Given in Ohio

**UNUSED RESERVOIR SERVES
555 AS DANCE HALL**

The leading feature of a municipal picnic given by a city in Ohio was a dance in which the basin of an unused water reservoir was pressed into service as a dance hall. The concrete floor served admirably for the purpose and furnished all the space needed by the hundreds of dancers who availed themselves of the novel privilege. The music was supplied by a brass band which occupied a temporary stand erected in the middle of the reservoir.

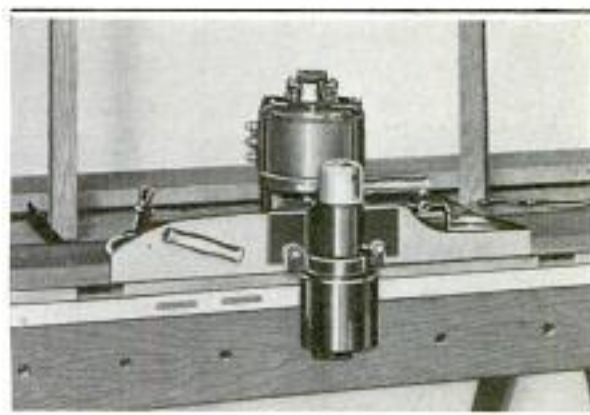
**LARGE TRIANGLES ARE USED
549 IN CANADIAN SURVEY**

G. A. Monitor 9-4-15
During the past summer triangles of uncommon size were employed by engineers in making a survey of the western Canadian boundary line between Queen Charlotte Sound and Prince Rupert. In one case a distance of 135 miles was measured by this method, the work being done at night with the aid of powerful lights which were used to identify the distant point to be sighted. The transit was placed on a mountain at a sufficient height to overcome the earth's curvature and escape intervening obstructions. The accomplishment is interesting, not because it is unique, but because it is unusual. The geodesist has worked with triangles having sides 200 miles in length. An instance of this was recorded some years ago when a survey was made across the Mediterranean between Spain and Africa.

**368 APPARATUS FOR FITTING
DOORS**

The elimination of the uncertainty and loss of time usually involved in fitting a door to its opening is the purpose of a new door-fitting apparatus that has made its appearance on the market. This apparatus consists of two parts, a frame and an electric cutting machine. The frame is made with sliding joints so that it can be adjusted to any size. It is simply placed in the

door opening, and when adjusted to a fit the joints are tightened. The frame is then laid and fastened over the door



How the Cutting Machine is Used in Connection with the Adjustable Frame to Cut the Door to the Right Size to Fit the Door Opening

to be fitted and the cutting machine is brought into service. This machine is equipped with a guide that works against the edge of the frame so that the door is cut down the right amount to make it correspond to the frame. By means of an adjustment controlled by a lever, any desired bevel can be cut.

**588 BALLOONED MOTOR-CAR TUBE
RESEMBLES HUGE SAUSAGE**

For local advertising purposes a motor-car tire dealer at Morgantown, W. Va., recently ballooned an inner tube to quite an enormous size. The distortion was effected by stretching and weakening the walls of the tubing; a thing which required time and considerable patience. Subsequently a coat of red paint was applied, giving it the appearance of a great wiener wurst. This had an injurious effect upon the rubber, causing it to deteriorate and the tubing to burst after several days.



*B. F. Woodhick Co. Akron, Ohio.
Byman & Wheel, adv. Dept.*

*Brotherhood of Carpenters & Joiners Co., Inc.
51 Third St.
Milwaukee.*

603 **STREET SEMAPHORE HAS INTERLOCKING ACTION**

A new semaphore for the regulation of street traffic has recently been tried out in eastern cities. A policeman operates the device in lieu of his usual club and whistle.



Solid Comfort Provided Eastern Policemen Regulating Traffic Congestion at Street Corners

Inventor: E. H. Peck
of above company

In its ordinary form the contrivance is built on a pole, and consists principally of two pairs of semaphore arms at right angles to each other. These are controlled by interlocked levers on the lower part of the pole. Because of the interlocking, a policeman cannot give both streets at an intersection the clear signal at one time. A sheltering umbrella is provided for hot summer weather or rainy days, and a platform and seat conduce greatly to the officer's comfort. At night the machine shows a red and green light in addition to the "Stop" and "Proceed" positions of the semaphore arms. A gong automatically gives forth signals corresponding to the usual one or two blasts of a traffic policeman's whistle. Much superiority to the unaided policeman is claimed for the device, permitting crowds to be handled more promptly and with less chance of misunderstanding. The unmistakable character of the signals is one reason for this.

706 **ANCIENT PORCELAIN FACTORY REOPENED IN CHINA**

The famous King Teh Cheng porcelain factory, which from the year 1396 furnished all the fine porcelain for the royal palaces of China, is to be reopened immediately, according to a Chinese newspaper, and a grant of \$20,000 has already been made by the president of the republic for this purpose. This factory was partly destroyed during the revolution in which the republic was established and the various samples and patterns kept there were divided among the leading revolutionists. While the making of porcelain has been one of the leading Chinese industries for generations, this factory is said to be the only place in which the ancient ways of making porcelain, with the beautiful

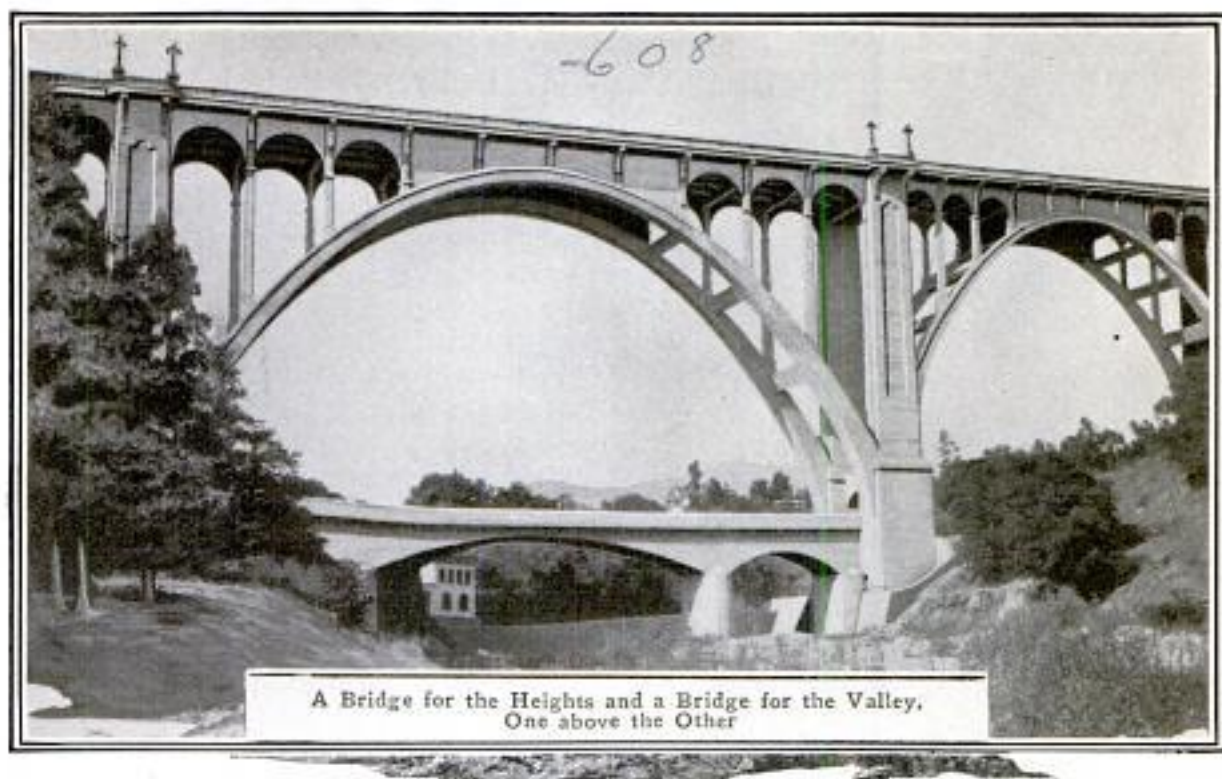
ancient colors and designs, has been preserved. The factory will not only be employed in producing porcelain for the market, but will have a special department in which porcelain of the highest quality will be made for presentation to the rulers of other countries.

608

A BRIDGE WITHIN A BRIDGE SPANS WESTERN RIVER

The Arroyo Seco is a small California stream, but the valley through which it flows is wide and the surrounding hillsides are steep and difficult to climb. The main automobile roadway between Pasadena and Los Angeles had to cross the stream, but motorists objected to descending into the valley, only to be met after crossing the wide bottom of the basin, with a sharp ascent on the other side. So a large bridge was constructed, spanning the whole valley, and giving a level speedway over what was formerly

Chas. Alma Byers

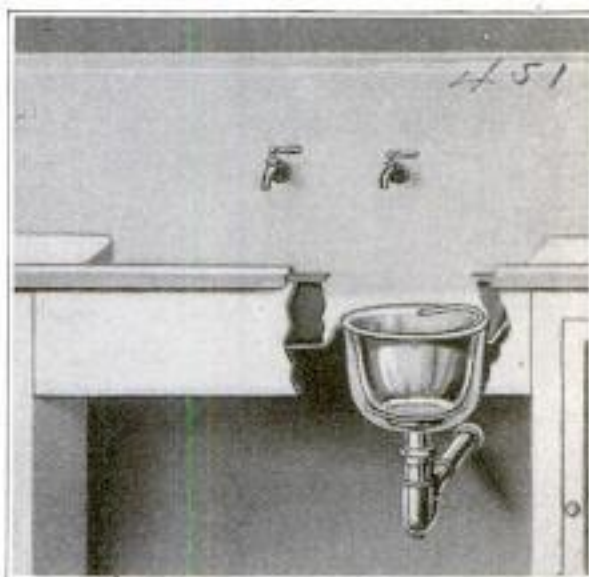


a difficult stretch of country. But this left the residents of the valley in an unusual predicament. To cross the river, they were confronted with the necessity of climbing the steep hills back of their homes in order to get onto the high bridge, and then, after getting to the other side, a corresponding descent had to be made. So, for their benefit, a second bridge was built directly under the first one, and even between its high piers. The result was a "bridge within a bridge," and neither of them very small structures. Both are of concrete, and together are said to have cost in the neighborhood of a quarter of a million dollars.

REFUSE COLLECTOR BUILT 451 IN KITCHEN SINK

Quite an interesting departure from the standard plan of kitchen-sink construction has been marked by the incorporation of a refuse trap as an integral part of the drain system. This idea has been developed by a western inventor who has provided a depression in which a strainer pail is counter-sunk. The waste pipe connects with this. The refuse collector is made of

white enamel and fits snugly in place, becoming a part of the sink. Dishes may be rinsed and cooking utensils scraped in the sink without danger of clogging it, for the sieve in this case is fine meshed. A bail is attached to the strainer to facilitate its removal when it is wished to empty its contents. Another convenient feature of the new sink is the presence of drawers and a roomy closet, which are provided beneath both ends of it.



The Refuse Vessel Fits Snugly into the Depression and Becomes Part of the Sink

See Nov 15-757
Improved Sanitary Fixtures Co.
R. 612 Metropolitan Bldg.
(Parish Bazaar) Los Angeles, Calif.

**ELECTRIC SAND SIFTER THAT
617 OUTWORKS TEN MEN**

Many modern foundries are being equipped with electric sand sifters, or what foundrymen call "riddles." For



This Electric Sand Sifter is Suspended upon a Trolley and may be Moved Anywhere about a Plant

this innovation several advantages are claimed. Among these claims is the assertion that it will do the work of 10 men using older methods, and that the machine is much easier handled. The mechanism of the new riddle imparts to the sieve a gyratory motion, cleaning and sifting the sand as fast as it is poured in. Only a small motor is required to operate this new sifter, $\frac{1}{16}$ hp. being the usual size. A trolley permits its easy transportation.

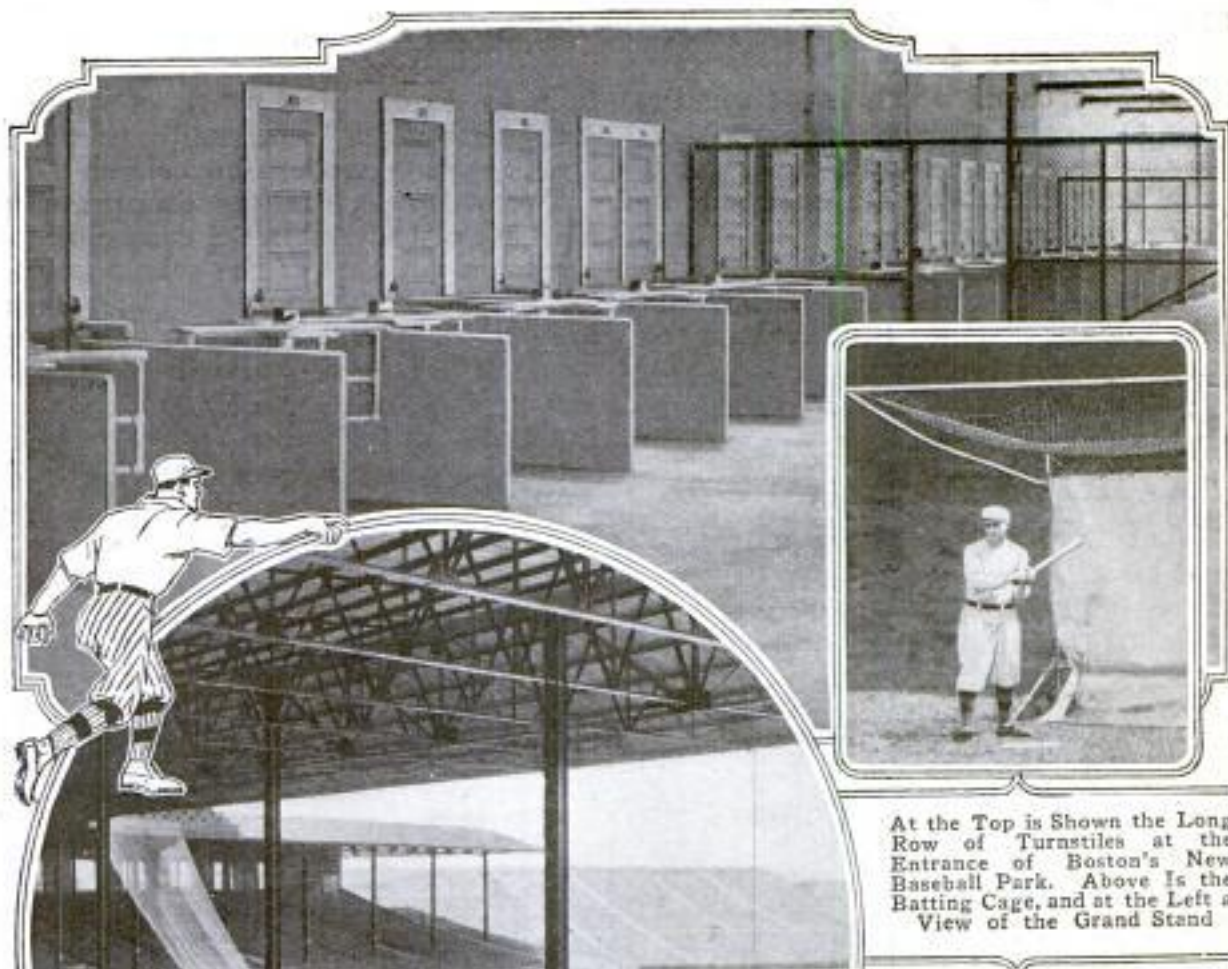
**BOSTON'S NEW BALL PARK
507 HAS NOVEL FEATURES**

Permanency in construction and convenience in arrangement are two of the outstanding features of the Boston Braves' new home, which is credited as being the finest baseball park in America. The grand stand and main bleachers, providing seating space for about 37,000 persons, as well as the administration building and other appurtenances, are built of steel and reinforced concrete.

The field is depressed 17 ft. below the street level, and is provided with a complete drainage system. It is surrounded by a 10-ft. wall, and extends 520 ft. in a straight line from the home plate, which is 60 ft. from the central part of the grand stand. The foul lines running from this same point are carried out to a distance of 375 ft. on each side. The low level of the diamond has made it possible for two-thirds of the grand stand and bleacher structures to be built solidly on the ground, which materially lessens the climb from the outside to the top tier of seats. All of the 18,000 seats in the grand stand consist of comfortable armchairs. There are 37 rows of these, spaced to provide plenty of room for their occupants. On the roof of the grand stand, which is supported by steel columns and trusses, are located the press boxes, a writing room for correspondents, and a room for their telegraphers. The grand stand is of heavy construction and has been designed eventually to support a gallery, should the present capacity prove inadequate.

A tunnel gives access to the home bench behind third base. The clubhouses for the players are situated beneath the grand stand and are fitted with the usual accommodations. There is a total absence of stairways at the park, all of the elevations being reached by concrete ramps. Trackage for about 42 cars is provided within the grounds, and is reached by inclines from the various sections of seats. At the park entrance there is a row of 28 concrete

"The Coombe-Lyons atory. Foundry. Rivelle"



At the Top is Shown the Long Row of Turnstiles at the Entrance of Boston's New Baseball Park. Above is the Batting Cage, and at the Left a View of the Grand Stand

The Photograph at the Right Indicates How Gently Sloping Ramps Take the Place of Stairways, While Below is Shown a Front and Side View of the Administration Building at the Entrance to the Grounds



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→ 114 State St. Boston
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Mass

stalls, in each of which is a turnstile. Past this point the passageways leading to the various sections of the grand stand and bleachers are inclosed by fences of iron netting. The ticket booths are situated within large concrete columns immediately back of the arcade extending along the front of the administration building.

374

HOUSEKEEPING MECHANICS TAUGHT IN MODEL SCHOOL

That the young women of Hollywood, Cal., may be instructed intelligently in various important branches of housekeeping which ordinarily re-



The Metal-Working Class at the Hollywood High School: Here the Young Women are being Shown the Inside of a Water Heater and Instructed in How to Repair It

ceive little or no attention in domestic-science classes, a high-school course has been inaugurated. The many mechanical devices which have been developed for lightening housework are dismantled and their principles explained. The purpose is not to make master plumbers of the girls, but so to equip them that if necessity demands it they may be able to fix a leaky faucet, repair a defective gas range, take proper care of a sewing machine or vacuum cleaner, and know instantly

how to do or direct work of similar character which continually presents itself in every modern household.

Every-day problems of almost every kind are considered in the course of instruction. A part of the school is finished off like a bungalow, and here each girl not only learns to cook and sew, but is taught to arrange furniture artistically, serve daintily a dinner or luncheon to a number of guests, and provide an evening's entertainment in accordance with her own ideas. Economical purchasing is an important feature of the training. Trips are made to the municipal market, where the art of getting good values is taught. In this the average wage-earner's income is taken as a basis.

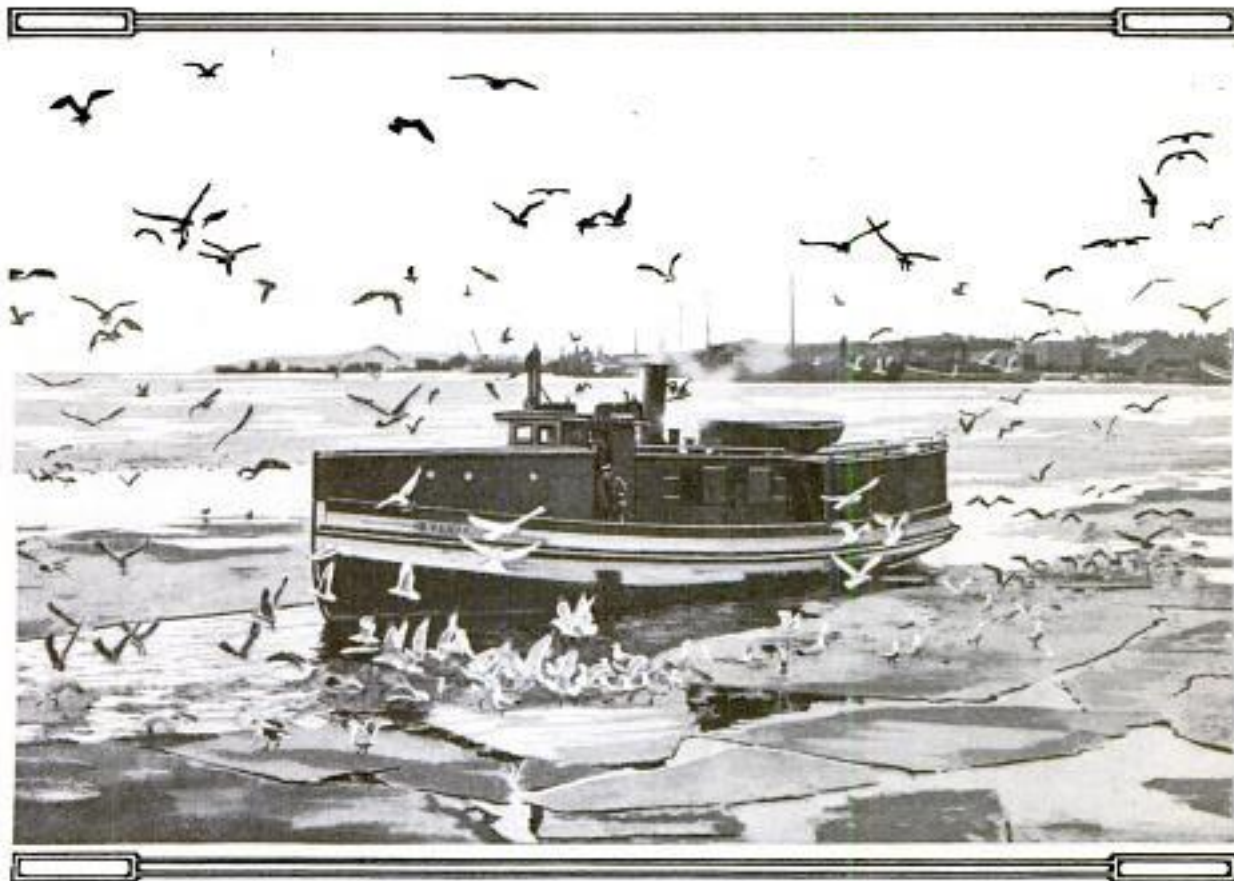
362

TRAINS PROTECTED AGAINST BULLETS BY STEEL FENCE

Along a Canadian railroad that passes the end of a rifle range it has been found necessary to build a solid steel fence to protect the trains from stray bullets. The railroad is located near the top of a high and precipitous hill. Since it is about 150 ft. above the rifle range and is at a considerable distance from the firing station, there was thought at first to be no danger from bullets. When the railroad had been in operation a short time several bullets went through the windows of a train, narrowly missing some of the passengers, and the steel fence was then built. The fence is as long as the range is wide and extends well above the tops of the cars. It is supported on steel rails driven into the hill under the track.



Steel Fence Erected for the Protection of Trains on a Canadian Railroad That Crosses the End of a Rifle Range



The Ice-Breaking Tug "Sylvia" Opening a Way through the Ice in Green Bay. The Gulls have been Attracted by the Opportunity for a Dip in the Channel Made by the Tug

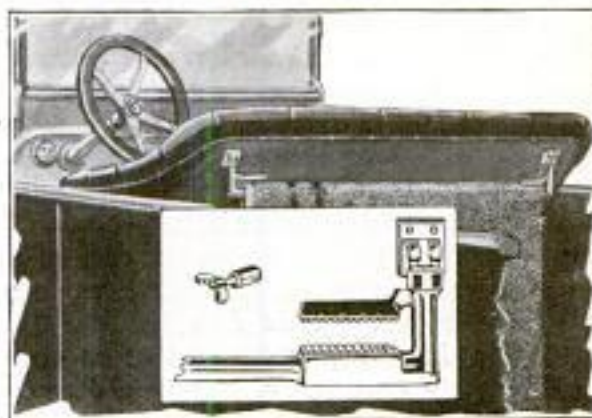
POWERFUL TUG BREAKS ICE
9687 FOR FISHING FLEET

Connected with the fishing fleet that operates in Green Bay, on the western side of Lake Michigan, is the "Sylvia," an ice-breaking tug that is said to be the most powerful in the world of its size. This tug is the subject of a wager that has been open for years but has never been taken. The bet offered is \$100 to 50 cents that no tug of the same size afloat is able to equal the "Sylvia" in ice-breaking feats. The "Sylvia" is 60 ft. long and 15 ft. wide, and has succeeded in breaking up the ice in the bay winter after winter when other and larger boats have failed.

H31
MOTOR-CAR ROBE BRACKET
WITH LOCKING JAWS

For use in the tonneau of a motor car, a robe rail has been devised which has movable jaws between which coats and wraps may be locked securely and left unguarded without danger of being

stolen. These gripping members are faced with pyramid rubber so that they hold firmly and do not injure a garment. They are controlled separately by an individual key, a few turns of which serve to open or close them. The two outer, or stationary, jaws are designed so that they support the rod. When robes or articles of apparel are left in a car, locked in this manner, they cannot be taken away unless the thief steals machine and all.



The Keys are Made in an Unlimited Number of Patterns, so That the Owner of One cannot Use It to Unlock a Rail in a Car Not Belonging to Him

Minnesota Motorob.
205 Temple Bldg, Duluth,
Minn.
(Philip G. Brown)
 Copyrighted material

*112-9379 - Philip Brown Brown 1/25/15
 Duluth Minn. Filed Dec 11, 1914, Ser. 876726
 Tel 45-137 Gopher 12-11-1075*

Bruce Daniels, 412 East 28th St.
Indianapolis, Ind.

Keystone Weekly 9-28-15

Submarine
War
876

POPULAR MECHANICS

ILLUMINE STEAMERS' SIDES WITH MOTOR-CAR LIGHTS

Neutral ships entering the so-called "war zone" carry their names and ports of registry displayed in large letters on their sides. In order that these signs may be distinguished at night by commanders of belligerent battleships and submarines, they are illuminated. Many of the small freight steamers at present engaged in the transatlantic

recent change to electric systems. These searchlights are mounted on arms, extended from the sides of the ships, and adjusted so that their shafts of light play over the banners.

684

PROPERTIES OF PLATINUM ARE STUDIED BY EXPERTS

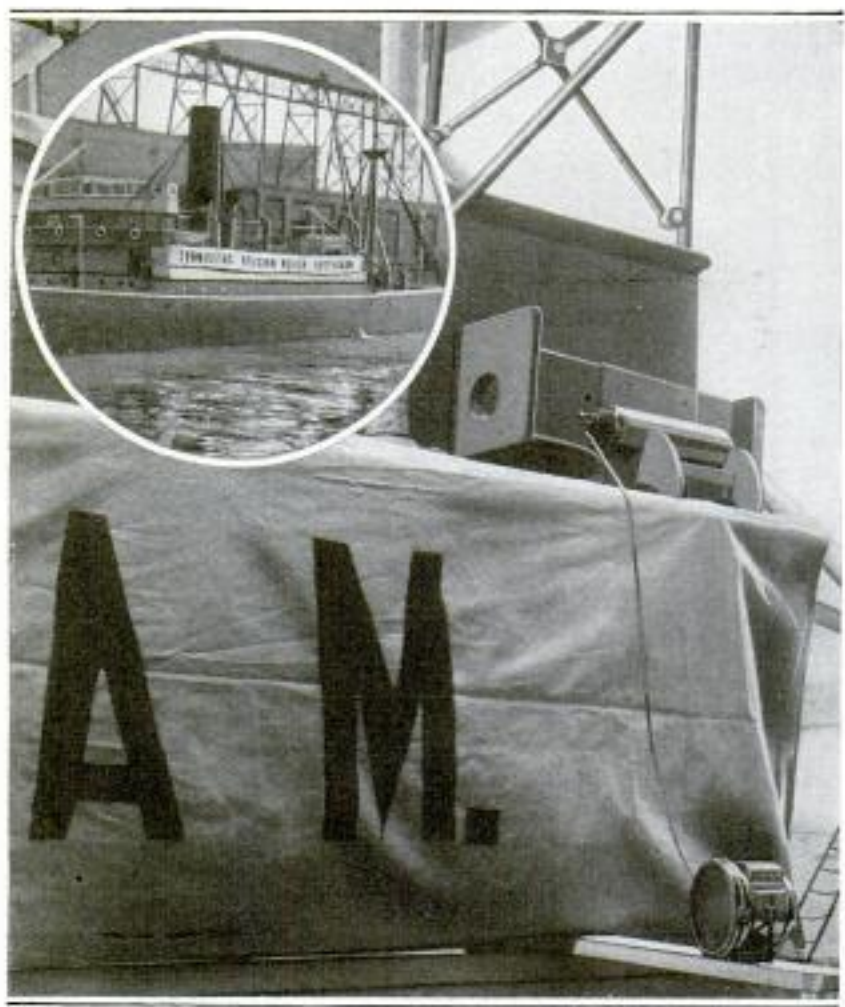
Though more valuable than gold and greatly used in the arts and sciences, there have been many things about

platinum not fully known or understood. Particularly is this true of the metal's precise physical and chemical properties. The United States Bureau of Standards recently undertook to investigate these things, and some interesting developments were a result.

One accomplishment of the bureau was the invention of a delicate thermoelectric test for the purity of platinum. By its aid a rapid estimate of the amount of foreign matter in the metal, such as iridium or iron, may be made—and without injuring the metal in any way. Large purchasers of platinum ware are said to be using this test extensively. The bureau also obtained data by which it is now possible to predict accurately what will be the loss in weight of a platinum

crucible when heated, thus enabling certain tests in analytical chemistry to be made more exact than formerly.

For the 12 months ended August 31, 1915, the exports from the United States aggregated \$3,035,033,280, an increase of \$754,847,489 over the exports for the corresponding next-preceding period.



Freighter in the Service of the Belgium Relief Commission with Its Sides Marked by a Large Banner Which is Illuminated by Motor-Car Lamps Mounted at the Sides of the Ship as Shown in Lower View

service are not equipped with electric-lighting facilities, which has made it necessary for them to be provided with auxiliary systems for the illumination of their sides. This has led to the adoption in many instances of motor-car lighting equipment; powerful acetylene headlights supplied with gas from high-pressure tanks such as were almost exclusively used before the

E. M. Weaver, Long Island R. R. Co., Jamaica, N. Y.



The Arms Are Strong Enough to Stop a Motor Car if Its Driver Fails to See the Danger Warning

RAILWAY-CROSSING GATES

453 BARRICADE TRACKS

In an attempt to devise a crossing guard which will effectively hold back motor cars in cases of extreme emergency, an eastern railway company has made use of two 40-ft. spruce piles. These members, which serve as arms for the gate, are about a foot in diameter at the base and 8 in. thick at the tip. They are supported between posts by means of 1-in. bolts and are counterbalanced with 1,000-lb. weights. Fixed to the tip of each pole is a rope with which a gate is drawn down by a watchman, who then secures it by means of a large hook and chain. When the gate is lowered it is 3 ft. 6 in. from the crown of the roadway. At this height the poles are in a position to stop a motor car which has failed to heed the flagman's warning. The arms are painted with black and white spiral stripes.

MUSIC STILL PRINTED FROM PUNCHED PLATES

For more than a quarter of a century the method of making the original plates from which music is printed has remained practically unaltered. This is more or less interesting in view of the material changes which have marked the development of the general printing and engraving processes during the same period.

With the exception of the method ordinarily used in printing hymn books, in which each character is reproduced from a separate piece of type, the first step in the process entails the making of a "punched plate." This is the original negative, and is made today essentially the same as it was years ago. The plate itself is a composition of lead and zinc. The staff lines are cut into it with a ruling pen, after which the impressions of the various notes and marks are made by hand with punches.

When a large run is to be made by the publisher, a zinc etching is usu-



Making "Punched Plate" Negatives from Which Music is Printed

Walter Brinkman, 40 Limes St., Cincinnati, Ohio

*Infr: North Cross. Mfg. Co.
American St. & Lehigh Ave*

878.

*Phila.
Pa.*

POPULAR MECHANICS

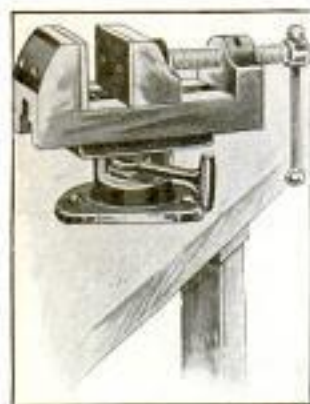
Engineering News 9-9-15
**NOVEL RAILROAD BRIDGE FOR
678 RIVER IN JAVA**

ally made from this plate and the printing done from it in the regular manner. In other cases, however, the remaining part of the work is done by the lithographer, who makes a positive impression from the plate on sensitive paper and transfers this to a stone from which the printing is done.

170

SWIVEL VISE IS DESIGNED FOR BENCH AND MACHINE

Several advantages to the toolmaker and machinist are presented in a swivel



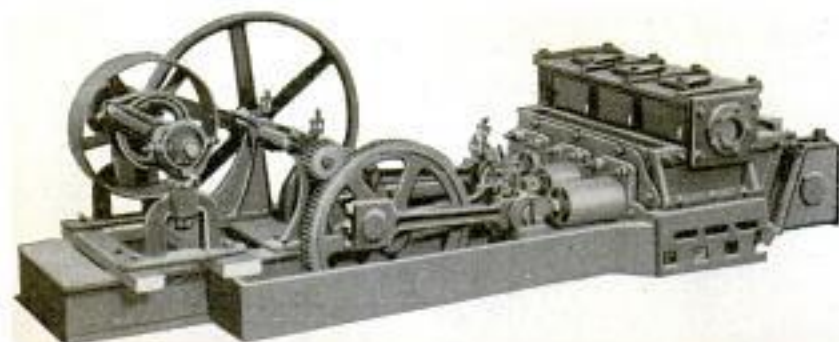
vise that has lately been brought out. This is so mounted that the upper section may be detached from the standard and used on a drill-press table, or in similar places.

At one side of the base is a lever, the adjustment of which locks or releases the device. On the under side of the mounting are three bosses that provide a level bearing on the bench.

8861

ACID-PROOF PUMP DESIGNED FOR USE IN MINES

For use in coal and mineral mines where the water is frequently of considerable acidity, a wooden pump has



This Wooden Pump is Designed to Withstand the Corrosive Effects of Water Found in Mines

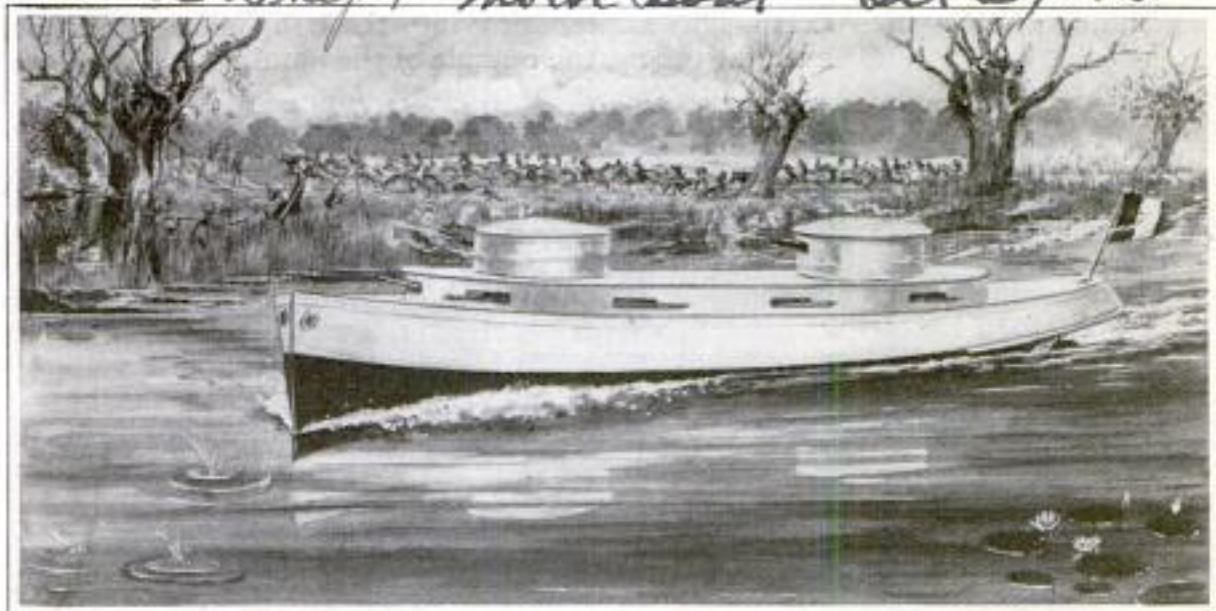
been invented to overcome the difficulty encountered by the corrosion of those built of metal. Practically the

only metal parts of this pump touched by water during its operation are the plungers, and these, by being kept well lubricated, may be protected from material deterioration. The cylinders, as well as the valve chests and plates, are made of wood and reinforced on the outside by metal castings. The valves are of the gravity type and do not require springs. An experimental pump of this kind has been in

use in an Ohio mine for approximately two years and is said to have required practically no repairing.

*N. E. Kuehner, Edit. Dept. Dispatch (X Dispatch)
Columbus, Ohio.*

Motor Ship + Motor Boat Oct 29-15



8936 Fast Armored Motor Craft Fitted with Revolving Turrets and Machine Guns

POSSIBLE WAR VALUE SEEN IN ARMORED MOTORBOAT

During the early part of the European war the Belgians made good use of a lightly armored motorboat on the River Dyle between Boom and Malines. The craft, having a length of about 35 feet, was protected by a double steel hull. The outer shell of this was about one-third inch in thickness, and the inner one approximately half that. The deck, carrying two revolving turrets, in which were mounted a pair of machine guns, was built over and provided with loop holes for military rifles. One officer, a helmsman, and 12 men constituted the crew. While cruising near Malines the boat was attacked by a relatively large body of German infantry and cavalry. The enemy failed to stop the vessel, was unable to kill any of its crew, and, moreover, suffered severely in the attempt, for the effect of the boat's machine guns was painfully apparent.

CA bulletin issued by the International Institute of Agriculture, at Rome, states that the crop of cereals grown in 1915 in the northern hemisphere exceeds the average crop of the past five years by more than 73,000,000,000 pounds.

FOUNTAIN SPONGE DEvised FOR VARIOUS USES

Fountain brushes both for painting and scrubbing purposes have been in use for some time, but a European inventor has recently adapted the same principle to a sponge. This is intended for washing surfaces from which sand or grit is to be removed. A nickeled pipe, which is shaped to fit the back of the operator's hand, is joined to the sponge and also connected to a piece



Water is Supplied to the Sponge through a Tubing
Connected with a Hydrant

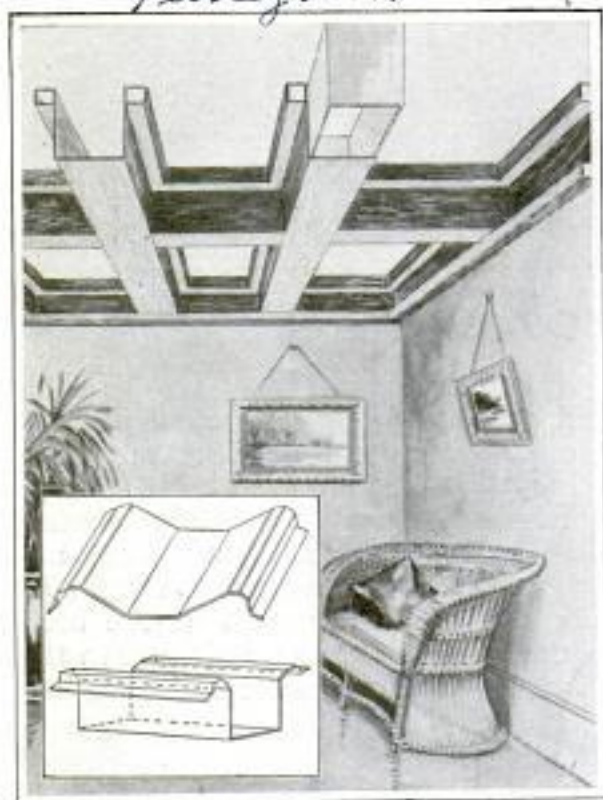
*Julius Pintsch Co.
Frankfurt a/M.
Germany.*

of flexible tubing which extends to a water faucet or tank. The metal tube is held in place on the hand by a bracelet which fastens about the wrist.

CEILING BEAMS MADE OF VENEERED STRAWBOARD

Artistic ceiling effects are easily and cheaply obtained by the use of ceiling beams made of extra-heavy strawboard and covered with paper veneer to represent

"Patney Pat. Beamed Ceilings"



These Strawboard Ceiling Beams, When Covered with Paper Veneer, Have the Appearance of Wooden Beams; They are Attached to the Ceiling by Screws Driven into the Lath

resent some particular kind of wood. One of the advantages claimed for this material is that it can be put in place without difficulty by any paper hanger. The material comes flat, but is scored so that it is easily bent into the shape of a beam. When the beams are in place they are 4 in. square in section with a molding 1 in. square in the angles. The location of the beams is first laid out on the ceiling with chalk. The beams are bent into shape along the score marks and are then attached to the ceiling by means of screws driven through the top side of the

molding into the lath. Following this, the outside of the molding is bent down into position, and the lower part is pasted to the side of the beam, the parts being held together by wire loops while the paste is setting. For joining two sections, a core box, made of the same material and designed to fit accurately into the beam is used, while a junction with the side of another beam is made by cutting the material to an accurate fit. When the beams have been in place long enough for the paste to set they are covered with the paper veneer.

NEW SOLDER FOR WELDING ALUMINUM PARTS

There has just been placed on the market a new kind of aluminum solder that is likely to prove of the greatest value in connection with automobiles, aeroplanes, and other lines in which aluminum is used extensively, since it does away with the usual tedious processes of welding broken aluminum parts. No soldering iron is used with this material. It melts at a comparatively low temperature and all that is necessary for applying it is a gasoline torch. It can be used not only for straight welding but for building in lugs and broken-out aluminum sections from such parts as crank cases and manifold pipes. When in place it is said to stand the hammer test better than the original aluminum.

SEARCHLIGHTS FLASH MESSAGES ACROSS PANAMA

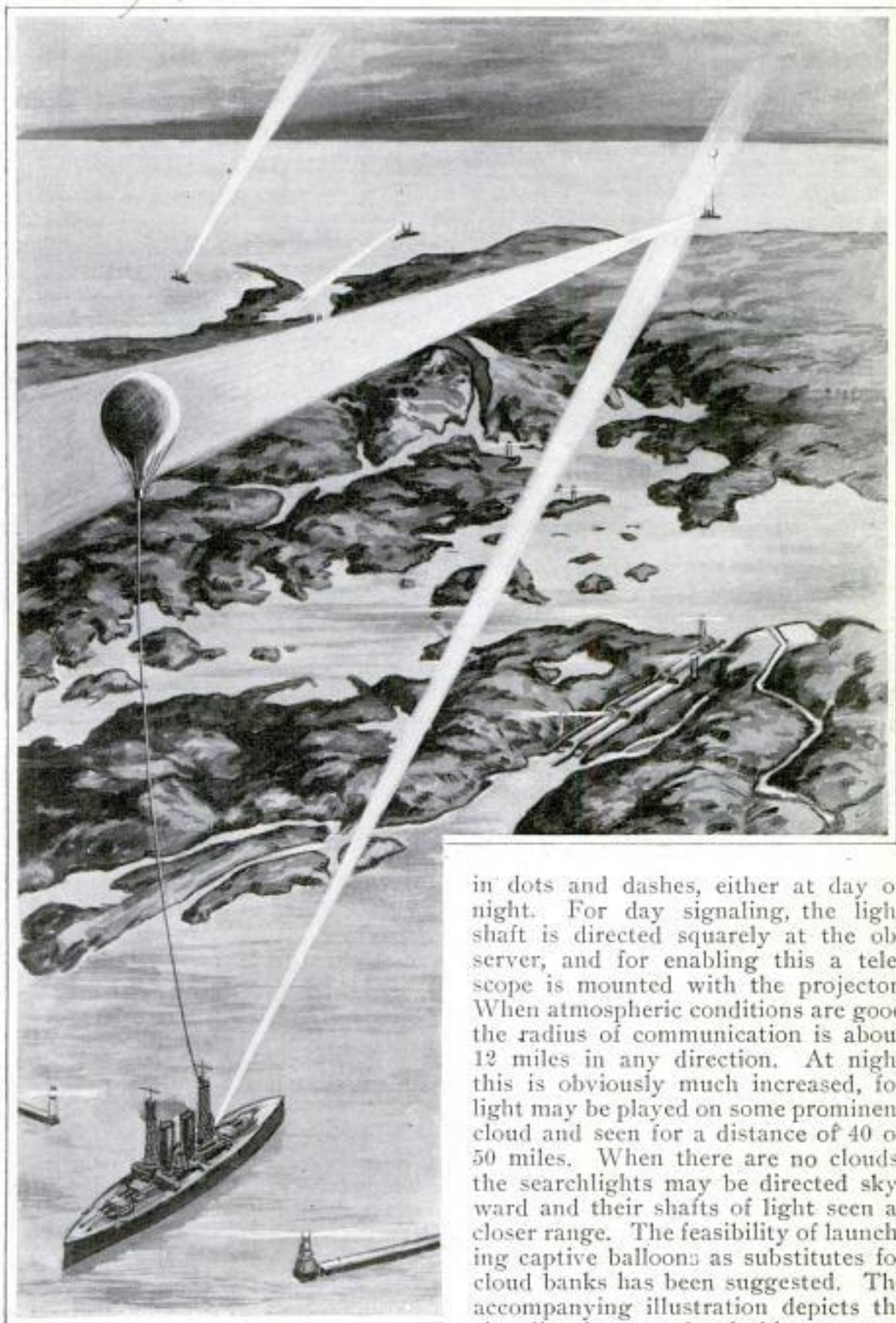
Although searchlight signaling between battleships was a means of communication at sea long before the introduction of wireless telegraphy, it is still utilized. The latest battleships of our navy have been equipped with projectors designed especially for this purpose, while the older vessels use their regular searchlights for which auxiliary shutters are supplied. Levers operate these latter members, flashing the lights on and off quickly so that messages may be spelled out

Alfred Pearl Co., 41 W. 14th St., New York City. Sole Distributor.

*800-
357790
9466*

J. R. Henderson, U. S. S. Michigan
U. S. Postmaster, New York City

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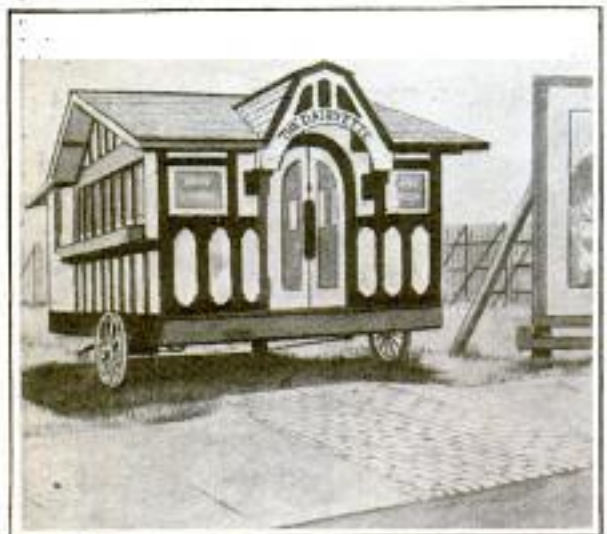
With Atmospheric Conditions Favorable, Messages may be Flashed in This Manner for Many Miles

in dots and dashes, either at day or night. For day signaling, the light shaft is directed squarely at the observer, and for enabling this a telescope is mounted with the projector. When atmospheric conditions are good the radius of communication is about 12 miles in any direction. At night this is obviously much increased, for light may be played on some prominent cloud and seen for a distance of 40 or 50 miles. When there are no clouds, the searchlights may be directed skyward and their shafts of light seen at closer range. The feasibility of launching captive balloons as substitutes for cloud banks has been suggested. The accompanying illustration depicts the signaling between battleships at opposite portals of the Panama Canal.

J. E. King, 202 S. Winnetka Ave. Dallas, Texas

MOVABLE QUICK-LUNCH CAFE OF BUNGALOW TYPE

In one of the largest Pacific-coast cities a dairy-lunch wagon of unusual proportions is driven to a favorable



Large Dairy-Lunch Wagon Used in a California City

street location in the evenings, where it competes with the all-night restaurants. Virtually the caravan is a portable house. The superstructure, which is mounted on heavy wagon wheels, is designed much like a small bungalow and is about 12 feet by 15 feet in floor dimensions. During the daytime it is kept on a vacant lot in the middle of the business section of the city. It is neat and clean in appearance and provides sufficient room for the seating of more than a dozen patrons at one time.

565

MUNICIPAL MILK STATION PLANNED FOR NUREMBERG

In an attempt to deal with the milk situation at Nuremberg, Germany, the municipal authorities have approved the development of a permanent distributing station to be established as a limited-liability company. A trifle less than one-half of the capital is to be subscribed by the city, while dividends to stockholders are to be limited to a maximum of four per cent. This plan is to be undertaken so that milk may be obtained from a dependable source and at reasonable prices.

VALUABLE OIL IS TRAPPED 601 BY SIMPLE METHOD

The supply of crude oil coming from the Kansas and Oklahoma fields is said to be falling off, due, according to experts, to the gradual draining of great pools of the liquid which formerly underlaid those states, far beneath the prairie surface. Because of the diminishing supply, the amount available has had to be economized to a greater degree than formerly.

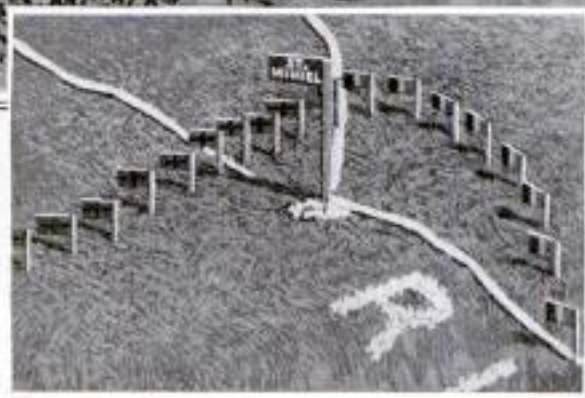
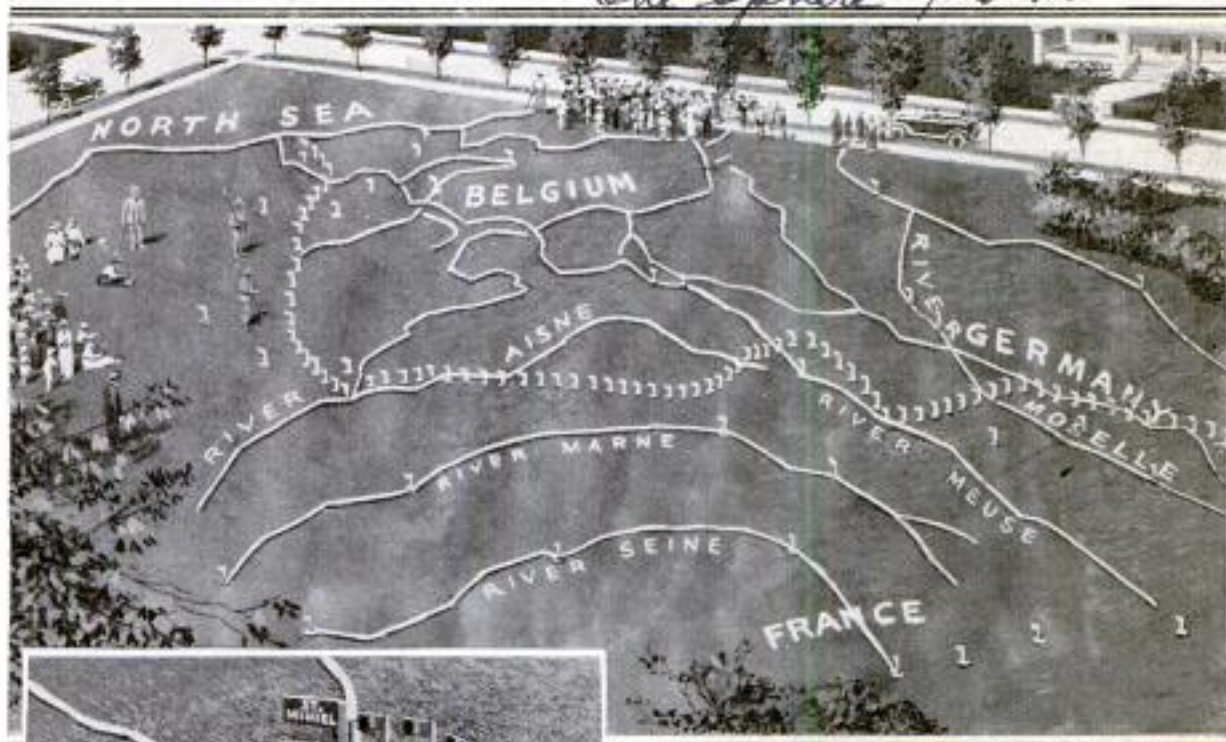
In other days oil from a newly bored well would generally be permitted to spurt out unchecked for a long period, flowing away on the surface of some near-by stream. Then, too, an occasional bursting oil tank would contribute its quota. As a means for saving this wasted oil, which of course floats on the surface of the water, oil men have taken to throwing out wooden booms over the surface, which shunt the oil off into pits dug in the banks of the stream. From the pits, the oil is pumped to storage tanks with gasoline engines. It is estimated that each of the traps so set up has caught, on an average, \$1,000 worth of oil per month. The oil is of inferior quality, however, due to the exposure and admixture of water.

MACHINE FOR SHARPENING 554 RAZOR BLADES

A slanting stroke that gives the razor the wedge-shaped edge so essential to satisfactory service, is the principal feature in the operation of a razor-sharpening machine that has just been brought out. This machine sharpens 12 blades at a time, the blades being carried in holders fixed to the ends of arms that are mounted on a horizontal floating hub. On each side of the space occupied by the holders is



12/28/15 R. C. McCall & Co. Caswell Block 319 No Laramie av. Chicago.
James W. McCall

The Sphere 7-3-15

Large-Scale War Maps, Such as This, Accurately Laid Out on a Hillside, or Other Convenient Locality, Offer a Convenient Way for People to Follow European War Operations. The Small View Shows Detail of Map

WAR MAPS ON LARGE SCALE GIVE USEFUL INSTRUCTION

a vertical disk having a sharpening surface. Through the action of two cams that alternately engage the arms, the blades are made to bear against first one sharpening surface and then the other, the connection between the hub and arms being such that the angle of each blade is changed slightly at each of these changes so that the blade bears at the proper angle against each of the sharpening surfaces. During the first third of each stroke the blade passes over a soft honing surface and during the remainder of the stroke over a leather strop or finishing plate. The machine is run by a $\frac{1}{40}$ -hp. electric motor, and with it it is possible to sharpen ordinary razors as well as any kind of standard safety-razor blade.

CA new course for teaching farm boys how to operate an automobile has been established at a leading Iowa college.

It is often difficult to comprehend from a small map the significance of different movements and the strategic value of certain positions in the present European war, because of the vast territory involved. Seeking to get around this difficulty, several English lawns have been experimentally converted into large-scale, open-air maps. On these huge plats one can actually stroll up and down the "firing line," observe how close one's position is to that of the enemy, and, in general, gain a comprehensive idea of progress in warring operations. Small national flags mark the positions each country's armies occupy, and the towns are indicated by small posts, also appropriately flagged. Colored tape, staked down at intervals, shows the location of rivers, and small stones set in the sod spell out names of the various districts. It has been suggested that such large maps as these, installed in city parks of this country, might be useful in giving Americans short-cut knowledge as to progress in the war—especially in these

Arthur Chapman,
2612 E. Colfax St

884

Denver,
Colo

POPULAR MECHANICS

days when much of the war news is not read because of its confused character, and the concentrated attention which must be given it in order to gain an adequate comprehension.

610—

BURROS AID IN MARKETING HUGE TIMBER RESERVES

As a natural consequence of having acquired millions of acres of the finest timber lands in the world, the national government has necessarily had to go into the lumber business. The sales of timber from the national forests of Colorado have increased year by year, and supplying ties to railroads forms no small part of the government's lumber business, which is conducted

up in the mountains and hard to get to market.

Pack mules have had to be used in some cases in order to get the big sticks safely down the steep trails. A tie is strapped on either side of the little burros, and they march off in single file, dragging one end of the sticks on the ground. After reaching railroad or mill, the ties are piled up and each is marked by the watchful forest rangers, part of whose duties it is to see that the government stamp is on every tie that goes out of the forest.

587—

ICE-BREAKING CAR FERRY HAS PASSENGER QUARTERS

The "Prince Edward Island," an ice-breaking steamer recently built in England for service in the Straits of Northumberland, Canada, is a craft of unusual type, since it is designed not only to do the work of an ice breaker but that of a car ferry and a ferry for passenger, and other miscellaneous, traffic as well. The straits separate Prince Edward Island from the mainland of New Brunswick and Nova Scotia, and like most of the waterways in this latitude are icebound during the greater part of the long winter.



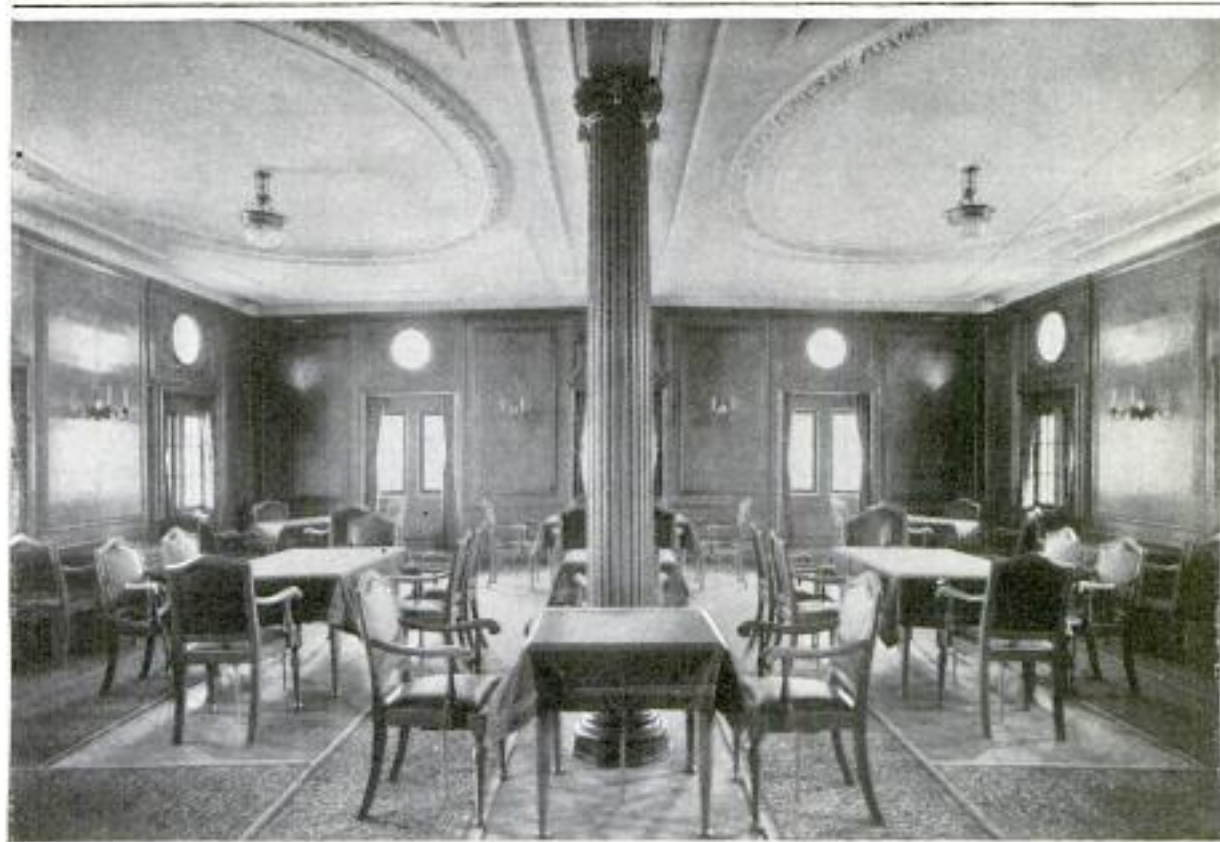
Top View: Forest Rangers Counting and Stamping Ties from Government Reserves before Turning Them Over to Purchasing Railroads

Lower View: Burros Trailing Railroad Ties down the Steep Mountain Sides of Colorado to Government Storage Yards

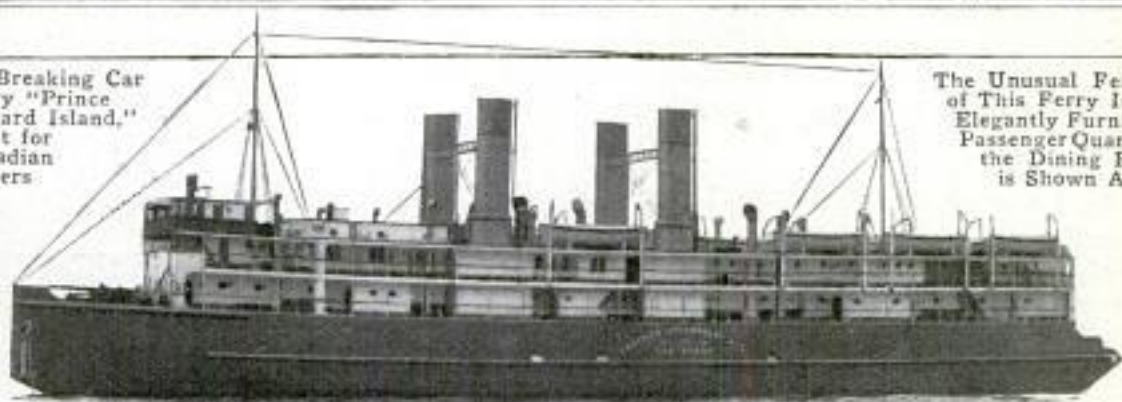
through the Forest Service. But much of the material available for ties is far

Infra: Armstrong, Whitworth & Co. Ltd.
Walker Shipyard 587 Newcastle upon Tyne,
England
885

POPULAR MECHANICS



Ice-Breaking Car Ferry "Prince Edward Island," Built for Canadian Waters



The Unusual Feature of This Ferry is the Elegantly Furnished Passenger Quarters; the Dining Room is Shown Above

At the narrow point in the straits, where the boat is to operate, the distance from the mainland to Prince Edward Island is about nine miles. With a clear channel the passage is made in about 40 minutes, but with the channel clogged with ice the passage may require several hours. On account of this the passenger quarters include a dining room and are comfortably and elegantly furnished throughout. The vessel is 285 ft. long, and has a mean draft of 18 ft., while the propelling ma-

chinery is capable of developing 7,000 hp. The load carried by the vessel, including coal, is about 650 tons. The bow is so shaped that it splits the ice and rides it down at the same time. One of the novel features of the craft is a propeller placed at the bow. This propeller is used not only in backing into the dock, but is a valuable aid in the work of breaking up the ice, since it draws some of the water from beneath the ice and thus weakens its support.

Pat. 1,142,233 June 8, 1916 Perry, D. Payson, Boston, Mass.
Assigned to Parier Wire Goods Co.
Worcester, Mass.

886 *Boyetts*
215-440

POPULAR MECHANICS

NEW SECTIONAL WIRE FENCE 297 EASILY ERECTED

A recently invented sectional fence designed for quick and easy erection is composed of U-shaped units, each



Fence Made Up of U-Shaped Wire Sections, Designed for Quick and Easy Erection

of which is made from a single piece of wire, the ends of the wires being driven into the ground in such a way that the units overlap and are securely bound together. One leg of each of the units is bent to form two loops, one located near the top of the fence and the other at the ground line. In erecting the fence the sections are driven into the ground successively, the straight leg of each section being first passed through the loops of the adjacent section.

675 —

AUTOMOBILES GET BUSINESS OF STEAMSHIP LINES

A steamship line in the excursion business on the northwestern coast found itself in an unusual predicament lately. The company started its season brilliantly by opening a number of resort places along the rivers and coast. For a time all went well. Then traffic

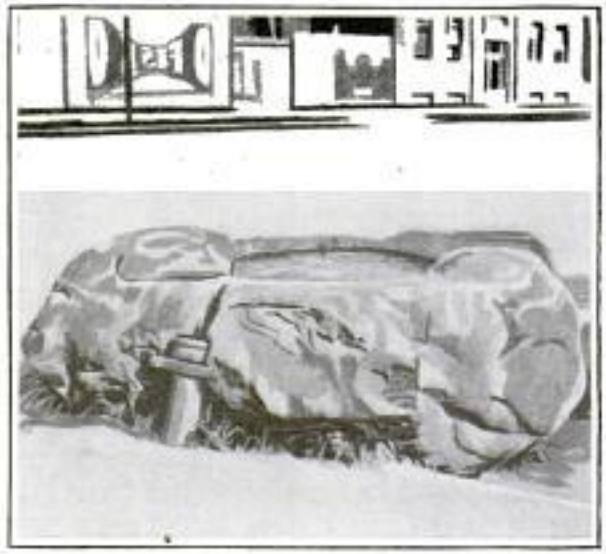
commenced to fall off, and stop after stop had to be abandoned.

An investigation revealed the cause. It was found that after the steamship company had popularized its resorts, most of the people who visited them came in automobiles. This was not at all satisfactory to the steamer people, as they had looked to passenger fares for their main returns. The company therefore concluded not to promote any places accessible to automobiles, and hereafter will plant all its summer colonies on islands, securely out of reach of four-wheeled rivals.

294 —

ROUGH BOULDERS ARE USED AS PUBLIC WATER BASINS

Municipal watering troughs for horses, and other animals, are most often constructed chiefly for utility, little of the esthetic entering into their designing. But at Grand Rapids, Mich., this is not the case. A large number of very plain, artistic basins have been installed at convenient places in different parts of the city. Instead of being made of iron according to a stereotyped pattern, they consist of large, rugged boulders, each weighing several thousand pounds. Bowls are



Many of These Rock Basins have been Installed at Different Points in a Michigan City

hollowed out in these, intake pipes laid to connect the water mains, and waste pipes joined with the sewer system.

*Superior Navigation Co
Seattle, Wash*

*Hester W. Shaper of News,
Grand Rapids, Mich.
Copyrighted material*

THE WAR'S INFLUENCE ON AMERICAN TOYS

695

By SEARLE HENDEE

POLITICAL conditions and social changes have for centuries reflected themselves in children's toys and games, just as they have influenced the dress, art, and literature of nations. It is not surprising therefore that this year the American boy's Christmas playthings bear conspicuously the stamp of Europe's conflict. A greater variety of military and naval toys is now afforded than ever before, both because of the status of affairs abroad and the striking changes in modern warfare and its instruments of destruction.

There is hardly a new war tool of importance which has not to some degree furnished a pattern for a child's bauble. A miniature battleship unequipped with wireless aerials or a complement of flying boats cannot be called modern. The air rifle which is without a blunted bayonet and a shoulder sling is obviously not designed for mimic hostilities. A cannon which fires only one wooden projectile at a time is at a disadvantage, for quick-fire and machine guns are now used in bombarding pasteboard forts and combating pigmy soldiers. These individuals have also undergone a radical change. They have developed into animated dolls fully attired in field uniforms and fitted with haversacks, cartridge belts, and rifles. They walk about with military pomp and clatter, instead of remaining quietly in the places they are set.

Thus the toy makers of both the old world and of America, who are the ordnance manufacturers for the youngsters' military forces, have kept astride with the Krupp, Schneider, and Bethlehem designers. Regardless of whether battles are fought from the bomb-proofed trenches in France, across a parlor floor, or in a bathtub, the exigencies of war are met with the latest implements. A few years ago a boy built his fort with blocks, inserted pencils in loopholes to serve as guns, and provided the "booms"

with his own lungs. The contrast between the war equipments of that lad and the boy of today is just as great as that of the fighting tools used in the Rebellion and those employed now. There are elaborate papier-mâché fortifications with disappearing guns that operate electrically and flash when they discharge. These may be fitted with toy radio plants and connected by electric railways over which troops and munitions can be transported from different parts of a room. If a boy's soldiers are attacking a fort, they have artillery batteries to cover their advance and siege guns to batter the stronghold.

One of the most ingenious toys of American manufacture inspired by the European war is a machine gun. This is mounted on a tripod, is 22 in. long, and has a businesslike appearance. The ammunition consists of wooden projectiles slightly less than two inches in length. Slots in these members allow them to be fitted onto a tape, which is passed over the barrel in front of a firing pin and attached to a reel. A crank at the rear controls the latter, and as it is turned the tape is wound, each revolution drawing a bullet into position and actuating a hammer which fires it. The gun may be shot in this manner a hundred times without reloading. As it is being fired, the barrel spitting out bullets in rapid succession, the gun may be sighted at different targets, or trained at a single object, as the operator deems expedient.

A play army equipped with a machine gun, but unprovided with fast artillery batteries, would be seriously handicapped. So a breech-loading, quick-fire gun has been developed. The mechanism of this is somewhat similar to that of the weapon just described, although its appearance is much different. It has a range of about 20 feet and may be fired at the rate of approximately 10 shots in three seconds. The ammunition, consisting of wooden projectiles, is held in a maga-

zine fixed at the top of a loading chamber. The bottom bullet rests in a slot at the rear of the barrel in firing position. A cylindrical block, fitted back of the loading chamber, is turned by a crank. Inside of it is a coil spring which is alternately compressed and released, forcing a firing pin against each shell in turn with considerable force.

The quick-fire gun is not of the mobile type, but instead is provided with a stationary mounting. A long-range field gun, however, which is similar in lines to some of the types used by the French and British artillery forces, has been produced. It is made entirely of metal, is mounted on wheels 6 in. in diameter, and has a barrel about a foot in length. With it is a mechanical soldier in uniform which lifts one end of the trail and draws the cannon along as he walks. The piece loads at the muzzle and fires wooden projectiles by means of a spring mechanism. It is fitted with a shield and is painted a war gray.

Another field gun, much smaller in size, is very similar in appearance to the famous French "75". It is provided with a slanting shield, while a recoil cylinder is attached beneath the barrel. Paper wads or rice kernels may be used as ammunition. For heavy work a wooden mortar which drops solid-rubber cannon balls on an enemy's fortifications is a part of the child's ordnance.

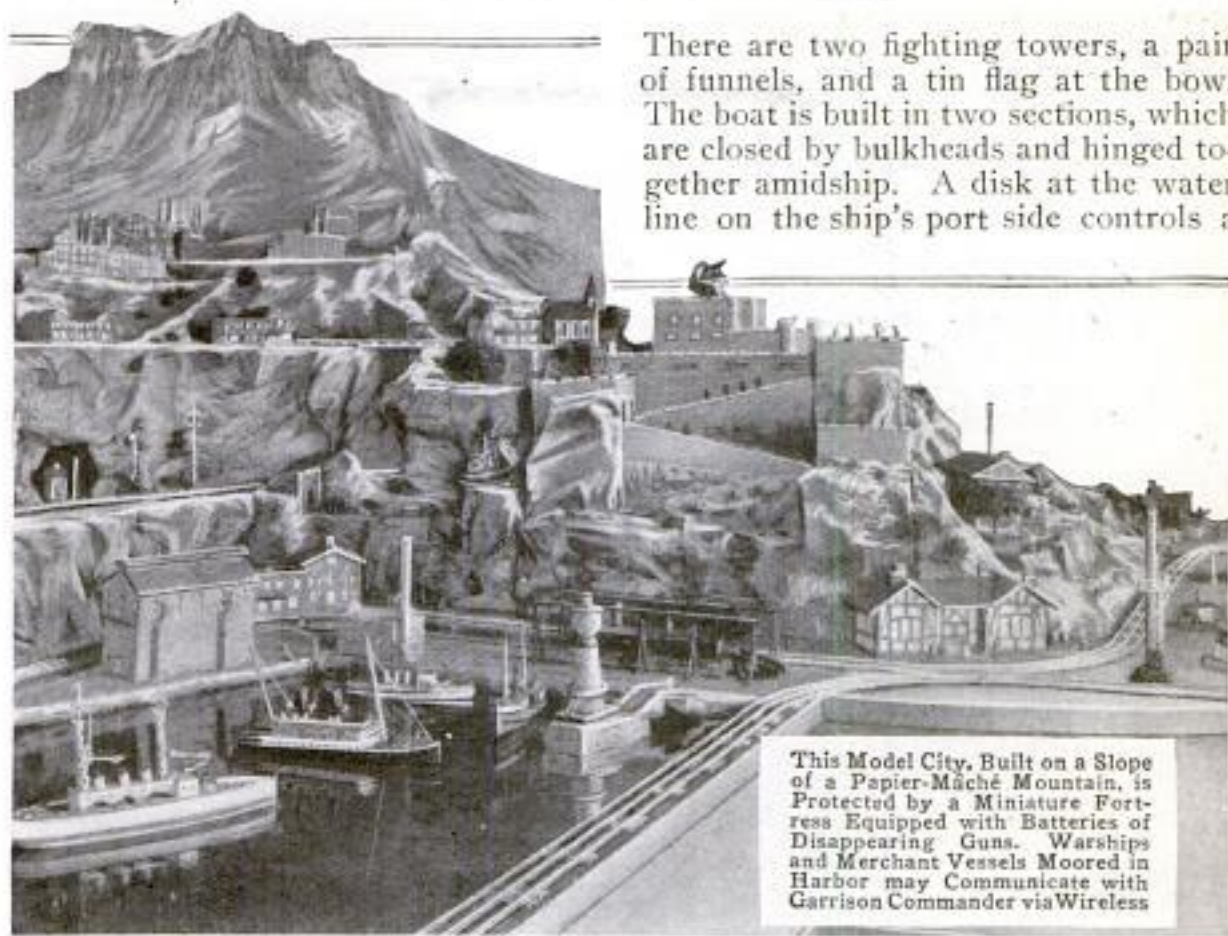
In the mind of a wide-awake child commander, a detachment of make-believe troops is no more immune to the effect of an enemy's fire than are flesh and blood men. The toy soldier now faces in the miniature many of the same engines of destruction as does his human prototype. If he is to make attacks against quick-fire and machine-gun batteries, he requires adequate defense. Therefore armored motor cars of different types have been placed at his service. Some of these resemble very closely the heavy, formidable vehicles of Europe's battle fields. One model, imported from England, looks much like an American-built car which

is being used by the allies. It is painted a war gray, has portholes for observation as well as rifle purposes, and mounts a light gun on a shield-protected turret. Inside of the car are two dolls, one a chauffeur sitting at the steering wheel, the other a gunner standing back of the turret. Metal doors in the sides of the body provide means of entrance and exit. An extra tire is carried at the rear, and the machine is propelled by clockwork.

For defense against aerial attacks an anti-aircraft gun has been designed. This is of the high-angle type and is mounted on the chassis of a toy motor car. It may be turned vertically or horizontally to any position. Ammunition is carried in a caisson immediately back of the driver's seat. The car is driven mechanically.

With all of these death-dealing implements, hospital and ambulance provisions are needed. So a motor-car ambulance for field service has been designed by an American maker. The power plant of this car, which consists of clockwork, is mounted under the hood, while a driving shaft extends to the rear axle. A small crank is used at the front in winding the motor. A stretcher of diminutive size is provided. Every army must have its field hospital, and, in addition to ambulances, surgeons and nurses, wounded soldiers, tents, and Red Cross flags are available so that proper care may be taken of those who fall in the bloodless parlor-floor battles.

During the winter months when it is not especially pleasant to play around a garden lagoon, naval battles must be waged indoors. This contingency has been looked after so that snow and ice need not interfere with an embryonic admiral's campaign plans. A large dark-blue rug forms a very good ocean for submarine attacks upon a dreadnaught, which is now provided. Both the ship and the toy undersea craft are made of wood and finished in war color. The latter has a hole in its bow which serves as a torpedo tube and allows a cylindrical wooden missile to be fired with considerable force by means of



This Model City, Built on a Slope of a Papier-Mâché Mountain, is Protected by a Miniature Fortress Equipped with Batteries of Disappearing Guns. Warships and Merchant Vessels Moored in Harbor may Communicate with Garrison Commander via Wireless

a spring gun. The mechanism is contained inside of the craft and operated by a lever which extends through the conning tower. The dreadnaught is made with its deck, gun turrets, and funnels as separate pieces which fit in place. On the interior is a spring device similar to a mouse trap. When this is sprung, the dreadnaught is blown apart. A plunger, to which is attached a small red disk placed amidship on the starboard side, controls the spring. By launching a projectile from the submarine and striking this vital spot, the larger vessel is torpedoed and to all purposes destroyed.

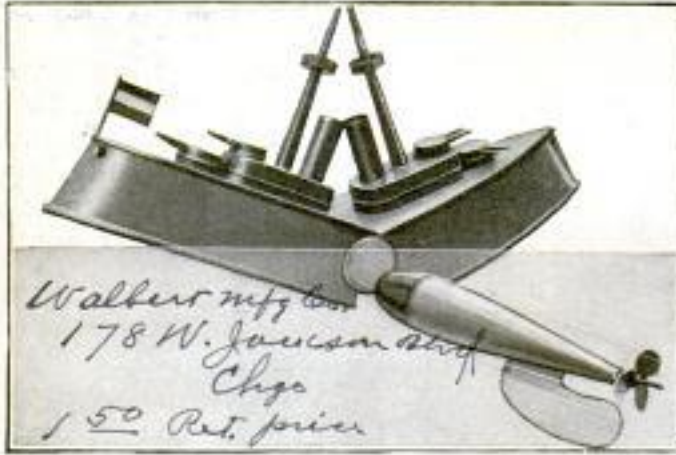
For the young tar who spurns a blue-rug sea and insists upon fighting naval battles on real water, a similar game has been devised which is quite well adapted for either bathtub or swimming-tank purposes. It consists of a metal warship and a wooden torpedo, which when in action allow a child's imagination to carry him as far as he desires. The vessel has a complement of eight guns mounted in four turrets.

There are two fighting towers, a pair of funnels, and a tin flag at the bow. The boat is built in two sections, which are closed by bulkheads and hinged together amidship. A disk at the water line on the ship's port side controls a

catch, which when released allows the boat to collapse. Water then rushes into the two compartments through holes in the upper part of each bulkhead, while the air is forced out through portholes at both the bow and stern. After a few seconds the battleship sinks. The torpedo is of the usual shape and is provided with a band motor and propeller which carry it through the water quite rapidly. If the missile is accurately aimed, a large rudder fixed to it steers it straight for the ship's vital spot.

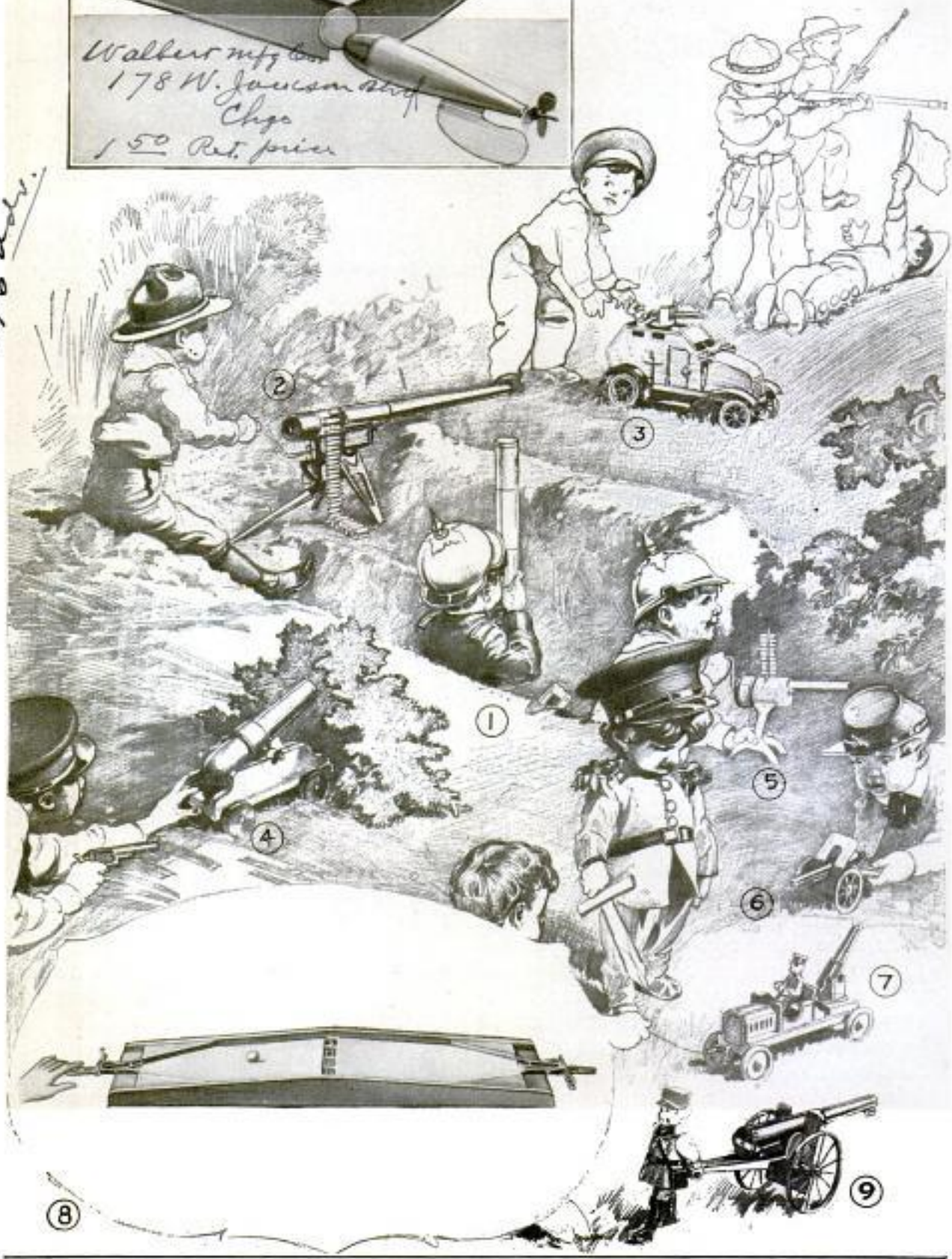
When the toy soldiers are cast aside and their commander becomes a mere private or petty officer in the neighborhood army, more mannish tools than these are required. A periscope is one of the instruments now available in the gewgaw world which has been directly inspired by the European war. Indian fighting, of course, doesn't require trenches and periscopes, but when the real war game is on, the average small boy has learned that bomb-proofed intrenchments are quite neces-

645



This Warship Buckles Amidship and Slowly Sinks to the Bottom of the Bathtub When Its Vital Spot is Struck by a Swift Toy Torpedo

② Rev. P. M. M. M.
Nov 16-196 adv.





- ✓ 1. Boy Soldiers have Found the Periscope Indispensable in Mimic Trench Warfare
- ✓ 2. One Hundred Shots may be Fired without Reloading This Ingenious Machine Gun
3. The Armored Motor Car Holds Out against both Quick-Fire and Machine Guns
4. One of the Heavy Artillery Pieces: A Siege Mortar Firing Solid-Rubber Missiles
5. Quick-Fire Guns Spit Out Their Wooden Projectiles with Considerable Force and Speed
6. Small Field Piece Similar in Design to the French Artillery's "75" Gun
7. When There Are Toy Aeroplanes, High-Angle Aerial Guns are Much Needed for Defense
8. One of the Novel Artillery Games Lately Devised for the Nursery or Living Room
9. The Mechanical Artilleryman Pulls the Long-Range Gun after Him as He Marches
10. Miniature Submarines That Submerge are Patterned after the German Diving Craft
11. Even a Tiny Stretcher is Provided with This Diminutive Motor Field Ambulance
- 12. Air Rifles with Rubber-Tipped Bayonets are Now Made for America's Boy Soldiers
13. Substantial Wooden Submarines Electrically Propelled are Made in This Country
14. This Electric Destroyer is Capable of Maintaining a Speed of Four Miles an Hour
- ✓ 15. When the Dreadnaught is Torpedoed It is Blown Apart in a Realistic Manner

sary. And with these strongholds, periscopes made of tin and fitted with mirrors, are quite important accessories. They are made in tubular form and have angular reflectors at each end.

The latest gun for outdoor use is distinctly of a military type. It is an air rifle equipped with a rubber-tipped bayonet and web sling. It has an overall length of 38 in. and is comparatively light in weight, so that it is good for drilling purposes and skirmish work.

By far the most ingenious of the new war toys is a miniature replica of a German submarine, imported from that country. It is driven mechanically, and on the surface is capable of making a speed of four miles an hour. It is fitted with diving planes and, when set to do so, will submerge so that only the tip of its periscope is visible. The diving is controlled automatically and after the boat has proceeded for a certain distance it will rise to the surface and then disappear again after a short time. If its operator desires, the automatic control of the planes may be dispensed with and the craft sent either along the surface or beneath the water.

A domestic submarine has been modeled after the B-class boats of the United States Navy. It is 28 in. in length and is driven at a speed of about four miles an hour by an electric motor which is supplied with current by a dry cell carried within the craft. Diving planes are fixed near the stern, but these are purely ornamental, for the boat does not submerge past its normal water line. The propeller and rudder are made of aluminum, while the stuffing boxes, shafting, and deck rails are of bronze. A small gun is mounted in front of the conning tower.

Another unit for the child's navy, made in America, is a torpedo-boat destroyer patterned after the "Decatur," U. S. N. The upper works of this vessel are built low, while the armament consists of light guns mounted in two turrets, five rapid-fire guns, and two deck torpedo tubes. There are ventilator funnels, smokestacks, and

lifeboats on the deck. It is finished in war gray and driven electrically.

Both in this country and Europe a large number of war games have been developed during the last year. Abroad this industry has been materially stimulated by a great demand for amusement devices with which to entertain the wounded at various hospital bases. Many of these are patterned after chess, checkers, and pachisi, as well as other standard games, while some are quite new in all their details. An American game which represents artillery work, is especially pleasing to children. The board on which it is played is rectangular, 26 in. in length and inclined from both ends toward the middle, or crest, which is designated as a hilltop. A groove extending across the board at this point serves as a trench and is divided into five numbered sections. At the bottom of each incline there is a spring lever, or gun, that shoots a marble. The player's skill is determined by his ability to place the marble in the division he desires, as a score of exactly 500 is required to win.

War chess is a German game which has become very popular at the military hospitals. It is played on a chessboard with two sets of men, each 12 in number. The contending figures are distinguished by their color, but from the front side are otherwise identical in appearance. On the reverse side, however, each member bears a number representing its value. There are "aviators," "scouts," a "king," and others, and it is the capture of the "king" which ends the game. A good memory and an exercise of strategy are required in playing creditably. In designing toys and games the Europeans have not escaped displaying considerable venom and hatred for their enemies. This is true even in playthings for young children. A picture puzzle shows a soldier killing a child.

These are a few of the scores of new baubles and games for both children and adults. In practically every instance they have been inspired by the European war.

Dept. of Agriculture
RAPID SPREAD OF THE BOLL
671 WEEVIL

Owing to unusual conditions that prevailed in August, the most rapid movement ever made by the boll weevil when advancing into new country was made this year in the southeastern states. Ordinarily this insect advances at the rate of about 50 miles a year, but this year an advance of 100 miles was made in a period of only two weeks. This rapid movement carried the destructive insects for the first time into Georgia, where 25 counties became infested. During this period eight additional counties in Florida and 20 in Alabama were also invaded for the first time, the entire movement taking place between August 15 and August 31. One of the reasons for this rapid progress, as given by the Department of Agriculture, was the drought in Alabama, which deprived the insects of their usual food and forced them to seek a new district. The most important condition, however, was a series of extremely high winds that began on August 15 and blew continuously for several days toward the northeast, the insects being blown many times farther by the high winds than they could have traveled by natural flight, or with the aid of ordinary winds.

Surveys are to be made in the immediate future for the preparation of military maps of Long Island and other sections in the vicinity of New York harbor.

AUTOMOBILE WHEELS ROLL**580 TO THEIR CARS**

One of the large problems in factories is to handle raw material and parts with economy of time and labor. If this is not done, production costs rise. Many parts are quite unwieldy; not so in the case of wheels, however, as they may be rolled around far easier than carried. In a Detroit automobile plant wheels are unloaded from a truck into a narrow runway in the factory yard, down which they roll to an elevator on the outside of the building. Here fingers on an endless chain grip each wheel and lift it to the top of the building, where it rolls along another runway to the men who put the wheels on the axles.



Auto Wheels Roll into This Plant: The Elevator on the Right Lifts Them to the Top of the Building Where They Roll on Farther to Their Respective Autos

#8 Ward Sealey, 69 East 59th St. N.Y. City
 method used in the Detroit plant of the Sturtebaker Corp.

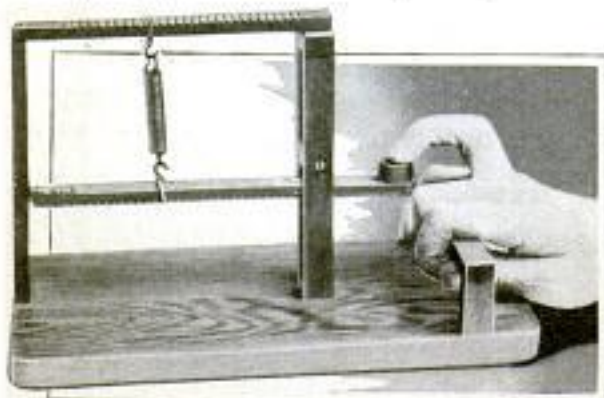
for sale by: Cecil McManimon Co.
San Jose, Calif.

894

POPULAR MECHANICS

463 FINGER-EXERCISING DEVICE
FOR PIANO BEGINNERS

For strengthening and limbering the fingers of pupils beginning the study of the piano, a device of very simple con-



By Changing the Position of the Spring the Tension may be Varied to Suit the User

struction is made which may be adjusted to suit the requirements of different users. It consists of a lever held between two uprights and connected by a spring with a crossbar above. Notches cut in the under surface of the movable member and the top side of the crosspiece provide graduated spaces in which to place the

rings holding the spring, so that the tension may be varied as desired. The lever bar is secured to the rear upright by means of a hinge and moves in a groove extending through the front one. At the fore part of the apparatus is a rest which enables the wrist to be held in the correct position while different fingers are being exercised.

GARDEN AND TENNIS COURT
557 ON GARAGE ROOF

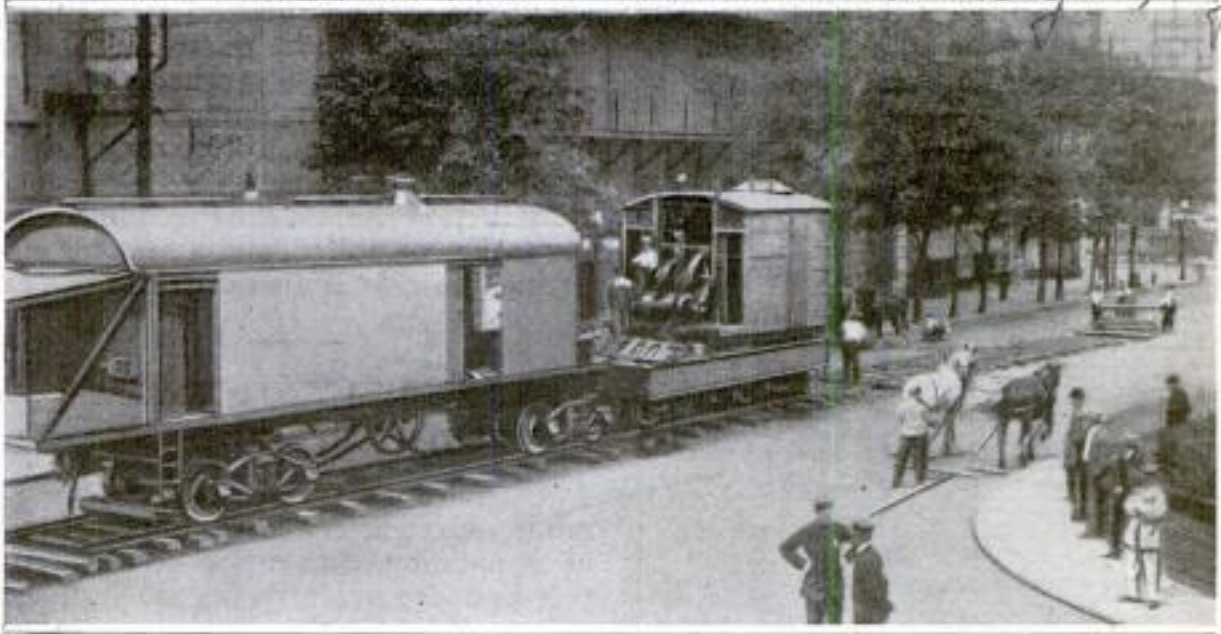
By taking advantage of a sidehill located at the rear of his residence, a builder of Salem, Mass., was able to build a garage the roof of which could be transformed into a garden and tennis court on the same level as the residence. The space for the garage was excavated out of the hill, which is about 18 ft. high. The structure is 38 by 27 ft., contains six compartments, and is built entirely of concrete. Part of the material excavated from the hill was placed on the roof and a garden and a tennis court of the regulation size were laid out. The tennis court has electric lights and is equipped with a wire netting that prevents the balls from going into the street below.



The Novel Features of This Garage Are a Garden and a Tennis Court Located on the Roof

J. Frank Reynolds, 1/2 Salem News
Salem, Mass.
Copyrighted material

Wm. B. Wallace 1102 Dean St. Brooklyn, N.Y.



How a Steam Crane and Steam Winch were Taken for a Distance of Three Miles through the Streets of Brooklyn

501

TAKING SUBWAY MACHINERY THROUGH CITY STREETS

A steam crane and a steam winch that are being used in subway construction in Brooklyn, N. Y., were taken under their own power through the streets for a distance of about three miles over something like 150 feet of temporary track, which was taken up behind the machines and built ahead as the machines progressed. A force of 25 laborers, with two foremen and a superintendent, were required for handling the track, and even with this force the rate of travel under the best conditions was less than a mile a day.

207

INSTRUMENT FOR FINDING A SHIP'S POSITION

Finding the true bearing of objects at sea as well as the position of a ship with reference to a coast line, without resort to computation or plotting, is made possible by a new attachment designed to be mounted on the binnacle hood and operated in connection with the ship's compass. The instrument consists of a sight tube carried on a revolving standard, to the lower end of which is fixed a curved arm terminating in a pointer. The standard

must be mounted accurately over the center of the compass. The pointer hangs close to the compass card, and since it swings with the sight tube it shows instantly the bearing of any object on which a sight is taken. The instrument is also provided with two graduated scales by which the distance to any fixed object, such as a lighthouse, may be quickly and accurately found. This is accomplished by taking two bearings and noting the exact time that elapses between the two sights. The distance traveled by the ship during the interval is then estimated from



Taking a Bearing with the New Nautical Instrument. Left: How the Sight Tube and Pointer are Mounted on the Standard

its known speed. The scales are so mounted on the bushing of the standard that when this distance is set off

Capt. E. Y. Haskell, 31 Bellevue Place, New London Conn.
 May 5 - Nov 5 C. Steam Yacht "Viking" Station, Foot of E. 23rd St. New York

Complete 7.75
 Luggage Carrier 9" x 5 1/2" x 5" 40¢ extra
 " 12 x 7 x 6" 60¢ "
 Headlight 75¢ "

896

POPULAR MECHANICS

Roller in box 3 1/2" x 7" x 30" - 16¢

on one of the scales the distance from the course to the object is given by the other scale to the nearest tenth of a mile.

619

ROLLER SKATE AND TOY AUTO COMBINE IN NEW VEHICLE

There are dozens of curious vehicles that pass for children's autos and coast-

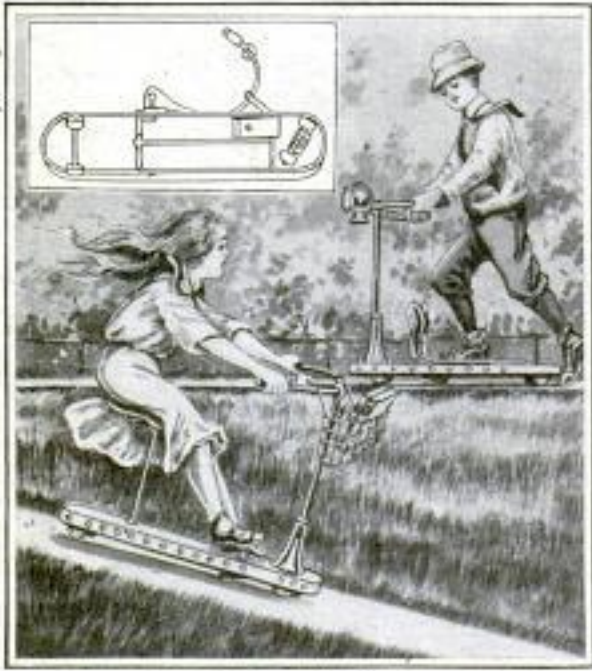
about the size and general mechanical construction of those on roller skates. The front pair can be turned about an axis by proper manipulation of the handlebars above, and thus the vehicle is steered. A foot brake of simple construction enables the speed in coasting to be controlled, and a seat for enjoying the ride is also provided.

553

ENORMOUS "NUTCRACKER" TESTS BUILDING TILE

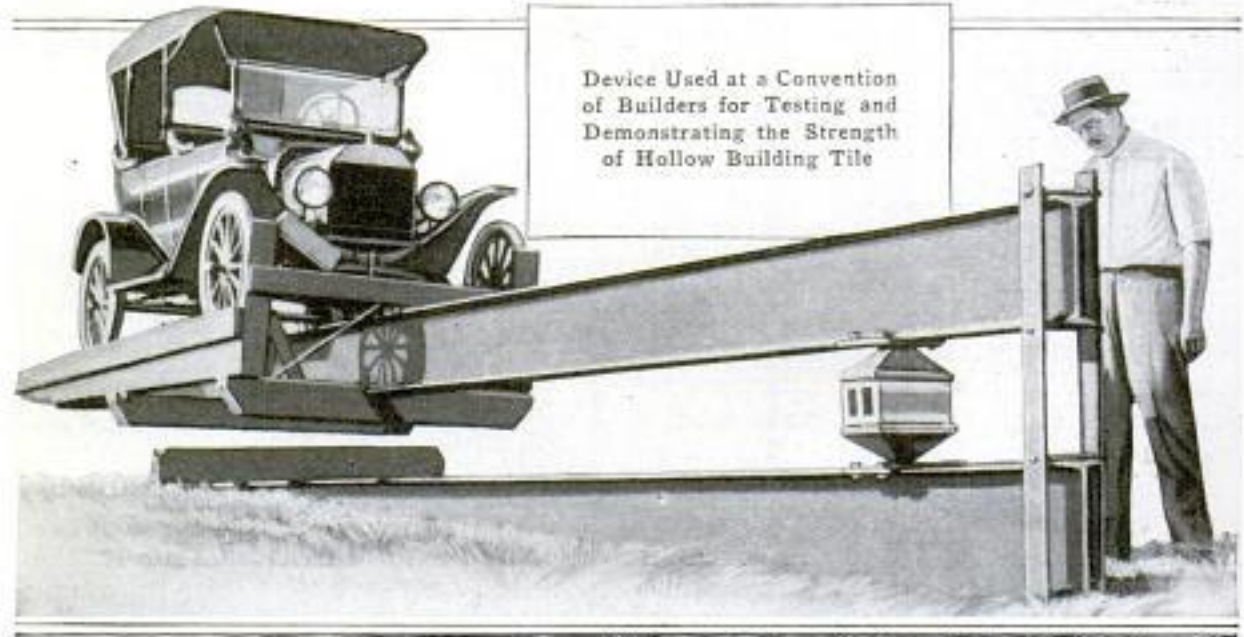
A device that resembled an enormous nutcracker was the means used at a building convention in Iowa to test and demonstrate the strength of hollow building tile. The handles of this nutcracker were two 15-in. steel I-beams, each 25 ft. long and weighing 54 lb. to the foot. The lower beam was imbedded in the ground while the upper one was hinged at one end, as shown in the illustration. At the free end of the upper beam a tilting platform was constructed so that an automobile could be run upon it. The tile to be tested was placed between the beams, 3 ft. from the hinge, so that the pressure on the tile was about eight times the weight of the automobile with a portion of the weight of the beam added. The tile stood the test without being damaged.

Skate - Mobile Mfg. Co.
 18-74 Mc Microm. Av., Leanti, O.
 (Amman & Sanderson Assoc.)



Toy Coaster is Built Like a Roller Skate, but Steers with Handlebars

ers, but it has remained for a Cincinnati firm to bring out a new variation. This contrivance has four small wheels



Device Used at a Convention of Builders for Testing and Demonstrating the Strength of Hollow Building Tile

Chas. Darlington, % Des Moines Capital, Des Moines, Iowa.
 Copyrighted material

DENVER FIRE STATION IS HOUSED IN BUNGALOW

One of the prettiest bungalows in Denver houses hose wagons and fire engines. When planning one of the newer stations, the board of safety decided to upset all prevailing ideas regarding fire-station architecture. Instead of conforming to time-honored plans and specifications, a building with a pergola and many of the embellishments of the modern bungalow was decided upon and built. The

firemen stationed in the unusual house have carried the idea farther by surrounding the station with well-arranged flower beds, shrubbery, and a well-kept lawn.



There is a Pleasing Contrast between This Denver Fire Station and the Type Usually Seen

MODEL LOCOMOTIVE BUILT BY BOY MECHANICS

As an illustration of what boys can do in the field of mechanics under the tutelage of skilled workmen, a group of apprentices in the shops of an eastern railway company recently built what is probably as complete a model of a Pacific-type locomotive as has ever been constructed by beginners.

This diminutive engine and tender, which are built on a scale of 3/4 in. to the foot, have together an over-all length of 57 in. and rest upon a stone-ballasted 3 5/8-in. gauge track. The work was done from 1/16-in. scale blueprints which were drawn by the boys and turned over to apprentice patternmakers as rapidly as they were completed. Before the work could progress very far, it was necessary for them to build much of their own machinery and equipment. This entailed the designing and construction of a lathe, shaper, and 1-hp. motor, besides the development of a machine shop, erecting plant, and foundry.

Needles were used in forming the pins for the valve gearing, for which hardened members were required, and rubber insulation stripped from copper wire was employed as air-brake hose. These and other ingenious substitutions were made by the boys, who frequently faced and solved perplexing



Complete Model of a Pacific-Type Locomotive Built by Boy Mechanics. Serving as Apprentices in the Shops of an Eastern Railway.

situations in finding fittings small enough in the railway shops to answer their needs.

FLEXIBLE OPERATING SHAFT FOR MOVIE CAMERA

By the invention of a new cranking device for motion-picture cameras a simple means has been provided for filming rapidly moving objects, such as birds in flight, aeronautical feats, and

H. E. Blackburn, Dunmore Apprentice School, Dunmore, Pa. made by apprentices above school

Mfd & sold only by Eberhard Schneider 219 Second St. No. 14th St. New York
(Mason of mine Vitas Nilson missing Moby)

similar things, which under ordinary circumstances are very difficult to catch. Movie cameras universally have to be used on tripods, and this makes it



The Operating Attachment Allows the Photographer to Follow His Subject with a Movie Camera in the Same Way that a Still Camera may be Used

exceedingly difficult for an operator to follow a speeding, or irregularly flying, subject. The new attachment consists of a flexible shaft connected at one end to a hand crank that may be turned by an assistant. This obviates the necessity of using a tripod, for the operation of cranking is done practically without affecting the steadiness of the camera. It enables an operator to hold a machine up with its finder before his eyes and follow his subject just as easily as if he were using a pair of field glasses. A small spring motor may be used instead of a hand crank, if desired. This instrument fits compactly into a small case worn suspended from the operator's shoulders.

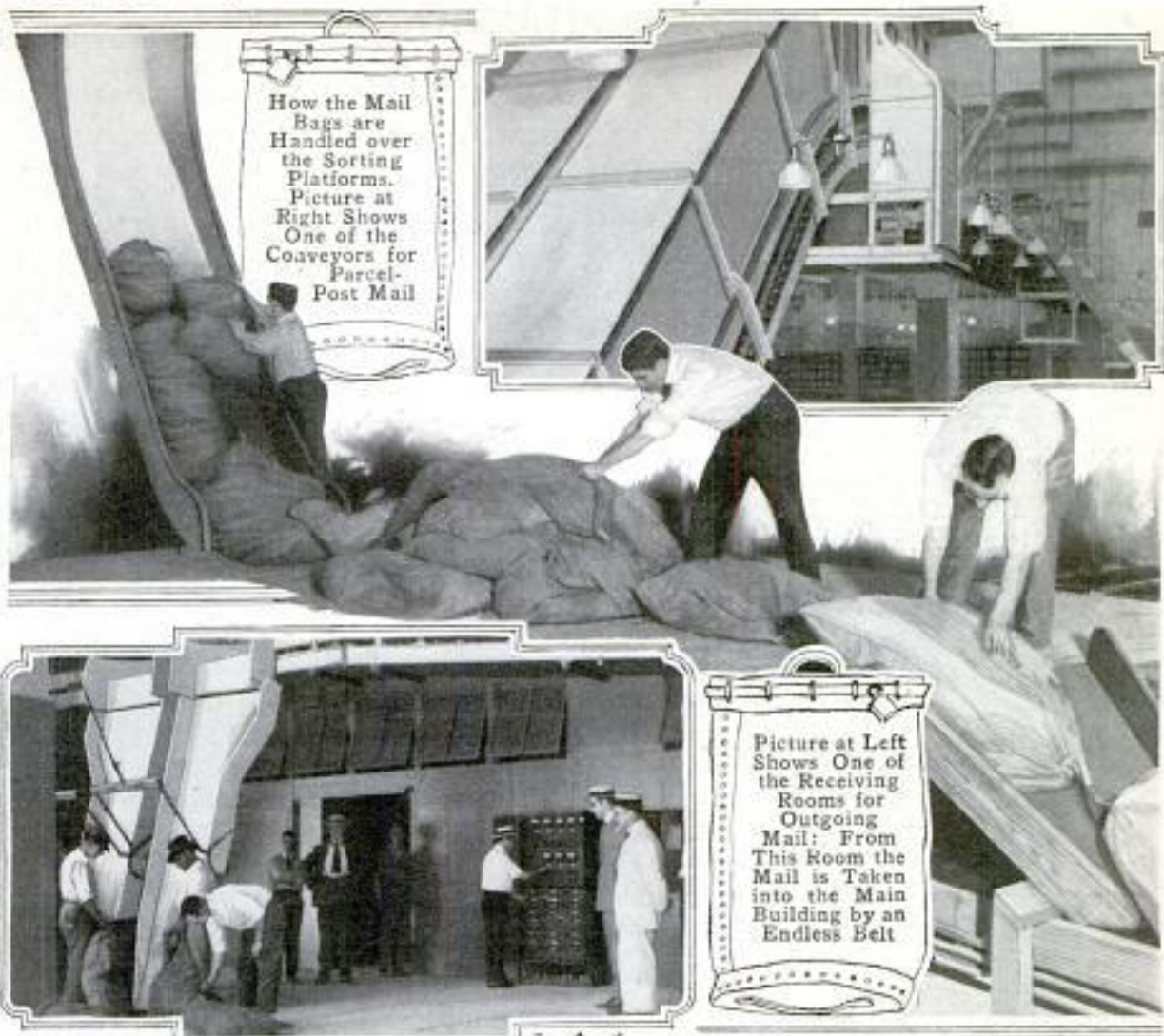
Peru is experiencing hardships because of the shortage of small coins. Financial stringency in that country has caused individuals to hoard metal money, thus preventing its circulation.

NEW MECHANICAL PLANT FOR 585 HANDLING MAIL *Machinery*

For sorting and forwarding the enormous quantities of mail going into and out of that city daily, there has just been placed in service in New York what is said to be the largest and best equipped mail-handling plant in the world. This establishment is known as the Grand Central Terminal Post Office Building. Although mail matter of all kinds will be passed through the establishment, its principal function is that of sorting and forwarding bulky mail, its construction having been brought about mainly through the importance of New York as a center for the publication of periodicals and through the growth of the parcel-post service. The most interesting feature is the system of mechanical conveyors with which the mail is taken into the building and then sorted and distributed for forwarding, without the aid of porters or trucks and without being touched by anyone except the sorters. With this equipment the establishment is capable of handling about 400 tons of mail a day. It is expected that the success of this establishment will bring about the construction of similar plants in other large cities for the handling of third-class mail and parcel-post matter.

The building occupies an entire city block and was erected and equipped at a cost of over \$1,000,000. In spite of the apparent intricacy of the carrier system it is made up mainly of three simple devices—endless belts for transporting the mail on a level, bucket lifts for raising it, and chutes for transferring it to a lower level. Coupled with these devices is a series of trips, electrically controlled by an operator working at a central station, with which the mail is diverted at various points in accordance with the route it is to take. One of the endless belts runs beneath the platform at which the outgoing mail is received. When a truck load of mail is received, the bags are dumped through hatchways in the platform and are carried by this belt

E. Leslie Williams, 116 Waverly Place, N.Y. City
Inter. News Service



Williams

to a second belt that moves at right angles to it, and carries the mail into the building. From this point the mail that requires sorting is elevated by a bucket lift to the floor above and deposited on a third belt which runs the entire length of the big distributing room, while that which requires no sorting is diverted by trips and conveyed directly to doors of the mail cars. Two systems like this are provided for outgoing mail, one for handling second-class mail and the other for handling parcel-post matter. Underneath the building, located on each side of an island platform, are two tracks for mail cars, the two tracks together having a capacity of 33 cars. When the mail has been sorted and

repacked it is placed on an endless belt and conveyed to chutes, through which it drops to a belt that runs along this platform. From this belt the bags are again diverted at the proper points and finally dropped down chutes to the car doors. Incoming mail is handled by a system similar to this, the bags being dropped from the mail cars through chutes to a belt underneath the platform, and then raised to the distributing room by bucket lifts. The belts are made of canvas and rubber, and are 3 ft. wide. They work over rollers set close together in a steel frame and around drums at the ends, and travel at the rate of 150 ft. a minute. Electric power is used for operating the entire plant.

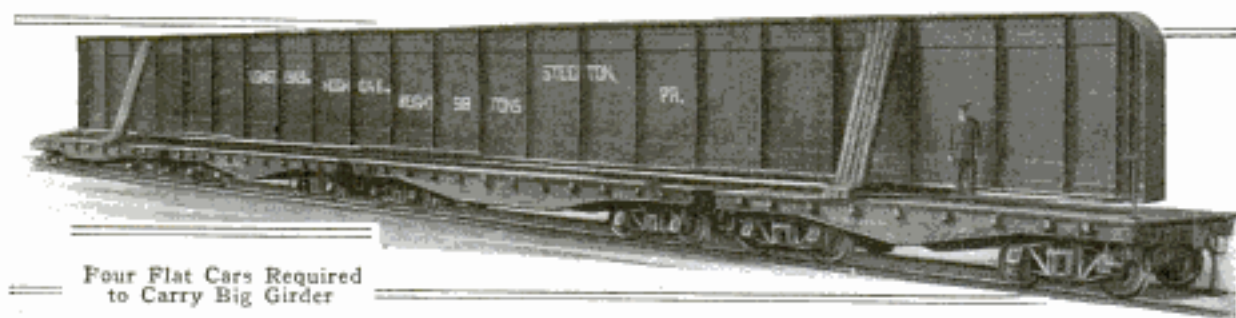
BRIDGE GIRDER OF UNUSUAL 545' LENGTH

A steel girder of such length that it was necessary to use four steel flat cars in shipping it was recently sent from the shops at Steelton, Pa., to Chicago, where it is to be used in a railroad bridge spanning a railroad and a street. This girder is 131 ft. 9 in. long and 10 ft. 6 in. high, and weighs 98 tons. The angles placed in the corners at the junction of the web and flanges form one of the unusual features of the girder. The legs of these angles are 8 in. wide and $1\frac{1}{8}$ in. thick, and each is made of one piece running the full length of the girder. They are said to be the longest angles of this size ever rolled. Particular attention was given in the shop to seeing that the girder was built with the right end

out having to be turned around. This girder is the longest of 15 required in the construction of the bridge.

691 MINERAL OILS SHOWN TO BE SUPERIOR FOR HARDENING

Experiments recently conducted on hardening oils show that those of mineral nature are superior to the kind originating from cottonseed, fish, or the like. Mineral oils were found to have a hardening effect of from .16 to .24, assuming water as unity, while cottonseed oil was found to be in the neighborhood of .16, with fish oil at .15. Rosin varied from .13 to .14. The kind of temper a piece of metal receives depends, for one thing, on its rate of cooling, as well as on the chemical composition of the medium in which it is placed. Thus different materials



Four Flat Cars Required
to Carry Big Girder

forward so that it could be loaded, shipped, and used in the bridge with-

C. E. Drayer, 1801 E. 92d St.
Cleveland, Ohio.
Built at Steelton, Pa. for the Nickel
Plate road.

can have a vastly different effect on the metal in tempering.

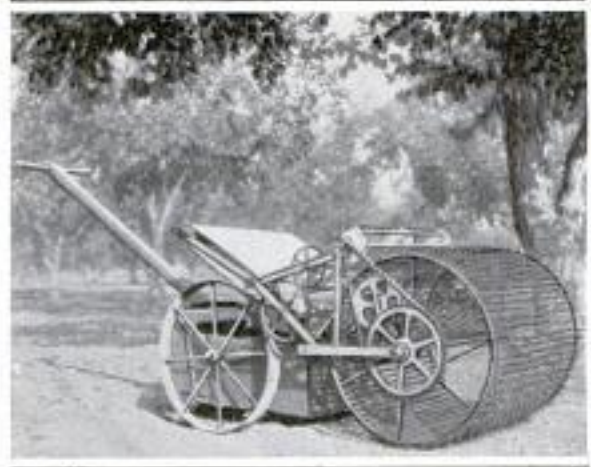
machinery Sept 1915

Inventor: P. H. Lint, Los Gatos, Calif.

591

PRUNE-GATHERING MACHINE FOR LARGE ORCHARDS

In the prune belt of California the fruit is allowed to ripen on the trees and fall of its own weight. The gathering is then done by hand, which is a slow method that causes difficulty when there is a shortage of pickers. To facilitate this work by saving expense and time, a western inventor has developed a machine which picks the prunes from the ground as it is pushed along by an operator. The work is done by a large revolving drum, the circumference of which is covered with rows of sharp spikes. The prunes are pierced by these members and carried around to a point where they are automatically removed and deposited in a hopper at the rear. It is stated that the fruit is not injured by being perforated in this



Prune-Gathering Machine Which Does the Work of Many Men

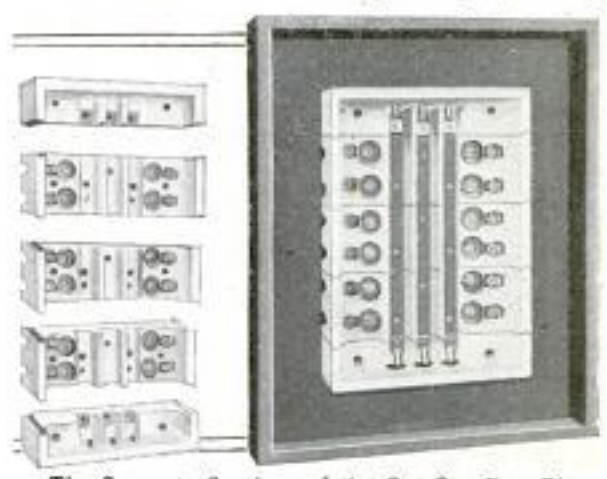
manner, because it is necessary to prick the skin of the prunes before they are dried.

583

A CUT-OUT BOX THAT CAN BE BUILT TO SIZE ON JOB

An eastern manufacturer of electrical goods has devised a cut-out box embodying the sectional idea. The box is not very different from the ordinary, except that it can be had in any number of duplicate units, which may be placed side by side to fit the demands of any kind of electrical installation. Thus it is unnecessary to order a special cut-

out box beforehand as at present, it being possible with this new type to construct one on the job by putting



The Separate Sections of the Cut-Out Box Fit Together to Satisfy Any Capacity Desired

together a sufficient number of sections. The ordinary cut-out box is a familiar fixture in most any house or other structure. It is usually mounted on, or within, a wall, and serves to control electrical circuits to various parts of the building.

STEERING ATTACHMENT MADE FOR DIRECT-CONTROL CARS

For certain light motor cars which are not equipped with worm-and-sector steering gears, a spring device which eliminates the strain on the wheel and permits safer and easier driving has been devised. It is a small, neatly housed attachment which is intended to be clamped to the front axle and connected with the steering rod. Ex-



The Single-Acting Spring Makes Easy Driving of Direct-Control Cars Possible



"Hastings Stabilizer" expansion and contraction actuate the spring, which takes up the jolts ordi-

C. P. Electric Works
92 Hayden St.
Springfield, Mass.

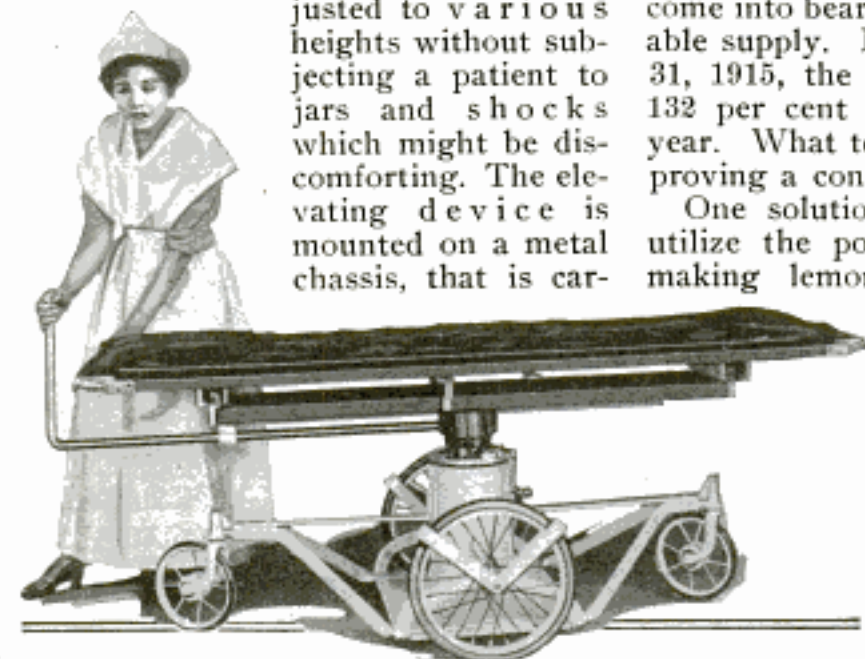
602 of Hastings Mfg. Co., Hastings, Mich. Hastings Stabilizer

narily transmitted to the steering wheel of cars having direct control. Without some device of this character the steering gear is affected every time the front wheels of the machine strike

a rut, bump, or stretch of sand. The stabilizing attachment prevents swerving and relieves the driver from the constant physical strain which otherwise he is under.

HYDRAULIC STRETCHER MADE FOR HOSPITAL USES

For hospital purposes a stretcher has been built with a hydraulic lifting mechanism which enables it to be adjusted to various heights without subjecting a patient to jars and shocks which might be discomforting. The elevating device is mounted on a metal chassis, that is car-



The Stretcher may be Lowered to the Same Level as a Bed, or Raised Even with an Operating Table

ried on rubber-tired wheels, and supports the stretcher above it. It may be lowered smoothly even with a bed, or raised to the same plane as an operating table, and without requiring exertion on the part of its operators. The stretcher itself may also be extended to one side or the other independently of the truck, so as to facilitate the work of moving a sick person onto or from it. The raising and lowering is done by regulating a flow of oil between two cylinders.

¶The "Independence," one of the oldest, and at one time the largest, of United States warships, was burned by its owners recently in order to recover the copper rivets which were used in its construction.

NEW CALIFORNIA PLANT WILL UTILIZE WASTE LEMON CROP

The Golden State is facing a problem in overproduction. Twenty thousand acres of young lemon trees will soon come into bearing and double the available supply. For the year ended Aug. 31, 1915, the crop was 6,667 cars, or 132 per cent more than the previous year. What to do with all this fruit is proving a considerable puzzle.

One solution offered is a plant to utilize the poorer grades of fruit in making lemon oil, citrate of lime, and similar products. This is now under construction, and will operate on a cooperative basis, the growers receiving full return for the by-products after paying the cost of production. By thus disposing of the poorer grades of fruit the growers hope to prevent demoralizing of

the market, as well as to get something from the part of the crop now going to waste.

NEW STEAM TRUCK USES COKE AS FUEL

The problem of devising a steam-driven road vehicle in which the firing is done with solid fuel without the necessity for an extra attendant to look after the fire, has apparently been solved in a coke-fired steam truck recently brought out by an English firm. Hills and other conditions bring about a continual variation in the power requirements of such a vehicle as it is driven over the road, and it has been found difficult to devise any kind of mechanical stoker that will meet these

inventor: National Steam Car Co. Ltd
W. Mansham Works,
Chelmsford
inventor: Chas. Clarkson

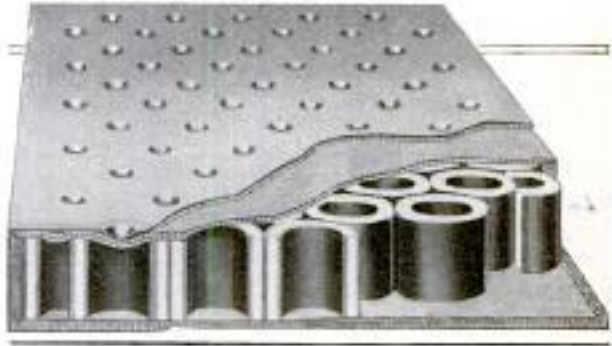
Inventor: Edward Taylor, Owensboro, Ky.

692
Bonniers Report 9/18/15
California Fruit Growers' Exchange
Los Angeles, Calif.

varying conditions satisfactorily. The semiautomatic feed which forms the essential feature of this truck and which enables the driver to control the steaming without leaving his seat, is apparently adapted as well to a passenger vehicle, in which the conditions are more unfavorable, owing to the frequent stops. The coke bunkers are built up the sides of the boiler and are filled through doors at the top. The grates slope from each side toward the center. At the bottom of each bunker is an opening of such size that the right amount of coke to take the place of that burned on the grates is fed through it by gravity. When a hotter fire is needed, as in climbing a hill, the driver simply works certain levers placed within his reach. These levers rock the grates, clearing them of ashes and clinkers, and also oscillate a set of bars that project into the bottom of each of the bunkers. Through the action of these bars the coke is loosened and made to flow to the grates more freely. In addition to these features there is provided a forced draft which is also operated from the driver's seat. This consists simply of a special nozzle which admits steam to the base of the chimney and thus accelerates the combustion.

GARDEN HOSE UTILIZED FOR MAKING RUBBER MATS

Considerable saving in the cost of rubber mats is brought about by a

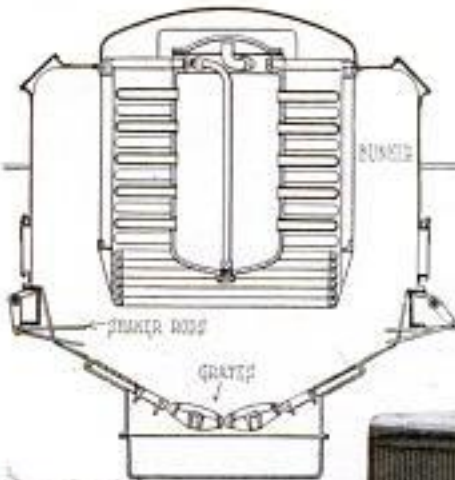


How Garden Hose Cut into Short Lengths is Used as a Filling for Rubber Mats

plan just invented for using scrap garden hose as an insert instead of making a solid rubber mat or using a



Two Views of Self-Dumping Steam Truck. Recently Brought Out in England, Which Uses Coke as Fuel



With the Arrangement Shown Above, the Coke Feeds Down Automatically Fast Enough for Ordinary Requirements; When a Hotter Fire is Required the Coke is Loosened by the Shaker Bars



*The Republic Rubber Co.
Youngstown, Ohio*

*inventor: web. Brown, adv. engr.
above firm*

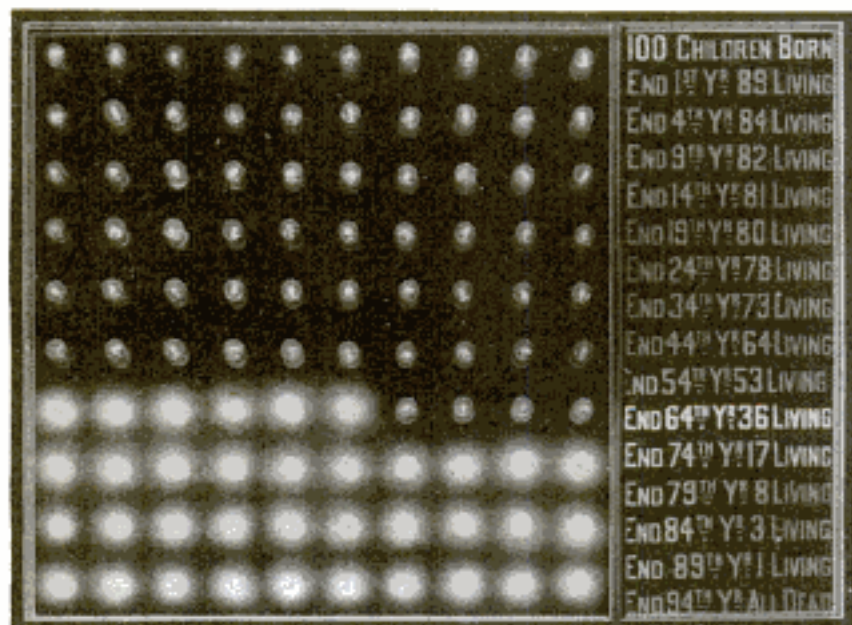
354
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cloth insert. The garden hose is cut into small pieces which are set on end, cemented together, and then impregnated with rubber. The filling thus formed is surfaced on each side with a sheet of rubber, an extra layer of fabric being placed under the upper surface in case the mat is to be sub-

jected to rough usage. The whole is then cured together, making a solid unit which gives an equal distribution of strain. Other kinds of material than garden hose can be used as a filler, the degree of resiliency depending on the kind of tubing employed. The mat can be made in any thickness from 1/2 in. up.

GOTHAM DEATH RATE SHOWN BY ELECTRIC CHART

In compiling vital statistics showing the mortality rate in New York City, the Department of Health investigated



All of the Lamps are First Lighted and Then Successively Extinguished to Indicate the Rate of Mortality

more than 225,000 deaths. The findings are so significant that an electrically illuminated chart has been built to display the figures for an obvious purpose. The statistics given on the sign trace the length of life of the average New Yorker by starting with 100 infants and showing the rate at which they die. At 89 years only one out of the entire group survives, and at 94 years all are dead.

(Fishing lines now being made by the Japanese from wild-cocoon silk are said to be especially valuable in taking game fish, since they are invisible under water.

STEAM SHOVEL BEGINS WORK FOR GOVERNMENT BUILDING

In beginning the excavating work for the new home of the Department of the Interior at Washington, the formality of breaking the ground was carried out without the use of picks or shovels. Instead of a golden spade, or even an ordinary one, a large, modern steam shovel was employed for the first time in such a ceremony at the national capital. At the appointed time, the assistant secretary of the treasury, in the presence of a number of government officials, pulled a rope which opened the clam and dropped a load of earth into an awaiting wagon. The new

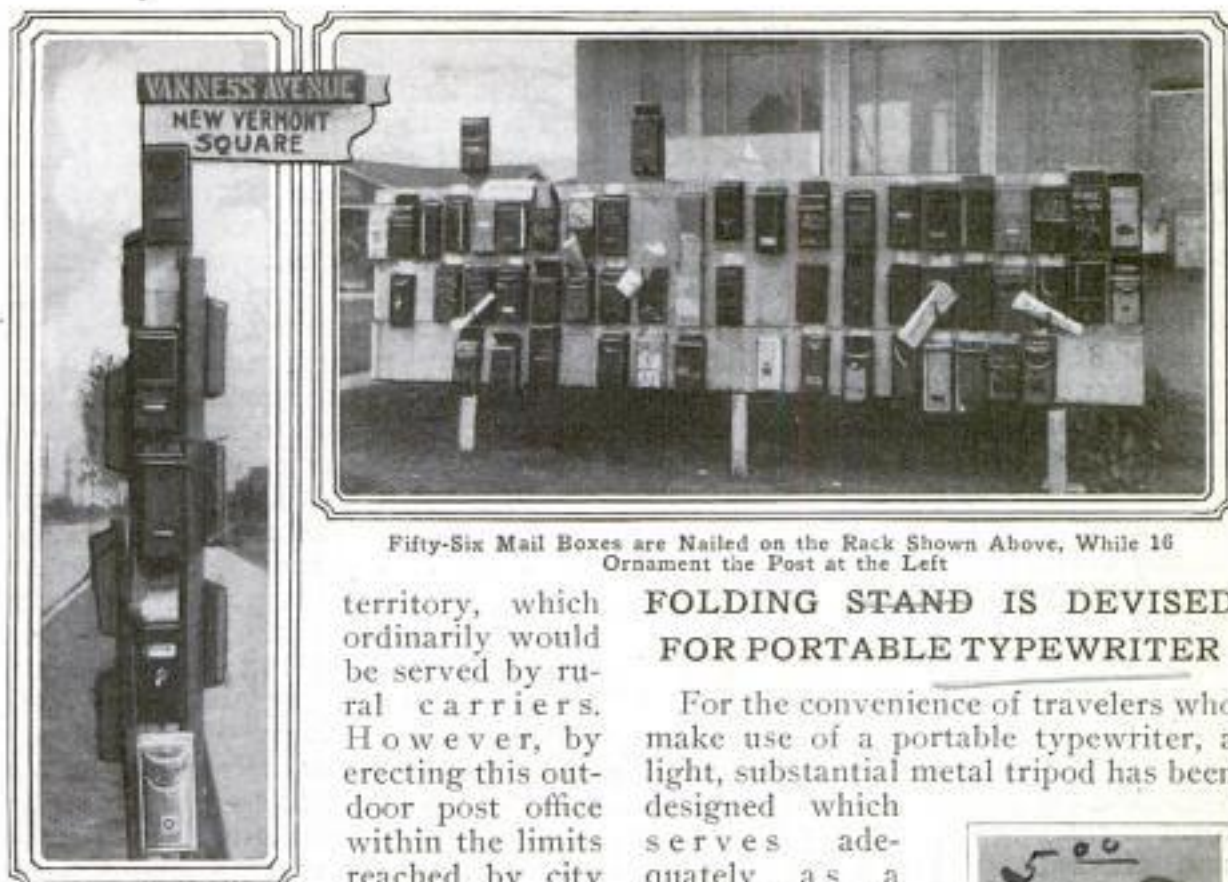
building, which will cost approximately \$2,000,000, will be constructed in accordance with the general plans laid out a number of years ago for the "ultimate Washington."

MAIL BOXES ROOST LIKE BIRDS IN COLONIES

Fifty-six mail boxes all nailed to the same rack is rather an unusual sight. It is stated that at one time there were as many as 70 boxes on this same rack. It is located in a suburb of a western city and was put up by the residents of a newly built-up section of

The Williams Service, 116 Waverly Place, N.Y. City

#2. D. Colburn, The Times, Wash. D.C.



Fifty-Six Mail Boxes are Nailed on the Rack Shown Above, While 16 Ornament the Post at the Left

territory, which ordinarily would be served by rural carriers. However, by erecting this outdoor post office within the limits reached by city delivery, the residents of the district were enabled to receive mail more than once a day. In another instance a street signpost served the same purpose as the rack. In this case there were 16 boxes all on the one post.

HOW ALKALI AFFECTS CEMENT DRAIN TILE

As the result of a series of experiments conducted by the United States Bureau of Standards it has been found that the alkaline soils found in some sections of the West are destructive to cement drain tile unless the tile is of the best material and has been made with the greatest care. Well-made tile of a mixture as rich as one part cement to three parts sand and stone combined, is apparently not affected by the alkali, but tile made of a leaner mixture than this is likely to disintegrate within a short time when placed in a soil having a strong alkaline content. These conclusions are based on tests extending over a period of one year.

Book from Bureau of Standards

FOLDING STAND IS DEvised FOR PORTABLE TYPEWRITER

For the convenience of travelers who make use of a portable typewriter, a light, substantial metal tripod has been designed which serves adequately as a stand for the machine. It folds compactly and fits into a case, 10½ in. long, which has a maximum diameter of 2¾ in. When in use it is 24½ in. in height and supports a typewriter at the proper distance from the floor. By means of a bracket, which may be secured to one side of the stand, an arm is provided for supporting a notebook or loose leaves of copy. There are no screws or clamps to fasten when a machine is placed on the tripod, and the absence of reflecting surfaces tends to dissipate the sound waves arising from the operation of the typewriter, so that an operator may work on a train, in a hotel room, or in any public place, without making an objectionable noise.



Corona Typewriter Co., Inc., 141 W. 42nd St., New York

Engineering Record, June 5, 1915
"Information" P. R. R. employee magazine

NEW RAILWAY-SYSTEM TEST PLANT MODEL OF EFFICIENCY

PRACTICALLY all of the standardization tests incident to the acceptance of some \$80,000,000 worth of materials and equipment purchased annually by one of the eastern railways, are conducted in the laboratories of an inspection plant lately established at Altoona, Pa. The shop holds particular interest at this time when the demand for efficiency is gaining impetus; for it represents an institution in which figures and facts replace guesswork.

The test department of this railroad is maintained at an expense of approximately \$500,000 a year. Its major purpose is to pass upon the quality and fitness of the goods and supplies bought by the corporation. This gives a suggestion of the magnitude and variety of the tests performed at the plant, where a staff of 350 persons is engaged in examining thousands of articles ranging in character from soap and plush to pig iron, incandescent lamps, and locomotives. In the chemical laboratories alone more than 50,000 routine tests are made yearly. As a result of this system of scrutiny, an annual average of \$1,000,000 worth of goods is rejected.

Nearly all of the departmental branches are concentrated in one building, which affords 41,000 sq. ft. of floor space and was erected and equipped at a cost of about \$500,000. The structure is five stories in height and has a subbasement which provides space for a receiving room for materials, a machine shop where the laboratory apparatus may be repaired, vaults for the preservation of records, and a chemical-storage room. The equipment of the machine shop includes two 14-in. engine lathes, a 12-in. lathe, a 24-in. radial drill, a 24-in. shaper, milling machines, and other facilities for the preparation of metal specimens prior to their tests. All of the machinery in the plant is electrically operated.

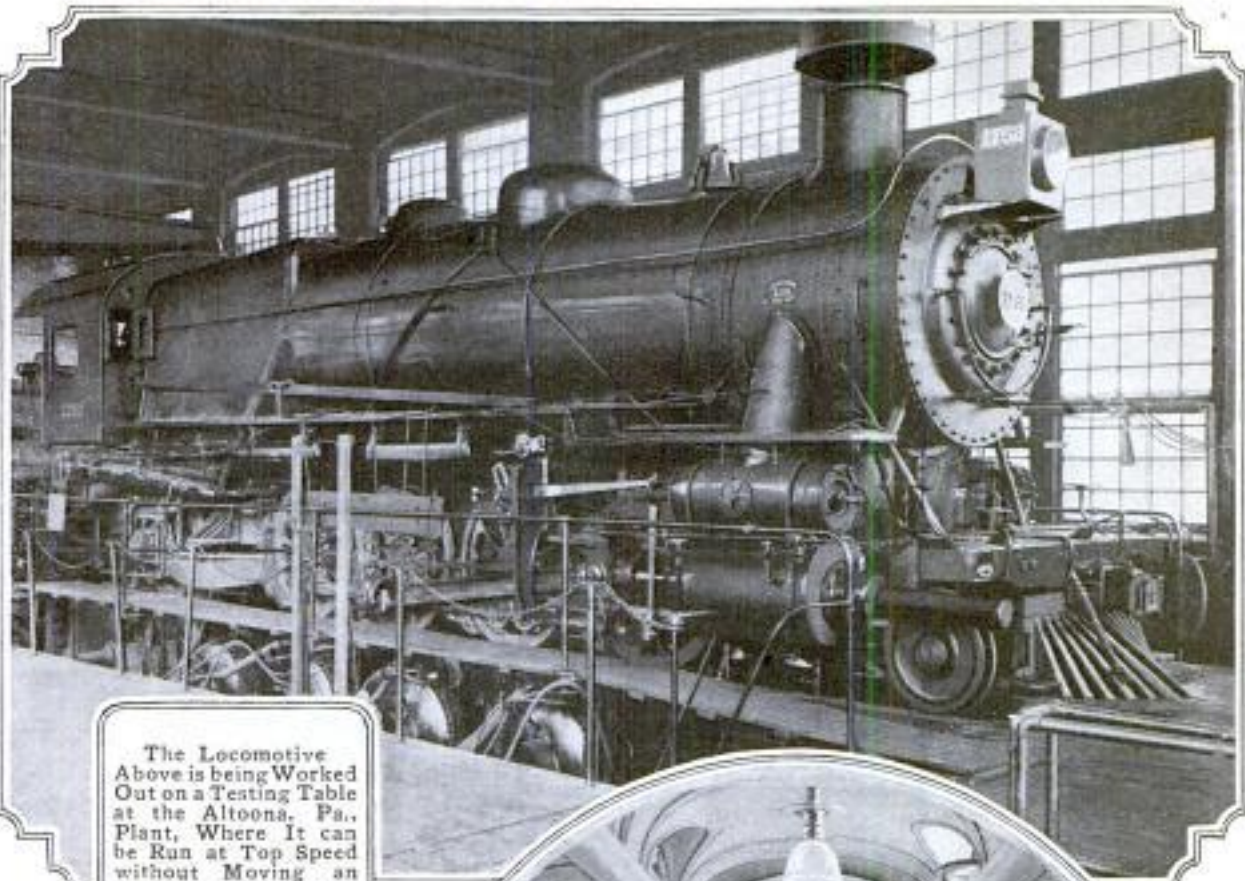
The first floor of the building is devoted to the physical laboratory. Five machines are provided there for testing the tensile strength of materials. One

of these has a capacity of 1,000,000 lb. and is capable of gripping the ends of a piece of steel as large around as a fence post and stretching it out like rubber until it breaks. Laboratories for gas and water analyses, the examination of rubber goods and electrical instruments, bacteriological tests, and photometry occupy the third floor. Chemical experiments and tests are conducted in laboratories on the floor above. By extending the central bay of the building, a fifth floor has been provided which serves as a photographic laboratory. The roof of the structure is used also for photographic purposes and for testing the durability of paints.

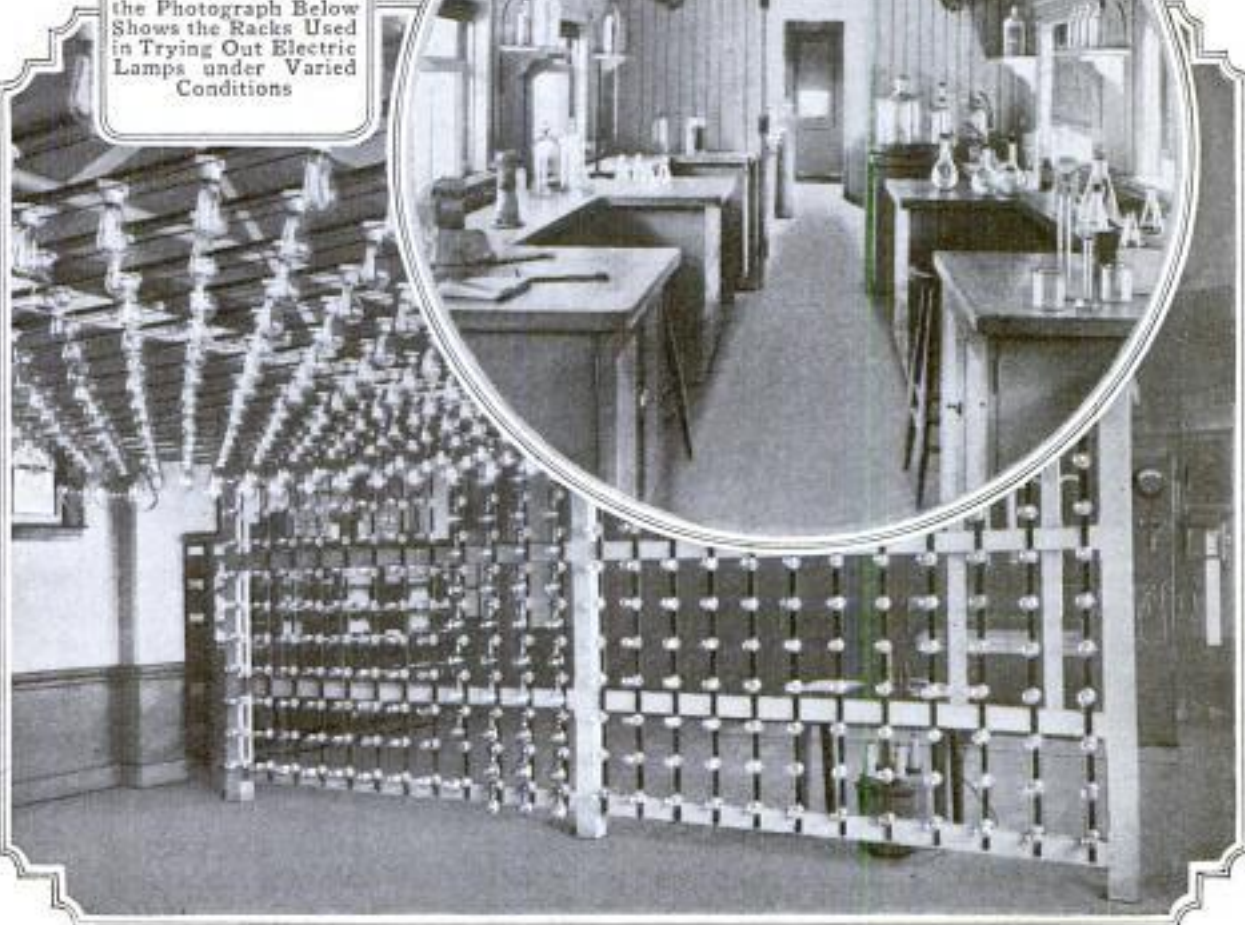
The locomotive test shop is separated from the main plant, as are some other of the divisions. Instead of taking a passenger or freight engine out on the road and making it pull a string of cars over different grades in order to test its capacity, as was once done, it is driven into the shop onto a testing table. There it rests on a series of heavy wheels which form a sort of treadmill for it, enabling it to be worked out thoroughly, "run" at a high rate of speed, or made to pull enormous loads, without moving an inch.

Many of the tests are made as nearly similar to conditions met in service as is possible. The stay bolts of a locomotive, for instance, are subjected not merely to a pull, but also to a peculiar twisting strain such as is encountered in actual use. Car springs are tried out in a heavy apparatus which compresses and releases them alternately. After a spring has undergone thousands of compressions in this manner, it is taken out and measured to ascertain the amount of elasticity it has lost. In testing incandescent lamps, a large rack is used in which 1,000 bulbs are inserted at one time. This is done in determining the efficiency and probable life of various kinds of lamps. Currents ranging from far below normal to excessive strengths, are used for this purpose. Food products used in the dining service, the drinking water

Photographs supplied by J. W. Lee, Substantive Agent P. R. R. Broad St. St. Phila. Pa.



The Locomotive Above is being Worked Out on a Testing Table at the Altoona, Pa., Plant, Where It can be Run at Top Speed without Moving an Inch. At the Right is Shown the Interior of the Chemical Car for Testing Steel Rails at the Places of Their Manufacture, While the Photograph Below Shows the Racks Used in Trying Out Electric Lamps under Varied Conditions



provided in stations and on trains, the condition of the atmosphere in various tunnels, and divers other things of similar character are tested regularly.

Much experimental work is done in order to devise means for lengthening the life of materials, as well as general equipment. For instance, some 286,800 cars periodically require painting. This is a big item of expense, and attempts are continually made to produce paints of greater durability. When a car is in the paint shop it represents a liability to the company instead of an asset. Therefore efforts are made to devise practical means for lessening the time required in painting

cars. A pronounced step in this direction was made not long ago. As a result of experiments, a great oven was built in which freshly painted cars are baked. This process reduces the length of the drying period 95 per cent and cuts in half the total time a car is kept out of service when being repainted.

To facilitate the work of testing steel rails, a car has very recently been fitted out as a chemical laboratory. This, when in use, will be sent to mills where rails are manufactured. Its attendants will thus be enabled to make their tests on the ground as the rolling is being done, which will save considerable time and delay.

586 OLD BRIDGES TRANSFORMED WITH CONCRETE

In one of the counties of southern Kansas novel work has been accomplished in reclaiming old dilapidated



This Bridge, Formerly an Old, Unsafe Steel Structure, was Made Serviceable by Coating It with Concrete

steel bridges which had been condemned. Instead of razing them and erecting new ones in their places, they have been converted into substantial, reinforced-concrete structures. This has been done by building wooden forms about the structural members and filling them with concrete. Thus the framework of the old bridges has been employed as reinforcements for the new ones. Metal bars and other pieces used in bracing the original structures provided reinforcement for the flooring.

666 THE "GROCETERIA," LATEST TYPE OF GROCERY STORE

The latest innovation in grocery stores is the "groceteria," which, as its name implies, is operated on the same plan as the cafeteria. In these institutions, three of which have already been opened in Santa Monica, Cal., there are no clerks, bundle wrappers, deliverymen, or bookkeepers, and, since they are run on a cash basis, there are no bad accounts. It is claimed that because of these conditions there is a saving of from 15 to 40 per cent for the consumer. Each customer simply helps himself to the articles he desires. As he departs the cashier checks over the goods and determines the bill. Package and canned goods take care of themselves without any attention, but it is necessary for the management to weigh and pack groceries that come in bulk. This is done in advance at times of the day when trade is not brisk.

Electric ovens are being used in German field hospitals for the treatment of bullet and shrapnel wounds.

Milton Axel Hagen, 2106 Magnolia Ave San Angeles, Calif.

435
MOTORCYCLIST IS SHIELDED FROM AIR BY DEFLECTOR

For motorcyclists, a simple deflector has been devised which, when attached to the handlebars of a machine, diverts the air currents over the head of the rider, leaving him in a comparatively still atmosphere while driving at almost any reasonable speed. It consists of a rectangular metal case containing a series of parabolical vanes, which form curved channels inside the case. When a motorcycle is speeding along with this apparatus fixed before its driver, the air enters the front of the deflector and is shot out of the top at a 45° angle. The air coming in the plane above the deflector strikes the upgoing current and is diverted by it so that it also takes an inclined course. This protects the upper part of the



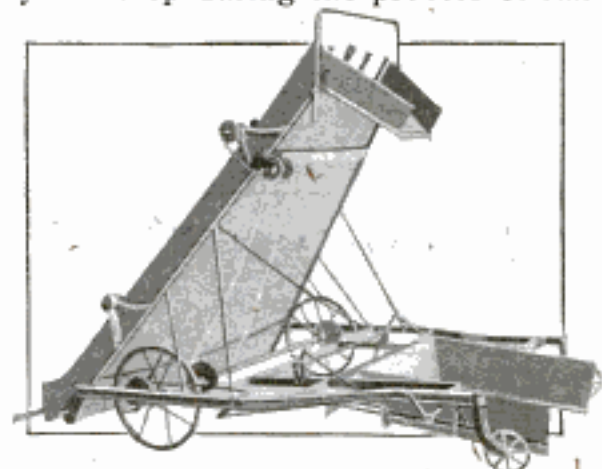
rider's body from wind and dust. The device is supported a few inches above the handlebars so that it is about a foot below the rider's chin. In this position it does not obstruct the view or cause any inconvenience in driving. It is said that when the deflector is

used for the first time a rider has difficulty in estimating his speed, because of the stillness of the air about him. While traveling at a good clip it is possible for him to light a cigarette or cigar without trouble. These points tend to illustrate the effectiveness of the apparatus.

NEW MACHINE FOR SHOCKING 199 ALFALFA

An alfalfa shocker that picks up the hay just as it is left by the mower and places it in the shocks without the necessity for gathering it into windrows, is now being introduced in the alfalfa-growing sections of the coun-

try. This machine does away with the hay rake, which often incorporates considerable quantities of dirt in the freshly cut crop during the process of rak-



With This Shocker the Alfalfa is Placed Directly in the Shocks Instead of being First Gathered into Windrows

ing. The inventor claims that the machine acts as a saver of food value, since by placing the alfalfa crop in the shock as quickly as possible at least 90 per cent of the leaves can be saved. With this method of harvesting, the alfalfa is cured by the circulation of the air through the shock rather than by the action of the sun's rays.

NEW IRRIGATION SYSTEMS 686 IN HAWAII

Several large irrigation systems in the Hawaiian Islands, on which work has been in progress for some years, are now nearing completion. One of these systems, located on the island of Kauai, comprises several miles of ditches and about 10,000 feet of tunnel. Another large system, which is rapidly approaching completion, is located on the island of Oahu and passes under the Koolau range near Honolulu, by means of a tunnel seven miles long. This tunnel is to be used for carrying water from the Waiahole Valley to the lands of a sugar company located on the opposite side of the island.

The Japanese government is considering the advisability of transferring to private ownership all the factories now owned and operated by the government.

*Van Zile Ventilating Corporation
 39 Cortlandt Street
 New York*

*Inventor: Hugo H. Engelken
 923 Grant St. Beatrice, Neb.*

USING A CHEMICAL TO KILL WEEDS ALONG RAILROAD

A chemical spray for killing weeds and other vegetation on the roadbed, now being used on a number of railroads, is said not only to be highly efficient for this purpose but to provide an excellent preservative for the track structure. The chemical is car-



How the Chemical is Applied to the Roadbed for Killing Weeds and Other Vegetation

ried in one or more tank cars and is applied at a pressure of about 15 pounds through an extension arm consisting of a pipe perforated on the under side. This arm is hinged and can be quickly raised out of the way of obstructions. On a railroad in South Carolina it required 126 gal. of chemical, diluted with 3,024 gal. of water, to spray a width of 12 ft. over a mile of roadbed. One application of the chemical each season is usually enough to keep the roadbed sufficiently clear of vegetation.

SHIPS USING PANAMA CANAL SHOULD SIGNAL APPROACH

In order to expedite the passage of vessels through the Panama Canal, the authorities in charge are calling upon ship masters to announce their approach by wireless. A general rule governing this point was posted with other regulations when the waterway was first opened, but according to recent advices it has not been closely followed. More than half of the ships crossing the isthmus carry radio equipment, but only about a fourth of these have observed the practice of signaling their approach.

Unnecessary delays and more or less trouble frequently result when ships arrive at the portals unannounced. When their masters communicate with the canal authorities, on the other hand, sufficient time is allowed to prepare for meeting different problems and handling the traffic more smoothly than would otherwise be possible. There are few vessels equipped with wireless which would be unable to furnish advice of their probable time of arrival 24 hours in advance, if their masters were so disposed. Matter of this character is handled without charge at the government stations. At the present time 2,300 messages, most of them of this nature, are handled at the Colon plant and some 400 communications at Balboa.

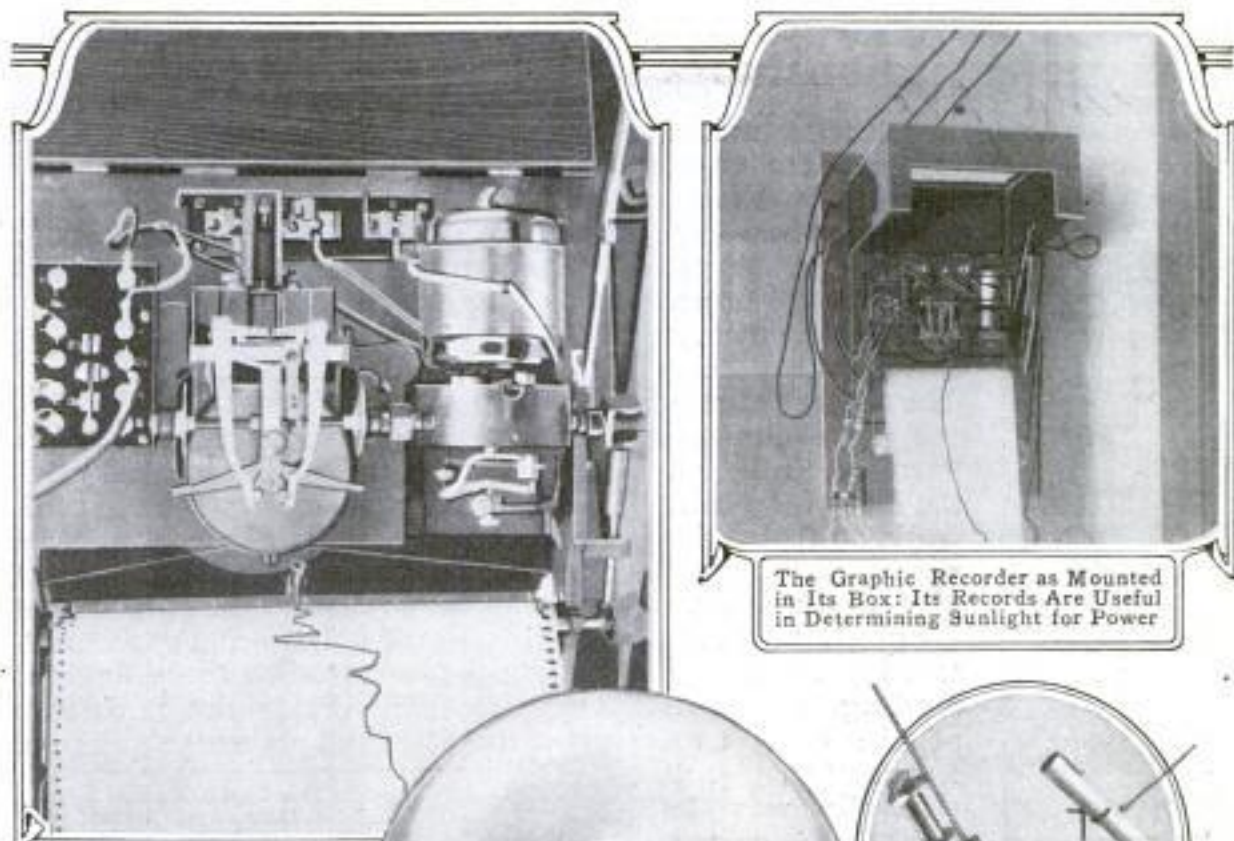
The canal radio stations are performing quite an interesting service which is probably not generally known outside of commercial and shipping circles. Each afternoon at 3:30 o'clock the Colon station sends out general news bulletins which are picked up by vessels in various parts of both oceans. At noon weather predictions relating to the Caribbean, South Atlantic, and Gulf regions are also sent out broadcast. Information concerning the positions of dangerous derelicts, and other matters pertaining to the welfare of navigators, is filed at regular intervals.

Large deposits of potash salts have recently been discovered in Spain.

Atlas Concentration Co. of America, Inc.,
95 Liberty St., New York

8668

INSTRUMENT RECORDS EACH DAY'S SUN HEAT

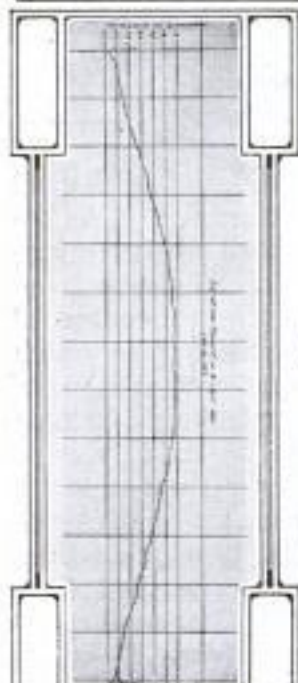


The Graphic Recorder as Mounted in Its Box: Its Records Are Useful in Determining Sunlight for Power

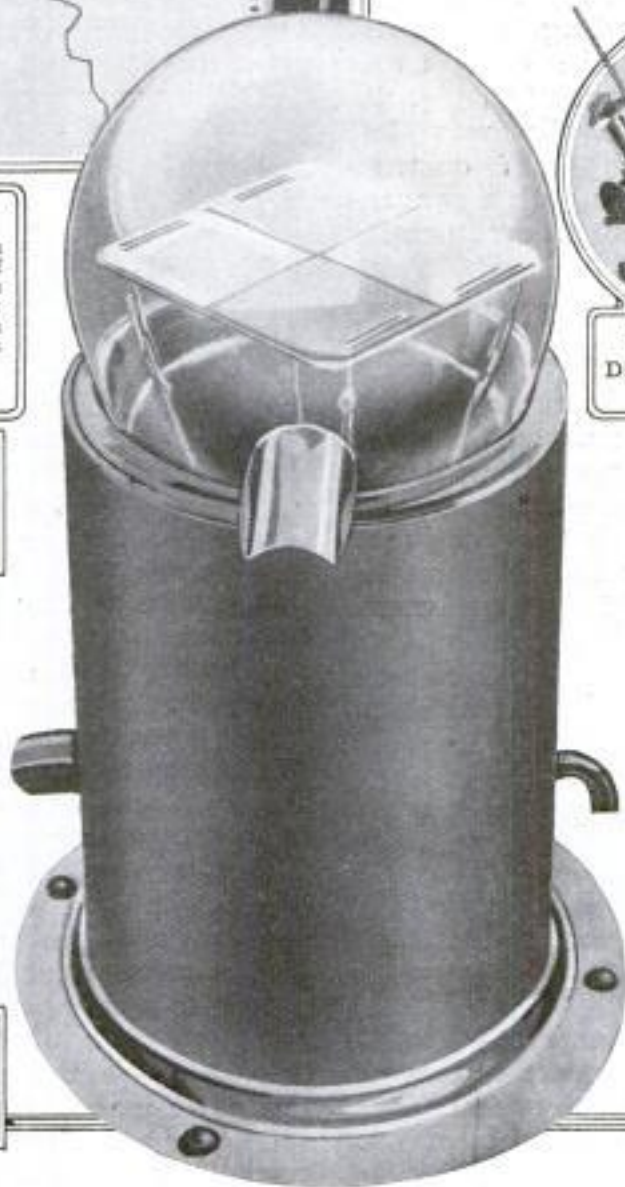
Above: Recording Galvanometer at University of Arizona Which Gives Chart of Amount Sun Shines in 24 Hours. At Right: Sunshine Receiver on Roof: Platinum Wires Change Resistance with Heat of Sun



Two Instruments for Measuring Direct Heating Effect of Sun's Rays



Smooth Record of a Clear Day



Clouds Cause Irregularities

WATER FOUNTAIN PROVIDED 41 IN FRONT OF BUILDING

Marple
In constructing a business building in a western city, a sanitary drinking fountain has been set in a niche provided in the front wall of the structure between two stores. The outer edge of the porcelain water bowl is flush with the face of the brickwork, so that it does not jut out in the way of pedestrians. By placing the fountain here, instead of erecting a pedestal at the curb, as is frequently done, the sidewalk was left free from obstructions.



The fountain is both a convenience to the public and an ornament.

406 — SIMPLE DEVICE FOR TIMING TELEPHONE TOLL CALLS

The time consumed in making a toll call is easily and accurately checked by the use of a simple timing device just placed on the market and designed for the convenience of telephone users. This device consists of a special clock



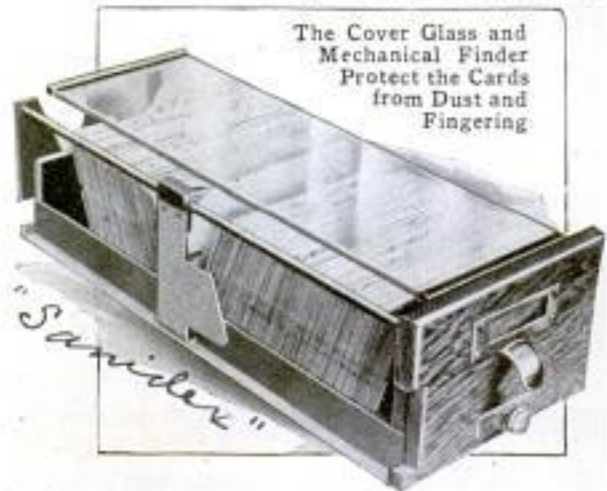
With This Special Clock the Time Consumed in Making a Telephone Call is Accurately Registered

having a single hand and a dial so divided that six minutes are registered with one revolution of the hand. The clock is started and stopped by means of a lever at the top of the case. The

hand is first set to zero and, with the completion of the toll connection, the clock is started by pushing the lever to the right. When the conversation is completed the clock is stopped by pushing the lever to the left. One winding of the clock is sufficient for 1,000 three-minute calls.

486 — INDEX CARDS KEPT CLEAN IN NEW FILING CASE

For sanitary reasons as well as for convenience and efficiency, a card-index filing system, arranged according to a new plan, has been introduced for office purposes. The chief points in its favor are that it offers a means of locating a card quickly and without allowing the record slips to be fingered or soiled. This keeps the cards in a clean condition and prevents them from



being worn or contaminated with filth because of frequent reference. The filing drawer is fitted with a plate-glass cover that protects its contents from dust. Passing through the center of it at the bottom is a small rod on which the perforated cards are threaded. On another rod extending along one side of the drawer is fitted a sliding device which acts as a finder. In locating a specific card, the operator makes use of this mechanical hand, which, when moved to and fro, turns the cards forward one at a time. The reading is done through the glass, which is intended to be removed only for the insertion of new cards or the removal or correction of old ones.

*C. N. Garrow Co.
Parsonage & Olive Sts.
Philadelphia, Pa.
"Phonometer"*

*G. W. Electric Co. Specially Co.
Chicago, Ill.
Chicago*

HOW A SHIP'S STABILITY IS DETERMINED

633

By JOSEPH R. OLDHAM, N. A.

2034 E. 81st St.
Cleveland, O.

(Since the appearance of the article on the "Eastland" disaster in the September number of Popular Mechanics Magazine we have received many requests for a more detailed explanation of the "metacenter" and the "metacentric height." The following article, written by an engineer and marine expert, makes this technical subject simple enough, we believe, for anyone to understand.—Editor.)

THE metacenter is a measure of the comparative stability of a ship. It is a fixed point, for one draft of water, through which the buoyancy may be assumed to act for all angles of inclination up to about 15° from the upright. It is also the point above which the center of gravity of a floating vessel cannot be raised compatibly with stable equilibrium.

In Fig. 1, the metacenter is marked M, the center of gravity is indicated by G, and the center of buoyancy is marked B. Though the altitude of the metacenter is measured from the center of buoyancy as its base, the actual power of the vessel to return to the upright position depends upon its height above the center of gravity of the ship, and not primarily upon its distance above the center of buoyancy. The metacenter may be compared to a pendulum having its point of suspension at M, and its weight concentrated in a bob at the center of gravity G. This distance is commonly called the G.M. So long as G is below M, the ship is in stable equilibrium. If G is above M, as indicated in Fig. 2, the ship is in unstable equilibrium. If G coincides with M, the ship is in neutral or indifferent equilibrium.

Consider a deep vessel, such as shown in section in Fig. 2, made still deeper by the addition of an upper deck, and then loaded with grain and no water

ballast carried, which was actually the case in the Atlantic trade a few years ago. This raised the center of gravity about three feet, moved that center slightly above the metacenter M, and produced a metacentric height of minus 5 in., and developed a heeling moment of nearly 3,000 tons, which caused the shifting of cargo and the capsizing of the vessel. The basic defect of this construction was excessive depth. Here it may be pertinent to state that when the depth of a bulk-cargo vessel, from the keel to the strength deck, materially exceeds 60 per cent of the extreme breadth, the structure may be considered as too deep. Though this vessel was deficient in statical stability, due to the low metacenter and the high center of gravity, it is, however, quite possible to have too great a metacentric height. If this height be excessive, due either to the high altitude of the metacenter, or to the low position of the center of gravity, or to a combination of these elements, the vessel will oppose too great a resistance to beam seas, thus setting up uneasy rolling and developing excessive vibration. This may be illustrated by Fig. 3, which shows a vessel with great metacentric height, due to small displacement, largely concentrated near to the load water plane, and to the great breadth of beam—the potent factor of a large moment of

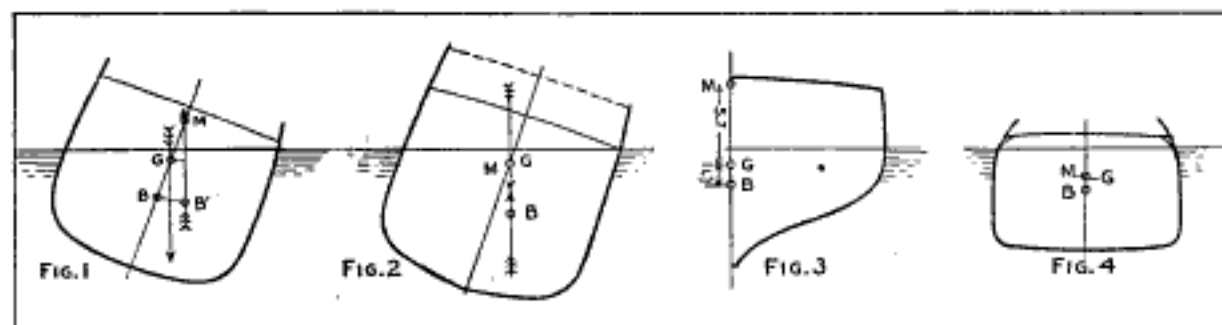


Fig. 1, Great Metacentric Height, Due to Fine Lines and Small Displacement; Fig. 2, High Center of Gravity Resulting from Excessive Depth, and Low Metacenter Due to Narrow Beam and Deep Immersion; Fig. 3, High Metacenter Due to Great Breadth of Load Water Plane, Small Displacement and Immersion; Fig. 4, Low Metacenter, Due to Large Displacement and Contracted Breadth of Load Water Plane

inertia. In this example the metacenter is 7.4 ft. above the center of buoyancy B, and as the center of gravity G is 1.7 ft. above the center of buoyancy, the metacentric height, or G.M., is thus 5.7 ft. The stiffness of a ship varies with the metacentric height. If it be doubled, the stiffness is doubled; if halved, the stiffness is reduced by one-half, and so on, in like proportion.

Though most of our lake steamers have an excessive metacentric height, due to the combination of a low center of gravity and a high metacenter, caused by the large moment of inertia of the load water plane and shallow draft of water, there are a few vessels afloat on these seas which exhibit a very moderate height when fully laden with a homogeneous cargo of low specific gravity. Some years ago, two large Atlantic liners were constructed resembling the outline section marked Fig. 4. These vessels had a "tumble home" of 7.5 ft. In other words, they were 7.5 ft. narrower at the deck than at their broadest point. Ships of somewhat modified design were constructed on the Great Lakes. Their architectural characteristics are a moderate moment of inertia, due to the diminishing breadths of the load water line, and large displacement with a low center of buoyancy, whose geometrical resultant is a low metacenter and

small metacentric height. This combination, however, can be readily counteracted by a judicious disposition of the weights carried, or by running some water ballast into the tanks, which would immediately lower the center of gravity and proportionately augment the metacentric height. They are, however, good sea boats and easy rollers, and they carry such cargoes safely, as their sides are strong and intact, with the exception of the small port aft, which is closed and made water-tight during severe weather.

Although the metacentric method is reliable primarily to demonstrate initial stiffness, or stability, it is susceptible of much broader application by shipbuilders of mature experience. Though a ship cannot capsize while she retains a metacentric height, it is equally true that certain types of ships, possessed of ample freeboard and unperforated top sides, may not capsize even though they have no metacentric height in the upright position. I have observed many such examples of similar vessels which were abandoned at sea. They heeled over toward an inclined position of stable equilibrium and there acquired a small metacentric height and a righting moment, continued to float, if the sea did not enter through the hatchways, and were finally salvaged.

8195

HINGELESS MOTOR-CAR DOOR DISAPPEARS WHEN OPENED

Instead of swinging outward into the path of passing traffic when opened,



This Motor-Car Door Disappears When Opened

a motor-car door, for which patent rights have just been issued, slides into the hollow space between the double walls of a vehicle body, disappearing from view. One of the advantages claimed for the device is that a lateral pressure upon it cannot cause it to open. It employs neither hinges nor locks and operates automatically by pressure on a release button. The door is hung on a pair of bars which are pivoted to the upper portion of it and to an angle plate fastened within the wall pocket. When in either an open or closed position it is held in place by its own weight and prevented from rattling by the tension of a spring.

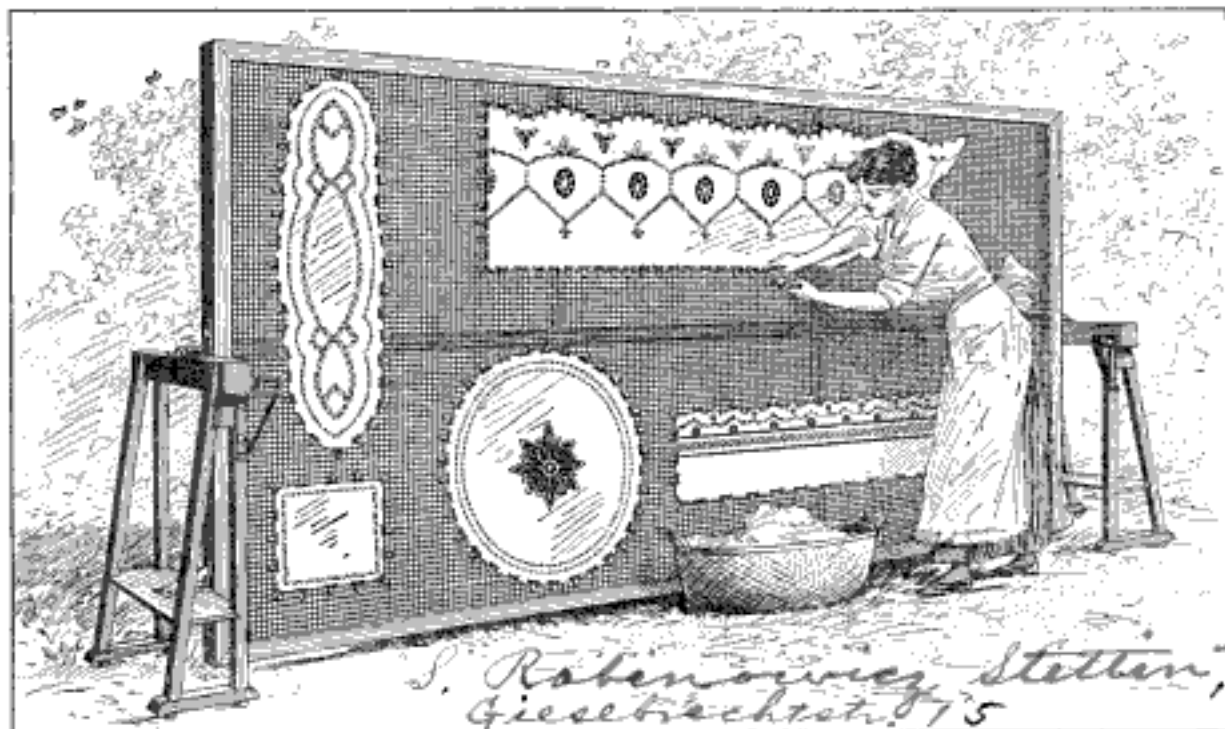
Invention of Des Rovières, Detroit Mich.
 1,100,057 - June 16, 1914
 Filed 3-23-13 Dec. 7, 1910
 25 Hendrie Av.

LACE-CURTAIN STRETCHER NEEDS NO ADJUSTING

For stretching lace curtains and pieces of needlework after they have been washed, a new type of drying

BOW AND ARROW MADE SAFE TOY FOR CHILDREN

Among the toys recently invented for children is one which is modeled after the old crossbow of medieval

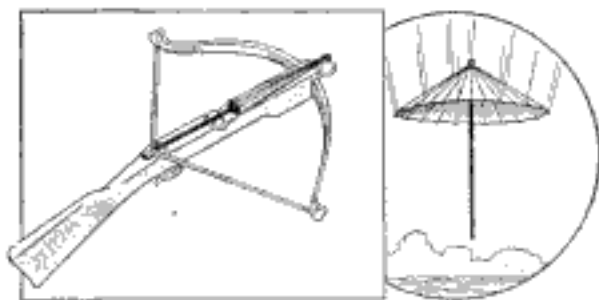


Curtains and Pieces of Lace are Secured to the Netting by Means of Specially Designed Clamps

frame has been brought out abroad which does away with the tedious task of adjusting forms such as are usually employed. The device consists of a wooden frame covered with a strong, large-meshed, nonmetallic netting. The articles to be dried are stretched to the surface of this by means of special spring clamps. Each of these is provided with a hook on one end which may be engaged in a mesh of the net. The clips are made in a number of styles with jaws of various patterns and sizes to suit the specific requirement of different articles. Besides its time and trouble-saving advantages, the frame prevents the distortion of the laces.

One thousand members of affiliated engineering societies in Scotland are being enlisted for week-end munition work in order to relieve those who have been so engaged since the war began.

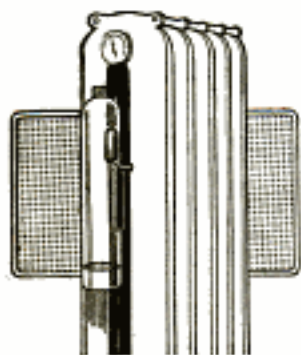
days. The arrow used differs from that ordinarily seen in that it has a small parachute device attached to it which brings it slowly to the earth as it commences its downward fall, eliminating the danger of injuring bystanders. The arrow has the customary feathered end, and at the moment it leaves the bow its parachute is folded up, so that the flight of the missile is not seriously



When This Arrow Falls a Parachute Device Opens, Making Its Downward Course Slow, to Eliminate Danger

impaired. As it reaches its limit of elevation and starts down, the device opens.

596
NOVEL AND PRACTICAL THINGS
FOR THE HOME



1 Glass Housing for Radiator Valve

An ingenious glass receptacle has been invented which serves a useful purpose. It is tubular in shape and has an aperture in its cylindrical wall which allows it

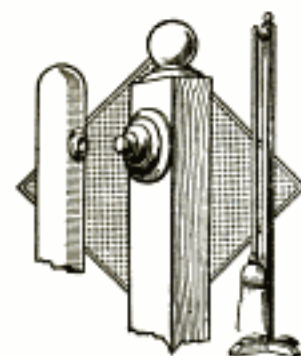
to be placed over a valve so as to catch the condensing steam and muffle the hissing noise.



2 Sanitary Toothbrush Has Removable Bristles

Designed for sanitary reasons, a tooth cleaner has been introduced which is so arranged that its brush may be renewed frequently. The brush and handle are separate members and joined by means of a small locking swivel. The former is made of bristles tightly gripped by twisted steel wire.

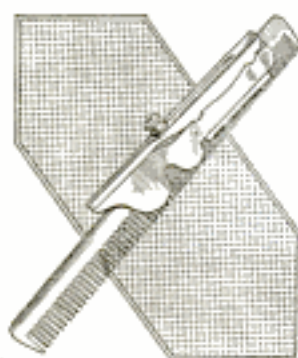
Near the upper end of the handle of a broom lately brought out there is a spring socket which is sunk flush with the surface. It is intended for suspending the broom, and for this purpose a button hanger is provided which may be screwed to a wall or kitchen tree. The socket slips over the ball readily and holds firmly.



3 Hanging Device Provided in Broomstick

A novel hair-trimming instrument

has been introduced for men and boys which might be of particular service to those who reside in rural districts. Essentially it consists of a metal holder for a safety-razor blade and is designed to be clamped over a comb.



4 Simple Instrument for Trimming Hair

Convenience is found, by the woman who sews, in an ingeniously mounted magnifying glass intended to be used in threading fine needles.



5 Magnifying Glass Aid in Threading of Needles

A curved wire attached to the rim of the lens fits into a spool hole which serves as a standard. The glass magnifies the eye of a needle considerably and enables a woman to see what she is doing without straining her eyes.

For those who delight in popping corn at an open fireplace on winter evenings, a popper is made which has a sliding cover. A wire attached to it and also secured to a ring, encircling the handle, provides for its operation. This does away with



6 Corn Popper Fitted with Sliding Cover

the annoyance of spilled corn and burned fingers.

Baking dishes made of a special-process fireproof glass, which it is said will not chip or craze, are being introduced in many pleasing shapes and different forms. They are used both for cooking and serving, enabling food to be placed on a table piping hot, and also lessening the number of utensils needed in preparing a meal.

For domestic use, ball-bearing shears which cut smoothly and work easily, are a novelty now being advertised. The ball fits in an aperture drilled for it in one of the blades immediately back of the pivot screw. This reduces the friction somewhat and is intended to improve the action.

Sleeping caps which are also suited for outdoor wear in cold weather are being made of corduroy and lined through-



Warm Sleeping Cap Suited for Outdoor Wear

fit snugly about the neck and are well adapted for winter motoring, or skat-

ing, besides outdoor sleeping.

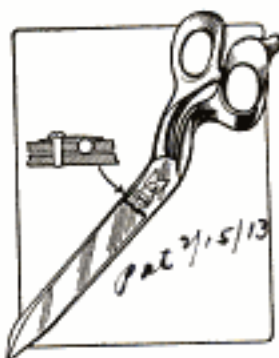
Several practical features are incorporated in a pot lately introduced which is fitted with a special cover. This is made in two parts, the inner of which is provided with a series of straining apertures and fastens in place securely. Over this sits another cover in which there is one large opening. By turning the knob at the top, the outer cover may be revolved and the strainers in the inner lid, which are of different mesh, exposed. A latch attached to the handle locks the top lid in place.

For the den, or as a companion piece for a smoking set, a combination cigar lighter and ash tray is made in an attractive design and finished in nickel-plate. It requires no batteries or wire connections, stands about six inches in height and weighs 9 oz. By pushing a small plunger, the flame is produced, and then extinguished by releasing the former.

To prevent the theft of groceries delivered at a residence, a receiving vault has been designed to be built in a kitchen wall. Its steel body is adjustable to different wall thicknesses and fitted with two cast-iron doors, the outer having a gravity lock.

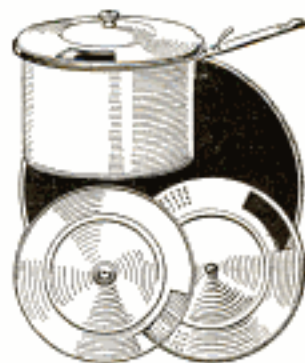


Baking Dish Made of Fireproof Glass



Ball-Bearing Shears for Household Use

out with a soft material. They are cut to permit various adjustments so that a person's face may be exposed entirely, only the nose and eyes left uncovered, or all but the tip of the former protected. They



Water is Poured from Food through Strainers



Combination Cigar Lighter and Ash Tray



Built-In Receiving Vault for Packages

88 p. doz.
 7.50
 7.25
 918
 8433
 Lamie - Helices Complete
 Projectiles - Pellets
 100
 10
 Laminated Machine Co.
 40 N. 2nd St., New York
 Sales agents for U.S.

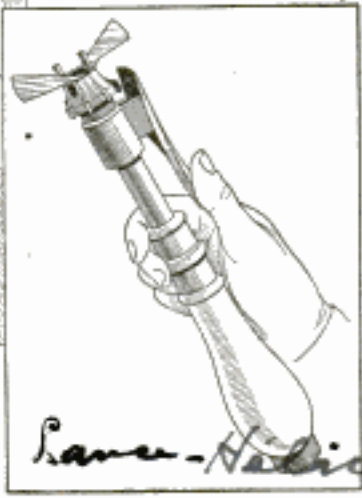
Kratz - Bouras
 Rue - Martel, 14, (10e) Paris

NEW FLYING TARGET MADE FOR TRAP SHOOTERS

To take the place of clay pigeons, glass balls, and similar flying targets used by sportsmen in gun practice, a small propeller-shaped device has been brought out in France. It is made of steel and is shot into the air by



This Propellerlike Flying Target has been introduced in France as a Substitute for Clay Pigeons



the strong spring action of an instrument which revolves it rapidly as it is released. The object can be made to ascend to a considerable height, and then planes for some distance before commencing to fall. As soon as it is struck by a shot, however, its rotary motion stops and it falls to the ground. Aside from the matter of cost, an advantage of the device is that it may be carried in a pocket.

NEW SHIM BLOCK IS MADE IN CONVENIENT FORM

Shimming brass is being made in solid blocks composed of thin layers



Shim Block Made of Thin Strips of Metal Held Together by a Metallic Binder

bound together by a metallic binder, so that in adjusting a bearing to take up wear it is only necessary to peel off

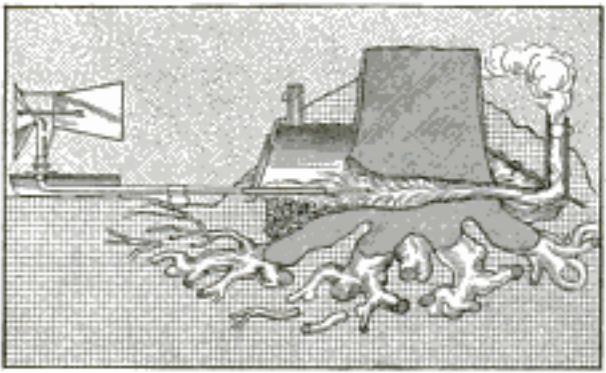
Laminated Shim Co. Inc.
 533-541 Canal St. New York
 (74707)

enough of the laminae to bring the strip down to the required thickness. This eliminates the laborious and exacting method of filing a bar to an accurate thickness, and offers greater convenience than the loose-leaf shim. The separate laminations are made in two thicknesses, .002 and .003 in., and by peeling off successive layers it is possible for an inexperienced workman to make a smooth, uniform shim of the required size.

FURNACE OF NEW DESIGN FOR STUMP BURNING

For clearing logged-off lands an Oregon man has patented a firing apparatus which is intended to facilitate the burning of stumps and do away with the necessity of grubbing and blasting. It is simple in design, and according to its inventor, is capable of destroying the upper portion as well as the root system.

It consists principally of a saddlelike hood with a flue and auxiliary apparatus for inducing a draft and stimulating the fire. In using it, a 2-in. hole



The Operation of the Apparatus is Inexpensive Because Fuel of Almost Any Character may be Used

is bored horizontally into the stump below the surface of the ground. This extends through the sapwood on a side from which the bark has been stripped. The ground adjacent to the hole is excavated so as to form a bed for the fuel. The furnace, which is made of metal with one end and its bottom open, is then set in place, while a pipe, less in diameter than the bore in the stump and provided at its far end with a wind funnel and vane, is set in close prox-

114 17 117 - June 1, 1914 - Danwell F. Zygote
 Thomas, Oregon. Filed Mar 12 - 1915
 Nov. 8 24 153. Dec 10 27 0: 803 12 15 10 233

imity to the auger hole. The latter member furnishes the air and promotes rapid combustion.

When a passage has been burned through a stump, a second hood provided with a smokestack and disk damper is set in place at the opposite side of the trunk and thoroughly banked with earth. After the burning has progressed a little farther, the first hood, and that section of the air pipe which holds the funnel and vane, are

1,141,747. APPARATUS FOR BURNING STUMPS. SAMUEL F. ZYSSEY, Thomas, Oreg. Filed Mar. 12, 1914. Serial No. 824,153. (Cl. 110-21.)



1. In a stump burner, the combination of a furnace provided with a combined draft and smoke outlet and open at its bottom and at one end to be located against one side of a stump, an air inlet pipe extending into the lower part of said furnace with its inner end in close proximity to the stump and movable progressively therethrough to supply air to the stump as a hole is burned therethrough and mechanism for directing a current of air into said air inlet pipe.

2. In a stump burner, the combination with a furnace adapted to be located against one side of a stump, an air pipe movably extending into the lower portion thereof with its inner end in close proximity to the stump, of a wind inlet funnel connected to said pipe, a supporting member carrying said wind funnel and movable bodily toward and away from the stump, and a wind controlled vane for shifting said funnel into position to receive the air and direct the same through the air inlet pipe into the furnace.

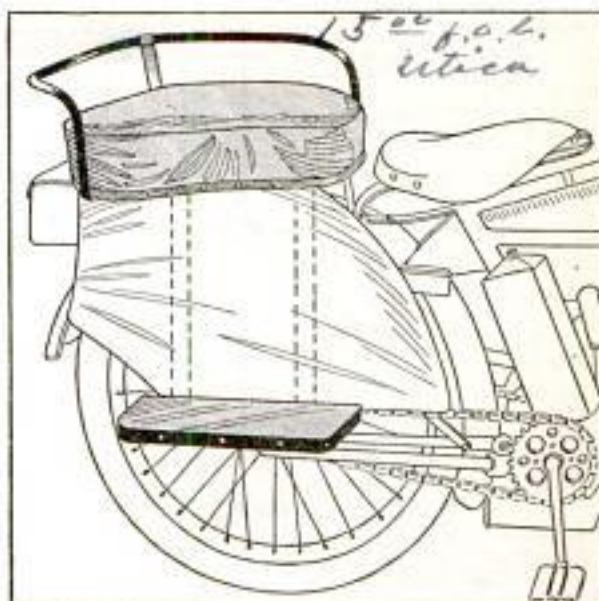
3. In a stump burner, the combination of a furnace to be located upon one side of a stump, a hood to be located upon the opposite side of said stump and provided with an outlet for the products of combustion, and a draft pipe extending into said furnace to facilitate the burning of a hole through the stump, and a wind funnel connected with said draft pipe and movable bodily therewith toward and from said stump.

4. In a stump burner, the combination of a furnace to be located upon one side of a stump, draft inducing mechanism comprising a hood to be located upon the opposite side of said stump and provided with an outlet for products of combustion, a draft pipe movably extending into the lower part of said furnace through the door thereof and movable bodily toward said stump, said draft pipe being admitted through an open end slot in said furnace door to facilitate the removal of said furnace and its replacement with a charge of earth after a hole is burned through said stump.

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SEAT

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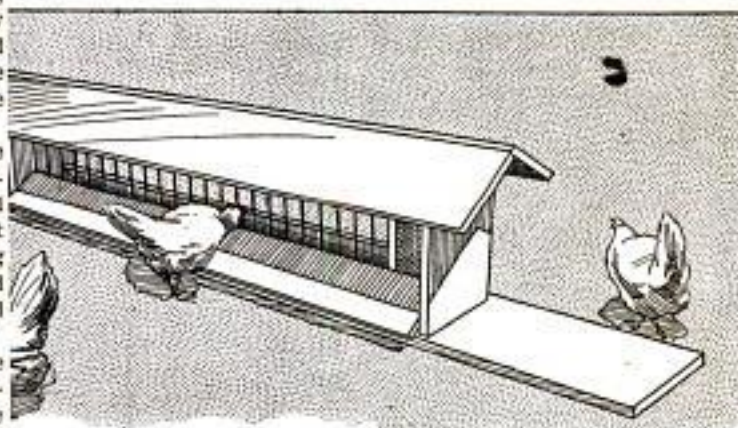
With This Seat a Person may Face Forward without Straddling the Rear Wheel When Riding Tandem on a Motorcycle

The seat is broad and roomy, and is intended to be attached by means of bolting clips to the frame of a luggage carrier. A canvas guard is provided to protect the skirt.

CA \$67,600 wire fence has been erected to inclose the Ashokan reservoir, which is a part of New York City's new water-supply system.

FEEDING DEVICE FOR POULTRY

alarm feeder will cause a bar, controlling the door catches, to rise, thus opening the doors.



Chickens by a Mechanical Apparatus Operated by an Alarm Clock

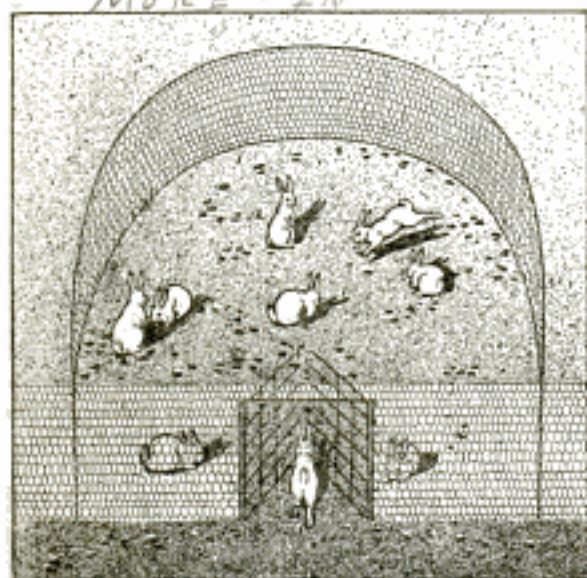
ned by placed in key By setting the clock for a certain hour and filling the trough with grain, the chickens are fed without trouble.

John H. Allen, 150 1/2 Lincoln St. Utica, N.Y.
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835 1913

H. H. Hinds Ltd. Young & Bridge Sts,
 Rabbit & Fox size 1 1/2 each
 posted anywhere 1/3 extra
 920
 also made for traps for mice, rats, etc.
 Sydney N. S. W.
POPULAR MECHANICS

**RABBIT TRAP MADE OF WIRE
 8957 NETTING**

A rabbit trap of a new type that is quickly and easily fixed in position for use consists simply of an inclosure
 "MORE-IN"



This Rabbit Trap, Made of Wire Netting, is Equipped with a Gate That Permits the Rabbits to Enter but Prevents Them from Getting Out

formed of wire netting and equipped with a gate of such form that it permits the rabbits to enter but prevents them from getting out. The trap is made up of two pieces, one straight and the other bent to a semicircle, and it is set up simply by joining these pieces together at the ends.

563
**LAND DRAINAGE IS PROBLEM
 OF EGYPTIAN FARMERS**

C. S. Monitor 9-7-15
 Agriculturists in Egypt are facing a peculiar situation which has been brought about by the promotion of irrigation. The financing of projects for supplying water to arid lands has not been attended with the difficulty met by drainage propositions. Because of this, certain districts once unproductive on account of the scarcity of water, are now suffering from an excess of moisture. Obviously much of the reclamation work has not been carried out as intelligently as it might have been, for conditions in some places have merely been changed from one extreme to another. The lack of

drainage facilities has caused fields to become soaked with water, ending with perfectly apparent results. Disastrous years have caused just as urgent a cry to be raised for drainage as was ever made for water, and eventually a normal balance will doubtless be established.

Egyptian cotton, which is of excellent quality, is grown almost entirely upon Nile land. A strip of soil reaching back about one mile on either side of the stream constitutes what at present is said to be the only area suited for cotton production. The country's part in this industry is governed by irrigation, and this in turn is controlled by the amount of water available in lean years. There has been a tendency to bring more land under cultivation, it is claimed by one authority, than could be maintained in years of minimum rise by the available irrigation facilities.

7658
**DEVICE KEEPS CABLE TAUT
 BY REMOVING SLACK**

Intended particularly for use on the control cables of an aeroplane, an instrument has been devised by an



English inventor for automatically taking up slack in a wire and keeping it taut. The check consists principally of a rod and piston fitted in a metal casing, with a strong spring so attached that it constantly tends to push them backward in the tube. A series of split spring rings fit around the rod between the heavy coil and the piston. In case a cable, to which the device is attached, stretches, the slack is taken up by the spring acting on the rod and piston. The same movement forces one or more of the spring rings into the piston chamber.

As soon as it enters this larger bore it expands and fills the space between the sliding member and the shoulder, preventing the former from moving forward.

Inventor: D. E. Turner
 2, King Henry's Road,
 Hampstead, Eng.
 Copyrighted material



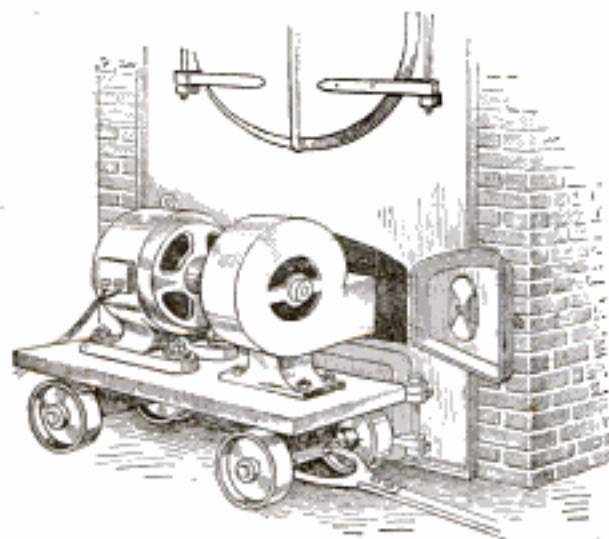
Shop Notes

Washing Unopenable Windows

While using a special preparation for washing windows, apply the inside coat crosswise and the outside coat lengthwise; then, after the preparation has dried, the streaks will determine which side is not wiped clean. This is especially handy when washing windows that cannot be opened, as it will save many trips around to the outside when the streak is on the inside.

Portable Fan Outfit for Cooling Furnaces

In a large plant where there are many boilers having automatic-stoker furnaces, great delay was experienced in waiting for the hot brickwork to cool sufficiently to allow a workman to enter for the purpose of making repairs. The illustration shows how the delay was lessened. The fan cools

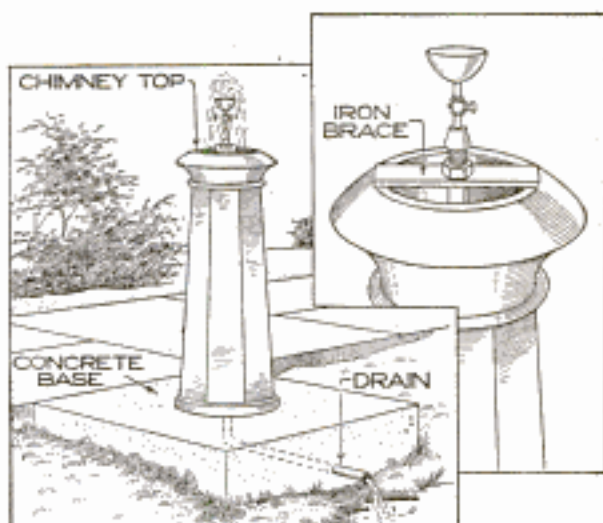


A Motor and Fan Placed on a Truck for Use in Cooling a Furnace for Making Repairs

the furnace to a workable temperature in a very small part of the time formerly required.—Contributed by J. J. O'Brien, Buffalo, N. Y.

Cover for a Drinking-Fountain Pipe

The drinking fountain in the playground in our city, when first erected, was merely a section of pipe with the cup attachment screwed into it. Recently a concrete base has been added, and a terra-cotta chimney top bedded



Terra-Cotta Chimney Top Used as a Protection and Ornament about a Drinking-Fountain Pipe

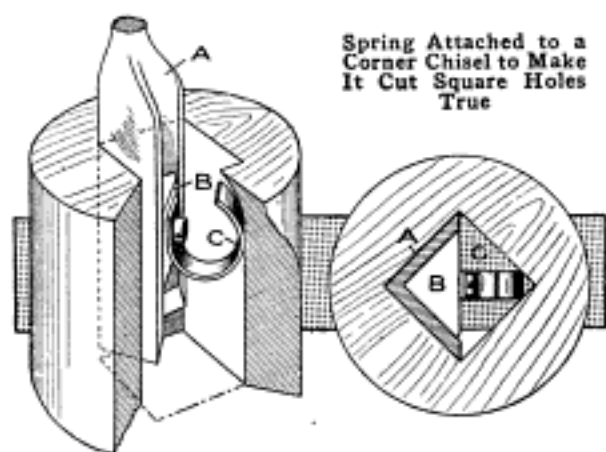
into it as shown. The concrete base is convenient for the youngsters to stand on, and the chimney top serves the double purpose of protecting the pipe and carrying the waste water down into a drain pipe running from the bottom of the chimney out into the gutter.—Contributed by James M. Kane, Doylestown, Pa.

Cutting Long Square Holes in Wood

It is often necessary to cut square holes through blocks of wood, and if the holes are of considerable length it is difficult to make them square and smooth. The tool illustrated is quite an aid for such work, and is simple enough for anyone to make.

An ordinary corner chisel is repre-

sented at A, into the angle of which is soldered a small block, B. To this block is fastened, by a small screw, a spring, C, of sufficient size to reach the opposite corner of the hole to be cut. The hole should be roughed out

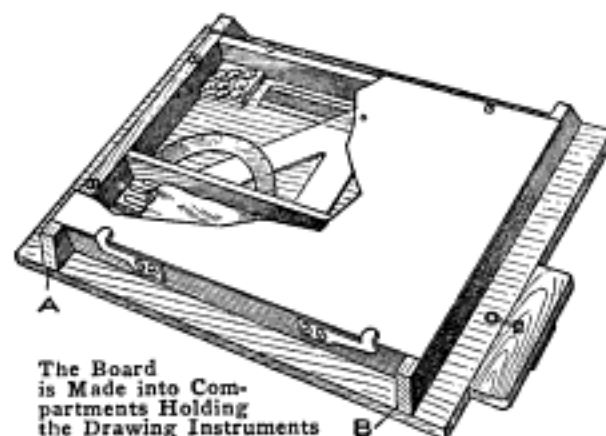


Spring Attached to a Corner Chisel to Make It Cut Square Holes True

first, after which it is easily finished with the corner chisel arranged as shown, since the spring C always forces the chisel down flat and holds it firmly in the corner as it is pushed through.—Contributed by J. A. Brearley, Washington, D. C.

A Portable Drawing Outfit

The illustration shows the construction of a self-contained drawing outfit, which is of value to engineers and students who find it necessary to carry drafting instruments to and from work. The size of the board is such



The Board is Made into Compartments Holding the Drawing Instruments

that it can be easily carried in a suitcase, and fair-sized drawings can be made upon it.

The drawing board is made of soft

pine, or poplar, $\frac{3}{8}$ in. thick by 14 in. long, and 12 in. wide. Three strips, with the grain of the wood running lengthwise of the board, are used for the board. The edges are made perfectly square and straight, for the use of the T-square.

The compartments for the instruments on the back of the board are made between two hardwood cleats, A and B, placed 1 in. from each end, and two similar cleats lengthwise, 1 in. from the sides. The cleats should be fastened to the board with wood screws.

The compartment formed within the cleats is divided in the center with another small cleat. A cover is made from a piece of sheet metal, aluminum preferred, and fastened in place by slots on one side which slip under round-head screws, and by two spring clips on the other side. The screws are driven almost down and filed flat.

In one compartment there is fitted a small chamois pouch, having pockets to receive the instruments, while in the other side there is room for a scale, protractor, triangles, pencils, etc. In one corner of one side, glue a small block of soft wood, to hold the thumb tacks. A T-square may be made to fasten across the face of the board by using small brass screw eyes and hooks. The blade of such a square should be about $1\frac{1}{2}$ in. wide, and just as long as the board.—Contributed by C. H. Van Fossen, Fayette, Ohio.

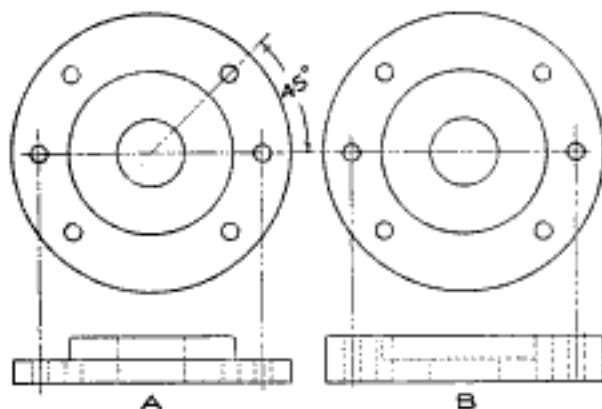
A Place for the Automobile Switch Key

If the key for the switch lock of an automobile is made of steel, it can be safely and conveniently kept in the car when not in use by attaching it to a small permanent magnet, concealed under the false dash, or elsewhere. Should the key be of brass, a steel duplicate can easily be made, or one may be made of tool steel, then hardened and magnetized so that it will adhere to any steel, or iron, part of the automobile. — Contributed by Carl F. Woodbury, Halifax, Nova Scotia.

Economy in Making Templates

A piece of work, shown at A, required holes drilled accurately, and quite a number of them were needed from time to time, making it necessary to have a template, as shown at B. The template was first made of machine steel and casehardened. The holes wore rapidly, and the template had to be discarded, and a new one made quite often.

To make a template that would stand the wear and not require a large amount of tool steel, one was turned up of machine steel, and the places for the holes were located and drilled for tapping with a $\frac{3}{8}$ -in. machine tap. Then the holes were tapped, and a piece of $\frac{3}{8}$ -in. tool steel was threaded and turned into each hole, and slightly peened over. The piece was then faced off, the places for the holes accurately marked on the tool-steel inserts, and drilled. The whole piece was heated, and the tool-steel pieces tempered. This formed a template as good as if



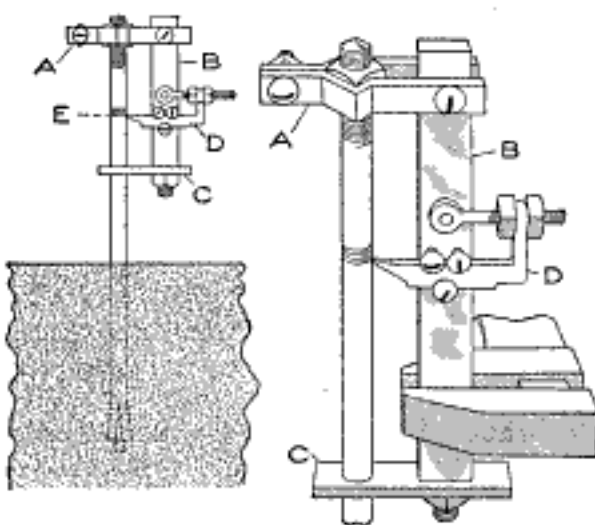
A Template Made of Machine Steel with Tool-Steel Inserts for the Holes

it had been made entirely of tool steel.—Contributed by Clarence H. Anderson, Worcester, Mass.

Cutting Threads on Foundation Bolts

In placing an engine on a foundation in a stone quarry, I found that some of the bolts had to be shortened about 3 in., and as these bolts were split on the lower end and an iron wedge inserted in the split it was impossible to remove them. The threads varied in

size owing to the bolt sizes, and by cutting off the necessary length from each bolt the threaded portion would



The Threaded End of the Bolt Provided a Means of Feed for Cutting Other Threads

be removed, thus making it necessary to cut new threads on the bolt ends. The bolts being located so close together, it was impossible to use ordinary stock and dies. It required a special threading tool, which was made as follows:

The nut was placed on the end of the bolt and turned to catch one thread. A clamp, A, was made of flat iron and screwed fast to the nut with screw-head bolts, as shown. A piece of flat iron, B, was drilled to fit the clamp A, the other end being provided with a thread and nut. An arm, C, was made of a piece of iron and bolted fast to the flat iron B. A thread-cutting tool, D, was made of flat tool steel, ground to the proper cutting point, and then clamped to the flat iron B with three screws. The device was placed on the bolt and the nut given a turn on one thread, then a wrench was applied to the bar B and by turning the nut, the tool cut the thread, the nut being used as a means for the feed. After cutting the thread the bolts were cut off at E.—Contributed by A. L. Kerbaugh, Allentown, Pa.

Turn the tailstock center of a lathe sufficient to take up the slack, and no more.

To Remove Burrs from Holes

The block shown is typical of many drilling jobs. Two holes, A and B, are to be drilled and one runs into the other. It makes no difference which hole is drilled first, the second hole throws up a burr in the first. The softer the metal the larger the burr, especially on brass. If one of the holes cuts only part way through, a small, thin shell of metal is left rather than a burr.

To take out the shell or burr, grind an ordinary twist drill flat on the end, and give the usual clearance to the flat edges. A drill so ground will do better and quicker work than one having a taper point. It will cut fast enough, and remove the proper amount of metal to please the most exacting production manager.

Another way in which this can be done is to insert a plug in the hole first drilled. If one or two pieces are to be drilled, this is a good way, but is too slow for quantity work. For a hole that only comes half through, a half round may be filed in the plug and it can be used over and over again.

Covering Paint in Pots Overnight

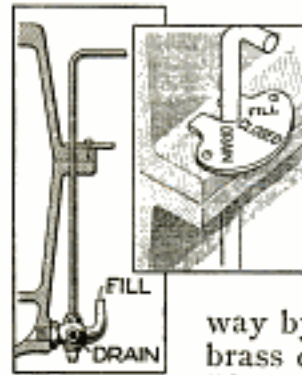
Paint in pots left overnight will harden on the surface sufficiently to make a scum that must be removed before starting work the next day. I avoid this by covering the surface of the paint in the pot with a disk of wax or paraffin. The disk is about $\frac{1}{4}$ in. thick, and should be of a size to fit snugly in the pot so that it will float on the surface of the paint. This covering prevents any scum from forming and



keeps the paint free from small bits of hard paint. When molding the disk a piece of wire should be put in so that a part of it will project from one surface, to make a handle for lifting the disk out of the pot.—James A. Hart, Philadelphia, Pa.

Dial to Locate Swing of Oil-Cock Control

The oil cock on the engine of an automobile was of the combination filling and drain type; that is, it could be opened one way to receive oil into the crank case, and the other way, to drain the lower half of the crank case of oil. The lever controlling the cock was made, as shown, without any provision for guiding it. The case was frequently drained by mistake when it was de-



sired to open it for filling, causing the sod pan to drip continually from waste oil. A plan was finally devised to prevent the turning of the control the wrong way by making a piece of brass on which the words "fill," "closed," and "drain" were stamped, and then fastening it to the flange of the upper case by means of screws.

Making a Reamer Cut Oversize

When a smooth, round hole of small diameter is required, a hand reamer is used to produce it, and many times the reamer is from .001 to .004 under size. The reamer may be made to work effectively in the following manner: With a scraper made of a medium-size, half-round file, burnish the face of each flute with the oval side. This will raise an edge and cause the reamer to cut larger, the size depending on how long and hard the faces are burnished. This, of course, does not make a permanent edge, but it does very nicely in an emergency.

A Small-Farm Workshop

By FRANK L. RUSSELL

IT makes little difference whether a person owns a large farm or a truck garden, a place for small tools is not only convenient but almost a necessity. The house can be of a size proportionate to the requirements. The one illustrated is suitable for a small farm, and makes a place for the small hand tools, as well as provides a place where one can occupy spare time in making repairs and keeping the implements in proper shape.

The size of the house is 7 by 12 ft. and 7 ft. high at the eave. Lay out the ground selected for the size of the house and make a level place, digging into the earth from 4 to 6 in., on which to place a solid floor. A box or inclosure should be made of boards so that its inside dimensions are 7 ft. by 12 ft.

The height of this box may be from 6 to 8 in., depending on how high the floor is to be raised from the surface of the earth. The upper edge of these boards should be well leveled in all directions so that in making the filling of concrete the surface will be level.

Tamp in a solid bed of cinders so as to make the surface a trifle lower than the surrounding ground. Make a mixture of concrete, using 1 part cement, $2\frac{1}{2}$ parts sand, and 5 parts of broken stone or gravel, and fill into the space to within about 1 in. of the top, tamping it down firmly while putting in the mixture.

The space left at the top is filled in with what is called a neat mixture, 1 part cement and from 1 to 2 parts sand.

This is struck off level with the upper edges of the boards and troweled to make it smooth.

As this forms a perfectly level surface there is no way to fasten the wood structure on top of it. The fastening, however, may be made in one of two ways: by setting bolts in the concrete while it is soft, or by drilling holes in it after it has hardened and leading bolts in the concrete.

In setting the bolts, be sure to have them about $1\frac{3}{4}$ in. from the edge, and that about 2 in. of the threaded end projects above the surface of the concrete. Two or three $\frac{1}{2}$ -in. bolts are required for each end of the building, and four or five should be used on each side.

A plate made of studs, 2 by 4-in. material, is fastened with the

bolts so that its outer edge will be flush with the cement base. After these are securely fastened with the bolts, construct the end and side wall studs in the same way as building a house, cutting the studs to square the ends and making them with both top and bottom plates just 7 ft. over all. It will require four studs for each end and seven for each side. It is built up square on the ends as well as the sides, using two studs together at the corners. The upper plates are mitered at the corners so that the frame will be securely held together in a rectangle.

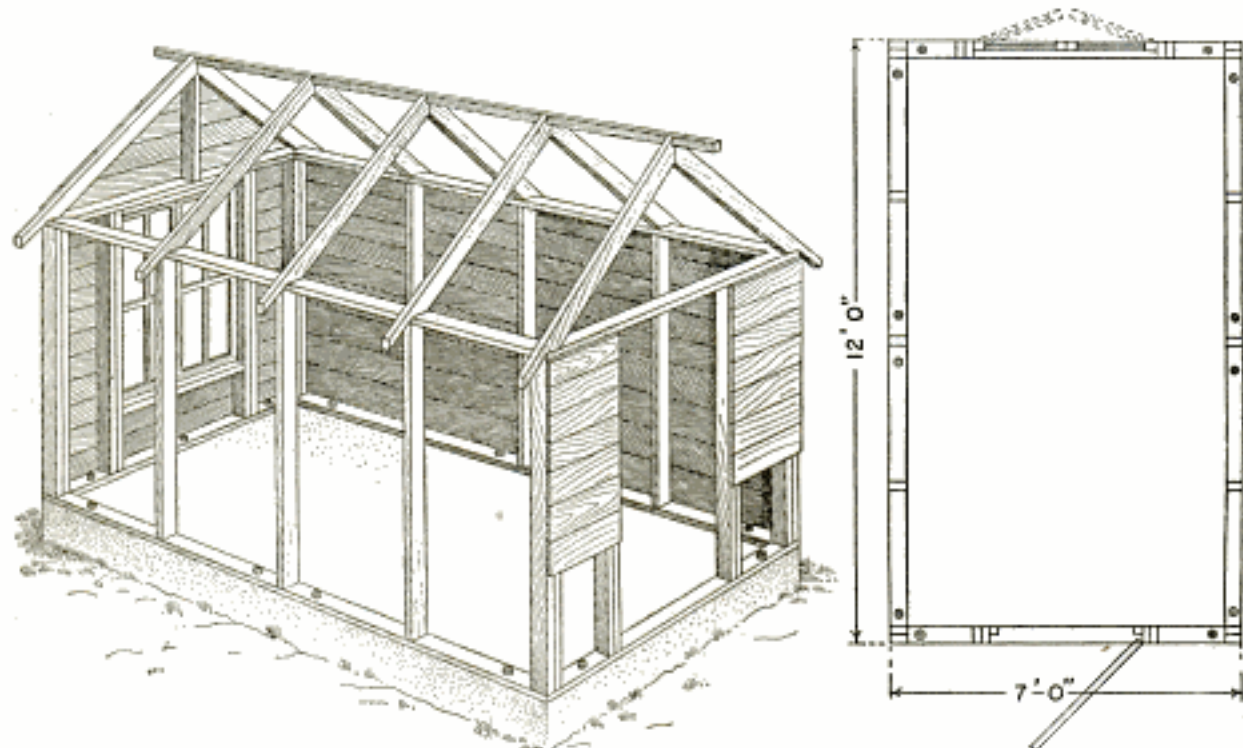
The rafters are cut to the pitch desired and fastened in position with a narrow board between their upper ends for a ridge. Ordinary siding can



A Place for Small Tools Is Not Only a Convenience but Is Almost a Necessity for the Farm, and a Workshop for Leisure Hours is Provided at the Same Time

be used, but since this is just a tool house and workshop, rough sheathing boards are put on, using halved joints

the pressure is sufficient to prevent the glass from turning. The tube was chucked and centered by running the



Ground Plan Showing the Location of the Studs and the Openings for the Door and Window, the Former a Regular Batten Door and the Latter Made Up of Two Casement Sash to Swing Outward

at the corners and allowing door and window spaces in the ends. Sheathing boards are put on the rafters and shingles laid.

The arrangement of the bench and hooks, or clips, for holding the tools can be made as desired and in the manner suiting the builder best.

Working Glass in Machines

At one time we had an order for a lot of glass tubes, inside diameter $\frac{1}{2}$ in., outside diameter $\frac{3}{4}$ in., and 10 in. long, to be threaded on each end with eight threads to the inch. The lathe was geared up for this thread, and a three-jaw universal chuck put on the spindle. The tubes were chucked with a piece of leather placed between the jaws and the glass. Near the other end of the glass tube the center rest was set, and a piece of leather was folded over each end of the center-rest jaws and wired in place.

This leather idea was to prevent scratching the glass surface. Very lit-

tle pressure is sufficient to prevent the glass from turning. The tube was chucked and centered by running the

tail center up and setting the jaws of the center rest. A 4-in. drum pulley was taken from the small tool grinder and put up over the lathe, and a tool-post grinder, carrying a beveled emery wheel, was set in the tool post instead of the threading tool. The tool-post grinder was belted to the 4-in. drum pulley, and the emery wheel set with a center gauge, whereupon the thread was cut as usual.

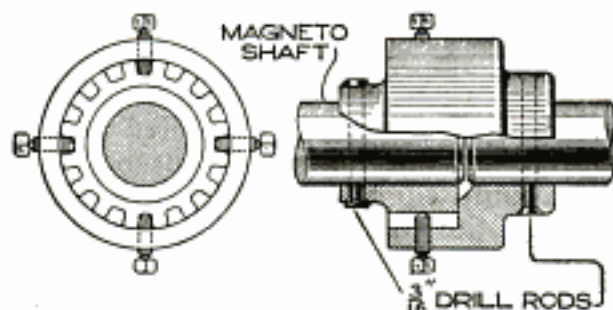
We found that by using hard wheels, dressed to suit the work, or by using a combination of wheels, glass can be worked as easily as cold-rolled steel. This would apply to planer work as well. Glass should be worked at high speeds, and a dull surface will be the result. The emery wheel must be kept wet, either by using a centrifugal pump or by means of the tin can with a hole punched in the bottom.—Contributed by J. B. Murphy, Plainfield, N. J.

☞ A little salt put in a forge fire will sometimes help wonderfully.

Homemade Magneto Coupling

In overhauling an automobile it was desired to change the ignition system from low to high tension. The high-tension system necessitated the installing of a magneto generator, and in addition a special type of adjustable coupling between the generator and the engine. The adjustment is necessary in order that the spark may be advanced or retarded at will. The magneto installed was a secondhand one, but to install a new coupling meant an expenditure of nearly twice that of the magneto. This being the case, it was decided to make one, with the result shown in the illustration.

A search of the junk heap in a nearby garage produced an old transmission spur gear and an old clutch ball-bearing housing. The gear was carefully cleaned up in a lathe and rebored to fit the magneto shaft, after which it was riveted in place, a piece of $\frac{3}{16}$ -in.

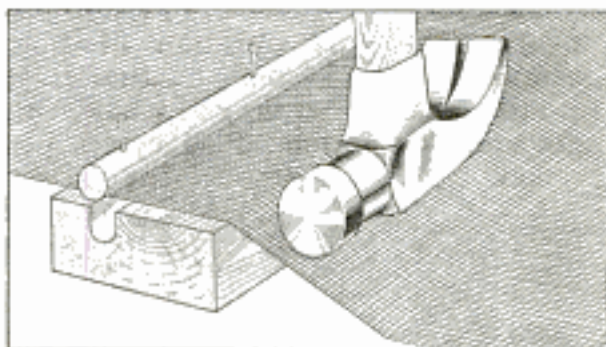


A Spur Gear Used as an Adjustment in the Coupling Driving a Magneto

drill rod being used as a rivet. The old ball-bearing housing was then rebored to fit the water-pump shaft, while the other inside diameter just happened to fit the outside diameter of the gear. Four holes were drilled, evenly spaced as shown, and tapped for four setscrews. The housing was then riveted to the shaft, the same as the spur gear. The setscrews serve as a connection between the two members of the coupling. The relative position of the two parts is varied by merely unscrewing the setscrews and turning the gear as desired. A small leather cover was provided for the complete coupling, to protect it from the grit and dust.—Contributed by Adolph Kline, New York City.

Stretching Window Screens on Frames

The screen wire is first fastened along one side with tacks, then this edge of the frame is placed against

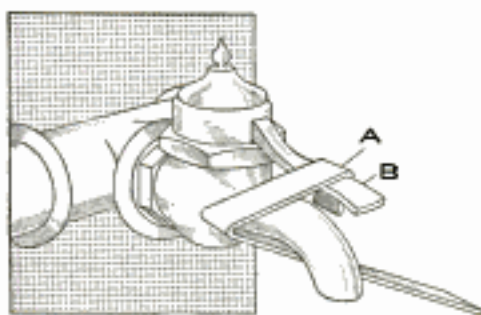


Stretching Window-Screen Wire on Frames with the Use of the Hammer Head

some support while it lies on the bench top or table. The screen is then stretched with the hammer head placed on the extending end of the screen and pressed down in the successive positions as shown. The screen will stay taut after removing the hammer, as the bend will hold it while the tacks are driven.—Contributed by E. K. Marshall, Oak Park, Ill.

A Faucet Lever

Upon a self-closing faucet I attached a piece of band iron, A, bent as shown and hooked over the faucet lever B and under the spout. The shape of the angle was such that if the lever was raised by taking hold of it at the end, it would pull down the faucet lever B, allowing the water to

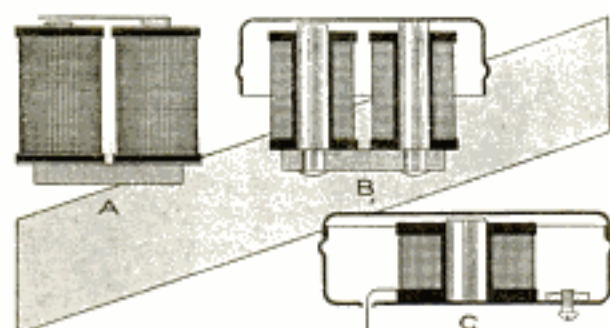


An Extra Lever Attachment for a Self-Closing Faucet to Hold It Open

run as long as desired. Pushing the iron back closed the faucet.—Contributed by R. F. Pohle, Lynn, Mass.

B buzzers without Contacts

How often a person sees the inscription "60 cycles" on alternating-current motors without stopping to think what it means. Nine people out of ten will underestimate the duration of time designated as a second, so that it is safe to presume that very few have any adequate conception of 60 cycles per second. The buzzers about to be



Three Types of Buzzers without Any Moving Parts for Use on Alternating-Current Lines

described will furnish direct and positive evidence to the ears, and will demonstrate, where an alternating current is available, that make-and-break contacts, with their liability to get out of adjustment and become corroded, are quite unnecessary. The small bell-ringing transformer, operating directly on the commercial lighting circuit, is largely replacing batteries as a source of power for bell and annunciator systems, and it is very natural that such should be the case, because the results are more positive, and the expense in the end less than that occasioned by the constant replacing of exhausted cells. While the small transformer greatly reduces the voltage, it does not, of course, affect the alternations or their frequency; hence, all that would appear necessary in order to make a buzzer, would be to provide a suitable armature and a coil with an iron core.

Simple though this may appear, in carrying out the idea in actual practice one is apt to learn several things about the subject of vibration. As a simple initial experiment, provide a coil with an iron core, and if the resistance is not 50 ohms or more, so that it may be connected directly across the 110-volt

circuit, connect it up in series with a small water rheostat. Clamp a strip of steel—an old hack-saw blade will do—in a vise and bring the coil near, having previously arranged a piece of board on which to place it. Vary the length of the spring projecting from the vise and note that there is just one length, about 2 in., for which the vibration will reach a maximum. It may also be noted that by shortening up the spring beyond this point, it may again be brought into phase by adding a small weight near the end. As 60 cycles means 60 reversals of the current per second it will cause 120 distinct magnetizations of the iron core, and when the spring is freely vibrating it is doing so at that rate. To furnish a comparison it may be stated that the middle "C" on the piano vibrates about 256 times per second.

This immediately suggests the simple form of buzzer indicated by the diagram A. Lay a piece of spring steel, or even tin, across the poles of a magnet and solder one end to one of the poles, which may be more easily done if a small hole is drilled in the spring at that point. With the edge of a knife slightly raise the other end barely the thickness of a sheet of paper, and the buzzer is complete. If the distance of the spring away from the pole is small enough, so as to cause it to hit the pole at each vibration, the tuning will be perfect.

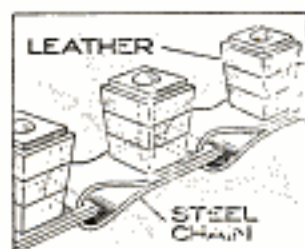
In the buzzer B, the sound is considerably increased by replacing the spring with a small tin box, from 1½ to 2 in. in diameter. After the solder sets, be sure to do no more than just pry the tin loose from the other pole.

In the diagram C is shown a buzzer that has a decidedly commercial appearance, as it is completely self-contained within a small tin box, such as used for shoe polish. The soft-iron core in the center should be just long enough to reach from the bottom to the cover. File it off squarely and solder it to the bottom. Slip the coil on, and if it fits loosely, fasten it with shellac and paper packing. Ground one wire to the tin, and solder a small

battery nut on the inside so that a connection can be readily made. The other wire may be let out through a hole. Put on the top and adjust it until a good loud buzz is secured, and then fasten it with a drop of solder. Test it again, and add a second drop of solder, about one-third of the way around. If the buzz still remains loud and clear, the addition of a drop of solder at a third point will settle the matter. It will be evident that as the buzzer is dust-proof and has no moving parts to get out of order, it should last indefinitely.—Contributed by John D. Adams, Phoenix, Ariz.

Homemade Belts for a Cyclecar

The V-chains, or belts, on my cyclecar wore out, and I constructed two chains that gave good satisfaction, in the following manner:



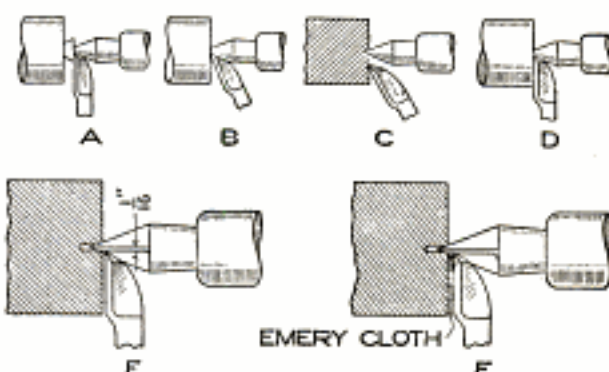
I procured enough galvanized-steel chain to extend around the pulleys, then from the nearest cobbler I procured enough scrap leather to make V-blocks for the links. The leather was put to soak, then cut into small pieces, and a hole was punched in the center of each piece for a rivet. The pieces were built up on a rivet to the desired thickness, and then they were cut to form a V-shape to fit the groove of the pulleys. For every link in the chain, a leather block was made and riveted to the link, as shown in the illustration.—Contributed by B. O. Bates, Campbellton, Can.

N. K.

A Center to Face and Polish in a Lathe

It often happens that amateurs, and sometimes even skilled workmen, have the troubles shown in the illustration when facing the ends of shafts in a lathe. In taking a roughing cut, more metal is removed than the depth of the center hole in the work, as shown at

A. At B is shown a tool set over at such an angle that it leaves tool marks, as exaggeratedly illustrated at



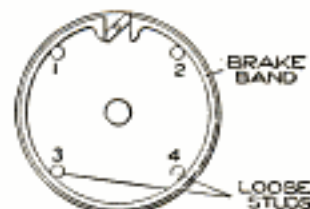
Center with a Cut-Out for the Tool in Facing and Polishing Work in a Lathe

C. If the tool is set as shown at D, the angle on the tool is too blunt at the point to fit into the space between the work and the lathe center, so that a burr is left similar to the one shown at A.

A good way to overcome or avoid these troubles is to use a center, as shown at E and F. A regular center is ground, or milled, to within about $\frac{1}{16}$ in. of the center point. This will allow the point of the tool to enter the center, and it will face the work smooth; besides, the work may be very easily polished by folding a piece of emery cloth, holding it between the tool and the work, and pressing it against the tooled face by means of the lathe carriage while the work is revolving.—Contributed by Geo. M. Jager, Irvington, N. J.

Repairing an Automobile Brake

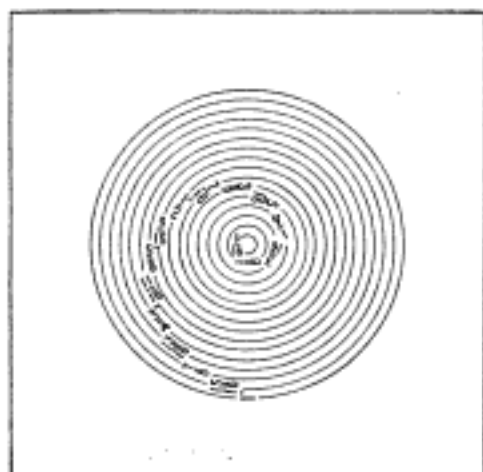
The internal expanding brake on a certain automobile gave trouble, and finally the car had to be laid up while repairs were made. In action the brake did not respond as quickly as it should, and when it did take hold it was so suddenly and so hard that the wheels slipped. An examination revealed nothing very wrong except that two



of the four studs, or posts, that spaced the brake band were loose. When new ones were made, driven in tightly, and riveted, the trouble ceased. These two loose studs let the band rise to the top when the cam was turned, and after considerable travel of the brake rod, the slack was taken up suddenly and so hard that it resulted in the slipping of the wheels.

An Aid in Drawing Fillet Lines

One of the most tedious operations in layout or detail work in a drawing room is the filling in of the lines of



Any Circle Set on Two Intersecting Lines Locates the Center for Drawing Fillet Lines

fillets, or arcs, tangent to two or more lines. The usual way of measuring the distance between points of the compass and then trying to strike the right center is slow and tedious. A simple contrivance for finding this center can be made as follows:

Procure a piece of transparent celluloid, about 3 in. square. Set the points of a pair of dividers $\frac{1}{16}$ in. apart, and with one point as a center, set it as near the center of the celluloid as possible and strike a circle, scratching the celluloid so that the circle can be plainly seen. Then with a $\frac{1}{8}$ -in. radius and the same center strike another circle. Make similar circles, increasing the radius by $\frac{1}{16}$ in., up to 1 in., or larger, if required. Prick a hole through the celluloid with the divider point at the common center. Scratch the radius length in figures on each circle, as shown.

If, for instance, it is necessary to draw a full-size $\frac{7}{16}$ -in. arc between two intersecting lines, lay the celluloid on the drawing, placing the circle marked $\frac{7}{16}$ in. tangent to the two lines for the arc. Run the marker through the center hole until it pricks the paper sufficiently to be seen when the celluloid is removed. This point will be the exact center of the arc, and a compass, spaced to $\frac{7}{16}$ in., will draw the arc correctly. It is not necessary, however, to space the compass on the rule, as the center is found and the spacing can be done directly from the drawing.—Contributed by W. A. Scranton, Detroit, Mich.

How to Mix the Electrolyte for Lead Storage Batteries

The electrolyte used in the various types of lead batteries consists of a mixture of pure sulphuric acid and pure rain, or distilled, water. Sulphuric acid, when concentrated, is a liquid having a specific gravity of about 1.835; that is, it is about 1.835 times as heavy as water. It is customary to carry all gravity readings out to three decimal places, and the gravity of water, which is 1, is written 1,000 and read 1,000 rather than 1. Then, by this reading, pure sulphuric acid has a specific gravity of 1,835. A lead storage battery will not operate with acid of this strength, and it is necessary to dilute it with water. The electrolyte should be mixed, preferably, in a large jar, or lead-lined tank, and the acid must always be poured into the water while stirring the solution vigorously. In the operation of the storage battery the specific gravity of the electrolyte reaches a maximum of 1,250 to 1,300 when the cells are fully charged, and drops from 100 to 150 points when the cells are discharged. The lower and upper working limits of the gravity of the acid may then be assumed as 1,100 and 1,300, respectively. The following table may be used in determining the parts of water both by weight and volume, and the percentage of acid to

water to produce the different gravities. The results in this table are based on the sulphuric acid having a specific gravity of 1,835 at 70° Fahrenheit.

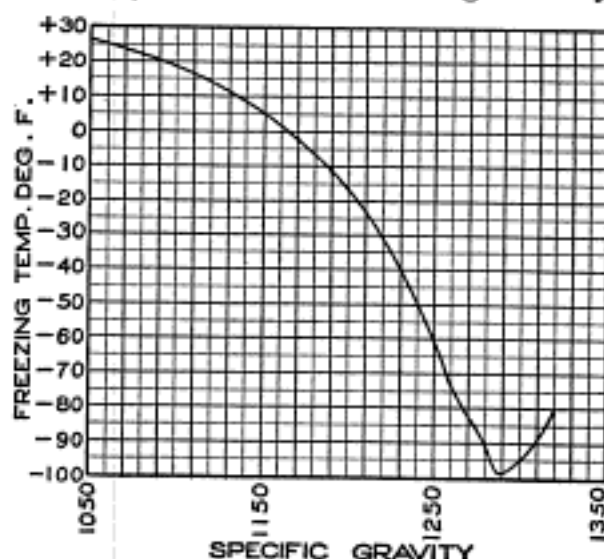
The electrolyte used in the storage battery expands when heated, and its specific gravity will change, although the actual strength of the solution will remain the same as before heating. The gravity of the electrolyte will change approximately one point for each 3° change in the temperature on the Fahrenheit scale. For example, if the electrolyte has a specific gravity of 1,250 at 70° F. and its temperature has changed to 85° F., the increase in temperature will cause the electrolyte to expand and its gravity will decrease one point for each 3° rise in temperature, or the total decrease in this case will be five points and the gravity at 85° will be 1,245. Similarly, a decrease in temperature will result in an increase in gravity. As a matter of convenience 70° F. is considered the normal temperature and all corrections in gravity due to a change in temperature are made so as to give the value of the gravity at 70° Fahrenheit.

Specific Gravity of Solution 70° F.	Parts of Water to One Part Acid		Percentage of Sulphuric Acid in Solution
	By Volume	By Weight	
1100	9.80	5.40	14.65
1110	8.80	4.84	16.00
1120	8.00	4.40	17.40
1130	7.28	3.98	18.80
1140	6.68	3.63	20.10
1150	6.15	3.35	21.40
1160	5.70	3.11	22.70
1170	5.30	2.90	24.00
1180	4.95	2.70	25.20
1190	4.62	2.52	26.50
1200	4.33	2.36	27.70
1210	4.07	2.22	29.00
1220	3.84	2.09	30.20
1230	3.60	1.97	31.40
1240	3.40	1.86	32.50
1250	3.22	1.76	33.70
1260	3.05	1.66	35.00
1270	2.90	1.57	36.10
1280	2.75	1.49	37.30
1290	2.60	1.41	38.50
1300	2.47	1.34	39.65

Parts of Water by Weight and Volume and the Percentage of Acid to Produce the Different Gravities

The temperature at which the electrolyte in the lead storage battery will freeze depends upon the specific gravity of the solution. The curve given in the sketch shows the approximate relation between specific gravity and

freezing temperature. This curve, as well as the other relations given, is used by one of the leading battery

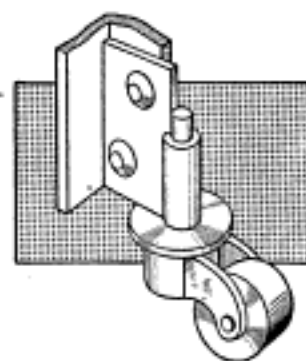


Curve Showing the Approximate Relation between Specific Gravity and Freezing Temperatures of the Electrolyte

manufacturers and may be considered, for practical purposes, fairly correct.

Attaching Casters to Angle-Iron Posts

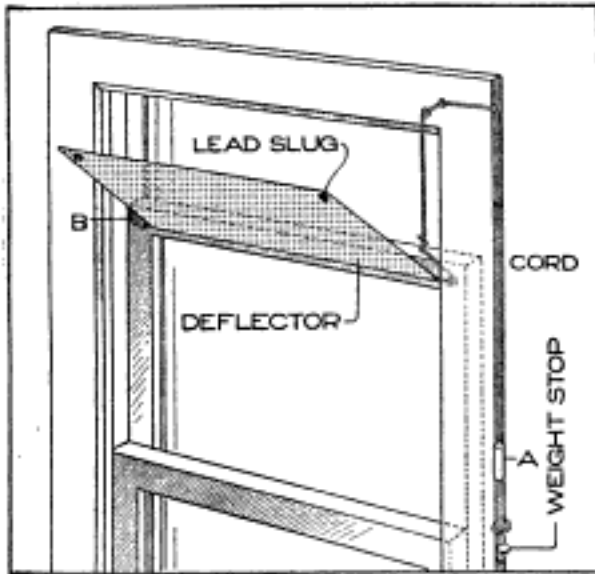
The illustration shows a method of attaching casters to porch cots, or any equipment constructed of angle iron, that must be moved from time to time. Many persons use cots of this construction on their sun, or sleeping, porches, and have had finely finished floors scratched and marred by the moving of the bed. The complete equipment is made up of two loose pin butts, using only the side with the double lugs, and is sawed in halves and riveted to the angle iron with the caster in place.—Contributed by W. D. Smith, San Francisco, Cal.



Use turpentine instead of oil when drilling hard steel, saw plate, and the like.

Automatic Draft Deflector for a Window

An office clerk working at a desk to the right of which was a large window, on many occasions found it impractical, or uncomfortable, to raise the lower section of the window on account of the cold draft and for the sake of the



Deflector Attached to Upper Crosspiece of Top Sash and Operated by the Sash Movements

safety of the papers on the desk. It was also impractical to lower the upper section of the window, as the current of air was directed downward with almost the same results.

The sketch is descriptive of an automatic deflector applied to the upper crosspiece in the top sash, in such a manner that when the section is lowered, the deflector automatically rises to an angle of 45° , and the air rushing through the opening is deflected upward, ventilating the room perfectly without any inconvenience to the occupants.

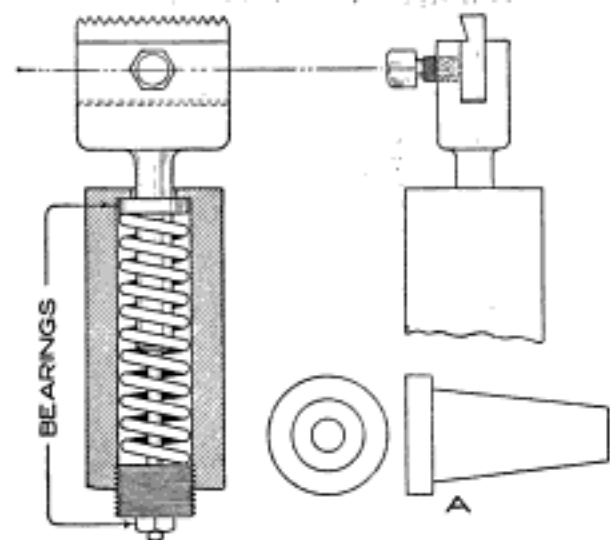
The deflector is made of a piece of canvas, stretched over a wire frame. As the window section is lowered, the weight A pulls the deflector up to a point where it is held at 45° by a small lug, or stop, B. As the window is lowered farther, the weight A is only pulled a trifle more in serving its purpose. When the top section is again raised, the weight A falls until it rests on the small stop or shelf, and

the loose string then lets the deflector drop flat against the window. Two small lead billets in the corners of the deflector aid it in dropping when the raising weight is lowered to its shelf. The weight A is a small piece of lead, which is not conspicuous, since it runs along the thin side of the casing. The canvas deflector can be painted the same color as that of the casing and sash, and does not give any unsightly appearance to the room.—Contributed by F. W. Bentley, Missouri Valley, Iowa.

A Threading Tool for Taper Work

The sketch illustrates a very handy tool for cutting threads on short tapers, shoulders, and the like. While the tool was designed for work similar to that shown at A, it is also good for straight work.

The casing, or body, is a steel block, drilled and tapped for a plug at one end, the plug having a bearing for the tool-holder end. In boring the casing, a small shoulder is left at the end opposite the plug, to afford a seat for a ring on the tool holder. This ring also provides a seat for a helical spring,



Tool for Use on a Lathe Not Provided with a Compound Rest, for Cutting Taper Threads

used to hold the cutting tool to the work, yet allows it to be forced away from the work when the pressure becomes too great, which occurs when the tool begins to remove more metal

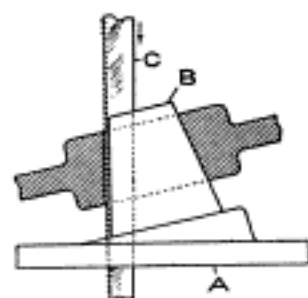
than is necessary to produce the thread. The cutting tool is simply a standard "chaser," used in every shop of any size.

The pitch of the chaser, of course, must agree with the pitch of the thread to be cut, and the line of the teeth points must coincide with the taper of the work to be threaded, and, having been so set, it is only necessary to tighten the setscrew, set the tool for depth, and start the lathe just as in cutting any thread. The lathe, of course, must be geared for the same thread that the chaser is to cut, so that the feed of the lathe carriage may not conflict with the thread the chaser is cutting.

The work may be either chucked or carried on the centers, and the tool is clamped on the carriage, as it is too wide for the tool post. At the end of the cut, the feed is thrown off, and the tool quickly backed out by hand as usual. The spring arrangement takes the place of the compound rest in this class of thread-cutting.

Cutting Key Seats in Taper Holes

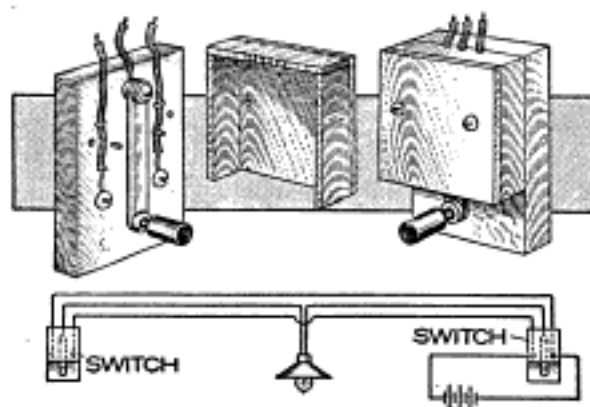
To cut key seats in magneto gears, or couplings on automobiles, which



have a taper bore, is quite a task if not properly equipped for cutting them. The illustration shows a simple jig to use with a tool similar to a broach. The jig consists of a casting, A, with a steel plug, B, tapered to fit the work. One edge of B is set so that it will be perpendicular to the base, and a key seat is cut in it. A toothed drift, C, is made of tool steel to fit the key seat, and tapered along the teeth so that the upper ones extend far enough to give the proper depth to the keyway to be cut. It is only necessary to set the work on the plug B and drive the drift in the same as a broach. —Contributed by Allan J. Monahan.

Two-Way Switch for a Hall Light

A very handy contrivance for those using gas to illuminate a house is a small electric lamp to run on a battery, the lamp being operated with two switches, one placed just inside of the door and the other under the nearest gas light. This will allow a person to see the way clearly until the gas is lighted, when the electric lamp can be

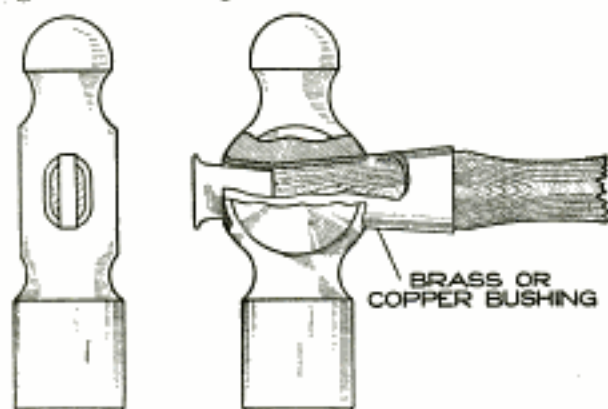


Operating an Electric Light in a Battery Circuit by Switches Located in Different Places

turned off without the trouble of returning to the door. For this purpose two-way switches must be used. They can be purchased cheaply, but are easily made by anyone at all handy with tools. The illustration shows the construction and scarcely needs a description. A small wood base, a piece of spring brass, a fiber, or wood, handle, and three screws are all that is necessary for one switch. The cover is in the form of a small box with one side removed, which can be fixed to the base with two screws. The wiring is shown in the diagram. The wires pass from the outside terminals of one switch to the outside terminals of the other. The center terminals connect directly to the lamp. The battery is connected to the two outside terminals of either switch. By this system of wiring, the lamp can be turned on or off at any time from either switch. The system is applicable to large rooms and basements where the gas light is some distance from the door.—Contributed by Morris G. Miller, New Rochelle, N. Y.

Reinforcing Hammer Handles

The illustration shows a method of bushing handles to prevent them from breaking at the eye of the hammer. The idea is one that will be appreciated by all machinists, toolmakers, and engineers that prefer tools of good ap-

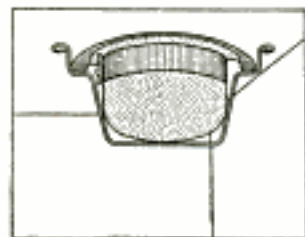


Bushing a Hammer Handle near the Head Where It Is Apt to Break Off

pearance and efficiency. Remove the handle from the head, and file the eye to the general shape shown, so that the bushing may be peened back to hold it in place. The front part of the eye is tapered uniform with the flat wedge, so that in driving the wedge into the end of the handle it also expands the bushing to the taper, and its sides force the wood of the handle and the soft bushing to the taper. This makes a neat and durable job, and adds much to the appearance of the hammer.

Hatrack for a Clothes Closet

Most clothes closets are built with a low ceiling, and do not provide sufficient space for hat hangers, so that the hats are apt to fall when taking out the clothes. In such a closet I made racks of a single piece of wire, bent as shown and nailed to the ceiling of the closet. Hats placed on these racks are more secure from falling, while within as easy reach.—Contributed by J. V. Loeffler, Evansville, Ind.

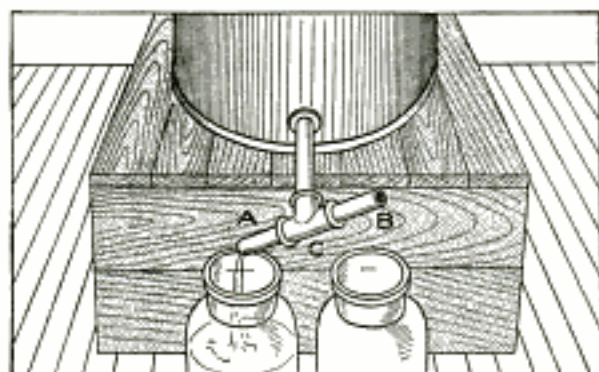


Cleaning Steel of Burnt Oil

The oil, coming in contact with the surface of steel when hardening, will burn in places, and is hard to remove. The cleaning can be accomplished easily by immersing the hardened tool in gasoline, and when exposed to the air, it will dry immediately. This will leave the part to be polished without the marks of burnt oil.

Shifting Continuous Flow of Liquid without Loss

It is practically impossible to change cans under a flow of liquid without spilling some of it or at least having it run down the sides of one or both cans. The sketch shows an arrangement of fittings which will positively eliminate this trouble. The flow of liquid from the vat, or tank, is through a pipe leading to the place for filling the cans. On the end of this pipe a tee is fitted and nipples, A and B, turned into the tee openings. It is only necessary to



No Liquid can Escape in Turning the Tee from One Can to the Other

turn the tee C, to change the flow from one can to the other, and there will not be a drop of waste.—Contributed by Ralph E. Frizzell, Cleveland, Ohio.

Lathe-Center Lubricant

White lead and sperm oil, mixed together with just enough graphite to give it a dark color, make a good lubricant for lathe centers. This grease can be kept in a tin box, and oil added when necessary, to keep it from becoming too thick.

BUILDING A HOME

By Geo. M. Petersen



PART IX—Interior Decorations

NO matter how artistically the interior of a home may be designed, how expensive the woodwork and floors, or how excellent the workmanship, it will never look right unless the decorations are in strict keeping with the interior finish. Many houses, finished by the contractor in a first-class manner, when turned over to the owner are spoiled by the latter by poor decorations, which reflect on the workmanship of the contractor when it is not his fault. As a rule, keep the decorations light, and do not make the mistake of selecting dark stains and wall papers or freak color schemes, as they soon become tiresome to the eye.

The best way to obtain satisfactory results is to secure the services of some experienced decorator and have him make suggestions and submit figures. The cost may be too high, but the owner will benefit by the suggestions. If this course is not convenient, however, the builder might use the sugges-

tions given in the following table to good advantage, changing the proposed color schemes to suit personal taste.

Of course, the color schemes of the various rooms must be such that those adjoining each other will appear well, and have a tendency to blend together when the doors are opened between them. It will be well for the inexperienced decorator to bear in mind that direct and positive contrasts are much more desirable than are poorly selected "matches" or "near-blends" that do not harmonize.

Rooms with only a moderate number of windows should never be decorated with dark paper or stain, and bedrooms should always be light and airy. As mentioned in the table the wall paper should be in light tints of yellow, pink, green, blue, certain shades of brown, etc.; plain colors, with a small flower pattern or a narrow vertical stripe. If a border is wanted, it should be only a

COLOR COMBINATIONS

Room	Wood Finish	Wall Decoration
Vestibule	Natural Wood	Light Brown, or Tan
Hall	To Match Vestibule, or Living Room	Light Brown, Tan, or Living-Room Effect
Living Room	Light Weathered Oak	Tiffany Blends
Library	Mission	Leather Effect
Dining Room	Fumed Oak	Medium Brown Shades
Bathroom	White Enamel	Glazed-Tile Paper
Bedrooms	White Enamel, or Natural	Light Blue, Pink, or Green, with Small Figure
Kitchen	White Enamel, or Natural	Oatmeal Paper, or Tint Plaster
Pantry	Natural	Oatmeal Paper, or Tint Plaster
Upper Hall	White Enamel, or Natural	Medium-Light, Striped Paper

3 or 4-in. cut-out design, or a narrow band placed close to the ceiling. Any picture molding should be placed in the angle formed by the walls and ceiling. Dark colors in bedrooms are oppressive and for that reason should be avoided. Large, striking or peculiar figures should never be used in a bedroom.

Bathrooms are generally finished in white throughout. If a white tile floor is too expensive, the oak, or yellow-pine, floor may be finished natural, and the wainscot enameled white. The wall paper should be one of the glazed-tile designs with a plain white glazed ceiling.

While genuine tiffany blends are a little expensive, they not only set off the room in which they are used, but also do away with redecorating for several years. Like most high-grade materials, tiffany blends will stand up for a considerably longer time than wall papers costing a few cents less a roll. These blended effects also set off the furniture to advantage and harmonize well with any finish. Tiffany blends should be hung over a lining paper, which will protect the colors from the effect of any loose lime which may be in the plaster. Too much lime, or lime that is improperly slaked, will cause a multitude of little hair cracks on the surface of the finished plaster. Usually a coat of shellac varnish applied to the spot will protect the paper from becoming discolored, but the best method is to line the wall before putting on the paper, as the lime is very powerful and will work through the size which is put on the walls before any paper is hung.

Wall boards are being used quite extensively at the present time, and their use is practically unlimited. Wall boards are made of a wood fiber; not "trunk board," "press board," or so-called "waterproof" boards, which cannot be sized to take paint properly or are so permeated with grease that paint will not stick to them. Be sure to procure from the manufacturer or his agent a written guaranty that the board can be properly decorated, and

also samples of the board decorated as desired. These samples will not only show how the board takes the paint, but will serve as a guide in doing the work. The rich tones of flat colors, and the artistic "blended" and "stippled" effect, which may be obtained upon wall boards, are limited only by the decorator's artistic ability. Stenciled designs may be obtained at a very nominal cost, and are easily applied even by the inexperienced. There are a few points in connection with wall-board decoration, and the suggestions given, if carefully followed, will enable the owner easily to decorate his own wall board and save considerable expense.

See that the board is properly cut, does not buckle or bulge, and that at least $\frac{1}{8}$ in. is allowed between sheets. Apply a thin coat of wall-board primer, which is put up by all paint houses, using a little of the color selected for the finish. After the primer has set hard, the board may be painted in the usual manner, two coats being sufficient. If the board is to have a blended or stippled effect, the ground color is covered with a coat of blending color, applied before the ground color begins to dry. Blend the colors together, using a piece of cheesecloth, and giving it a circular motion. After the blending is completed and thoroughly dry, the stencils, if any are to be used, are put on in strict accordance with the accompanying instructions, care being taken to see that the panel strips, when applied, will not cut off part of the design. Leave plenty of edge around the stencil design so that it will show off to advantage and not appear crowded. The panel strips should be stained, shellacked, and varnished, and all panels decorated before putting the strips in place, as it is absolutely impossible to decorate a panel nicely with the strips fastened to the wall.

Finishing interior woodwork and floors is a very broad subject, and leaving out all "tricks" of the trade, a good job may be obtained if the work is done in accordance with the following suggestions: Upon the comple-

tion of the interior woodwork, and before any decorating is done, the surfaces of all wood parts to be stained, painted, or enameled, are lightly sanded, and all knots varnished with shellac. The surfaces are then given the priming coat, if paint is to be used. After the priming coat has hardened, any imperfections in the wood are filled with putty, using a wood spatula, as steel will mar the finished woodwork. The next step is to apply a second coat of paint mixed with turpentine and boiled linseed oil in equal quantities. The paint will dry out with a dull, or flat, surface, which will take the third coat properly. The third, or last, coat may be a regular ready-mixed "gloss" paint, or a prepared "flat" finish, as desired.

When enamel is to be used, the woodwork is usually given three coats of "flat white," the same as mentioned for the second coat in the preceding paragraph, and two coats of white enamel. The first coat of enamel should be lightly sanded before the second coat is applied. The finish coat may be left glossy, or may be rubbed with fine sandpaper or curled hair, to give it an "eggshell effect." Because of the great amount of work required to keep white-enameled woodwork clean, a number of first-class decorators are finishing the window sills, medicine-case doors, closet seats, and room doors in mahogany. White enamel and mahogany make a very pleasing and artistic combination, and the mahogany is naturally better adapted for places coming in contact frequently with the damp and soiled hands of children. The mahogany doors also set off the white-enamel trim to much better advantage than those having white surfaces.

Where interior woodwork is to be stained and varnished, the method of procedure is somewhat varied. If the material is oak, ash, chestnut, or any other open-grained wood, a coat of paste filler should be applied. Liquid fillers are often used, but are not, as a rule, satisfactory for the succeeding work. Paste fillers are applied with a

stiff brush and well rubbed in. After having set for about half an hour, the paste should be rubbed off with a handful of shavings, excelsior, or a rough cloth, rubbing across the grain and not with it. If the wood is to receive a stain, mix the filler with the stain. If the stain is applied to the wood and the filler afterward, it is very likely to produce small gray spots in the grain of the wood. Acid stains cannot be mixed with the filler. All putty work should be done after the filler has been wiped off and the work given a coat of shellac varnish. The putty is mixed with the color of the stain. Allow the shellac time to dry, and give the work a coat of good varnish. Do not use a cheap varnish, as it will dry with a too high gloss; will not cover as much surface or as well, and will not last as long. Never varnish in a damp room, as it will dry "tacky" or "sticky" and may never dry hard. The ideal place for drying varnish is a dry, warm room with plenty of sunlight. It may be well to mention that dark rooms should not be white-enameled, as the enamel will turn yellow in a short time. If a light stain will not do for the woodwork, it is better to use a cream, or old-ivory, color and paint it.

If it is possible to stand the expense, have the first coat of varnish hand-rubbed, and a second coat flowed over it. Sometimes as many as seven coats of varnish are applied, each coat being "flatted" before the others are put on, but one or two-coat work is sufficient for medium-priced houses. The woodwork may be finished with shellac, if preferred, but at least three coats are necessary.

The "eggshell" or "dull-gloss" finish, so popular at present, cannot be obtained in cans, but must be hand-rubbed from gloss varnish, although a fair imitation may be obtained by mixing dull-gloss varnish and gloss varnish about half and half, as a large percentage of dull-gloss varnishes are too dull, and are worthless unless used over a gloss varnish. The method of mixing the varnishes is very satisfactory.

Outside doors, window sills, and any

places exposed to direct and intense sunlight, should be protected with exterior, or spar, varnish, which will stand the effect of the rain and sun.

Close-grained woods, such as pine and whitewood, do not require any filler, the stain being thinned to the desired shade and put on like a wash. After the stain has had time to penetrate the pores of the wood, it is wiped off with a piece of waste, or a soft cloth. The grain will then show up much better than if the stain is allowed to dry in. The shellac and varnish are put on in the same manner as for open-grained woods.

The first thing to do in finishing floors is to have them properly scraped by the carpenter, or a regular floor scraper, preferably the latter, as they specialize in this kind of work and do it a great deal cheaper than the average carpenter. No matter how carefully, or how well, a floor is laid, there are sure to be little imperfections which all the finishing possible will not efface, or cover up, and, therefore, they must be scraped.

Floors are usually finished in natural oak, the lighter shades being the most popular, as they do not show the dust like the darker surfaces. After the floor has been properly scraped, it is filled, or stained, depending on the kind of wood, as mentioned for interior woodwork. The floor may then be shellacked, varnished, or waxed. If a semigloss finish is desired and shellac is used, the floor should be given about five coats of thin white, or orange, shellac. Shellac stains, or discolors, the wood less than any other varnish, and has the additional merit of drying quickly and refinishing cheaply. When varnished floors are wanted, the woodwork is first given a thin coat of shellac over the stain, and then as many coats of varnish as desired. From one to three coats of good floor varnish is sufficient.

To produce a wax-floor surface properly, apply two thin coats of shellac varnish and then five, or more, coats of wax, thoroughly rubbed down and polished with a weighted brush, made

especially for the purpose, between the coats. Each coat of wax should be allowed from five to seven days to harden before the following coat is applied.

Do not make the mistake of trying to save money on floor wax by using beeswax cut with turpentine or alcohol. Beeswax is not floor wax, and it is unfit for this purpose. Floor wax is a compound manufactured especially for this work.

In remodeling an old house, the interior woodwork may be cleaned by burning off the old varnish with a blowtorch and using a scraper, or it may be removed by the application of varnish removers and a stiff brush. While the latter method is a trifle slower and a little more costly, it is the best, as the fire hazard is removed entirely, and there is no chance to have any scorched woodwork. All varnish removers are volatile and highly inflammable, and should never be used in a room in which there is a fire of any kind. Varnish removers are used almost exclusively for cleaning out molding, which would be almost impossible to do with a blowtorch, and for cleaning floors.

For cleaning old wax floors, a 10-percent solution of carbonate of soda is the finest thing known. The soda is dissolved in hot water and applied with a brush, after which the solution is wiped up and the floor thoroughly rinsed with clean, cold water.

Locating Point on Planer Work to Set Pin Gauge

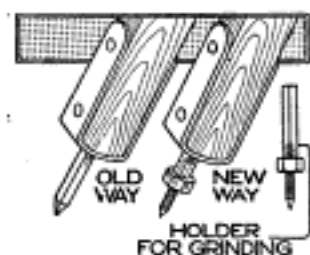
When pin gauges are used, mostly in large shops, on planer or boring-mill work, it is often a tedious job to find the point, exactly under the tool, where one wishes to face off the boss, or other elevation, to a certain height. To locate this point, squirt a few drops of oil on the tool, and where the oil drops will be the exact location for the lower end of the pin gauge. This appears to be very simple, but it saves a great deal of time.—Contributed by W. E. Butler, Wausaukee, Wis.

To Keep a Long Stencil from Sagging

Doing stencil work alone on walls and ceilings is a tedious job, especially when the stencil is 10 in. or more long. In brushing one end, the other end hangs down in the way, and there is also danger of smearing the work. A remedy for this is to tack a thin strip of wood to one side of the stencil—a yardstick is about the right size. This will hold the stencil flat to the wall and avoid all danger of smears. In making lines on ceilings, I alone have in this way handled stencils that were 3 ft. in length, and made a good job of it.—Contributed by Claude O. Soots, N. Salem, Ind.

Removable Spurs on Ladder Ends

Working as a beltman in a large manufacturing plant, I had considerable trouble in keeping the spurs on my ladder sharp. The floors were of wood, and a great many times the spurs would strike nails or pieces of metal on the floor, thus dulling the points. When dull, it was quite a task to remove and sharpen them. To overcome this difficulty I made the ends to hold a threaded spur, as shown. It is now very easy to remove the spur when it becomes dull, insert it in a holder, and grind a sharp point on it.—Contributed by William F. Gunn, Chicago, Ill.

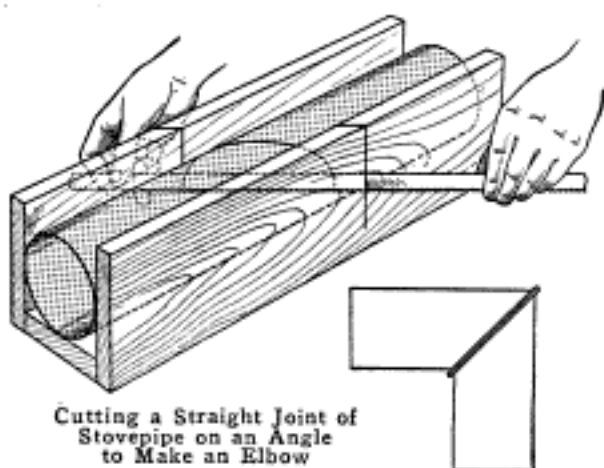


Stiffening Thin Wall Board

If thin wall board, the cheap kind that is weak and flexible, is given a coat of filler and a coat of oil paint on each side, it will not only be preserved against warping, but will become decidedly stiffer and stronger. Painting on one side only does not prevent warping, and only slightly increases the strength.

To Make a Stovepipe Elbow

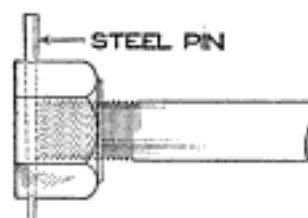
In a mining camp, far from a supply station, we received a lot of stovepipe, but there was not one elbow



among them. To construct an elbow, which was badly needed, I made a box like a miter box, and cut a slot with a saw across the top, at a perfect 45-deg. angle. Then, with a hacksaw blade held in the hands, I sawed down through a straight length of pipe as shown. About $\frac{1}{4}$ in. of the stock on each slanting end was turned up like a flange. These flanged ends were set together to form the proper angle for the pipe, and then riveted, after which they were folded over to make the joint smoke-tight.—Contributed by W. A. Lane, El Paso, Tex.

Holding Threaded Studs in a Bolt Cutter

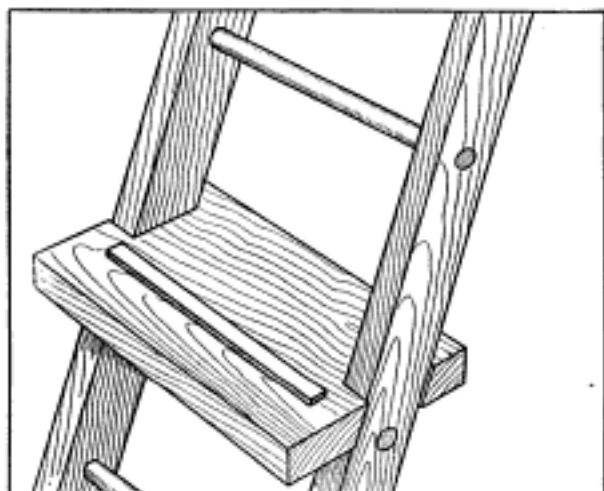
Short studs, or studs with only a small part left without threads, present a problem for the bolt cutter. In a certain machine-repair shop the usual scheme was to use a locknut, or to let a nut jam on the imperfect threads of the end first threaded. Both of these methods are crude and inefficient, as much time is lost in removing the stud. The following is an effective



and simple solution of the difficulty. A hole, drilled through the base end of a nut as shown, is provided with a slightly tapered pin. The operation is evident. One end of the stud is threaded, the nut is placed in a vise, and the stud run up against the pin. After the threading, the pin is easily backed out by a slight rap and the stud removed with the fingers.

Flat Step for a Round-Rung Ladder

One who is not accustomed to painting, finds that the rungs of the ladder soon make the feet tired. This may



Flat Step to Fit on Ladder Rung, to Prevent the Feet from Becoming Tired

be prevented by procuring a plank, $1\frac{1}{2}$ in. thick, 8 in. wide, and as long as the width of the ladder, and cutting notches in the ends to fit the sides of the ladder, for a step. Nail a small strip on the step, as shown, to keep the feet from slipping. The plank can be changed from rung to rung as desired.—Contributed by W. S. Drace, Richmond, Mo.

Heating Tips of Tools for Hardening

When it is necessary to heat the tips of tools to harden or anneal them, use a raw potato to prevent any other part of the tool from heating, as follows: Stick the tool through the potato, leaving only the portion to be worked projecting, and the heat will reach only the exposed part.

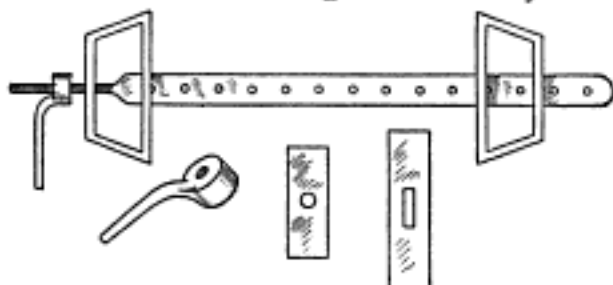
Using a Large Planer for a Press

Sometime ago we had several steel tubes, about 5 in. in diameter and 4 ft. long, which had to be a press fit over the piston rods they were to cover. Not having a press large enough to handle the job, we were stuck until the following idea was hit upon. There was about .003 in. left for a force fit. Both ends of each tube were capped and live steam turned into them, which enlarged them about the amount mentioned.

The rods were bolted upon the platen of a 36 by 36-in. planer, and a solid back stop was erected just far enough away to allow for starting the tube. When all was ready, the steam was turned off, the caps removed, and the tube lifted in position and shoved on by hand for about 8 in., when it began to go hard; then the planer was started very slowly, which pushed the tube home without further trouble. The whole scheme worked out very nicely and without much trouble or outlay.—Contributed by A. Dane, Pottstown, Pa.

A Carpenter's Clamp

The clamp illustrated is quite handy, as it can be made adjustable for almost any size of work. The bar is of cold-rolled steel, 6 ft. long, 2 in. wide, and $\frac{1}{2}$ in. thick, with one end forged into a round shank and threaded. Two dogs are used on the bar, one adjustable for any position with the aid of holes through which a pin is inserted in the bar. The other dog travels only the



One Dog can be Set at Any Position within the Limits of the Bar, and the Other Used for Clamping

distance of the threads on the shank by the use of the handle.—Contributed by H. J. Olsen, Hibbing, Minn.



Measuring Resistance with a Lead Pencil

By JOHN D. ADAMS

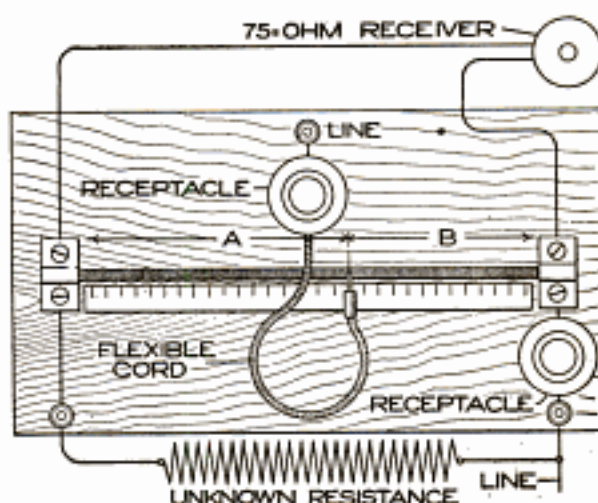
THERE are very few electrical experimenters who can afford a Wheatstone bridge for measuring resistances, and yet, if one is to gain any knowledge from his experiments, it is very necessary to know what resistance is being used, particularly in handling 110 volts. The amateur will find the following method very useful.

There are several brands of lead pencils, the leads of which have a resistance of 200 to 300 ohms, while others have comparatively little resistance. Soak several pencils—preferably the large kind carpenters use—in water over night so that the leads may be removed without breaking. Connect up two 40-watt lamps in series and note how they burn. Then replace one lamp with a lead and note the relative intensity with which the remaining lamp burns. If the lead is of a sufficiently high resistance it will cut down the illumination about as much as the additional lamp.

Having selected a lead, mount it on a suitable board, holding it in place by clamping each end under a strip of brass held down with wood screws. Next screw in place two porcelain receptacles and place three binding posts in position, all as shown in the sketch. Connect up as indicated, and attach a short length of flexible cord, with a metal tip on the free end, to one terminal of the central receptacle. Procure a cheap 75-ohm receiver and connect it to the two ends of the pencil lead. Finally glue on a paper scale.

To operate, place a high-resistance lamp in the center receptacle—say, a 15-watt lamp—to prevent heating, and almost any lamp of known wattage in the other receptacle. From the rating

of this lamp the resistance may at once be determined by Ohm's law. Thus, at 110 volts, a 25-watt lamp will have a resistance of 484 ohms; a 40-watt



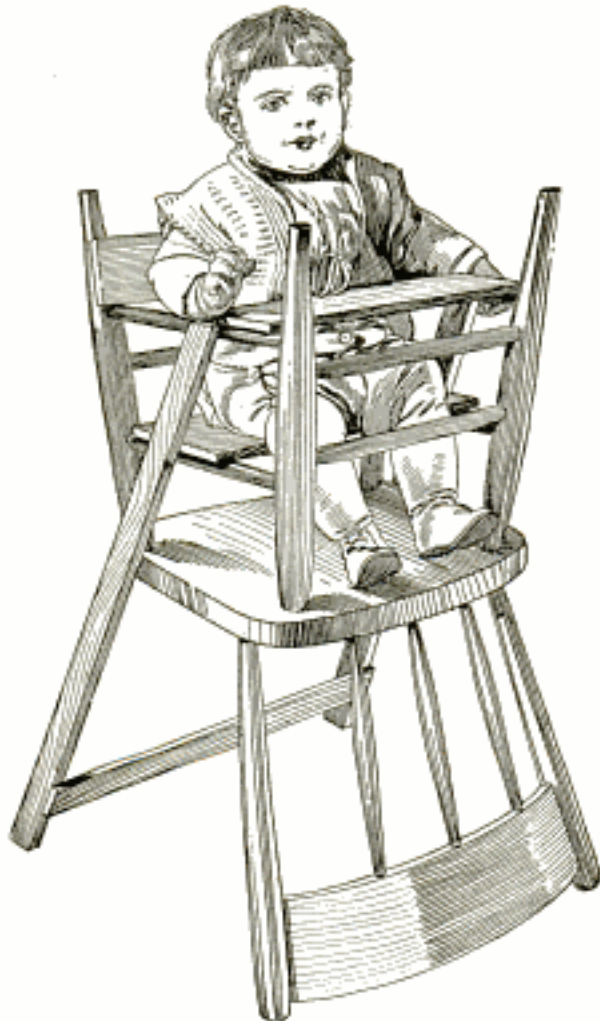
The Lead Taken from a Lead Pencil and Used as a Means of Measuring Resistance

lamp 300 ohms, and a 60-watt lamp, 200 ohms. Connect the unknown resistance, as shown in the drawing, and move the metal tip on the end of the flexible cord back and forth along the pencil lead until a point is reached where no sound is emitted by the receiver. This point will be very well defined, and as the connection is moved away from it in either direction the sound will increase rapidly. Note the reading on the scale, and then if a 40-watt lamp is used in the end receptacle, the unknown resistance will be $= \frac{300 A}{B}$.

The resistance of the center lamp does not enter into the computation, but by changing the lamp in the end receptacle, another set of figures may be obtained, and a means had to secure increased accuracy.

A High Chair

Where a high chair is not at hand or available, an ordinary solid-bottom kitchen chair can be used instead, if



An Inverted Solid-Bottom Chair with Attachments Used for a Child's High Chair

rigged up as shown in the illustration. The chair is reversed, and the back is used as one support, while two pieces of wood fastened to the sides form the other. A seat board is fastened to the upper side rounds, and a table board to the two lower side rounds. A small piece is nailed to the two back posts for a back.—Contributed by J. S. Fritzen, Minneapolis, Minn.

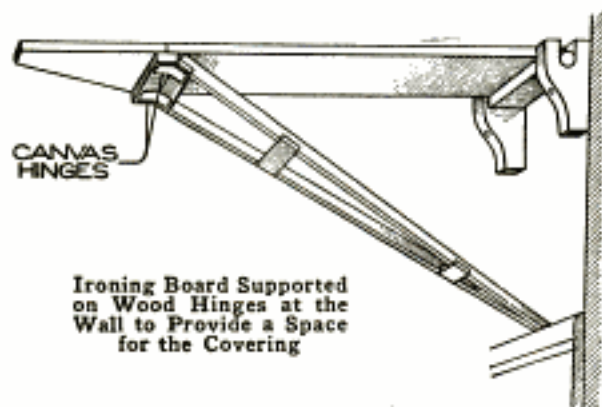
Blower for a Fireplace

Having considerable trouble with a smoky fireplace when trying to start a coal fire in the basket grate, I decided to make a blower of sheet iron. A

blower covers the upper part of the fireplace and forces the draft through the basket grate until the fire gets a good start, then it can be removed. Before making the blower I again had trouble one morning when the chimney would not draw, and the whole room became filled with smoke; I then grabbed a newspaper and held it up against the upper part of the fireplace like a regular blower. To my surprise the suction of the chimney held the newspaper in place without any outside aid. In a few minutes the fire was roaring, and best of all, when it became hot, the newspaper caught fire and was sucked into the flames. This in reality became an automatic blower, as it removed itself when no longer needed.—Contributed by Charles F. Kopp, Amite, La.

An Ironing-Board Wall Fastening

One of the most useful and convenient articles for a household is an ironing board, one end of which is fastened to the wall by means of hinges to allow it to be folded up against the wall when not in use. Wood brackets are preferable to the metal hinges, as there must be some little space between the wall and the board to allow for the thickness of the covering. The brace which extends from near the end of the board to the base of the wall is best hinged with canvas strips, as they will last better than any other material for this joint. The hinges should be put in place when the board is in a vertical



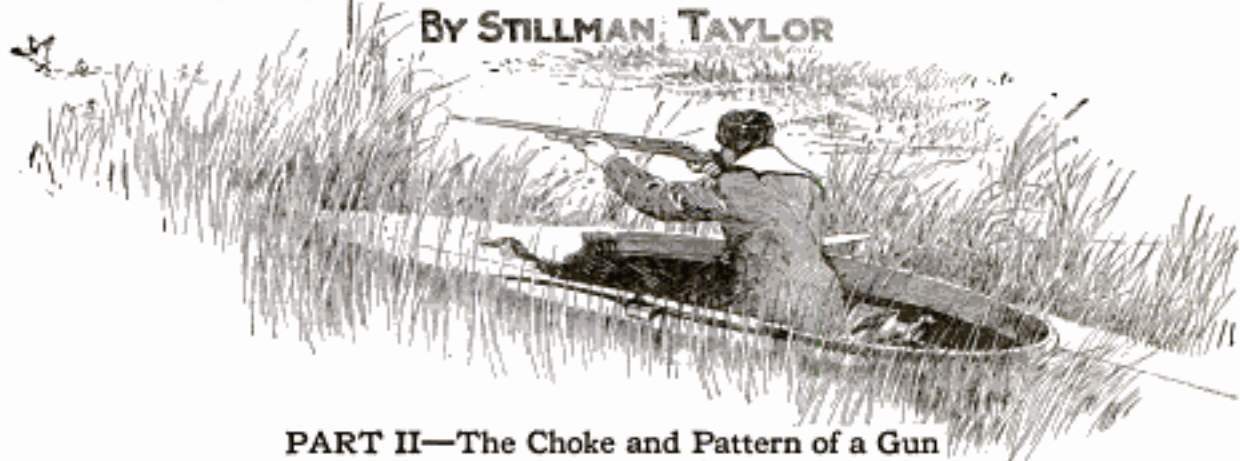
Ironing Board Supported on Wood Hinges at the Wall to Provide a Space for the Covering

position to allow the brace to go in position without straining.—Contributed by J. H. Beebee, Rochester, N. Y.

THE SHOTGUN

AND HOW TO USE IT

BY STILLMAN TAYLOR



PART II—The Choke and Pattern of a Gun

HAVING picked out a gun that "fits the man," the matter of choke and pattern should be considered. For trap shooting and for wild fowling, the full-choke gun may be considered a necessity, since it will throw the charge of shot within a relatively small circle; in other words, make a denser pattern. Chokeboring is accomplished by constricting the barrel at the muzzle from $\frac{1}{25}$ to $\frac{1}{50}$ in., the amount of taper depending on the size of the bore and gauge. The narrowing of the muzzle forces the charge of shot together and prevents the pellets from scattering over a wide area. Guns are bored with varying degrees of choke, from the full to the plain cylinder, and the manufacturers compare them by recording the number of pellets which any given choke will shoot in a 30-in. circle at 30 yd., or any other range selected as the maximum distance. This gives the pattern from which we find that the full choke produces 70 per cent, the half choke 60 per cent, the quarter choke 50 per cent, and the cylinder 30 per cent.

For trap shooting and wild fowling the expert considers it essential that his 12-gauge should be capable of throwing not less than 300 pellets; hence he selects a full-choked gun with a pattern of 300 or better. As a full-choked 16-gauge will pattern about 275, it may be used for ducks with good success. For a general-purpose gun, a pattern from 250 to 275 will prove quite

satisfactory for ducks and upland game, and this may be had by picking out a half-choked 12-gauge, or selecting a full-choked 16-gauge. The 20-gauge gives a pattern of about 245 shot, and thus scatters its charge over too large a circle to prove effective on wild fowl, although it is very effective on upland game, which is flushed not over 35 yd. from the shooter. A gun patterning from 225 to 250 may be considered the ideal upland gun, and this may be had by choosing a quarter-choked 12-gauge, a half-choked 16-gauge, or a full-choked 20-gauge gun. These are known as "open-choked" guns, are the most effective at short ranges, up to 35 yd., and cannot be depended upon to kill clean when used at longer ranges.

Shooting with Both Eyes Open

To handle the weapon well is the desire of every sportsman, and this knack is not difficult to attain, providing the novice will make a good beginning. First of all, it is necessary to hold the gun correctly, and while the forward hand may grip the fore end at any convenient point, a well extended arm gives a better control of the gun when aiming, by giving free play to all the muscles of the arm; hence the gun should be held in a manner natural to the shooter, rather than in imitation of the style of another.

The old manner of aiming the shotgun by closing one eye and sighting

along the rib is fast becoming obsolete, for better shooting may be done by keeping both eyes open. Doctor Carter was the first great exponent of binocular shooting, and while but few men can hope to approach this famous gunner's skill, every one can learn to handle a shotgun more quickly and with greater accuracy by following his common-sense method. It may appear a bit strange at first to disregard the sights and keep both eyes open, and aim the gun by merely pointing it in the desired direction, but to sight along the rib and attempt to see the bead on the muzzle end can only make a slow and poky shot. This old-fashioned method may be good enough for making patterns on a stationary target, but it is not much of a success for wing shooting. For fine rifle shooting the left eye is invariably closed for target work, but for snap-shooting both eyes are kept open, the sights are disregarded, and the aim is taken by pointing the gun at the object to be hit. Of course, there are many good gunners who shoot with one eye closed, but the novice who is anxious to become a good wing shot should make it a point to practice with both eyes open. Vision is always clearer, and the objects more accurately judged with both eyes open than with one, and when this is done, and one eye controls the line of aim, the shooter is not so likely to make mistakes in estimating the distances and the rapidity of the flight of his game. In shooting, the right eye naturally governs the right shoulder, and vice versa, and this is so because habit has trained the eye to do this. To find which is the master eye, hold a pencil out at arm's length and point it at some small distant object with both eyes open, then close the left eye, and if the pencil still points to the object, the right eye controls the vision, and is the master eye. Should the closing of the left eye alter the aim, the right eye must be trained by practice until it becomes the master eye, or else the gun must be shot from the left shoulder, which is many times more difficult. The modern way of

mastering wing shooting is to point the gun where both eyes are looking, and after a little practice this may be done quickly, and the charge thrown more accurately at the object than by closing one eye, or sighting along the barrel in the old manner.

The Knack of Hitting a Flying Target

When shooting at clay targets, or at a flying bird, allowance must be made for the swiftness of flight and the distance from the shooter to the game, or in other words, the shooter must calculate the speed of the flying target and allow the probable time it will take for the shot to reach its mark. To make a quick snap shot at the flying target, the gun may be directly thrown at the mark and discharged as quickly as possible, or the gun may cover the mark and be quickly swung ahead and the charge sent at the point where the swiftly moving bird will be found when the shot gets there. Snap-shooting is only possible when the birds are flying straight away or quartering, and as the shooter fires point-blank at the rapidly moving bird, the shot must be delivered so rapidly that only a very quick and responsive trigger and a fast man back of it can hope to score even a fair percentage of hits. A more certain way of aiming a snap shot is to throw up the barrel below the bird, then rapidly swing it to the proper elevation ahead of the moving target, and throw the shot at the point where the line of the aim and the flight of the bird intersect. For shots at quail, woodcock, and partridge in the brush, the quick snap shot often must be taken, regardless of the chances of missing, for to delay even a second will lose the bird. When a bird rises near the shooter, no allowance of lead or elevation are required, and the charge is thrown directly at the bird.

The rapid swing, however, is the most accurate manner of using the shotgun, at all angles and at any distance within the killing zone of the weapon. To make this shot, the gun must be thrown up behind the bird and

then rapidly swung ahead of it, throwing the charge without checking the swing of the arm. In this style of snap-shooting, the elevation of the gun must be identical with the flight of the bird, inasmuch as the gun follows it, and if the gun is swung about three times as fast as the bird is traveling, plenty of allowance for the time necessary to press the trigger and deliver the shot at the determined point will be made.

To swing deliberately and cover the bird with the sight, then shove the gun ahead to give the proper lead, is all right for duck shooting where the game is usually seen approaching and thus remains within range for a longer time. But this deliberate style of handling the gun is far too slow for the uplands, and since the rapid swing is the only accurate manner of cutting down the fast bird, and usually useful for wild fowling, the novice should confine his practice to this practical style of wing shooting.

Stationary-Target Practice

The first great mistake the novice is likely to make is the natural one of supposing that he must take his gun to the field and learn how to handle it by practicing at flying game. This is by no means the best method, and there is scarcely a poorer way of becoming a wing shot, because the gunner is intent upon bagging the game and forgets to observe the many little points of gunnery, shooting high and low, and making the hundred and one mistakes of judgment he would not be guilty of when practicing at a stationary mark. Snap and wing shooting is the last word in shotgun handling, requiring quickness in throwing the gun, as well as a trained eye to calculate the distance from and the speed of the flying target. To acquire confidence in using the gun, begin by shooting at a fixed mark. A good target may be made by obtaining a dozen, or two, sheets of stout wrapping paper and

painting a 4-in. circle in the center of each sheet. Tack it up on a board fence, or on a board hung on a tree, measure off 60 ft., and try a shot. The shot will not



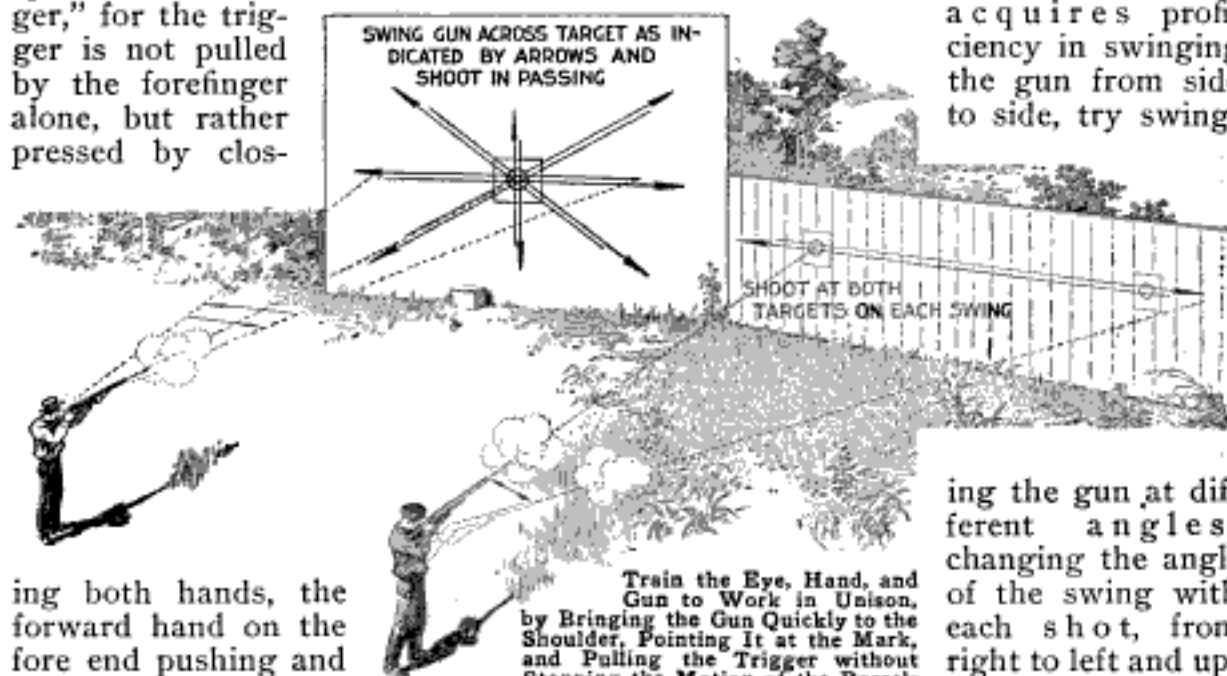
The Forward Hand may Grip the Fore End at Any Point, but a Well-Extended Arm Gives a Better Control of the Gun

spread very much at this short range, and it will be an easy matter to determine the result of your skill in holding a dead-on to the large mark. To avoid flinching and other movements of the head and body, caused by the recoil, begin your first practicing with a light powder-and-shot charge, say, about 2 dr. of bulk measure, or its equivalent in smokeless, and $\frac{7}{8}$ oz. of No. 8 or 9 shot. There is no advantage in using a heavier charge, and the recoil of the gun will appear much greater in deliberate shooting at a target than is likely to be felt during the excitement incidental to shooting in the field. A dozen shots at these targets will enable the gunner to make a good score by deliberate holding, and when this can be done without flinching, snap and wing shooting may begin.

Snap and Wing Shooting

The object which the gunner should now strive for is to train the eye, hand, and gun to work in unison, and to do this, bring the gun quickly to the shoulder, point it to the mark, and press the trigger without stopping the upward and even swing of the barrels. At the first few trials some difficulty may be encountered with the pressing

of the trigger at the proper moment, but a little practice will soon tell how to time the shots. Note the phrase, "press the trigger," for the trigger is not pulled by the forefinger alone, but rather pressed by clos-



ing both hands, the forward hand on the fore end pushing and closing, and the hand grasping the stock being drawn back and squeezed at the same instant. This is easily done, but rather hard to picture. After a few trials with an empty gun, the novice will see the point, and also discover the fact that the recoil of the arm is much lessened by this proper grip of the weapon.

Confine the first practice in snap-shooting to throwing the gun to the shoulder, and when proficient in hitting the mark, try a snap shot by swinging the gun from the side, right to left and also left to right. Do not attempt to check the even swing of the gun, but rather let the barrels swing past the mark, concentrating the mind upon pressing the trigger the instant the line of aim covers the mark. Practice swinging slowly, and after being able to hit the mark with the center of the charge pretty regularly, increase the speed of the swing. In doing this, it will be discovered that the speed of pressing the trigger must also be increased to balance the speed of the moving barrel, and very likely it will be found that the natural tendency is to press the trigger a bit late. This is the common mistake which

practically every novice makes when in the field, although the error is likely to pass unnoticed when after game.

As the gunner acquires proficiency in swinging the gun from side to side, try swing-

ing the gun at different angles, changing the angle of the swing with each shot, from right to left and upward, at an oblique

angle upward, and so on, until it is possible to hit the mark with a fair certainty from a variety of angles. When trying out the several swings, one should always begin slowly and increase the speed of the swing as he becomes more expert, only making sure to shoot by calculation and not by guess. The manner of acquiring expertness sounds easy and is comparatively easy, and, as it is the backbone of snap-shooting, improvement will be rapid if the novice is willing to practice slowly and master each detail in turn. Do not make the mistake of overdoing the thing at the outset by shooting too long at a time. A box of 25 loads is ample for a day's practice, since it is not how much one shoots, but how well, that counts.

Snap-Shooting at Moving Targets

When the gunner has reached the point where he can hit the stationary target by swinging his gun both fast and slow, he has acquired better control of the weapon than many old shooters, and he is well prepared to take up snap-shooting at flying or moving targets. The access to a gun club

where clay birds may be shot at, will prove of much value, but this is not absolutely necessary, since tin cans, bits of brick, and bottles, thrown in the air at unknown angles by a companion, will afford the needed variety. Better than this is one of the inexpensive "hand traps" which project the regulation clay targets by means of a powerful spring worked by a trigger. One of the large powder manufacturers makes a trap of this kind, and a very good trap can be had for \$1.50. The standard clay targets cost about \$2.50 a barrel of 500. Practice of this sort may be made a very interesting and highly instructive sport, providing the targets are projected from different and unexpected angles, thus simulating the many-angled flight of the live bird.

Value of Second Barrel in Shooting

The use of the second barrel should not be overlooked in practicing with the idea of becoming an all-around wing shot, for the second shot is often needed to kill a cripple, or bring down a bird which has been missed with the first shot. Two-shot practice should begin by placing two paper targets about 20 ft. apart, then shooting at the first one and continuing to swing the gun to cover the second target. Practice swinging from various angles as directed for the initial practice, increasing the speed of the swing as proficiency is gained, and fail not to profit by the mistakes which must inevitably occur to all who try to master the shotgun. After a reasonable amount of practice, conducted along these lines, the gunner may venture afield, and if his acquaintance includes an old seasoned sportsman who will point out the mistakes made, much may be learned regarding the knack of handling the gun, as well as relating to the haunts and habits of our wild game birds.

Cleaning and Care of the Gun

A good shotgun is a thoroughly reliable and dependable weapon, but as with all tools of the sportsman's craft,

the best results can only be had when the arm is in good condition. It is gun wisdom always to clean the weapon after a day's shooting, and the amateur should make it a positive rule never to put his gun away until it is cleaned. The sooner firearms are cleaned after the firing the better, and if cleaned before the burnt powder has had time to corrode the steel, much future trouble is saved. In cleaning the barrels, never rest the muzzle against the floor. If a rest is needed, use an old piece of carpet or a bundle of rags. Clean from the breech end only, as any slight dust, or burr, at the muzzle will greatly impair the shooting qualities of any firearm. Never use a wire-wheel scratchbrush, as it will scratch the polished steel; a soft brass-wire cleaner is the only suitable implement for this work. There are several good cleaners to be had. For removing any rust deposits, a brass brush may be used, while for ordinary cleaning, plenty of cloth should be run through the barrels, taking care that it touches every part of the interior. This is easily done by rotating the cleaning rod as it is pushed through the barrel from the breech to the muzzle. When putting the gun away, the barrels should be stopped, at the breech and muzzle, with tightly fitting corks, or gun ropes may be run through the barrels after soaking them in some good oil. To prevent rusting, cover the metal, outside as well as inside the barrels, by smearing on a little heavy lubricating oil. Slip covers of chamois are often used to protect the stock and barrels before putting them in the leather case, but stout woolen covers are better, since chamois is likely to absorb more or less moisture.

The mechanism of a gun is not exactly complicated, but the novice had better leave well enough alone and not attempt to dismount the locks or tinker with the mechanism. The modern steel barrel is very hard and not easily dented, but if so injured, it is better to ship it to the factory for repairs than to trust it to the crude methods of the average gun repairman.

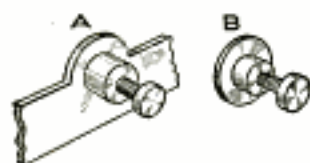
A gun should be given ordinary good care, and this is not forthcoming if one makes a practice of opening it and letting the barrels drop down with a bang. Snapping the triggers on an empty barrel is likewise foolish. If one desires to practice trigger pressing, put a couple of empty shells in the barrels.

If one owns a good-grade shotgun, the stock is probably finished in oil and hand-rubbed to a nice, durable polish. On cheap arms the varnish is usually employed to give an attractive finish in the store. Of course, this varnish will scratch, and otherwise come off,

and spoil the appearance of the arm. If a good finish is wanted, do not re-varnish the stock, but remove all the old varnish by using a little varnish remover, and rub down with oil. For an extra-fine polish, wet the wood to raise the grain; rub down with very fine sandpaper; wet the wood again, and sandpaper a second or a third time; then rub down with oil until the wood is saturated with it, and polish with a cloth, using plenty of pressure, and the stock will be as fine in appearance as if it had the "London oil finish" supplied with all high-grade guns.

Brass Machine Screws with Nuts

When small brass machine screws and threaded nuts to fit them are needed in small devices, or for experimental work, and the necessary taps and dies are not at hand, secure some old brass globe holders and cut out the threaded hole for the nut. The fastening-screw arrangement on these will answer every purpose very well. Enough metal can be left on each one to fasten it on wood, as shown at A, or they can be cut, as shown at B, if they are to be soldered to metal.



Snapper-Shell Ash Tray

An odd and unusual ash tray can be made from a snapping-turtle shell. Four brass, or wood, balls, or knobs, secured with screws, as shown, will keep it balanced. The exact points to place the supports under the tray will have to be determined by experiment, as no two shells are of exactly the same shape.



A Portable Fire Screen

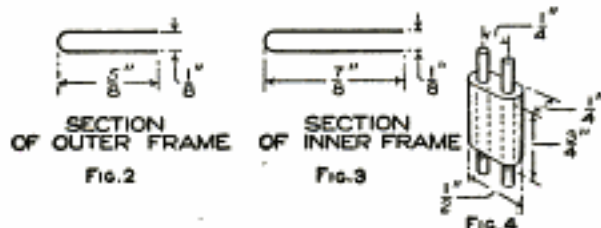
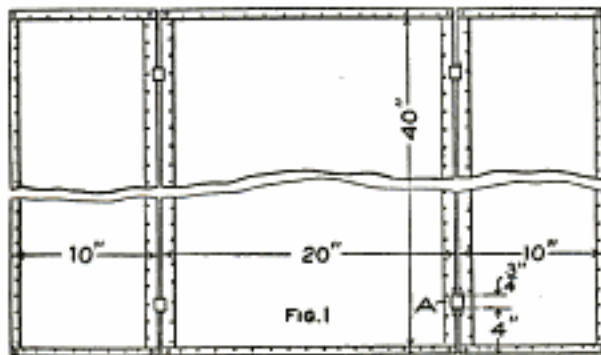
The fire screen illustrated can be constructed at very small expense. In brief, the screen consists of a light metal frame surrounding three pieces of $\frac{1}{8}$ -in. sheet asbestos. The frames enclosing the asbestos pieces are hinged together, as shown in Fig. 1, with special hinges made to meet the requirements.

The asbestos comes in sheets 40 in. square, and this size determines the outside dimensions of the screen. The size of the different sections can, of course, be changed if such a change will better suit the existing needs. By making the screen in sections it may be folded up and thus occupy much less space, and when in use, the sections, by placing them at an angle to each other, serve the purpose of legs, which would be required if the screen were in one straight piece.

The dimensions and form of the outer portions of the frame are given in Fig. 2, and those of the inner portions, or edges, where the hinges are attached, are given in Fig. 3. The joining edges of the frames are made wider than the others for the reason that some of the metal is cut away where the hinges are attached. These frames may be made from heavy tin or galvanized iron, and it will be a simple matter for a tinner to bend them into shape. After all these pieces are

bent, fit them together at the corners, making sure that they clamp tightly on the asbestos sheets, as these help to hold the frame in shape. Drill a small hole in each of the corners and provide a small round-head rivet of proper length for each of the holes. The vertical portions of the frame should be placed inside of the horizontal, or end, pieces at the corners.

Make four pieces of brass having the form and dimensions given in Fig. 4. Two $\frac{1}{8}$ -in. holes are drilled in each of these pieces as indicated. Slots are cut in the inner edges of the frames of such dimensions as will accommodate these brass pieces. The location of these slots is given in Fig. 1. Obtain eight pieces of $\frac{1}{8}$ -in. steel rod, about 2 in. long. Place the ends of the brass pieces in the slots in the inner frame and then put the rods through the holes in the ends of them and solder the ends of the rods to the inside of the frames. Make sure that there is no solder run in between the rod and piece of brass, as this will prevent the hinge from operating freely. After the hinges are in place, the frames are riveted together. Notches are cut in the edges of the asbestos sheets at the location of the hinges to allow the lat-



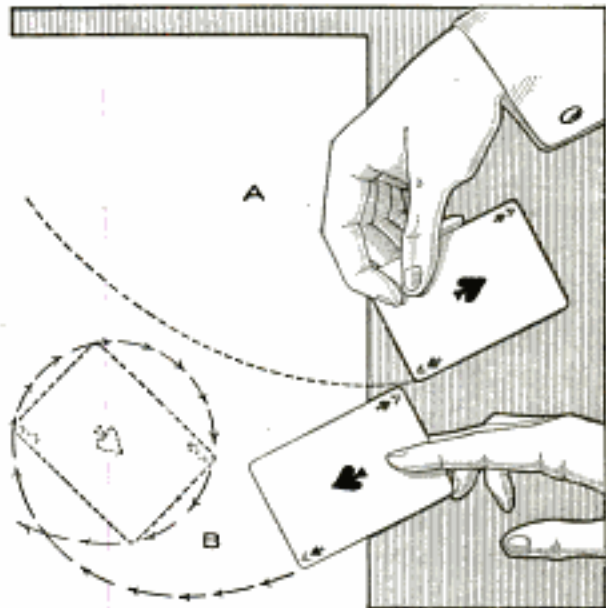
Fire Screen Made of Sheet Asbestos Inclosed in Thin Metal Frames Hinged Together

ter free movement. The sections of the screen may be made very rigid by placing a number of small rivets around the

inner edges of the frame to hold it tightly against the asbestos. The asbestos may be given a coat of bronze, or be otherwise decorated for appearance.

Tossing a Card at a Mark Accurately

There is an interesting old game that can be played instead of solitaire. It consists in trying to toss the great-



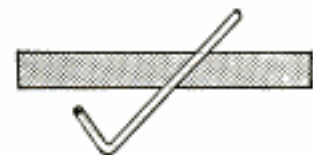
Tossing Cards Accurately so That They will Fall into a Receptacle Set at a Distance

est number of cards into a small basket or an upturned stiff hat, set at a distance. If the cards are held as shown at A, and tossed as at B, they may be thrown with surprising accuracy.—Contributed by James M. Kane, Doylestown, Pa.

A Sanitary Drinking Tube

To make this tube, procure a piece of $\frac{3}{4}$ -in. gauge glass, about 10 in. long, and bend it by heating the glass with a blow torch $2\frac{1}{2}$ in. from one end, as shown.

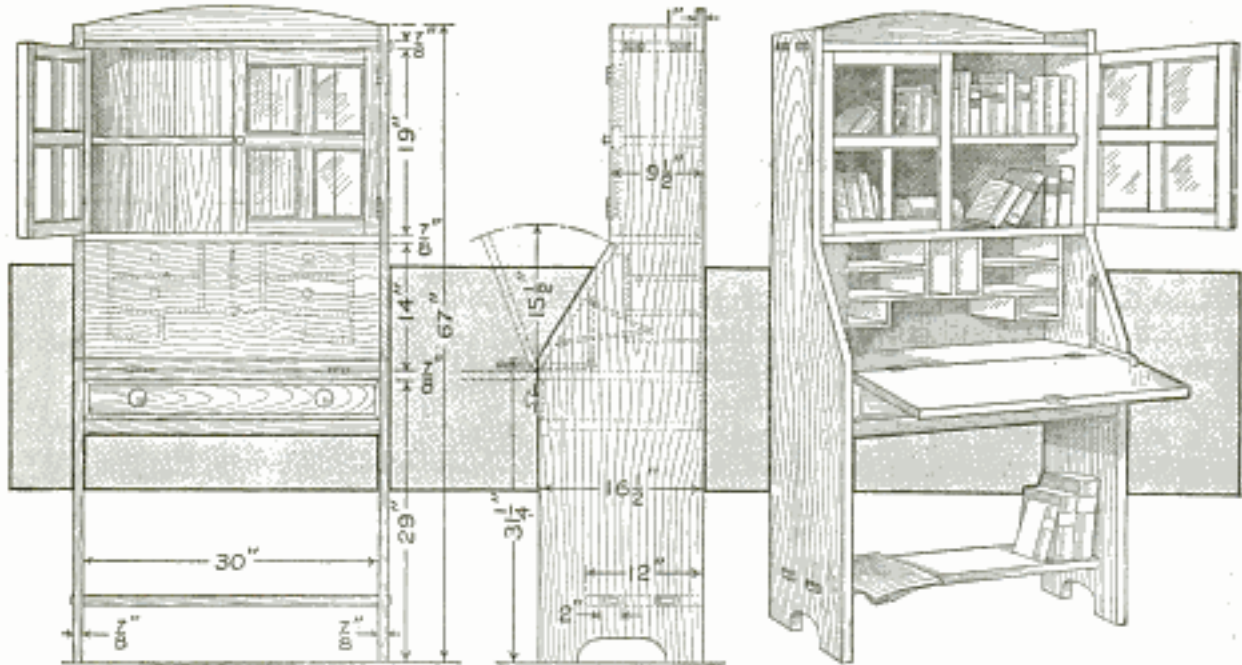
If this is done in a place where no air will strike the glass while it is heated and the tube is then allowed to cool slowly, it will not crack. It is used by putting the short end under the faucet and drawing on it as on a pipe.



Combination Bookcase and Writing Desk

In planning a writing desk, much convenience can be added by providing

have this done by an experienced joiner, or in the mill. The back edges should be carefully planed, and rabbeted $\frac{3}{8}$ in. deep by $\frac{1}{2}$ in. wide for the $\frac{3}{8}$ -in. thick back. The bottom or foot piece of the



Combined Bookcase and Writing Desk Which can be Made Up in Golden Oak, Mission, or Mahoganyed Birch, and will Appear Well with Other Furniture of Like Construction

it with a bookcase, in which may be stored those reference works most frequently used. The design illustrated furnishes ample room as a drawing desk, besides providing sufficient space in an inclosed cabinet for books or letter-filing cases.

The material required, figuring exact sizes, is as follows:

- 2 sides, $\frac{3}{8}$ by $16\frac{1}{4}$ by 67 in.
- 1 bottom shelf, $\frac{3}{8}$ by 12 by $32\frac{1}{4}$ in.
- 1 top shelf, $\frac{3}{8}$ by $9\frac{1}{4}$ by $32\frac{1}{4}$ in.
- 1 back, $\frac{3}{8}$ by 40 by 31 in., made of pieces of convenient widths.
- 1 desk board, $\frac{3}{8}$ by $16\frac{1}{4}$ by 30 in.
- 1 lower bookcase shelf, $\frac{3}{8}$ by $9\frac{1}{4}$ by 30 in.
- 1 middle bookcase shelf, $\frac{3}{8}$ by $8\frac{3}{4}$ by 30 in.
- 1 desk cover, $\frac{3}{8}$ by $15\frac{1}{2}$ by 30 in.
- 1 upper back rail, $\frac{3}{8}$ by 5 by 30 in.
- Bookcase Doors**
- 4 stiles, $\frac{3}{4}$ by $1\frac{1}{4}$ by 19 in.
- 4 rails, $\frac{3}{4}$ by $1\frac{1}{4}$ by $13\frac{1}{2}$ in.
- 2 mullions, $\frac{3}{4}$ by 1 by $17\frac{1}{2}$ in.
- 2 mullions, $\frac{3}{4}$ by 1 by $13\frac{1}{2}$ in.
- 1 pigeon-hole stock, $\frac{3}{8}$ by 7 by 72 in.
- For Main Drawer**
- 1 front, $\frac{3}{4}$ by 4 by 30 in.
- 2 sides, $\frac{3}{8}$ by 4 by $15\frac{1}{2}$ in.
- 1 back, $\frac{3}{4}$ by $3\frac{1}{4}$ by $29\frac{1}{2}$ in.
- 1 bottom, $\frac{3}{8}$ by $15\frac{1}{4}$ by $29\frac{1}{2}$ in.
- 2 drawer slides, $\frac{3}{8}$ by $1\frac{1}{2}$ by 15 in.
- 1 lower rail, $\frac{3}{8}$ by $1\frac{1}{2}$ by 30 in.
- 1 molding strip, $\frac{3}{4}$ by $\frac{3}{8}$ by 120 in.

As the main sides are of considerable width, it would be best to make them of two pieces glued together and, in order to obtain a strong and neat joint, to

sides should be squared up with the back edges, or the completed desk is liable to be winding, or warped. The bottom and top shelves or main cross braces should be marked and cut out, and, to be in harmony with the shape of the sides, the lower-shelf tenons are made wider than those on the upper shelf. The top shelf should be rabbeted $\frac{1}{2}$ in. deep by $\frac{3}{8}$ in. wide, to fit the back boards which are nailed to it. The required mortises in the sidepieces are marked from the corresponding tenons of the shelves, and can then be cut out with a chisel. When finished, the four parts constituting the frame should be assembled, and may be held together with blind screws, or dowel pins, passed through the tenons.

The desk board and two library shelves should then be fitted, and fastened in place with blind screws through the sides, or with cleats from the inside. For a neat, finished appearance, the back boards should be carefully joined, exposing no cracks, and fastened with nails driven into the vari-

ous shelves. The upper rail, resting on the bookcase, and the lower rail, forming part of the drawer support, can then be fitted and secured to the sides with blind screws, either from the outside or diagonally through the rails from the inside. Drawer slides are fitted in place flush with the top edge of the lower rail, and fastened to the sides with screws.

In making the drawer, the usual construction should be followed. The front piece should be rabbeted near its lower edge to fit the drawer bottom, and notched $\frac{1}{2}$ in. at each end to fit the sides. The bottom and end pieces fit into grooves cut in the sides. Suitable drawer pulls or knobs should be provided.

For the doors of the bookcase, the best construction would be to tenon the rails into the stiles about $\frac{1}{2}$ in. The glass panel fits in a notch, $\frac{1}{2}$ in. deep and $\frac{1}{4}$ in. wide, cut around the inside edge of the door, and is held in position with molding strips. In order to give the door an appearance of being divided into four parts, mullions, or cross strips, are fitted on the outer side of the glass flush with the rails and stiles, and fastened to them with brads. The doors are attached with butt hinges.

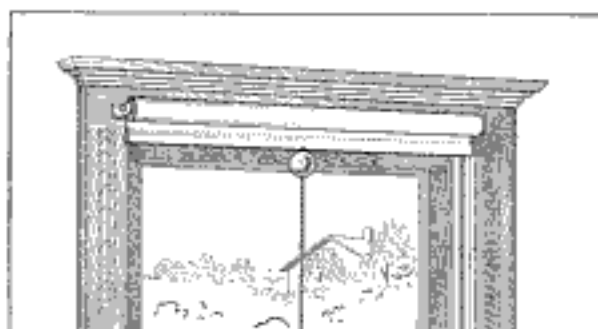
In making the desk door, a specially selected board should be used, as the finished appearance of the desk will greatly depend on this. The ends and sides should be perfectly squared, and the lower or hinge end cut beveled corresponding to the edge of the desk board. Butt hinges are used to secure it in position, and hinged brackets or chains provided to support it when open. When closed, it rests against a strip fastened to the lower side of the bottom bookcase shelf.

In arranging the pigeonholes it is best to have the inside boards rest on the desk board, so that, when desired, the entire arrangement of the drawers and shelves may be withdrawn easily.

When thoroughly sandpapered and finished to taste, a serviceable, handy and attractive piece of furniture is obtained, suitable for either office or home.—Contributed by James Gaffney, Chicago.

Automatic Stop for Spring-Roller Curtains

It frequently occurs, in adjusting spring-roller curtains, that the cord slips through the hand and the curtain not only winds up to the top but continues until the spring has spent its force, and the curtain and cord are



The Rubber Ball Fastened on the String at the Stick Prevents the Curtain from Winding Up

rolled up out of reach. It is then necessary to use a chair, or stepladder, to readjust it. All this trouble and annoyance can be avoided if a small hollow rubber ball is obtained, and holes punched through so it may be threaded on the curtain string, and tied close to the stick. Should the curtain slip away with this attachment, the ball will jam up against the window frame, preventing further winding up.—Contributed by T. B. Lambert, Chicago, Ill.

Spoon Attachment to Prevent Child from Using Left Hand

To discourage a child from using a spoon in the left hand, a projection was made of a piece of brass, filed into the shape shown in the illustration. After the projection was attached, the entire spoon was plated. This makes it impossible to use the spoon in the left hand, as the projection will prevent the

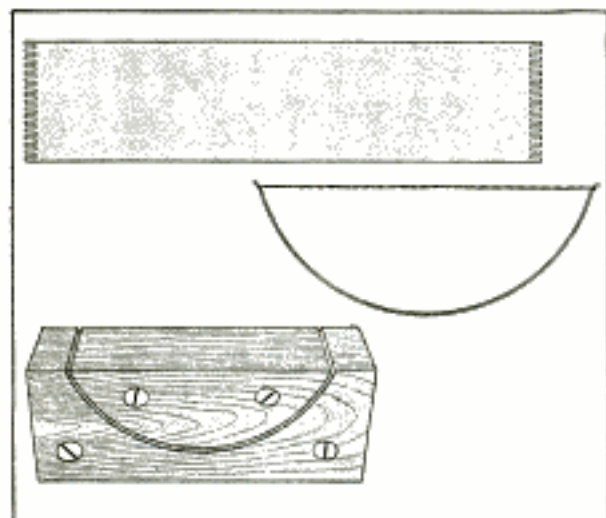


The Projection Keeps the Spoon from Entering the Mouth When Taken in the Left Hand

bowl from entering the mouth.—Contributed by W. H. Hutchinson, Hamilton, Ont.

A Comb Cleaner

A very handy device for cleaning combs can be made from a piece of spring sheet brass, $4\frac{1}{2}$ in. long and about 3 in. wide. Notches are cut in the ends of the brass with a hacksaw, making the projections as wide as the



The Twisted Wires Form an Excellent Device for Cleaning a Comb

saw cut. The brass is then bent into shape with a special clamp made for the purpose, which consists of three pieces of wood, two being cut to form a curved slot, then fastened to the third piece. The brass is sprung into the slot, and then fine wire is stretched between the ends in the notches. The wire should be very fine and two strands twisted together and run through the notches.

Concealing the House Key

The time-honored custom of concealing the house key under the door mat, or in the letter box, when the family has not enough keys to go around, is so well known that an unauthorized person seeking to enter the house would look in these places first of all.

A simple and effective hiding place for the key can be quickly and easily made with the aid of an auger and two



pieces of tin. Pick out an obscure section of the porch railing, and in the edge of this bore a $\frac{3}{4}$ -in. hole, about $\frac{1}{4}$ in. deeper than the length of the key. Make a piece of tin into a cylinder, the same length as the key, so that the latter will slide easily into the hole. At one end of this cylinder solder a 1-in. disk of tin, which will make it appear as in the illustration.

If the key is placed in the cylinder and the latter pushed into the hole until it is flush with the surface, it will scarcely be noticed by anyone not in the secret, and by painting it the same color as the railing it will become still more inconspicuous.—Contributed by Frank L. Matter, Portland, Ore.

A Mysterious Watch

A very interesting experiment may be made with the ordinary dollar watch in illustrating the law of the



pendulum. A pendulum 39.1 in. long will make 60 one-way swings per minute, the number of swings varying inversely as the square root of the length. By actual count

it was found that the balance wheel of the watch in question made 240 one-way swings per minute, which is just 4 times as fast as the 39-in. pendulum. Therefore, according to the foregoing law, a pendulum $\frac{1}{16}$ as long, or about $2\frac{1}{2}$ in., would swing in unison with the wheel of the watch. The question then arises as to what would happen if the watch itself were suspended so as to swing as a pendulum of the latter length. The experiment was made as illustrated, with the result that the watch keeps on swinging continuously. The swing amounts to about $\frac{3}{8}$ in., and appears so vigorous that it is almost incomprehensible that the small spring in a watch should be able to maintain so much weight in continuous motion for 24 hours.

Surface Mining for Gold

By W. M. MILLS

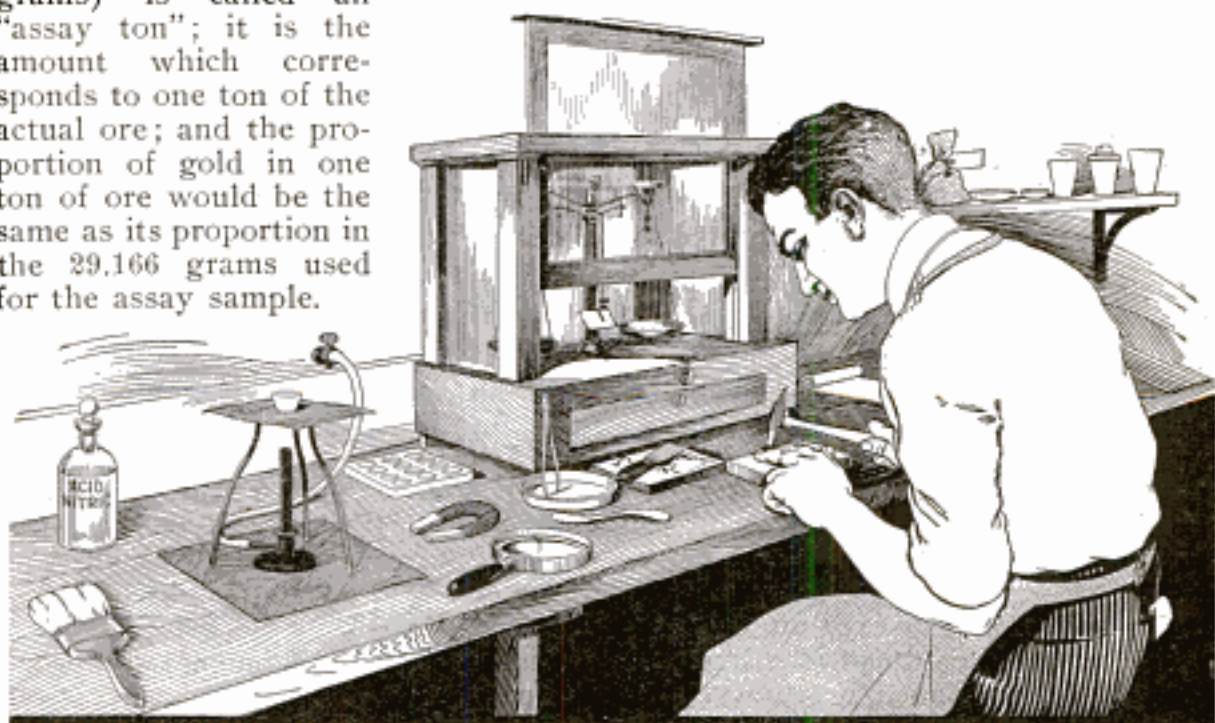
PART III—Assaying

IN making a fire assay of gold, a more expensive and greater variety of tools is necessary than in the prospector's outfit or simple mining operations. Great accuracy must be used in weighing the small amount of gold found in a sample, or serious errors will result. It is, therefore, necessary to have a very delicate balance—capable of measuring $\frac{1}{20}$ milligram—for weighing tiny gold beads; a coarser set measuring to several ounces should be provided for weighing the crushed-ore sample and slag-forming ingredients. Besides these, there is needed a furnace, or forge, for melting the ore, and other equipment such as crucibles, cupels, ore grinder, and chemicals.

Weigh out approximately 30 grams—29.166 to be exact—or about one ounce of the ore. In the final weighing of the separated gold, every milligram weight will correspond to one ounce per ton of the ore. For example, if a bead of gold weighs 25 milligrams, then the ore value is 25 ounces troy of gold per ton of 2,000 lb. of ore. The amount of ore used in assaying (29.166 grams) is called an "assay ton"; it is the amount which corresponds to one ton of the actual ore; and the proportion of gold in one ton of ore would be the same as its proportion in the 29.166 grams used for the assay sample.

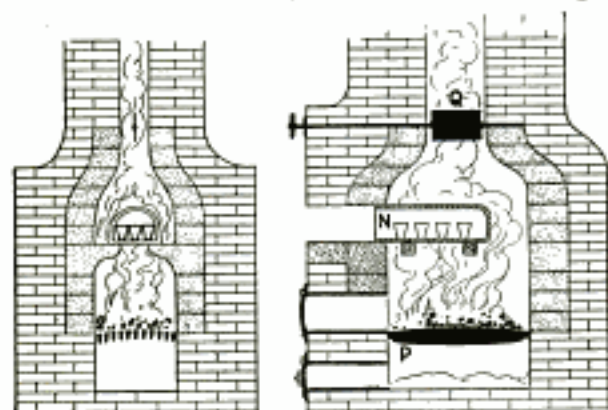
In order to form a proper composition with the gold-bearing ore, so it will readily fuse on the application of heat, certain chemicals and lead oxide, or litharge, must be added, which will combine with the ore, forming a molten slag. The lead oxide is reduced to lead, and forms an alloy with the gold and silver which sinks to the bottom of the crucible as soon as boiling of the slag ceases. The necessary composition of the flux varies with the character of the ore. A general lead flux may be made as follows: Sodium bicarbonate and potassium carbonate, both four parts by weight; powdered borax, two parts, and flour, one part. To this flux is added litharge in amounts depending on the character of the gangue, or soil surrounding the gold. If this contains sulphides or sulphur, several iron nails are added and the flour is reduced; if the gangue is siliceous and acid, the flour is increased. No one composition will work equally well for all ores.

If an assay ton of ore—29.166 grams—is to be used, a 20-gram crucible



The Tools Necessary for Making a Fire Assay of Gold Are Greater in Variety Than Those Used by the Prospector or for Simple Mining Operations

must be provided for the fusion. In practice the amount of ore is usually cut down to one-half assay ton, making possible the use of a 10-gram crucible. Where assays are run in large



An Especially Large Furnace is Required for Fusing the Charge Where Assays Run in Large Batches

batches and one assay ton of ore is used in each, a specially large furnace would be required for fusing the charge.

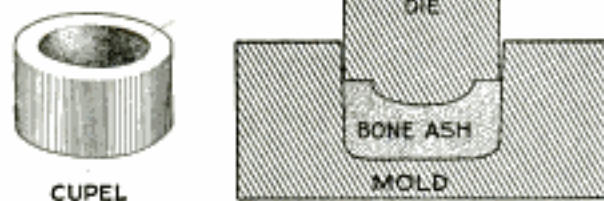
When the mixture is made and combined with the finely ground ore, it is placed in a fire-clay crucible of suitable size, which is filled to about two-thirds of its capacity. The crucible and charge is now ready for the furnace. This may be either open or "muffled," but must produce an intense heat; coal is, therefore, generally used. For want of anything better, an ordinary blacksmith's forge may be used, in which case the crucible should be put well down in the coals. A muffle furnace, as illustrated, is one in which the crucibles are placed in an inclosed fire-clay muffle, or oven, having an opening at one end only; the heat of the fire can only affect the crucibles and charge. The muffle, or oven, N, is usually about 9 in. wide by 15 in. deep. Its open end may be closed up by a fire-clay door in order to increase the heat. The fire is built on grates, P, the ashes falling into an ash pit, whence they are removed through the door. The intensity of burning is regulated by a damper, Q. Furnaces using gasoline for fuel instead of coal or coke are coming into favor rapidly, due to their compactness, light weight, portability, and ease of heat regulation.

The muffle should be red-hot before

placing the crucibles in it. The fusion, or melting, will require from 20 to 30 minutes, after which another 15 minutes should be allowed to form a good, fluid slag. If the boiling is too violent, a small amount of common salt may be added. If a charge has boiled over, the assay is not reliable and should be repeated. When the fusion is completed, the crucibles should be removed from the furnace by means of a pair of long tongs, and the fused charge is then poured out on a piece of cold iron or metal mold, making sure that everything has been removed by tapping the crucible lightly. In cooling, the molten lead will settle to the bottom of the slag and may be easily separated from it when cold. This is now the lead button and contains all the gold and silver of the ore charge; it should be hammered into the shape of a cube and is then ready for the process of cupellation, which consists in evaporating and absorbing the lead in bone-ash cupels, the gold and silver remaining as a small bead.

Cupels are small shallow cups, usually about $1\frac{1}{4}$ in. diameter and $\frac{3}{4}$ in. high. They are made by mixing fine

Cupels Are Small Cups Made of Bone Ash and Water in a Mold



bone ash with water so it may be easily molded, then placed in a cupel mold and formed by several blows on the die. If a large number are to be made, cupel-stamping machines can be had which will turn out several hundred in an hour. The cupels should be dried for about a week before using.

The cupel should be heated red-hot before placing the button in it, after which they should be placed in the muffle with the opening closed un-

til cupellation begins, which is indicated by the fumes of lead oxide given off. The door is then opened to increase oxidation of the button. This gradually disappears as the lead oxidizes and is absorbed by the bone ash. Cupeling requires about 40 minutes.

When it is nearly finished, bright colors play over the surface of the button, which will suddenly darken and then brighten again with a flash; cupellation is then complete, and the cupel should be withdrawn from the muffle and allowed to cool slowly, to prevent spitting, or bursting, of the bead. It may even be necessary to cover a large bead with a hot cupel in order that cooling may be slower.

During cupeling it is very necessary to keep the temperature as uniform as possible. If the temperature should become too low, the button will "freeze," that is, become covered with a film of lead oxide which prevents further oxidation, and even though it may be thawed by placing it in a hotter part of the muffle or by placing a piece of charcoal on top of it, the final results are unreliable.

The cupel bead of gold and silver is then ready for weighing. It should be cleaned with a fine brush and carefully weighed on an accurate scale, registering to $\frac{1}{20}$ of a milligram, or less. This weight is the total of silver and gold, and should be recorded as such. The two must then be parted so the true weight of each can be determined. The bead is put in a small porcelain crucible and covered with a solution of one-third chemically pure nitric acid and two-thirds distilled, or pure, water, gently warmed on a hot plate. Bubbles will be given off as the silver passes into solution; parting is complete when these cease. The gold remains as a black bead; the acid should be drained off, and the bead washed in several changes of water, and finally dried on blotting paper, after which it may be brightened by heat. The gold may then be weighed very carefully and this final reading subtracted from the total weight, the difference being the amount of silver

in the ore. The weights are recorded in milligrams, each of which is representative of ounces in troy weight per ton of ore. If the original charge of ore in the crucible was less than one assay ton—or 29.166 milligrams—the determination can be made as follows:

Weight of button in milligrams
 \div weight of ore in assay ton or fraction thereof =



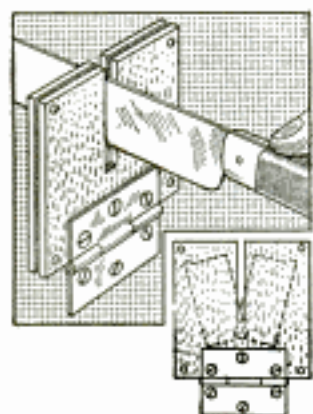
Parting the Silver from the Gold so That the Weight of Each may be Determined

troy ounces of gold per ton ore of 2,000 lb. For example: it frequently occurs that only one-half assay ton of ore is used in the crucible; then, supposing the weight of the gold bead to be 1.5 milligrams, the value would be $1.5 \div \frac{1}{2} = 3$ oz. per ton of ore; exactly the same as though one assay ton of ore had been used in the crucible and three milligrams of gold weighed in the balance. The money values of the gold and silver in ounces, as determined by weight, added together represent the value of the ore per ton, as assayed. If the gold assayed 1.5 milligrams per assay ton and its value were \$20 per ounce, it would mean a value of gold in the ore of 1.5×20 , or \$30. The value of the silver should be figured the same way, and the combined values would be the actual value of the ore per ton.

All assays and operations should be carefully recorded, not only for one's own benefit and habits of work but also for future reference. It is advisable to give all details of the assay, such as the owner, assay number, dates, values of all metals, and process followed.

A Table-Knife Sharpener

The knife sharpener shown can be easily made of two pieces of thin wood,



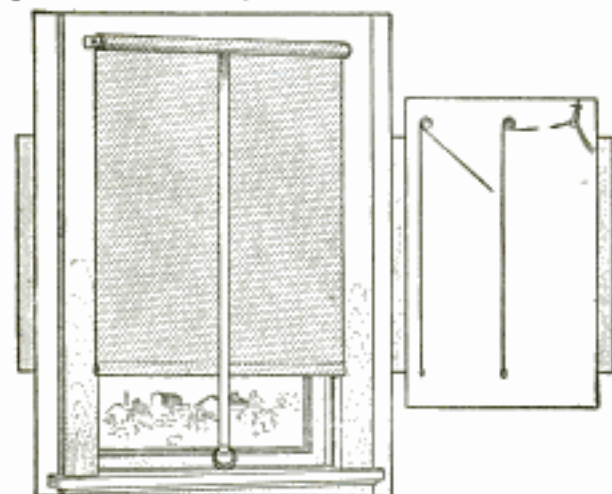
such as cigar-box covers, about 2 in. wide and 2½ in. long, and two discarded safety-razor blades of the heavier type. Lay the wood pieces together and saw a slot down the center for about 1¾ in. Lay the two

razor blades at an angle of about 2° on each side of the slot, as shown, fasten them to one of the boards, and securely attach the other board over them.

To sharpen a knife, run it through the slot two or three times. The sharpener can be fastened with a hinge so that it will swing inside of the drawer, or box, that the knives are kept in, and it will always be ready for use.—Contributed by Henry J. Marion, Pontiac, Mich.

Raising and Lowering Curtain at a Distance

To enable an invalid, or any other person, to easily raise and lower a cur-



A Ribbon or Tape Attached to a Curtain Roller to Operate It at a Distance

tain from a position at a distance from the window, a ribbon can be attached to

the roller, at the center and on the inner side of the curtain. The ribbon may extend across the room in line with the window, and still operate the curtain as well as with the regular cord attached to the bottom. If desirable to operate the curtain by a vertical pull, a flat pulley may be conveniently fastened to the ceiling or wall, and the ribbon passed over it, or through a ring, as shown. This plan is especially adapted for show windows where the curtain string would otherwise mar the appearance, and be hard to get at.—Contributed by L. E. Turner, New York, N. Y.

The Mystic Climbing Ring

The performer hands out a wand for examination and borrows a finger ring.



He holds the wand in his hand, point upward, and drops the ring on it, then makes mesmeric passes over the wand with the other, and causes the ring to climb toward the top, stop at any place desired, pass

backward, and at last fall from the wand. The wand and ring are examined again by the audience.

To produce this little trick, the performer must first provide himself with a round, black stick, about 14 in. long, a piece of No. 60 black cotton thread, about 18 in. long, and a small bit of beeswax. Tie one end of the thread to the top button on the coat and to the free end stick the beeswax, which is stuck to the lower button until ready for the trick.

After the wand is returned, secretly stick the waxed end to the top of the wand, then drop the ring on it. Moving the wand slightly from oneself will cause the ring to move upward, and relaxing it causes the ring to fall. In the final stage remove the thread and hand out the wand for examination.

Dies for Cutting Cardboard

An inexpensive, yet very efficient, die for cutting quantities of tin foil, sheet lead, paper, and cardboard can be made from a steel rule such as used by printers. Procure a rule, two points or about $\frac{1}{32}$ in. thick, which comes in 2-ft. lengths. The rule can be readily bent without annealing. Bend it to the desired shape and solder, or weld, the ends together. To give it rigidity, fill in the space with melted lead to a depth of half the height of the die.

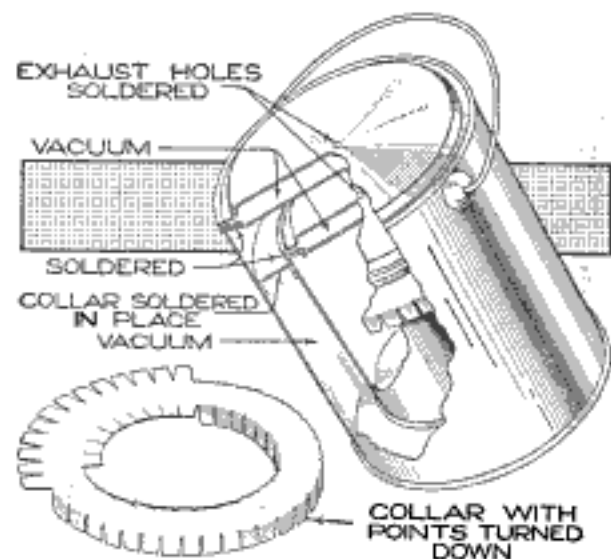
Place the material to be cut against the die and put both into a vise, or letter press. Apply pressure steadily until the die has cut through the last thickness of the material. As many as 25 pieces can be placed and cut at one time. When cutting designs for static machines, etc., from tin foil, this appliance does away with the tedious work of cutting one at a time, and then, too, they will all be uniform. In making the connection at the ends of the rule, be sure that they meet evenly and do not lap to make the joint.—Contributed by M. H. Granholt, Long Beach, Cal.

How to Make a Vacuum Pail

As a substitute for a vacuum bottle a very efficient pail can be made in the following manner: Procure a 1-gal. sirup pail for the outside and a $\frac{1}{2}$ -gal. size for the inside. Make a collar of tin, as shown, with projections; bend these down, inside and outside, then solder the collar to the inside of the larger pail, and the smaller pail to the inside of the collar. Be sure to make a perfectly air-tight joint in the soldering. This gives a double wall with an air-tight space all around the inner pail, or opening. To make vacuum covers for the pails, take two covers of each size and solder them together, as shown.

To produce a vacuum, make a small hole in the metal forming the collar, also one in each cover. Put a few drops of water in each vacuum compartment and set the parts on a heated

surface. When the steam escapes, solder the holes. This will produce a partial vacuum in the space around the

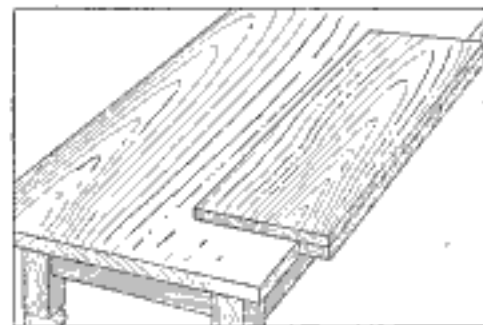


A Two-Wall Pail with Covers in Which a Partial Vacuum is Made

inner pail and in the covers. This will make a very efficient vacuum pail.—Contributed by John H. Spicer, Magnolia, Ark.

Ironing Board for Use on a Table

A handy ironing board for use on kitchen or dining-table top is made with a cleat to keep it from moving across the table top. The cleat, which is $1\frac{1}{2}$ or 2 in. wide, is fastened to the board with screws. If desired, the board can be made as immovable as the table top by putting another cleat at one end, so that the two cleats will



A Cleat Fastened to the Underside of an Ironing Board to Hold It on the Table Top

hold against one side and one edge of the table top.—Contributed by H. S. Craig, Rushford, Minn.

POPULAR MECHANICS

INTERESTING NEW PATENTS

COMBINED ELECTROLIER AND TELEPHONE COVER (Fig. 1)—The base of the electrolier is hollow and is made in the form of a receptacle for the telephone. It is equipped with two hinged doors, so that the telephone is easily removed, or is entirely concealed when it is in the receptacle and the doors are closed.



Fig. 1

METHOD OF REMOVING SNOW FROM CITY STREETS (Fig. 2)—The feature of this invention is the provision of ducts leading from the street to a sewer or other conduit, the snow being shoveled down the sloping ducts at the sides. As the snow is shoveled into the sewer it is flushed away with water forced into the sewer through the pipes in the vertical conduit at the center.

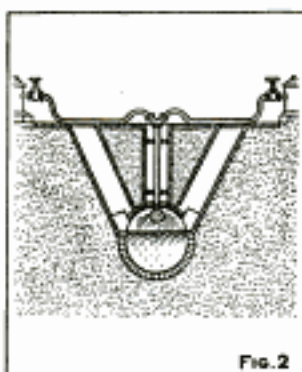


Fig. 2

DEFLECTOR AND DIMMER FOR AUTOMOBILE HEADLIGHT (Fig. 3)—This simple device consists of an oblong plate pivoted vertically in front of the headlight. When the edge is turned toward the lamp a full light is thrown ahead, and when it is turned with the side toward the lamp, the light is dimmed. The light is thrown to either side of the road by turning the plate at an angle.

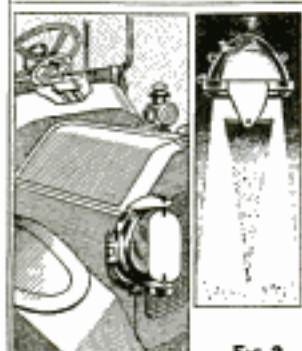


Fig. 3

COMBINED SHOE HORN AND BUTTON HOOK (Fig. 4)—The hook is hinged to the horn near one end so that it is easily folded back out of the way or extended for use. Clips are provided for holding the hook in either position.



Fig. 4

KNIFE SHARPENER (Fig. 5)—This device consists simply of a base, designed to be securely mounted on a table, on which is a standard split into two arms at the top. In recesses on the inner faces of the arms, near their junction, are mounted abrasive plates, and these are placed at such an angle that the proper angle is given to the edge of the blade when it is drawn between them.

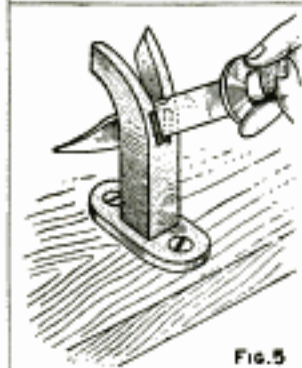


Fig. 5

FROST-PROOF BOX FOR WATER PIPES (Fig. 6)—The feature of this box is the arrangement by which the air is kept in constant circulation so that the cold air at the top is constantly displaced by the warmer air at the bottom. At one side of the box is a by-pass which opens into the box at top and bottom. As the warm air ascends through the by-pass the cold air is displaced and descends through the main chamber.

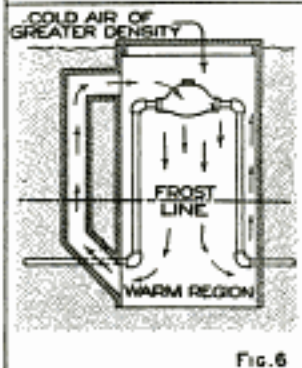


Fig. 6

DOOR HOLDER (Fig. 7)—One of the best features about this door holder is its simplicity. It consists simply of a plate pivoted to the door and controlled by a tension spring. One end of the plate is provided with a floor-engaging surface, while the other is formed into a prong that projects nearly at right angles to the door. The relation of the spring and pivot is such that when the holder is changed from one position to the other, the spring swings past the pivot and holds the plate in the new position. The prong is designed to engage the spring and prevent the upper end of the plate from being pulled against the floor when the holder is released.



Fig. 7

UNDERTOW INDICATOR (Fig. 8)—In this apparatus, which is evidently intended for use at bathing beaches, a gong is set ringing when an undertow is running. A submerged plate is set out from the shore far enough to be affected by the undertow. This plate is ordinarily held upright by a spring. When it is deflected outward it actuates mechanical and electrical connections that set the gong to ringing.

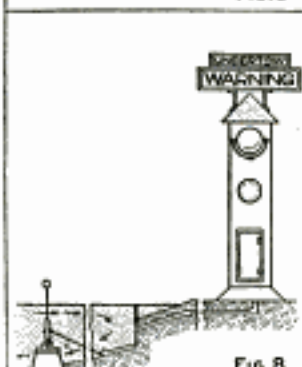


Fig. 8

FENCE POST (Fig. 9)—This post is made of steel and is tubular in form. The prongs at the bottom are for the purpose of anchoring it securely to the ground.

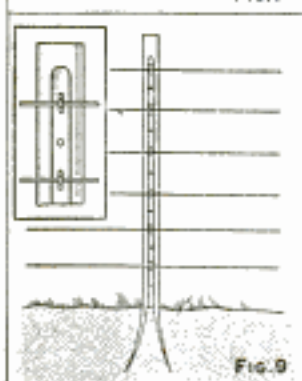


Fig. 9

MUZZLE SUPPORT FOR GUN (Fig. 10; American patent to Frenchmen)—This is a plan for using the bayonet scabbard for supporting the muzzle of the gun. For this purpose a leg is pivoted to the scabbard, and a lug and curved link are provided for attaching the scabbard to the gun barrel.

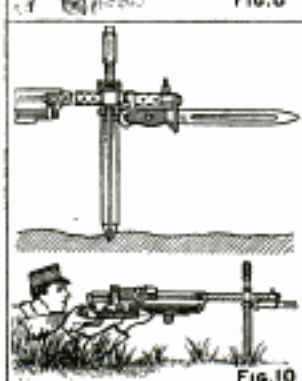


Fig. 10

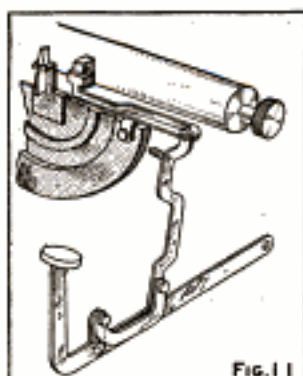


Fig. 11

ERASING ATTACHMENT FOR TYPEWRITER (Fig. 11)—With this attachment the eraser is permanently mounted on the typewriter and is operated by a key in an up-and-down direction. The eraser is carried on the end of a pivoted arm which is worked through a lever-and-link mechanism by a key lever mounted on the side of the typewriter.

SANITARY BREAD BOARD (Fig. 12)—The purpose of this invention is to provide a fresh surface of paper each time bread is kneaded. The paper is carried in a roll at the end of the board, where there is also means for clamping and tearing the paper. At the opposite end are clamps for holding the paper in place over the board.

MOTOR-DRIVEN SLED (Fig. 13; American patent to a German)—The feature of this invention is the plunger rods, having pointed ends for engaging the snow or ice, which are alternately thrust downward and rearward. These rods are operated by a crank shaft, which in turn is driven by the motor.

SILO WITH HINGED ROOF (Fig. 14)—The roof is hemispherical in form and consists of two sections carried on shafts that project from opposite sides of the silo, as shown. One section fits inside the other, so that a tight roof is provided when the sections are closed. When the sections are swung back and downward, unobstructed access to the interior of the silo is provided.

ATTACHMENT FOR PHONOGRAPH (Fig. 15)—In this attachment the jewel point that works in the groove of the record is mounted on a flexible arm, an arrangement designed to prevent wear on the record. By adjusting the counterweight carried at the opposite end of the attachment the pressure of the point on the record may be varied, with a corresponding variation in the intensity of the tone.

EXTENSIBLE SUITCASE (Fig. 16)—The bottom is hinged to both of the sides instead of being rigid, as is the usual practice. With this arrangement the suitcase lies flat when opened.

REPAIR ATTACHMENT FOR VEHICLE SPRINGS (Fig. 17)—This device consists of a rigid plate that can easily be secured to the spring to bridge the crack or break. It is fixed in place by means of bolts that extend down each side of the spring, as shown, and engage clamping plates placed under the spring.

BLOWGUN WITH AMMUNITION MAGAZINE (Fig. 18)—The blowgun is of an ordinary type and is equipped with a magazine, which is mounted on top of the barrel so that it can easily be slid back and forth. The barrel forms the bottom of the magazine. In the barrel is an opening just large enough to admit one of the projectiles, and a fresh charge is fed into the gun simply by sliding the magazine forward over this opening.

DEVICE FOR CHECKING MILEAGE OF AUTOMOBILE TIRES (Fig. 19)—This device has recently been invented for enabling a manufacturer to determine whether or not a tire has lived up to its guarantee. It consists of a metal tube which is imbedded in the bead when the tire is made. One end of the tube is closed, while the other is threaded to receive a gutta-percha plug. Inside the tube is a weight equipped with a pointed shank projecting toward the plug, while in the end opposite the plug is a metal ball. At each revolution of the wheel the ball first falls against the end of the tube and then against the weight, driving the pointed shank a slight distance into the plug. The mileage that the tire has traveled can be determined by the distance the point has penetrated into the plug.

LEMON SQUEEZER (Fig. 20)—The interesting feature of this device is the operation of the perforated hinged bottom. While the lemon is being squeezed, this bottom is drawn up close, permitting only the juice to escape. With the handle drawn back, the bottom drops so that the peeling can be thrust out.



Fig. 12

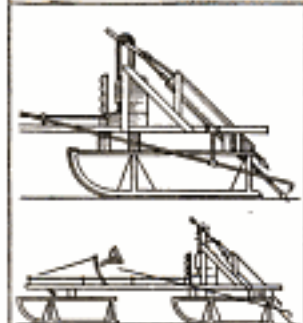


Fig. 13

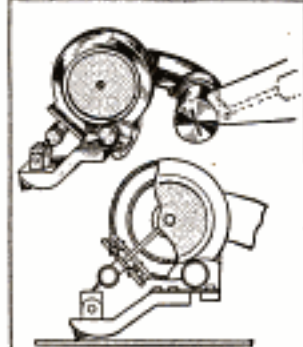


Fig. 15

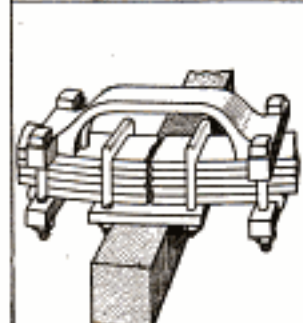


Fig. 17

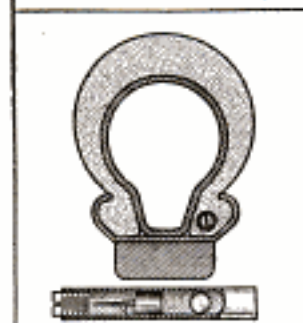


Fig. 19



Fig. 14



Fig. 16



Fig. 18

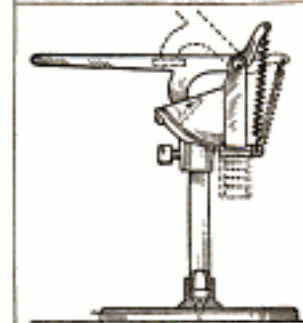
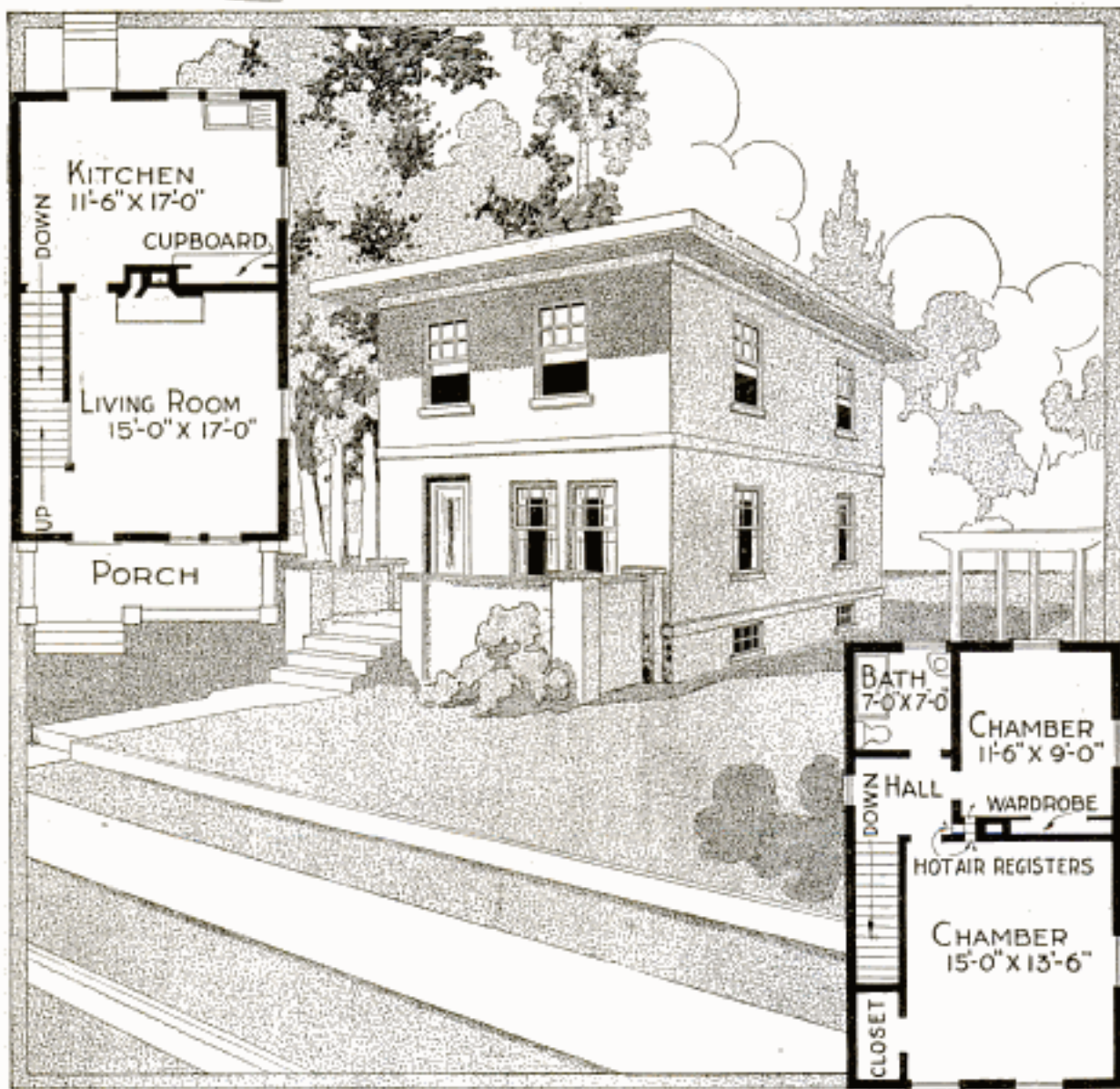


Fig. 20

CONCRETE RESIDENCE BUILT AT SMALL COST



J. A. POEHL, ARCHITECT, BUFFALO, N. Y.

DESIGNED originally as a cheaply built residence for workmen in the mining districts of Pennsylvania, this house is adapted as well to the needs of any owner of small means, especially for a suburban location, who desires to build a small home of permanent construction. The house is of poured concrete, a simple and quick method of construction, and is estimated to cost \$1,400. The exterior is what is known as "rough cast." In the interior, the walls and ceilings are of plaster laid on metal lath, the lath being so applied as to leave an air space for insulation against heat, cold, and moisture. The house is equipped with modern conveniences, and in spite of its small floor plan, the arrangement is convenient and the rooms are of sufficient size for comfort. An interesting feature that is made possible by the room arrangement is the heating system, there being only one hot-air duct. This is cast in the chimney and is provided with a register for each of the rooms except the bathroom, which must be heated from the hall. Built into the chimney at the side of the register in the living room is a fireplace. The kitchen is provided with a cupboard of ample size, while one of the bedrooms has a large closet and the other a built-in wardrobe. The front porch and steps, like the remainder of the house, are built of concrete.

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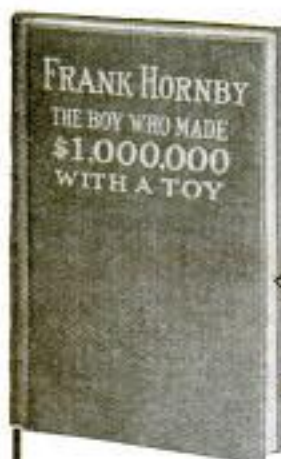
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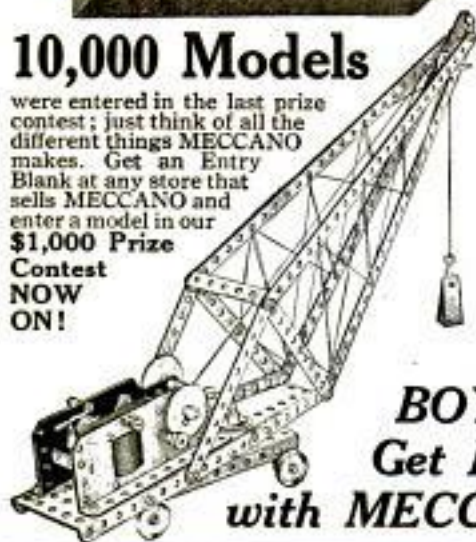
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No. 1x with Electric Motor	3.00	No. 3x with Electric Motor	7.50
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were entered in the last prize contest; just think of all the different things MECCANO makes. Get an Entry Blank at any store that sells MECCANO and enter a model in our **\$1,000 Prize Contest NOW ON!**



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MECCANO COMPANY
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MECCANO

Makes Fine Working Models The Ones You Like to Play With

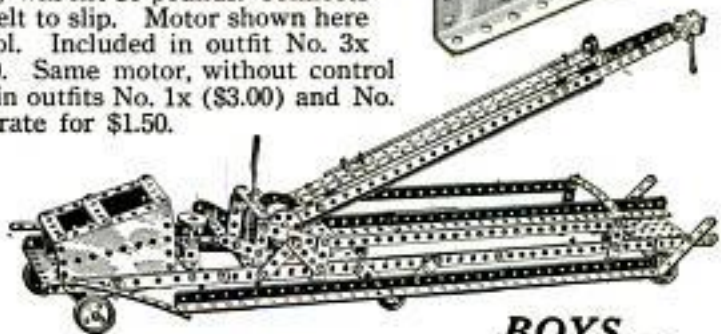
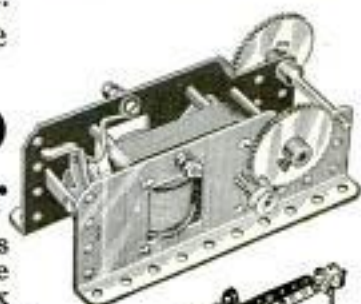
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BOYS—
Build Models like
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some real fun!



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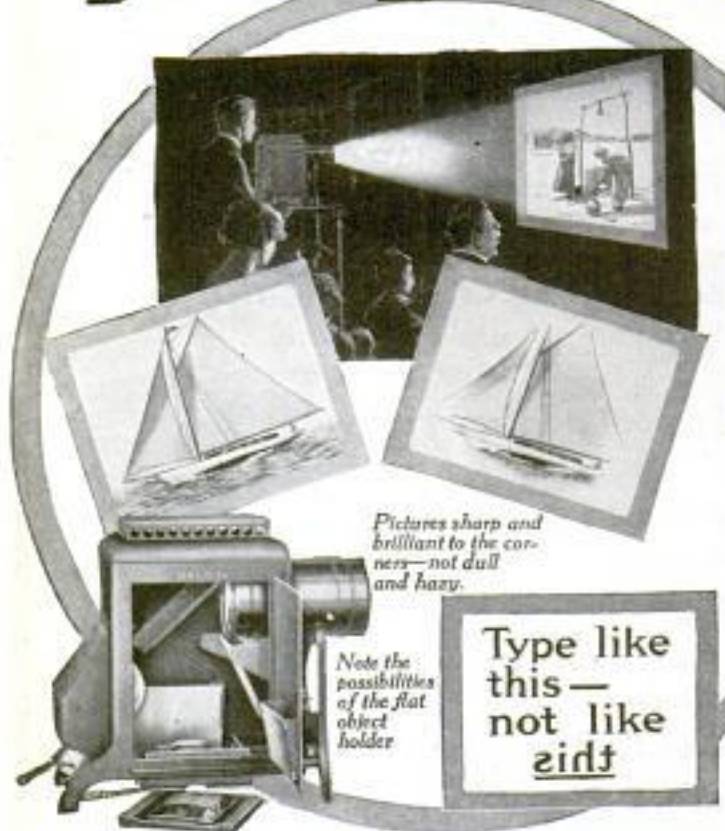
Over a million merchants have proved our Cash Registers to be a business necessity.

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IT HAS *BEAUTY*, because it fits into the surroundings—it is a *part* of the home premises; because it has the graceful lines and “Homey” appearance that only a wood structure can have.

IT GIVES *SERVICE*, because, built of wood, it is *drier* and *warmer* in wet, cold weather than any metal, concrete, or brick structure possibly can be; and because the wood used—

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Here's a *real* safety guard razor, shaves in the only correct way, cuts close, doesn't rough the skin.

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STICK — POWDER — CREAM

Wonderfully softening and soothing in whichever form you use it. Send 4 cts. for a trial size of stick, powder or cream.

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Wear this ring for one week; show it to your jeweler; if not satisfied, we will refund money.

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Yes, an innocent call, "To Arms!"—and all the sharpshooters, little and big, file into the billiard room. Then the thrilling battle begins—moments of breathless suspense, jest and volleys of laughter.

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Select the table you want. We let you try it 30 days. We also include Complete High Class Playing Outfit *free*—Balls, Cues, Markers, Cue-Clamps, Chalk, Expert Book of 33 games, etc.

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Make Happy Boys

His Christmas Question Answered

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With Ives Struktiron you build strong steel models of railroad bridges, elevated railways, signal towers, cranes and derricks operated by the powerful Ives electric motor. You can also construct hundreds of other realistic, practical models, such as aeroplanes, revolving shovels, battleships, "shoot the chutes."

Toy, hardware and department stores sell Ives Trains, (\$1 to \$25) and Ives Struktiron (\$1 to \$25). Ask to see them.

Write for Catalog and names of Ives dealers in your town.

Poster Stamps Free

Twelve of them—beautifully illustrated in colors. Six show the development of the locomotive from the famous "De Witt Clinton" of 1831 down to 1915. The other six show remarkable Struktiron models.

Absolutely free to any boy or parent. Write now (giving toy dealer's name) for complete set.


The Ives Manufacturing Corporation
202 Holland Ave. Bridgeport, Conn.

Boston Garter

Velvet Grip

Three Popular Styles:
NEVERBIND CORD and PAD

GEORGE FROST CO.
MAKERS
BOSTON



Silk 50¢
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3 YEARS TO PAY

Meister Piano 30 days free trial in your own home
\$1 A WEEK or \$5 A MONTH Price **\$175.00**

No cash payment down. No interest—no extras. Piano stool and scarf free

ROTHSCHILD & COMPANY
Dept. 16N CHICAGO, ILL.

VENTILATION OF THE NEW SUBWAY LINES IN NEW YORK—According to present plans ventilation will be by means of open gratings on the sidewalks. This plan is opposed, however, by the shop owners along the streets affected on the ground that the gratings are avoided by pedestrians, and they thus will look less into the store windows. Single tubes with the trains acting as pistons would secure a constant change of air.

10 Cents a Day

Pays for This Cornet An astounding offer! Only 10¢ a day buys this superb Triple Silver Plated Lyric Cornet. **FREE TRIAL** before you decide to buy. Write for our big offer.

WURLITZER Free Band Catalog

Write for our big new 256-page Band Catalog. Rock-bottom, direct-from-the-manufacturer's prices on all kinds of instruments. Pay for them at the rate of only a few cents a day. Generous allowance for old instruments. Free Trial. We supply the U.S. Govt. Write now

THE RUDOLPH WURLITZER CO., Dept. 1199
4th St., Cincinnati, Ohio 8. Wabash Ave., Chicago

1/3 SAVED Buy Direct From MANUFACTURER

J. Hardin Co., J. J. Lane, Pres.

No. 1 \$9.60 No. 2 \$15.50 No. 3 \$12.90

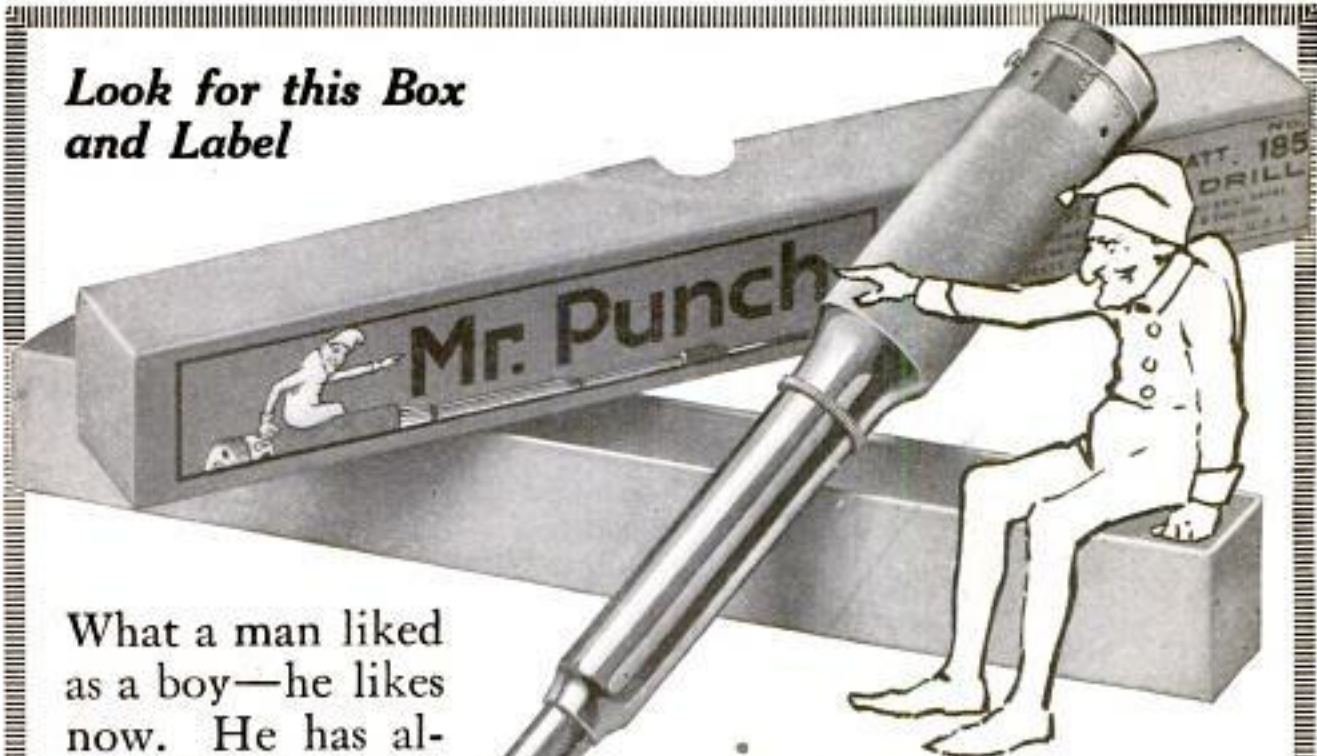
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Install Your Own Plumbing and Heating

Get our catalog No. 69A—contains complete heating plants, heating goods of every description, bathroom outfits, sinks, roughing-in goods, pipe fittings, valves, etc., water pressure systems and lighting plants. In fact, absolutely everything in both grade plumbing and heating supplies, exclusively at wholesale prices. Any handy man can install our goods with our free easy installing plans. 400,000 plants behind our guarantee. **WRITE TODAY.**

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J. HARDIN CO. 40 years at 4540-50 Cottage Grove Ave. **CHICAGO**

**Look for this Box
and Label**



What a man liked as a boy—he likes now. He has always liked Good Tools. Give him what he likes.

A Dandy Gift

Mr. Punch is an Automatic Drill. You place the point of the drill and push. A spiral twist drives the drill. It will bite through an inch of solid oak in ten seconds.

The one great need in home tinkering is something to make a hole with. To drive a screw easily you must first make a hole.

You want a hole through broom and brush handles. To repair a chair, to put on screen or storm-door, to put up a hammock, to put up curtain or bathroom fixtures, to make a bookcase—you always have to make a hole.

Mr. Punch is the handiest tool in the home tool-chest.

In the handle are eight tool-steel drill points, seen through numbered holes of same size as drill points. Drills are released through a hole in the revolving cap.

Mr. Punch is solidly made of brass and has a high nickel finish. He sells for \$1.50 at

**GODELL
PRATT
1500 GOOD TOOLS**

Hack Saws
Micrometers
Saw Sets
Gauges
Grinders
Screw-drivers
Punches

Drills
Lathes
Levels
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Bit Braces
Calipers
Squares

all hardware stores.

Send for our Christmas booklet, "What to Give the Boy," describing Mr. Punch and fifteen other Good Tools which every home needs.

Goodell-Pratt 1500 Good Tools are known all over the world by Good Mechanics. They combine exceptional quality with reasonable prices. Buy Mr. Punch for Christmas.

GODELL-PRATT COMPANY, Toolsmiths
Greenfield, Mass.



WIZARD

TRADE MARK

ELECTRIC PORTABLE LAMP

The Prize Winner of the
Panama-Pacific Exposition
Special Price, \$3.50



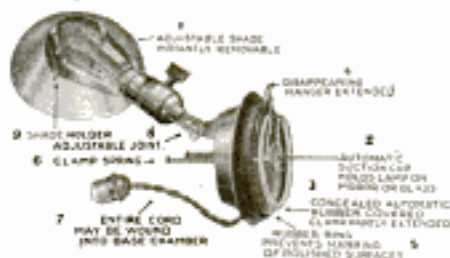
The Wizard Electric Portable Lamp, so named because it is almost magic in performance, gives you light just where you want it and just when you want it. It saves the eyes and is a wonderful convenience to every home. It sticks, hangs, clamps or stands anywhere. It has been named by those who have used it—

"The Lamp That Saves Its Cost."

A Wizard Lamp will make a much prized and a much appreciated Christmas Gift.

The Wizard must be seen and used to fully appreciate its many advantages. Send us \$3.50 for a "Wizard" today. Try it in your own home for 10 days and if you are not fully satisfied, return it and your money will be refunded.

The Wizard Lamp was awarded the highest award of any portable electric lamp at the Panama-Pacific International Exposition.



**Wizard
Electric Lamp Co.**
145 New Montgomery Street
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We have a very attractive agency opportunity. Write for it.



The Durham-Duplex Domino Razor with white American ivory handle, safety guard, stropping attachment, package of six of the famous Durham-Duplex double-edged, hollow ground blades in genuine red leather folding kit.

SOLVES YOUR CHRISTMAS PROBLEM

\$5 DURHAM-DUPLEX Domino RAZOR FOR \$1

We are requesting the owners of Durham-Duplex Demonstrator Razors to pass them along to friends, or at least to tell their friends about the shave it is possible to obtain with the wonderful Durham-Duplex Blade. This is good advertising for us, and we are paying for it by giving Demonstrator users an opportunity to obtain a Domino Razor for \$1.00, with twenty United Profit Sharing Coupons.

DURHAM-DUPLEX RAZOR CO., Jersey City, N. J.

Gentlemen:—Send me a \$5 Durham-Duplex Domino Kit Outfit as per illustration above for which find enclosed \$1.00.

Name

Street

City..... State.....

Any dealer will honor this coupon TA

Please Mention Popular Mechanics

For lack of copper, Germany, according to reports, uses the finer grades of sheet metal as a substitute for sheet brass in the manufacture of war material.

On railway lines between France and Belgium which intersect the trenches, and consequently cannot be used by regular trains, the Germans operate storage-battery cars to remove the wounded from the battle front, and to bring back supplies.

600 Shaves From 1 Blade



Yes, and more. That's the record of many men who shave themselves. Old blades made sharper than new—in ten seconds. Quick, velvety shaves for life with the wonderful, new

Rotastrop

For safety and old style razors, Dropblade in, turn handle, machine gives "heel to toe action", just like a barber strope a razor.

10 Days' Free Trial Write for free booklet. Send name of nearest dealer and state make of razor.
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have an added dignity thru their uniqueness of size, retaining with the detail of design of the regular-sized emblems. Inserted in point of lapel and tightly screwed

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GENUINE PERFECT CUT
DIAMONDS \$97.50
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 SPECIALLY SELECTED ARTICLES SUITABLE FOR CHRISTMAS GIFTS
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S01—This 14K solid gold ring, complete with 1/2 carat diamond, \$12.00
 1/2 carat diamond, \$21.25
 1 carat diamond, \$35.00
 1 1/2 carat diamond, \$48.75
 2 carat diamond, \$73.25
 3 carat diamond, \$101.25
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S07—1/2-carat diamond. Compl. \$19.75

S08—1/2-carat dia. each. Compl. \$65.50

S09—Coral Cameo ring. 3 diamonds. Compl. \$18.00

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S11—Man's cluster ring. 21 blue white dia. Special price compl. \$45.75

S12—Ladies' cluster ring. 7 blue white diamonds. Special price compl. \$17.50

S13—1/2 car. dia. Compl. \$27.50

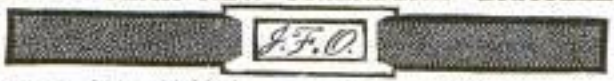
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 It protects you against loss or disappointment. It is a written legal guarantee to refund in cash the full price paid less 10% should you for any reason wish to return your diamond any time within a year. Also allows full price in exchange at any time. Contains written statement of carat weight, quality and value of the diamond. "See that your diamond is Basch guaranteed." **Beautiful Basch De Luxe Diamond Book FREE!** We will forward you postpaid, a copy of this beautiful, costly book

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Start your sisters, girl friends, relatives, etc., with a friendship bracelet. Solid Sterling Silver links only 15c each. Retail value 25c. Black silk velvet band free with each link you buy for your different friends. The links are worn on the velvet band until you have enough links to encircle the wrist; then send us the complete set of links and we connect them with Sterling Silver Fasteners for 25 cents. The Friendship Bracelet is then complete and makes a very attractive permanent piece of jewelry. Mailing charges prepaid. Retail in any form convenient to you.



upon receipt of your name and address. It is complete, valuable and authoritative, and you will find it a helpful guide to select Christmas Gifts, and gifts for all other occasions. Contains facts written by life-long experts which enable you to buy your diamonds and jewelry safely and intelligently. Thousands of illustrations, of diamonds, watches, platinum and gold jewelry, silverware, cut glass, etc., all priced to you at remarkably low figures. See this book before making your purchase—you will appreciate our money-saving prices. Mail coupon or write us a letter or postcard for your free copy, now!

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Please Mention Popular Mechanics

BE A BIG MAN IN YOUR OWN TOWN

START A HAYWOOD
TIRE REPAIR PLANT



MAKE \$3000 A YEAR TO START

Sounds like a whole lot of money, and it is—looks pretty big from where you stand if you are earning just an ordinary salary at an ordinary job, but why continue the job? Why be on that side of the fence?

It is not every business that will permit you to start with a very small investment. Most manufacturing business require big capitalization. And rich men take the profits, while you the producer, get a salary and the small end. But here is a business that gives **big returns, quick returns,** and the demand for your product is ahead of the supply and increases every day in the year.

YOUR WONDERFUL OPPORTUNITY

The certainty of success in this business is about as sure as anything in the world can be. Automobile owners increase by the thousands each year and the tires are still the least durable part of the car. Every owner tries to cut down his tire expense—every owner tries to repair his tires as long as they will hold together. Make up your mind and send for our catalog TODAY. Learn of the wonderful money making possibilities in this fascinating new business. Make something—supply a want—become a manufacturer. This is your chance. **Send today for FREE catalog.**

The Haywood Tire & Equipment Co., 963 N. Capitol Avenue, Indianapolis, Ind.

— Steel Shoe Book Saves You \$20! —

1 Pair Outlasts 3 to 6 Pairs All-Leathers | FREE

If you are tired of wet, sore, calloused feet—Rheumatism and Galls—hard, twisted, leaky leather—Big Doctor and Shoe Bills—loss of time, money, health and comfort—TRY FREE my Latest Triumph—Leather-Tapped "Steels"
Light, Springy, Comfortable, Economical, Waterproof, Warm in winter—Cool in summer—Adjustable Leather Taps, instantly renewed. **FREE BOOK** tells how you can try "Steels" 10 days FREE and save \$10 to \$20 shoe money.



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FREE BIG BOOKLET TELLING
HOW TO GROW
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at home all the year. Big profits. Take advantage of this wonderful opportunity to become independent. With **Nat'l Spawn Co., Dept. 12, Boston, Mass.**

ART PIANOS From
and PLAYERS Factory
to You!

To introduce our wonderful Profit-Sharing Plan, we offer you on

30 Days Trial

this Handsome Art Piano. Our unlimited guarantee, backed by Three Million Dollar Capital, is your assurance of a Piano with Artistic Design, Exclusive Features, Wonderful Tonal Qualities and the Acme of Perfection. Write today for Catalog—it is yours for the asking.

Story & Clark Piano Co., Dept. A-18, Chicago

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A large-capacity coal car for the Erie Railroad was exhibited at a recent convention of the Master Car Builders' Association. It is a hopper-bottom car with high sides and has a capacity of 70 tons.

The Grand Central Terminal in New York City has one of the largest, if not the largest, hot-water heating systems in the world. It comprises about 600,000 sq. ft. of radiating surface, and requires a water circulation of 10,500 gal. per minute.



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Free Catalog—128 pages—full of valuable information about guns and ammunition. **THE MARLIN FIREARMS CO.** Send 3 stamps postage to 65 Willow St., New Haven, Conn.

Repeating Rifles in all popular calibers. Repeating Shotguns, 12 and 16 gauges, hammer and hammerless.

Champion Racer



MODEL AEROPLANES

Send 2c postage for Complete handbook of Models and Supplies.

Our set contains this and 9 other drawings, with instructions for building.....\$1.00

WADING RIVER MFG. CO.
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Here's a New Business

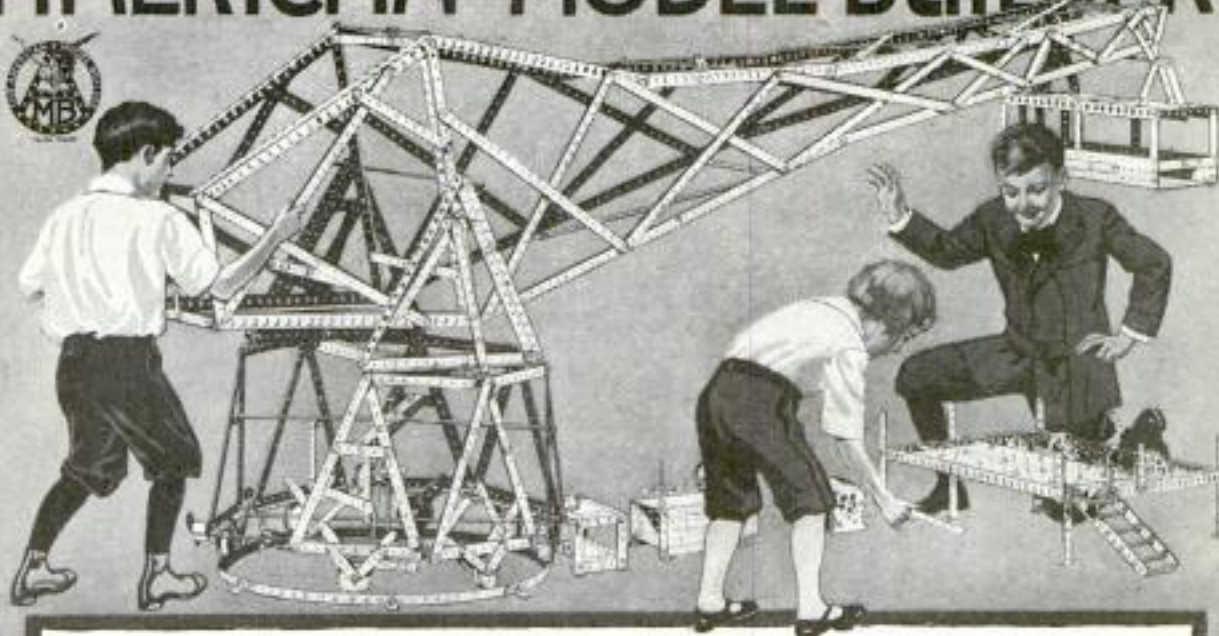


Reproduce Photographs of persons and scenes upon watch caps, dials, china, etc. Work easily done. Knowledge of photography not necessary. **TRIAL OUTFIT** with directions, \$2 postpaid—Contains enough materials to make at least 15 reproductions that you should sell from \$2.00 to \$5.00 each.

START NOW—ORDER TODAY

AMERICAN ARTS & CRAFTS COMPANY, BOSTON, MASS.

AMERICAN MODEL BUILDER



Say fellows! Here's the Boss of 'em all!

The American Model Builder! Gives you 15% more new and novel parts! Builds more practical working models! Builds models impossible with other outfits! Our big manual shows 370 models, and hundreds of others can be made. Every part made of finest brass and cold-rolled steel, double-plated. A real electric motor given free with most sets.

Boys, what do you think of that? Don't you say its many big improvements make the American Model Builder the "Boss of 'em all?"

Think what you can do with 15% more new and novel parts — such as real automobile wheels, car wheels, truck frames, bolster plates, "T" strips, ratchet pawls, new gears and angle irons!

Think of building a big grandfather's clock that will run for two hours; a stationary engine that will go like a real engine; traveling crane that will actually lift; derricks, windmills, automobiles, elevators, printing presses, trolley cars, pile drivers, warships, hoist bridges, and hundreds of other models that you can really operate!

This high-grade electric motor

Free! A real electric motor

This high-grade powerful electric motor is included with even the medium-priced sets of the American Model Builder. It has bronze bearings throughout, finest wiring, brushes, commutator, etc. Not a toy, but a real motor in miniature, capable of lifting ten pounds. Can be operated on dry cells or on city current through our inexpensive transformer.

Write for catalog

showing different outfits and hundreds of models you can build and details of big prize contest for new models. \$55 prizes. With it we will send you the "New Story of Steel," a mighty interesting romance of the steel industry. Write now. See it at your dealer's.

The American Mechanical Toy Co.
423 E. First Street Dayton, O.

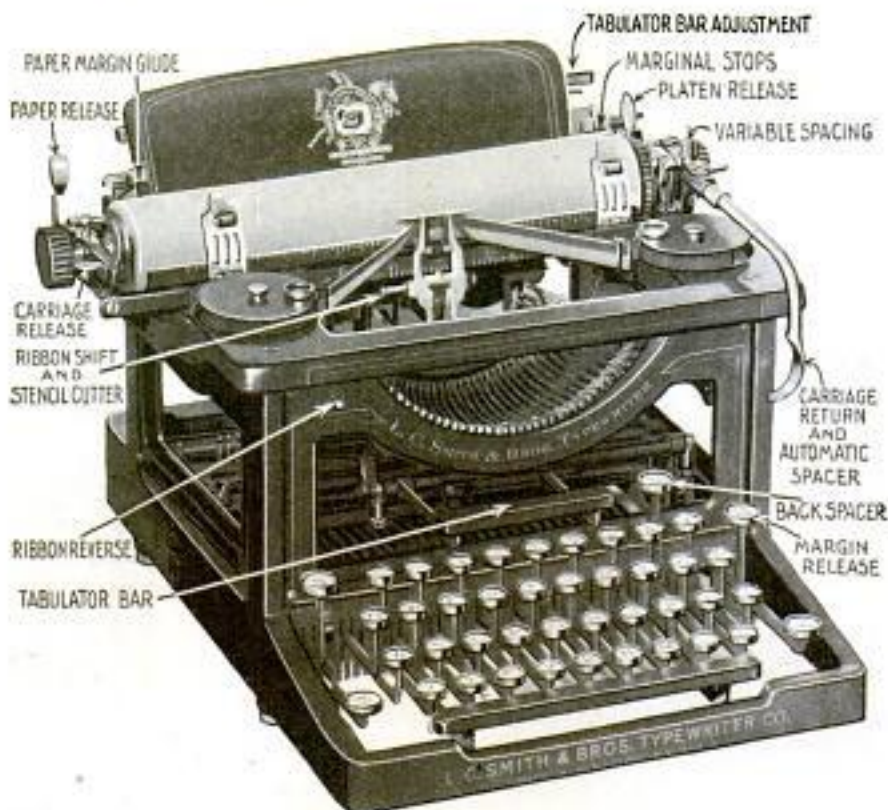
given with most sets.



Write for

big free book

Please Mention Popular Mechanics



TYPEWRITER SENSATION

Free TRIAL—Use As You Pay
Only \$2.50 a month until the low total price of \$48.80
is paid, and the machine is yours

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay \$2.50 a month and own one. Think of it—Buying a \$100.00 machine for \$48.80. Cash price, \$45.45. Never before has anything like this been attempted.

Standard Visible L. C. Smith

Perfect machines, not damaged or shop worn. Standard size, Keyboard of Standard Universal arrangement writing 84 characters — universally used in teaching the touch system. The entire line of writing completely visible at all times, has the tabulator, the two color ribbon with automatic reverse, the **Back Spacer**, Ball Bearing type bars, Ball Bearing shift action, the carriage runs on Ball Bearings, in fact every late style feature and modern operating convenience. Comes to you with everything complete, tools, cover, operating book and instructions, ribbon, practise paper — nothing extra to buy. You cannot imagine the perfection of this beautiful reconstructed Ball Bearing typewriter until you have seen it. I have sold several thousands of these perfect latest style Model No. 2 typewriters at this bargain price and every one of these thousands of satisfied customers had this beautiful, strictly up-to-date, visible machine on five days' free trial, before deciding to buy it. I will send it to you *f. o. b.* Chicago for five days' free trial on receipt of your request, without obligation of any kind on your part to purchase. It will sell itself, but if you are not satisfied this is the greatest typewriter bargain you ever saw, you can return it at my expense — but — you won't want to return it after you try it — you cannot equal this wonderful value anywhere.

H. A. SMITH
 510-231 N. Fifth Ave.
 CHICAGO, ILL.

Ship me a No. 2 L. C. Smith F. O. B. Chicago, as described in this advertisement. I will pay you the \$40.00 balance of the SPECIAL \$48.80 purchase price, at the rate of \$2.50 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

You Take No Risk—Put In Your Order Now

When the typewriter arrives deposit with the express agent \$8.80 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me \$2.50 a month until our bargain price of \$48.80 is paid. If you don't want it, return it to the express agent, he will return your \$8.80 and return the typewriter to me. I will pay the return express charges. This machine is guaranteed just as if you paid \$100.00 for it. It is standard. Over one hundred thousand people own and use these typewriters and think them the best ever manufactured.

The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today—mail to me—the typewriter will be shipped promptly. There is no red tape, I employ no solicitors—no collectors—no chattel mortgage, I deal direct with you — by mail only. It is simply understood that I retain title to the machine until the full \$48.80 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have.

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Only \$100

—and After Trial!

YES—the great New Edison with the new Diamond Stylus reproducer and your choice of all the brand new Diamond Amberol Records will be sent you on **free trial without a penny down**. The **finest**, the **best** that money can buy at very very much less than the price at which imitations of the genuine Edison are offered—a **rock-bottom offer direct from us**.

Mr. Edison's Own The Genuine New Edison Phonograph

Among all his wonderful inventions his phonograph is Mr. Edison's pet and hobby. He worked for years striving to produce the most perfect phonograph. At last he has produced this new model, and now it will be sent to you on a startling offer. **Read:**

Rock-Bottom Direct Offer

If you wish to keep Mr. Edison's superb new instrument, send us only \$1.00 after the free trial. Pay the balance on the easiest kind of monthly payments.

Think of it—a \$1.00 payment, and a few dollars a month to get this brand new style outfit—the Diamond Stylus reproducer, the musical quality—the same Diamond Amberol Records—all the musical results of the highest price outfits—yes, the greatest value for \$1.00 down, balance on easiest **monthly terms**. Convince yourself—a free trial first! No money down, no C. O. D., not one cent to pay us unless **you choose** to keep the instrument.

Our New Edison Catalog Sent Free

Your name and address on a postal or a letter (or just the coupon) is enough. No obligations in asking for the catalog. Get this offer—**while this offer lasts**. Fill out coupon today—right now.

F. K. BABSON, Edison Phonograph Distributors
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Entertain Your Friends

Hear all the latest up-to-date song hits of the big cities. Laugh until the tears stream down your face from laughing at the funniest of minstrel shows. Entertain your family and friends with everything from


Grand Opera to Comic Vaudeville—then if you choose, send it back.

To F. K. Babson
Edison Phonograph Distributors
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Gentlemen: Please send me your New Edison Catalog and full particulars of your free trial offer on the new model Edison Phonograph.

Name

Address



1916 MODELS NOW READY Any Watch You Want On CREDIT

**Waltham
Hamilton
Howard
Elgin
Illinois, Rockford**



ALL ARE 1916 MODELS

I SMASH THE TERMS!

And I am the first man in the country to offer the **New 1916 Models** of America's best known watches. I have them all, the latest products of the world's most famous factories, and watches are by no means all. You can get too, the very latest style mountings for **Diamonds**, and the most up-to-date pieces of exquisite **Jewelry**. Whether you buy for cash or credit, **THE PRICES ARE RIGHT.**

**Your Choice of
Inlaid Enamel Cases**

**30 Days Free Trial — No Money Down
Express Prepaid in Advance by Me**

That is the test that tells. Suppose you want a watch? Any make, any grade, any size, any case. I have it for you—just the watch that you want. **No Money Down, Express Prepaid.** You can try any one of America's best known timepieces for 30 Days. **A Free Trial, a Full Month to Carry It in Your Pocket.**

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The same kind of credit you get from your grocer liberally and cheerfully given. Arrangements are made for an Open Account as soon as you write. No red tape, publicity, notes or collectors. Every transaction is strictly confidential on terms made to suit you.

Send Coupon for Watch and Diamond Book

Why You Should Have This Book. It is the Encyclopedia of watches; a Dictionary explaining watch words; a History of Watch Making in America; the only Index Book of a **Good Watch** and an Absolute Authority on Watch Buying. Use a postcard, a letter or the convenient coupon. **Know Facts on All makes of watches before buying anywhere.** This book is a **Key to watch buying.** It tells you how to judge a good watch. Write for it today and get a letter from Square Deal Miller that makes you a friend for life.

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Miller-Hoefler Co., 577 Miller Bldg.

**Detroit,
Mich.**



**FREE
CATALOG COUPON**

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Dear Sir: Please send me, without cost or obligation, your big book on all makes of High Grade Watches, the **1916 Models, Genuine Diamonds and Jewelry** and full information on your Easy Payment, No Money Down and 30 Day Trial Plan.

Name _____

Address _____

Please Mention Popular Mechanics

WHEE-E-E-E! A RIOT OF FUN FOR EVERYONE!



**EVERYBODY-
GOLFERS
AND SANE
PEOPLE**

PLAY GOLF WITH CARDS!

Whee-e-e-e! Father makes a 200 yard drive. Billy's next. Shucks! The ball's ditched. Watch Mother. Good for her! She "lofts" out of the sand on to the green. Poor Clara! She "slices" into the water. Hear them laugh!

That's the way it goes—real golf! Talk about fun—say, one hour on the card-table links with this game will crowd more merriment into sixty minutes than you've had in a coon's age.

"GOLF BUG" The GAME That's Biting 'em All!

The *only* game of golf with cards. You can slice, pull, top or fozzle the ball; you can drive for 200 yards, or make a nice mashie onto the green and hole out in bogey. You meet all the conditions experienced on an actual course.

Start A Golf Club! "GOLF BUG" clubs are all the rage. They are being organized for the winter everywhere. Be the one in your set to start the "GOLF BUG" parties rolling. Novel way to entertain. Solves the Winter evening question of "what to do." Try a Golf Tournament instead of a Euchre or Bridge Party and see which makes the bigger hit. Don't fail to have the game for your *next* gathering.

Get the "GOLF BUG" Today!

You'll avow that a dollar never did you a better turn than the one that buys your "GOLF BUG" game. The more you play the game the more you'll prize your investment. If your dealer hasn't got his supply as yet, just pin a dollar bill to the coupon or a letter and send it direct to us. If you don't say it's the most fascinating card game you ever played, return it and get your money back.

The game will be sent prepaid. Please give dealer's name when sending to us. *Today* is the day to get the "GOLF BUG."

CON. P. CURRAN PRINTING CO.
728 Walnut St., ST. LOUIS, MO.

What if you've never played golf! What if you don't know a mashie from a mutton-chop. Here's where you pick up the whole thing in one game right in your parlor in the king of indoor sports—"GOLF BUG!"

Note the youthful ring that comes back into Mother's voice when she plays it. And Father—what a kid it makes of him. And the young folks—they go wild about it. *Some* game, you'll articulate.

Not any more a matter of luck than the field game. "GOLF BUG" is a *scientific* game of absorbing interest to both those who play golf and those who don't. Keeps you "on edge" from start to finish. One game will make you a fan. It's the game that's "got" us!

Complete Outfit Only \$1

Eight golf sticks of 120 cards of highest quality; a golf links chart; book of golf terms and rules; score cards and markers—whole outfit packed in handsome durable box for only \$1. Makes a cracker-jack Xmas gift.

Ask for it at the stationers, sporting goods house or department store. If your dealer is not as yet supplied, send direct to us. Enclose only \$1.

Special \$1 Coupon

CON. P. CURRAN PRINTING CO.
728 Walnut St., St. Louis, Mo.

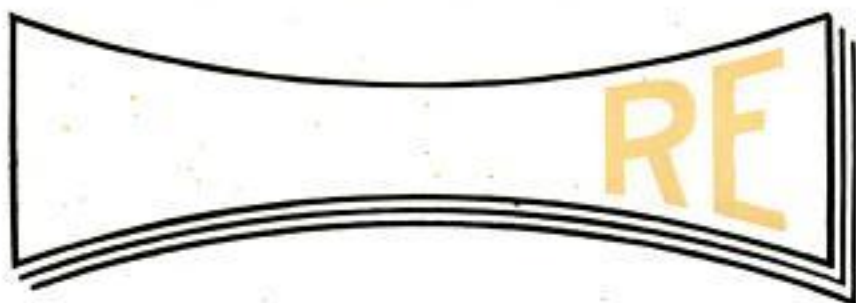
Enclosed is \$1 for which you will send me prepaid complete outfit of "GOLF BUG" game.

My Name

Address

Dealer's Name

The Next Great Business



Domestic-Electric-Refrigerator

THE better living American public has been waiting to pass up the ice man and delivered ice. Are you the man who will control this demand in your territory? We will turn over an **exclusive** and **perpetual** sales contract to the financially responsible man who knows the present and future possibility of practical and economical electric refrigeration for the homes.

HERE IT IS— READY FOR DELIVERY

Not a laboratory experiment but a machine with two summers' proof of service behind it. Not a model but a manufactured product of interchangeable parts.

A silent, sturdy, electrically driven apparatus that keeps your present refrigerator at a uniformly low temperature night and day, without any attention or regulation.

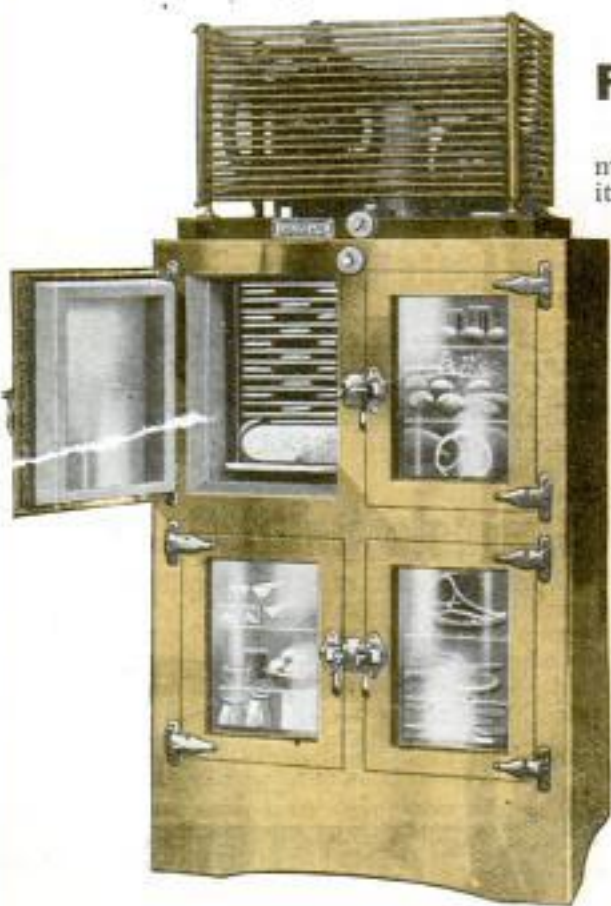
Makes ice in cubes for table use from your favorite drinking water.

Maintains the safe and sanitary low temperatures insisted upon by the health experts—temperatures and dryness impossible with ice.

And the first new use of electric current that is cheaper than the service it supplants.

Don't write us if you are looking for a job, but if you want the most profitable business in your locality and have the ability or capital to finance a real monopoly, write for our proposition.

We have nothing to sell but machines and we have **opportunity** for the man who knows he can place domestic electric refrigeration in the good homes of your territory.



Cleaner, Colder, Cheaper than Ice

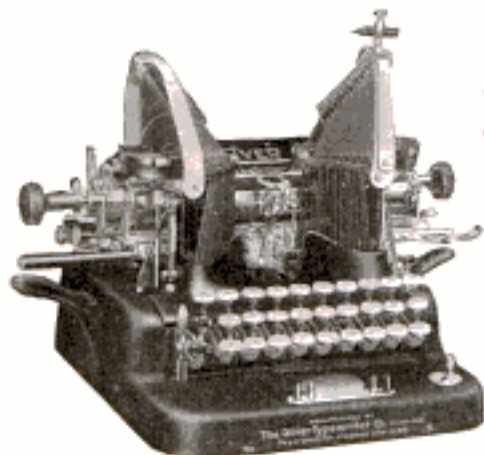
The Mechanical Refrigerator Company

718 Fisher Building, Chicago

FACTORY—CLYBOURN AVENUE AND WILLOW STREET, CHICAGO, ILL.

May 1-1916 to
The Ice Co 1735 Mt Elliott St. Detroit
See Sept 1915 p 412
Ice Co. of Chicago 343 S. Dearborn St. Chicago
Mich

7 CENTS A DAY Buys This Standard Visible Oliver Typewriter



Much Less than Half Price FREE Trial—10-Year Guarantee

This is the best typewriter offer ever made. The typewriter is the genuine model No. 5 Standard Visible Oliver with complete, brand-new equipment. Perfect machines only. Not shop worn, not damaged, not inferior. Back spacer and tabulator—no features lacking. Warranted to be the equal in quality of any other \$100 typewriter.

This offer is not on some ancient style of blind typewriter, but on an up-to-date, standard, visible machine, the same kind of typewriter that many thousands of the world's best business firms are today using.

Oliver Points:

Nearly one-half million Olivers have been sold. Its record has never been equaled. It is easily "The Favorite."

Its simple efficiency, lightness and durability place it in a class ahead of all others; writing always in sight; writes in many different colors without changing the ribbon. Has the universal keyboard, back spacer, tabulator, ruling device, disappearing indicator. The type is beautiful; it is so hard that nothing can mar it. It outwears type found on other machines.

It is the lightest of all the standard typewriters. It is the only practical, portable typewriter. It has the lightest key action. Its speed is unlimited. It has the patented "U" shaped type bar which insures perfect alignment of the letters. One can write on ruled lines with it or it can be used to draw lines. It makes an efficient billing machine as well as correspondence machine.

The downward stroke of the type bar gives greater power. The Oliver is nearly always chosen for manifolding—some firms write as many as 20 copies at one writing. It does any practical thing which any typewriter can do.

It has the fewest parts. It requires the least adjustments. There is nothing to wear out. We guarantee it for 10 years.

While it is the choice of the experts, it is so simple in its design that anyone can learn to write on it in 10 minutes' time.

Sensational Reduction

Many thousands of purchasers paid \$100.00 for typewriters of this model. They were satisfied that at that price they were getting the best value that the market afforded.

Now, without any reduction in quality and with brand new standard equipment, our price to you is but \$39.80—a saving of over half, and we give you over a year in which to pay.

Our Offer Is This

Send the coupon and we will forward one of these typewriters with complete equipment on ten days' trial. We will ship it by express. When it arrives you leave \$3.80 with the express agent to be held while you try the typewriter.

If you do not find it to be the best typewriter that you ever examined, satisfactory in every respect, the best value offered anywhere, then you simply return it to the express agent, who will give you back the \$3.80 and return the typewriter to us at our expense.

If you decide to keep it, the express agent will forward the \$3.80 to us and it will be deducted from the \$39.80 price, leaving a balance of \$36.00, which you can pay at the rate of \$2.00 per month, the first monthly payment not being due until one month after date of delivery.

There are no interest charges, no red tape, no salesman, no collectors, no bother. The simple coupon is all we require.

Send the coupon today. Make sure of getting this bargain, as we will only supply 100 typewriters at this price.

United States Typewriter Exchange
Dept. 317, All Light Bldg., CHICAGO, ILL.

Trial Order Coupon

United States Typewriter Exchange

Dept. 317, All Light Bldg., CHICAGO, ILL.

You may send me a No. 5 Oliver Typewriter on approval. When it arrives I will leave with the express agent \$3.80 with the understanding that if I do not wish to keep the typewriter the \$3.80 will be returned to me by the express agent when I return the typewriter to him within ten days from the date I receive it.

Otherwise I will keep the typewriter and the \$3.80 will be forwarded to you to apply on your special purchase price of \$39.80, and I will pay the balance of \$36.00 in 18 consecutive monthly installments of \$2.00 each, commencing one month from date of delivery.

The title of the Oliver Typewriter remaining in you until it is totally paid for.

Name.....

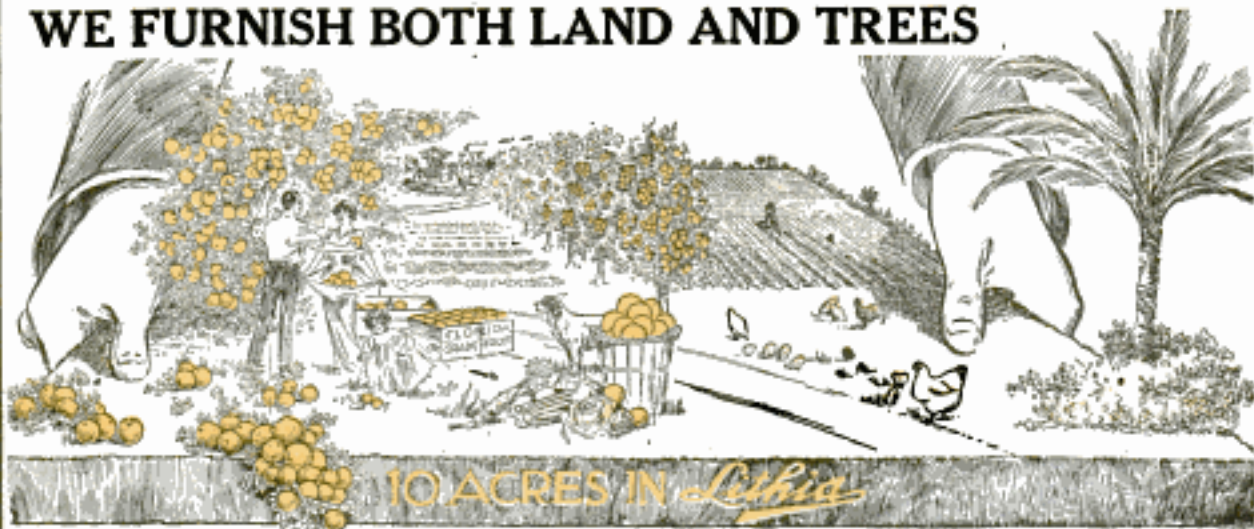
Address.....

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(127)

Grow Grapefruit and Oranges in Florida

WE FURNISH BOTH LAND AND TREES



Get Away From City Drudgery

Live a real life in the bright health-giving sunshine. Enjoy your work in the open air the year 'round, in America's most delightful—most charming of all states. A few cents a day will pay for your land—also trees any time you want them—which opens the way to your independence and can be made to soon bring you a life income. No better land or location for fruit, truck, poultry and livestock can be found anywhere.

INVEST NOW IN OUR NEW LITHIA TRACT SUBURBAN TO TAMPA, the metropolis of South Florida. It is one of the few choice suburban farm tracts left in Hillsboro County, the recognized center of Florida's grapefruit and orange belt.

This is the third great Hillsboro County tract that has been opened to homeseekers and investors by our old established, responsible, thoroughly experienced organization. Over 2,500 families are now rejoicing because they bought at opening prices in our two former tracts. Every family can tell you they got a square and generous deal.

Our new Lithia Tract now offers you the same wonderful opportunity—and more, because of the rapid growth and development on all sides within the past five years.

The visible supply of select Hillsboro County grape fruit land is melting away very fast. Prosperous homes are scattered around the Lithia Tract—grapefruit and orange groves, truck gardens and poultry farms are flourishing on all sides. Already buyers are building homes on our new Lithia Tract, and values are due to rise soon.

Free—Absolutely Free—100 grapefruit and orange trees to each and every purchaser who reserves one of these farms NOW. These trees will be held in our Nurseries until you are ready to plant them. This will give you a splendid start in developing a grove which will bring you an ever increasing income and greatly increase the value of your entire farm.

The C. E. Thomas Nurseries are growing the finest varieties of grapefruit, orange, lime, fancy peach, plum and other semi-tropical and southern fruit trees, which we are selling to land owners throughout the south, as well as our land buyers. There are no better trees grown than the C. E. Thomas Nurseries Warranted Citrus Fruit trees. Every tree fully guaranteed to grow.

Get our big new Florida book and look at the map—read the many enthusiastic testimonial letters from settlers now living on the farms they bought from us. Four big railroads intersect these suburban tracts—all the comforts of modern life right at hand! The completion of the Panama Canal throws the spotlight on Tampa, the nearest deep water port, and the traffic of the whole maritime world will pause at Tampa's door.

Think of it—a 10-acre farm suburban to a city like this—a farm big enough to keep you in comfort all your lives, yet one you can pay for so easily that it will really surprise you.

Get the facts now. The coupon brings them to you without cost or obligation. Get this new wonderful opportunity clearly before you while prices on this newly opened tract are still low and terms easy. Today \$1 per acre per month buys you independence and a future. Tomorrow—who can say?

North Tampa Land Co., Pop. Mech. 12-15
837 Marquette Building, Chicago

Please send me, FREE, assortment blank for 100 grape fruit and orange trees, and your latest Illustrated Book on choice Citrus Fruit and Truck Farms suburban to Tampa, Florida.

Name

Street No.

City State

If you already own land and are in the market for high-grade fruit trees do not fail to write for our New Illustrated Nursery Catalog before buying trees elsewhere. It is free and gives much valuable information and instructions on planting and caring for trees. The coupon is for our land book only.

Honestly, now wouldn't you like to become the owner of a beautiful 10- or 20-acre farm in the heart of Florida's richest agricultural belt? You can easily do it if you will make the start. A few cents a day will pay for the land. You can improve it at your pleasure, or we can plant trees for you and have your grove taken care of for a term of years. Where else could you put aside a few odd dollars so safely, so securely, and with such surety of seeing your modest savings fund develop into a great big investment?

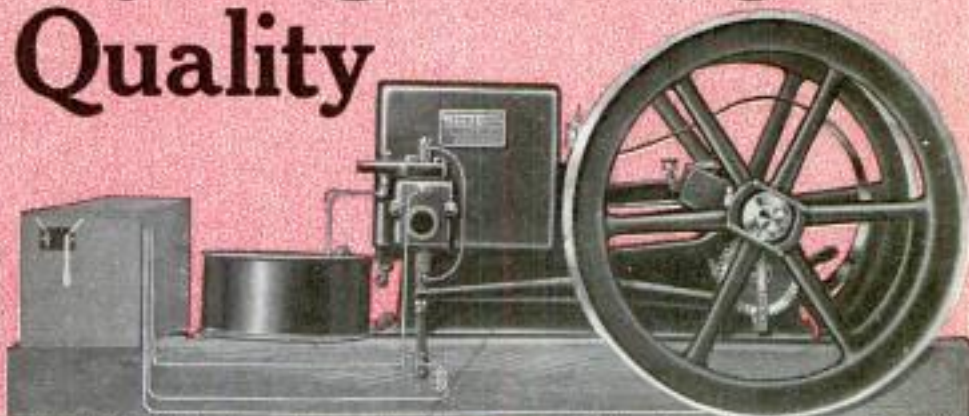
No use trying to make yourself believe that savings bank interest will ever make you independent, nor 6% loans make you rich. Your money isn't working when you tie it up in such ways—it's LOAFING. Make your money work for YOU; right here in these rich fruit lands is your opportunity—here where a few dollars put to work NOW will reap all the benefit of development work constantly being done by the fast increasing population.

If you do not wish to improve your farm, you can in a few years, cash in on it from the investment standpoint without a stroke of work on your part. Think of it—an investment of a very few dollars a month—and a magnificent grapefruit and orange grove is the result almost before you know it!

Tear off the coupon and mail it now and we will pay before you, by return mail, full and complete information showing how you can easily become the owner of one of these beautiful grapefruit and orange groves, and why it is sure to prove the shrewdest, most profitable investment you can possibly make.

NORTH TAMPA LAND CO.,
C. E. THOMAS, President
837 Marquette Building CHICAGO

Lower Power Cost Proves My Higher Engine Quality



Latest WITTE Prices F. O. B. Factory STATIONARY

2 H-P.	\$ 34.95
4 H-P.	69.75
6 H-P.	97.75
8 H-P.	139.65
12 H-P.	197.00
16 H-P.	279.70
22 H-P.	359.80

PORTABLE

2 H-P.	\$ 39.95
4 H-P.	82.75
6 H-P.	127.75
8 H-P.	174.65
12 H-P.	237.00
16 H-P.	329.70
22 H-P.	412.30

SAW-RIG

6 H-P.	\$152.25
8 H-P.	202.15
12 H-P.	267.00

My engine H-P ratings have not been raised to make prices look low. My ratings are the same as in previous years—a 10% surplus of power in each size over the regular rating.

A WITTE Engine of any size is guaranteed to give its full rated horse-power with a liberal surplus. So, probably, will any other strictly high-grade engine. But the mere ability to deliver its rated horse-power is not all that is needed to prove engine quality. The big question to consider is this: "How much will it cost in fuel, lubricant, and upkeep expense to get that rated horse-power out of an engine?" Real engine quality is measured by the engine's ability to keep that cost down to the lowest possible notch. And, other things being equal—strength, durability, simplicity, ease of operation, smoothness of running—the engine which keeps its operating cost down to the lowest notch is the engine for you to buy.

WITTE ENGINES

Gasoline, Kerosene, Distillate and Gas

Thirty years ago when gasoline and other like fuels were cheap almost any type of engine that could pull its rated load, regardless of amount of fuel used, would answer the user's purpose. Those early engines were mostly over-heavy and a large part of their own power was consumed in overcoming excessive friction of their over-heavy parts.

Today fuel is a matter of first importance. I foresaw this years ago and began working toward a cheaper power cost. The result is the WITTE Engine of today which, measured by the cost of power put into the drive belt—its actual dollar-earning value—has set a new standard for engine efficiency. A saving of 25% of the fuel used by older type engines amounts, in a year, in many cases to more than enough to pay the entire first cost of a WITTE Engine.

Sent Direct From My Factory To User

CASH OR EASY TERMS

Five Year Guarantee On Efficiency And Durability

For 28 years the WITTE has maintained its lead in Engine Quality. Compare my prices with others and see how much you save on the first cost—to say nothing of the steady saving on fuel and upkeep.

FREE ENGINE BOOK. Tells why I use semi-steel castings; why I make cylinder and bed separable; vertical valves; four-ring pistons; automobile style ignition; safety spark shift for easy starting; and use other features without which no engine is of high grade quality. Mail coupon today.

ED. H. WITTE, Witte Engine Works
1745 Oakland Ave., Kansas City, Mo.
1745 Empire Bldg., Pittsburgh, Pa.

ED. H. WITTE, Witte Engine Works
1745 Oakland Ave., Kansas City, Mo.
1745 Empire Bldg., Pittsburgh, Pa.

Without cost to me, and with no obligation on my part, I should like to receive your latest and finest Engine Book, and to investigate your New Liberal Selling Plan.

Name.....

Address.....



WITTE Saw-Rig
Sizes: 6, 8 and 12 H-P. Kerosene and Gasoline engines furnished in this style.

Please Mention Popular Mechanics

The New Triumphs of Master Goldsmiths

The latest products of the craft. Exquisitely beautiful. Your own initials handsomely engraved on the superb gold strata case — guaranteed for 25 years. *The masterpiece of watch manufacture—19 jewels, adjusted to the second—adjusted to positions—adjusted to temperature—adjusted to isochronism. Open face or hunting case, ladies' or gentlemen's sizes.* Direct to you at the rock-bottom price.

The Movement

For the purpose of this sweeping *direct* offer the Burlington Watch Company selected its finest and highest grade watch. The 19 imported ruby and sapphire jewels represent maximum time keeping efficiency. The fact that 19 jewels gives the maximum, being known to every posted railroad man.

Adjusted to temperature and adjusted to isochronism and adjusted to positions—the Burlington watch is subjected to the most rigid tests—tests that require months after the watch is completed. Then after being fitted at the factory into its proper case, every Burlington watch is retimed so as to meet the ultimate standard of quality.

New Ideas In Watch Cases

Newest Ideas: Inlay Enamel Monograms, Block and Ribbon Monograms, Diamond Set, Lodge, French Art and Dragon Designs, Etc., Etc.

Open face or hunting case, ladies' or gentlemen's 12 and 16 sizes.

Imagine a beautiful hunting case with your own monogram on one side and the emblem of your lodge or any other emblem on the other side. Our catalog shows complete illustrations.

Every fighting vessel in the U.S. Navy has the Burlington Watch aboard



19 Jewel \$2.50 Burlington A Month

The Master Timepiece Now Sold Direct for Only

The Superb Burlington Watch—*adjusted* to positions, *adjusted* to temperature and *adjusted* to isochronism—now at the *direct* rock-bottom price—the same price that *even the wholesale* jeweler must pay—and in order to encourage everybody to secure this watch at once, pay this rock-bottom price, either for cash or \$2.50 a month on this great special offer. We send the watch on approval, **prepaid**. You risk absolutely nothing—you pay nothing, not one cent, unless you want this *exceptional* offer after seeing and thoroughly inspecting the watch.

Write for Special Offer!

Send us the coupon below—or a postcard for the great, sweeping *direct* offer on the genuine Burlington. We want you to see and examine the Burlington. Find out for yourself what a magnificent timepiece it is—and at a price which must surprise you. Write today for the book that shows you handsome illustrations in full color of the newest watch cases that you have to choose from. The latest triumphs of master goldsmiths are yours on this special offer.

Send the Coupon for New Watch Book

Learn the inside facts about watch prices, and the many superior points of the Burlington over double-priced products. Just put your name and address on the coupon, letter or postcard and get the Watch Book Free.

Burlington Watch Co.

19th Street and Marshall Boulevard, Dept. 1199, Chicago, Ill.

Burlington Watch Co.
19th Street and Marshall
Boulevard, Dept. 1199
Chicago, Ill.

Please send me (without obligations, prepaid), your free book on watches showing all the latest designs, with full explanation of your cash, or \$2.50 a month offer on the Burlington Watch.

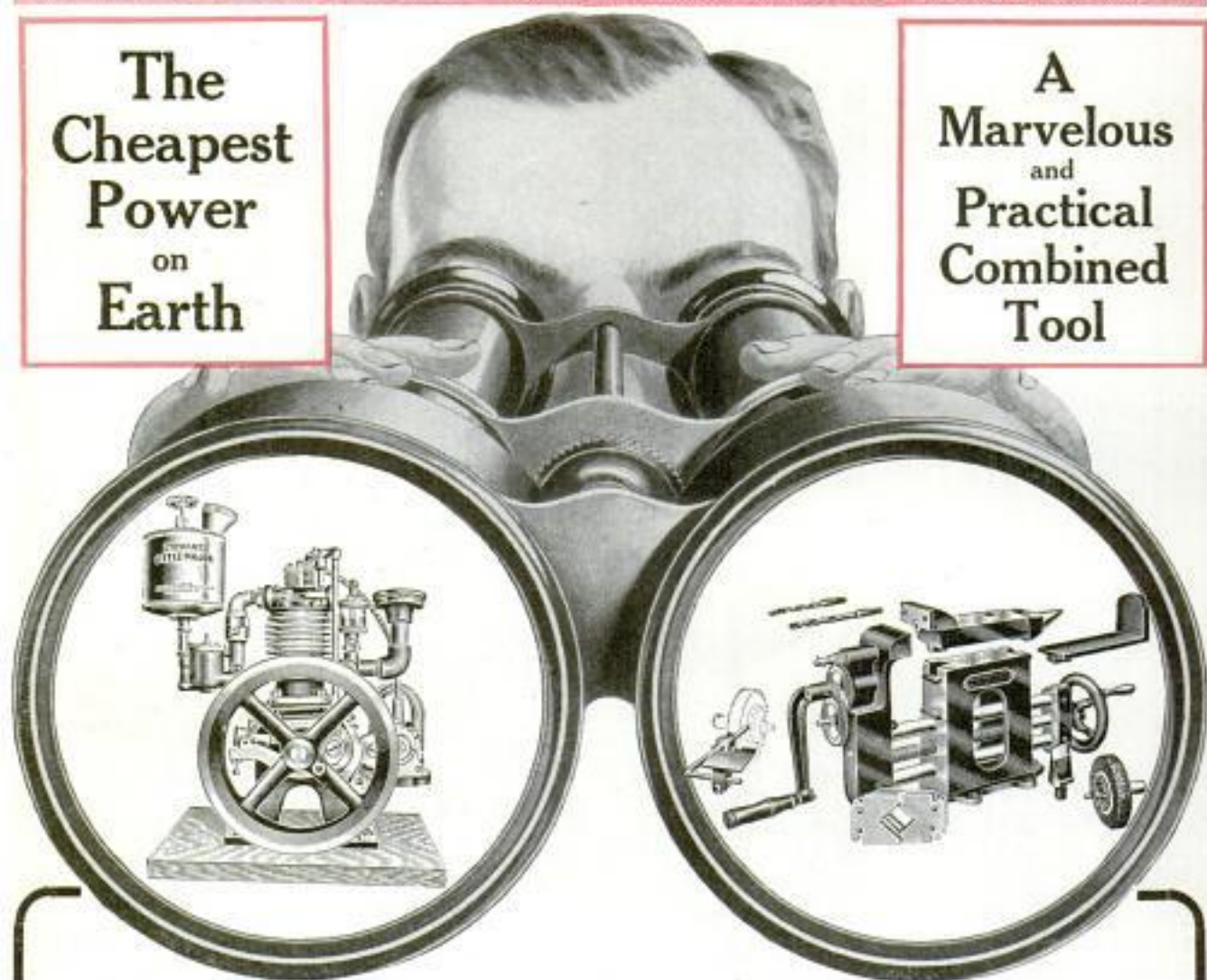
Name.....

Address.....

LOOK! The Best You Ever Saw

The
Cheapest
Power
on
Earth

A
Marvelous
and
Practical
Combined
Tool



STEWART Marvelous Small Engines

are thoroughbreds. There is a vast difference between thoroughbred horses and scrubs. So it is with engines and Stewart Engines represent the last word in quality.

The Stewart Little Major

$\frac{1}{2}$ H. P. Engine shown above will operate any machine that can be run by hand and do it better and cheaper; uses less than a half gallon of gasoline for day of ten hours. Ideal for washing machine, small printing press, pump, fan, corn and feed cutters, ice-cream freezer, etc.

With battery **\$27.50**
with high tension magneto **\$37.50** and worth it.

Also 2 and 3 H. P. Engines of super quality and worth every cent asked for them. Send for catalog.

STEWART Handy Worker

THE HOME WORKSHOP

A big, strong, everlasting combined tool that will save many a quarter and half dollar. Enables one to make repairs at home. Valuable in the garage, small shop and about almost every home.

HERE'S WHAT IT COMPRISES:

A steel faced vise up to 4 $\frac{1}{2}$ inches. A steel pipe vise of marked superiority; takes pipe up to 1 $\frac{1}{2}$ inches. A strong and sturdy anvil. A cutting hardie. A corundum grinder, 5 inches by 1 inch; 3 speeds. A two-speed drill press, taking any standard drill.

Weight, boxed, 90 pounds. Price **\$12.50**
complete as shown

Send \$2.00 and pay balance when it arrives, or write for booklet.

CHICAGO FLEXIBLE SHAFT COMPANY, 105 N. La Salle Street, CHICAGO

Electric Light for Your Home

Have Electricity in your home this winter

No matter if you *do* live in the country or in a small town where direct city current is not obtainable, you can now have electric light and power in your home—at lower cost than ever before.

Think of having any room in your house instantly lighted at a snap of the switch. Think of the long winter evenings made bright as day by a steady, clear, non-flickering light.

The Uni-Lectric Lighting, Cooking and Power System

This wonderful invention, backed by a year's success in the hands of owners, is based on the fundamental principle of proper efficiency with utmost simplicity. Unlike all other private electric plants, the "Uni-Lectric" has no batteries, switchboards, rheostats, belts or chains. It consists simply of a high speed gasoline motor, generator and automatic governor, all complete in one small compact unit, occupying about two square feet of floor space. A complete "central station" plant in domestic size—easily operated and requiring no electrical knowledge at all. Better still, its first cost is much less than that of any other system, its operating cost still lower.

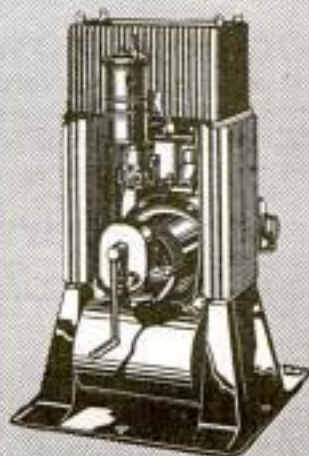
Generates standard 110-volt direct current and runs from one to 50 lights of different sizes and standard makes. Also operates electric motor, electric iron, vacuum cleaner, force pump, churn, washing machine, etc.

If you are still using kerosene or acetylene lamps, it's high time you changed to "Uni-Lectric"—the only light that does not consume the oxygen you ought to breathe. City people have been enjoying electric light and power for years—why shouldn't you have it this winter?

Write today for complete description, and let us demonstrate just how little it will cost to have your home electrically lighted this winter.

Waterman Motor Company

182 Mt. Elliott Avenue
DETROIT, MICH.



Uni-Lectric
GASOLINE-ELECTRIC UNIT
LIGHTING SYSTEM

Please Mention Popular Mechanics

Copyrighted material



Brand New REX Typewriters

On Our Agency Plan will cost you no more than an old-fashioned second hand rebuilt.

Monthly Payments if you like as low as
\$250

(ABOUT 7c A DAY)

No Money Down
10 Days' Free Trial
10 Years' Guarantee

1. Tilt back paper shelf.
2. Extra wide platen.
3. Line space lever.
4. Two color ribbon shift.
5. Shift lock.

6. Back spacer.
7. Right hand shift keys.
8. Universal keyboard.
9. Left hand shift keys.
10. Margin release key.

11. Tabulator key.
12. Two color ribbon.
13. Carriage release key.
14. Feed roll release lever.
15. Paper fingers.

16. Removable platen.
17. High writing line.
18. Tool steel center guide.
19. Line lock.
20. Stencil cutting.

Tie This Up—Quick!

for Your Town Write quick for our remarkable proposition to DEALERS. A wonderful opportunity to get the "exclusive" in your town for the greatest sensation ever sprung in the typewriter trade—the great new high-grade REX—the first perfect, faultless typewriter ever produced.

The New Typewriter Sensation

This is the new wonder that has staggered the typewriter industry and brought upon us a hail of criticism from our competitors for breaking the fixed \$100 price for standard machines. Here is the chance you have waited for, Mr. Dealer—an opportunity to line up with the livest typewriter organization in the world today. We are making the **DEALER** the foundation of our big business. We do not have, and will not have, any branch offices or salesrooms. By cutting out all the enormous expenses of branch offices and stores, rents, manager's and salesman's salaries and commissions, etc., and selling only through **dealers**, we are able to market a **better** typewriter—right from our factory to you—at an astounding low price. At last the typewriter field is open to you. Send coupon.

We guarantee the REX for 10 years and prove it to be superior to any other \$100.00 typewriter made, with every essential feature. Full standard size; visible writing; lightest touch; unlimited speed; extra wide platen; two-color ribbon; back spacer; line lock; tabulator; removable platen; perfect paper feed, etc., etc. A masterpiece of engineering skill—the first perfect typewriter.

Live Dealers Make Big Money We allow our dealers better profits than machines or second-hand (so-called "re-built") typewriters, and protect them fully. If you are the first to answer this ad from your town you can get the exclusive agency for the new REX. Don't wait. Write today for our dealer's proposition and the REX catalog. Don't miss this wonderful opportunity. Write now. You will never get another opportunity like this. The time to investigate is NOW. Write us immediately. Don't wait till your competitor, or some other hustler in your town, has seized this opportunity. Be the first to write us. No obligations whatsoever in sending for full details.

"Re-built" Dealers

Think of the advantages of selling the high-grade REX and building up for yourself a permanent, profitable business with the aid of our big organization—more sales and larger profits! Why not sell a new, guaranteed, satisfaction-giving machine and avoid the kicks of disappointed, "re-built" customers and the ruinous competition of "re-built" sellers. Get our proposition.

REX TYPEWRITER CO., Dept. 18, Steger Bldg., CHICAGO

BIG MONEY

in Taxidermy

**We teach you with complete success by mail!
Pleasant, fascinating work — quickly, easily learned!**

Professional Taxidermists earn from \$2000.00 to \$3000.00 a year, and there are not half enough Taxidermists to supply the demand. By giving only your *spare time* to this work you can easily earn from \$20.00 to \$50.00 per month without interfering with your regular business or occupation. Mounted specimens sell readily for big prices. Many birds and animals that are now killed and thrown away are *valuable* and can be turned into cash. Send the coupon today.

Sent FREE!

Our beautiful catalog, The Taxidermy Magazine, Sample Diploma, Pictures of Mounted Birds and Animals. Hundreds of letters from Sportsmen Students. All the above absolutely FREE for the asking. Mail coupon now.

We teach you **BY MAIL, IN YOUR OWN HOME**, to successfully

Mount Game Heads, Birds & Animals

also to **TAN** all kinds of hides and furs, and make them into beautiful **rugs** and **robes**. No other art is so fascinating, interesting. No other profession so profitable.

SPO

M

Mount Your Own Trophies!

Hunters, Anglers, Trappers, Nature Lovers—

Here is an opportunity you have long been waiting for! It's no longer necessary to lose the fine trophies you've secured during the hunting season, nor to pay the high prices asked by Taxidermists for stuffing them. *You can now learn* this great art for yourself during your spare time. You'll soon mount specimens as well as the most expert Taxidermist.

By taking our course of 40 lessons you will soon be able to do perfect mounting, and can *decorate your home, office or den* with the choicest of art. You will have a delightful diversion for your leisure time, and will *enjoy every moment* you give to the subject. Thousands of men and women of every vocation—bankers, lawyers and business men—are members of our school and highly endorse it.



Mounted by our student, F. Hawson, Kalamazoo, Mich.

This is the Original School of Taxidermy, and is endorsed by our thousands of students and all leading Museums, Naturalists and Taxidermists. We teach the **BEST STANDARD METHODS**, and positively **guarantee success**. Expert instructors in every department. Our Taxidermy work is widely known, having been awarded First Grand Prize and 9 Gold Medals at the Exposition. The Editor of any Sportsman's Magazine will tell you of the high standing of this school, which has taught Taxidermy successfully for many years.

Send for our printed matter today. It will interest you, and it's absolutely **Free**. We want every sportsman or nature lover in the country to become a member of the only school in the world "for sportsmen by sportsmen."

Our school and the success of our course are well known and highly endorsed by all highest authorities. Mail coupon or use postal card.

The Northwestern School of Taxidermy
1199 ELWOOD BLDG., OMAHA, NEB.

Sign and Mail Coupon Today
N. W. SCHOOL OF TAXIDERMY, 1199 Elwood Bldg., OMAHA, NEB.
Please send me sample Magazine, catalog, etc., FREE. I am interested in Taxidermy.

Name.....
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R. F. D.....

Please Mention Popular Mechanics

Here's Health and Power



Do you want them? Strength that is more than mere muscular strength. The strength of better health, abundant nerve force. The strength of keen relish. Write and find out what vibration will do for you. Nine out of ten people are only half alive. How about yourself? Do you feel just right? If you haven't that vigorous "go ahead" feeling all the time, don't fail to send the free coupon today for our big new book that will tell you all about

THE **WHITE CROSS**
ELECTRIC VIBRATOR

Our Combination Outfits give you three of the greatest curative agents—Vibration, Faradic and Galvanic electricity. We will send this wonderful machine to you on free trial. See it—try it—feel its health-giving vibrations for yourself.



Vibration Is Life!

In vibration there exists many of the secrets of life. The safest, surest and quickest way to recover normal health is by scientific manipulation of the organs affected and in this way stimulating them to perform their duties, whether it be those of digestion, respiration, circulation, or the nervous system. The rich, red blood will be sent coursing through every vein and artery. Write today—now—for our free book.



Lindstrom, Smith Co.

1100 S. Wabash Ave.
Dept. 1199, Chicago, Ill.

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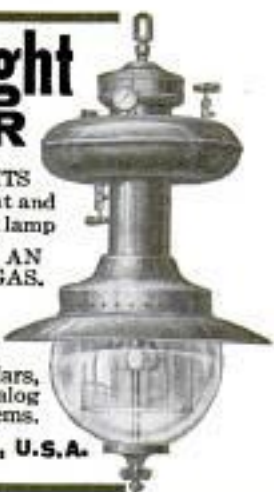
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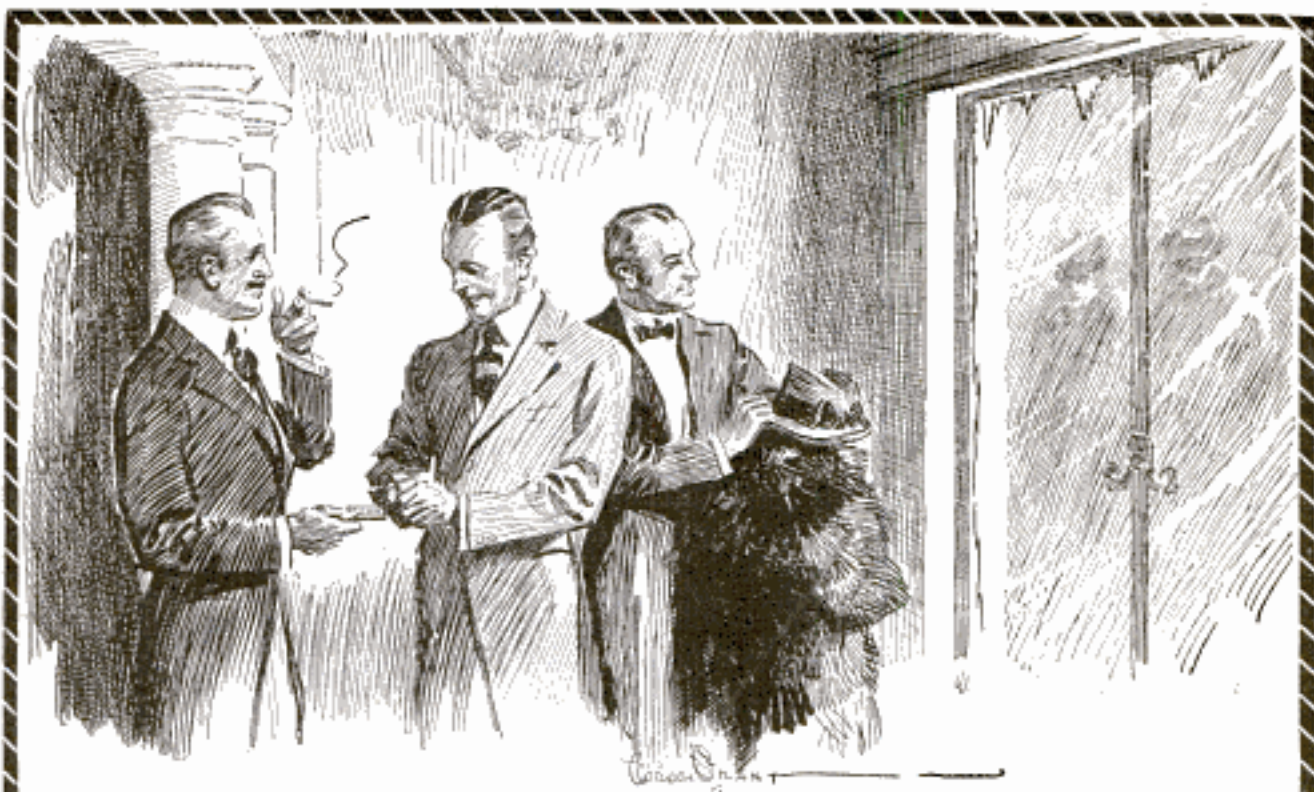
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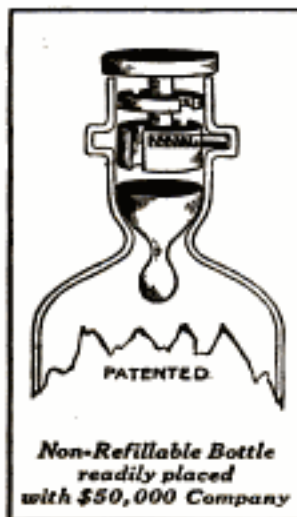
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Manufacturers Calling for Over Two Hundred Inventions

Money Is Waiting to Back the Good Idea

(By a Washington Patent Attorney)

Never was there so good an opportunity for the inventor of something—*anything*—of merit as right now.



Manufacturers with money and facilities are asking for ideas—*calling* for them. The supply is not nearly equal to demand. Over 200 inventions are asked for in a list just given in a little book "What to Invent." The demand is not for anything extraordinary—just the common everyday things that make work easier or life more pleasant in the household, the shop or the field.

You might think the possibilities of the window screen had been exhausted, but I know of 28 concerns that are looking for a new screen, duly covered by patent, which they can manufacture. I know of 46 manufacturers and others who are ready to manufacture any good, patented household article such as can openers, baking pans, coffee pots, washing machines carpet sweepers and other devices.

Within the last few weeks I have received forty special requests for a dishwasher and drainer; seventeen others request an improvement in scissors. Manufacturers know that everyone must have a pair of scissors in the house, and they realize that a novelty in them would always sell in place of the old kind, and hence the demand. Among my letters are sixteen requests for a device to turn sheet music on a music stand or piano, and seventeen people are interested in the

purchase of a patent on a device for holding an electric light in any position. Besides these there are hundreds of manufacturers who do not specify any particular device but state that they would be interested in anything of merit



A Chicago man says: "I want something that can be sold to farmers by mail. There is practically no limit to the investment my associates would make in a good proposition." A man in Woodhaven, N.Y., says he is in the market for a small household article, light in weight, which can be sold somewhere around ten cents.

A prominent manufacturing company is interested in something to sell to hardware stores, but would also be interested in other things promising to be money-makers.

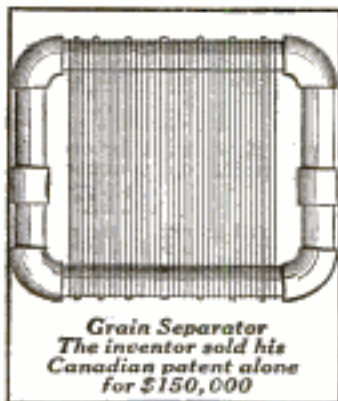
A man in Revere, Mass., says: "I am looking for something that can be manufactured, plant equipped, etc., and marketed for an outlay of not over twenty-five thousand dollars."

A big textile machinery company says they are interested in newly patented devices that can be


either bought outright or manufactured on royalty. They do not require machinery inventions alone, but anything of merit.

A company in Belvidere, Illinois, wants patents on small tools or metal novelties.

A Dayton, Ohio, concern writes for some machine or device that would have a general sale throughout the land.



The names and addresses of these prospective purchasers are supplied absolutely without charge by Messrs. Chandlee & Chandlee to those who obtain patents through their firm. This firm has been in practice before the Patent Office for over twenty years, and its members are, consequently, familiar with every detail of patent work. They also issue a booklet entitled "How to Obtain a Patent," which tells in simple words just how to go about protecting an invention. The two books, "What to Invent" and "How to Obtain a Patent," are both free. Why don't you write for them and learn what manufacturers are looking for and how to protect your ideas? If you have an invention, send a sketch or model and description of it to Chandlee & Chandlee, 969 F Street, Washington, D.C. They will give you a free opinion as to whether or not it can be patented.



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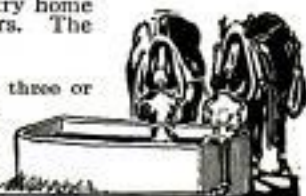
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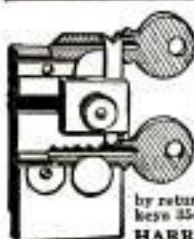
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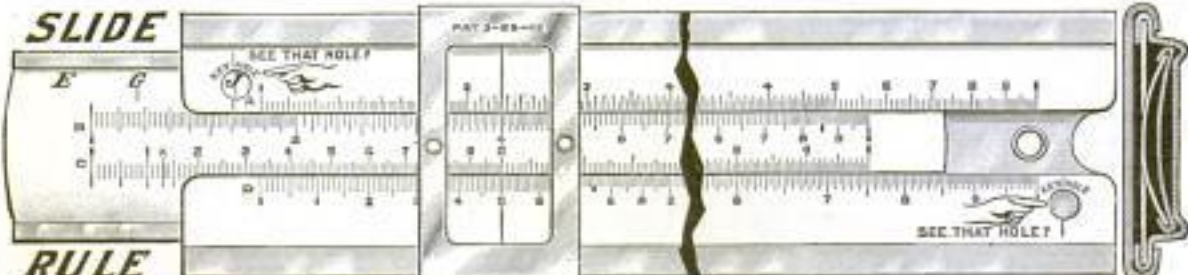
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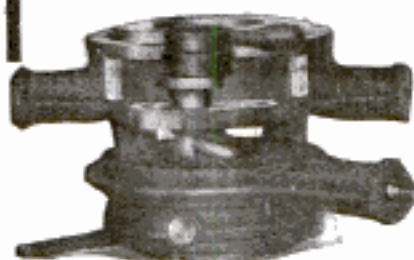
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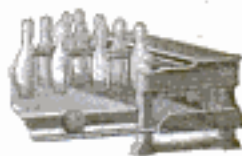
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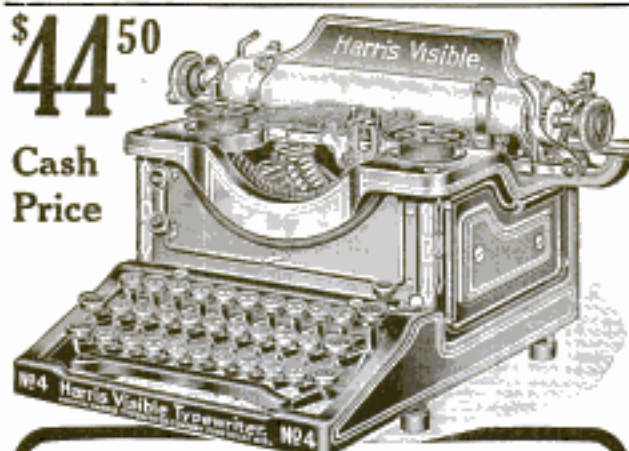
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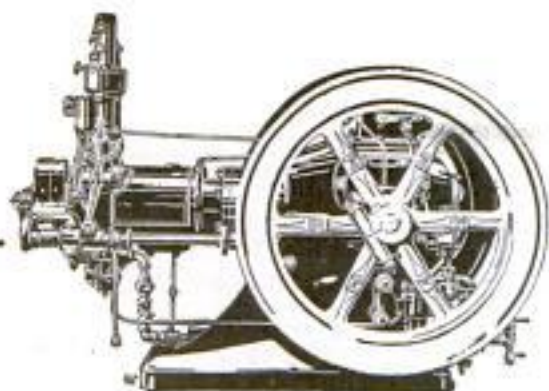
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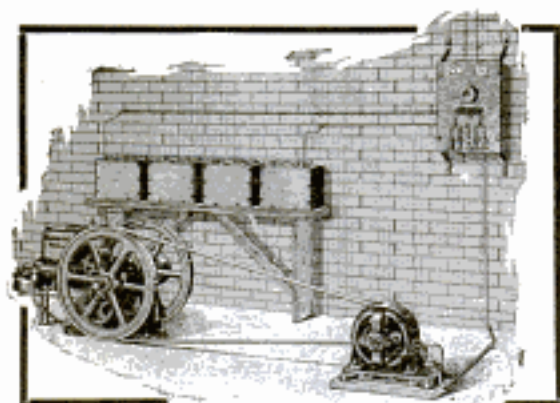
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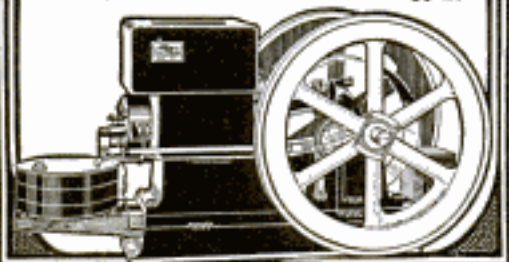
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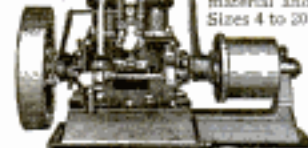
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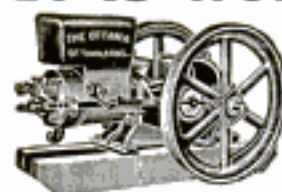
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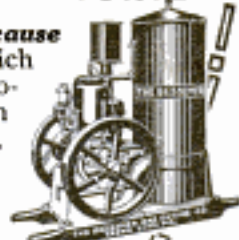
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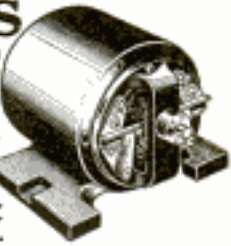
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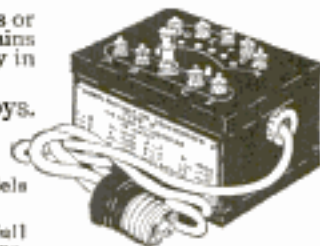
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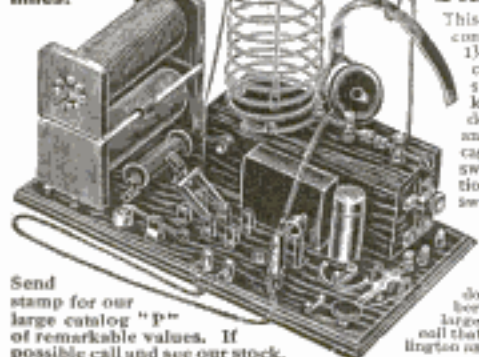
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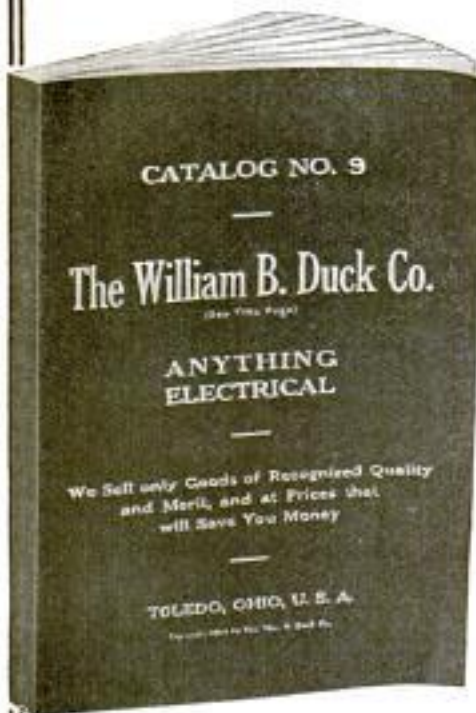
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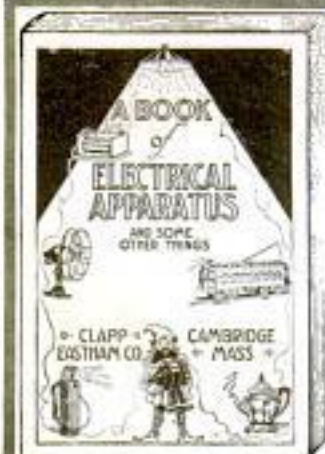
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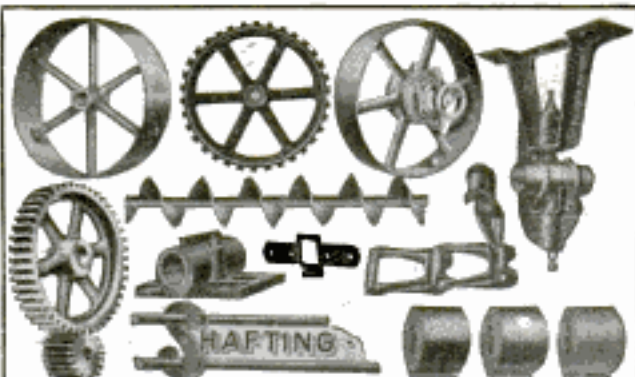
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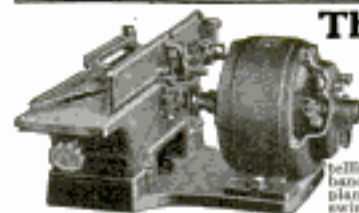
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Not only the most but the best that such a price has ever bought.

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SAFETY FIRST Yale Electric Lantern



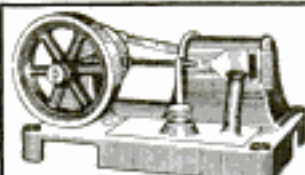
and Combination Horse Lamp, Search and Flash Light. This is NOT a Toy. Turn a switch and you get a flood of light! The safest, handiest, most simple all-around light for motorists, campers, sportsmen, mountaineers, farmers, etc. Eliminates: Filling, matches, oil, grease, smoked chimneys, trimming of wicks and other troubles. Always ready when wanted. Introductory Price \$3.50. A sample will be sent by prepaid parcel post on receipt of remittance of introductory price. Order sample and agents' proposition now—be the first. Sold on money-back guarantee. A big money-maker for agents. Agents Wanted Everywhere. International Light, Novelty & Specialty Co., 424 S. Clinton St. Chicago, Ill.

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MILLERS FALLS TOOLS
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Do Better Work and Last Longer
Write for catalog showing complete line
MILLERS FALLS CO., Millers Falls, Mass.

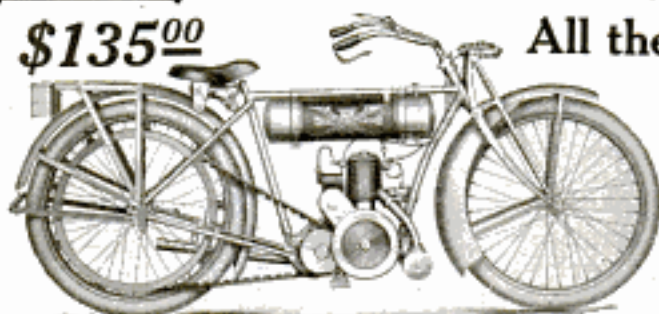
Howard Earl (sailor) writing "I have found that a ship is called 'she' because the rigging cost more than the hull." B "1/20/15"



EXCELSIOR LIGHT WEIGHT



\$135⁰⁰



All the **SPEED** and **POWER**
You Need at Minimum
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*All the Utility of a \$300 Motorcycle
at little more than the operating cost
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The Valveless Two-Stroke Motor is Simple, Efficient and Economical.

The Two Speed Gear is the automobile type with annular ball bearings.

The Frame is Seamless Steel Tubing and Nickel Steel Drop Forgings throughout.

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**More Comfortable, Healthful
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Eliminates the out-door privy, open vault and cesspool. They are breeding places for germs. Have a warm, sanitary, odorless toilet right in your house. No going out in cold weather. A boon to invalids. Endorsed by State Boards of Health.

W. M. Davis writes: "Your indoor closet is giving absolute satisfaction. It is certainly the thing for a home without sewerage."

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The germs are killed by a chemical process in water in the container which you empty once a month. **Absolutely no odor.** No more trouble to empty than dishwater. Closet absolutely guaranteed. Write for full descriptions and price.

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Ask about the No-San Washstand — Hot and Cold Running Water Without Plumbing

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1916 Model **RIDE a RANGER**

bicycle and know you have the best. Buy a machine you can prove before accepting.

DELIVERED FREE ON APPROVAL and 30 days' trial. No expense to you if you do not wish to keep it. **LOW FACTORY COST,** great improvements and values never before equalled in our 1916 models.

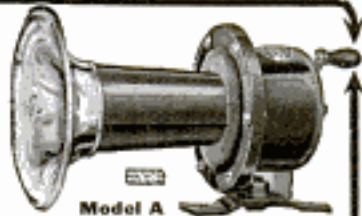
WRITE TODAY for our big catalog showing our complete line of 1916 bicycles, TIRES, sundries and parts, and learn the wonderful new offers and terms we will give you. Auto and Motorcycle Supplies at factory to user prices. Do not buy until you know what we can do for you.

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\$4.00 SEISS

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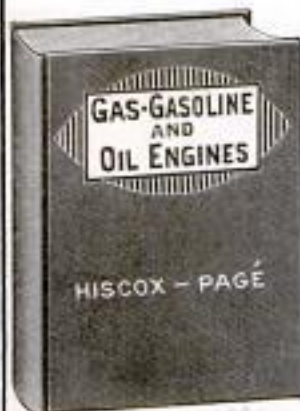
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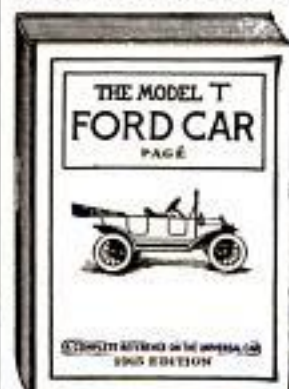
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The most remarkable detector ever made—it will simply astonish you by its performance. Requires no battery or potentiometer and is ever ready to serve you under all conditions. Will stand all kinds of hard usage without being injured. This detector is a radical departure from all other types, inasmuch as it is constructed in such a way that a large surface of a very sensitive mineral is brought into contact with a very light, finely divided alloy. This arrangement renders the receiving apparatus free from static and other interferences. Price, Complete \$3.50

Complete \$14 Outfit

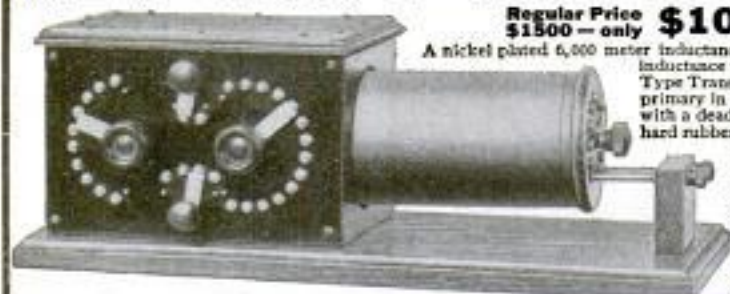
Sends up to 20 miles. Receives up to 2000 Miles

Mechanically and electrically perfect, ready for receiving and sending—including a 2000 Ohm headset, 1 1/2 inch spark coil, air cooler spark gap, collapsible helix, big two-slide tuner, fixed condenser, detector, wireless key, DPDT switch-buzzer with key.



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All finished parts of this coupler ready for assembling, **\$6.50**

A nickel plated 6,000 meter inductance tuner, perfect in every detail. Equipped with four point loading inductance which increases the wave length 4,000 meters over the average Navy Type Transformers. The primary winding has 24 taps—one switch controls the primary in groups of tens, the other controls one turn at a time—and is equipped with a dead end switch. Enclosed in a cabinet, the front of which is polished hard rubber. The secondary coil is wound with double silk covered wire and the inductance is varied by a ten point switch. With this coupler the very finest and most accurate tuning is easily and quickly secured. With a good sized aerial the reception of wave lengths up to 4,000 is possible. Send 4c postage for 152 p. Catalog A-10.

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Complete Wireless Receiving Set

with 80 ohm double pole receiver, head band and cord
Receives 1500 Miles
With Suitable Aerial **\$4.45**

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Gives positive drive to both rear wheels; all the advantage of a solid axle in straight going; power delivered only to wheel having traction in ruts or slush. Adds 50 per cent to comfort and safety; saves fuel, oil and tires. Thousands in use. Shipped ready to install on Money-back offer. See dealer or write for circular.

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All you fellows who are devoting every bit of your time and attention to the cultivation of mental efficiency, do you ever

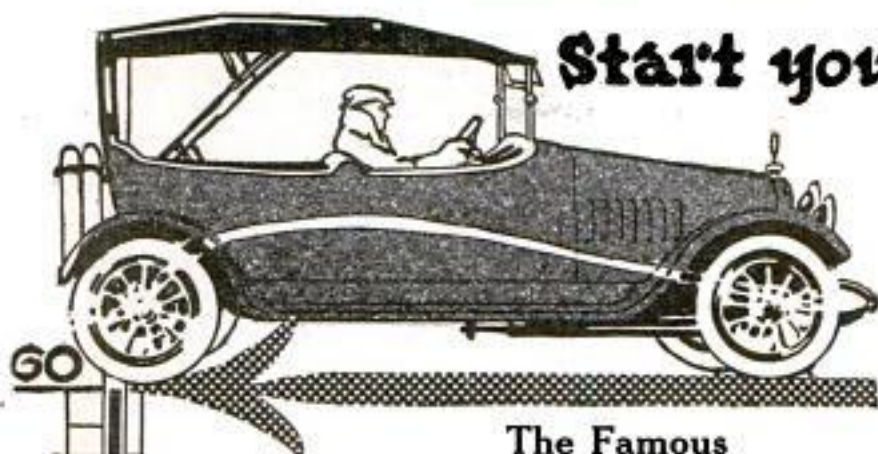
STOP

and ask yourself what it will avail you if you neglect your body? You think the brain is the all important essential in the race for your goal. Is it?

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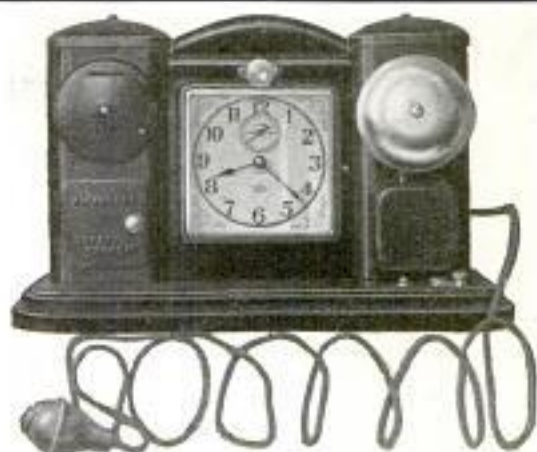
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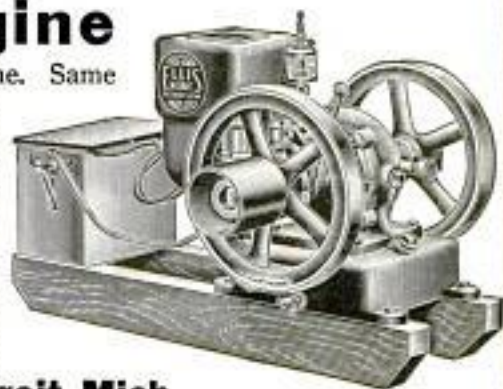
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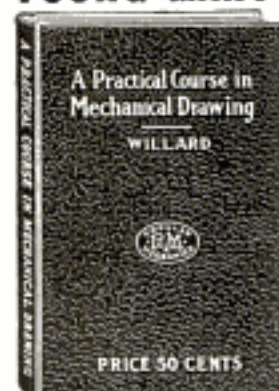
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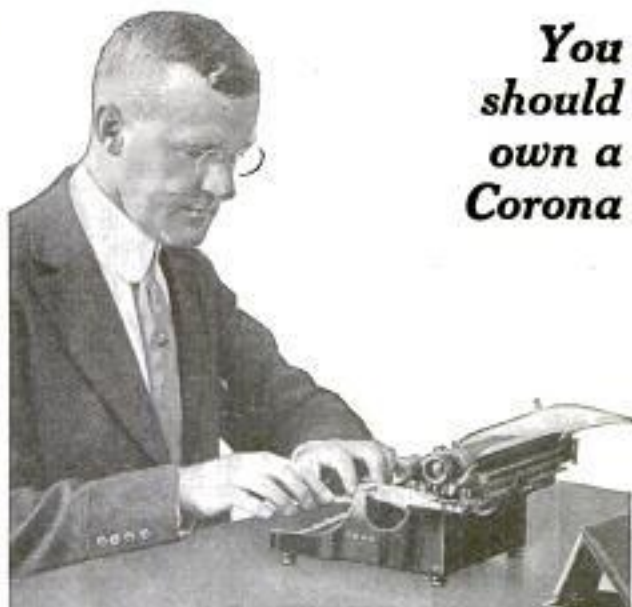
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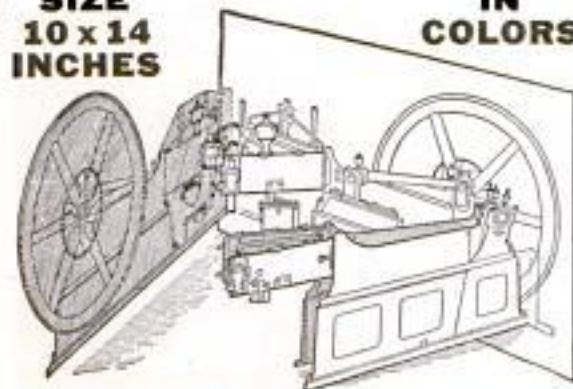
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Three factors predominated.

Alice Verlet, the famous Belgian prima donna, whom European musical critics have hailed as the "New Queen of Song."

The New Edison Diamond Disc Phonograph.

And Thomas A. Edison. He alone knew of the revelation to come; of the human voice with all its range, its sweetness, its mellowness, its sympathy and pathos coming from the instrument he had created.

Miss Verlet stood beside the New Edison Diamond Disc Phonograph. Mr. Edison sat with his head bowed upon his hand.

There came the clear notes of the beautiful song, "Caro Nome," from Rigoletto.

Which was singing, phonograph or lady? The ear could not distinguish. Only the eye could discern that Miss Verlet's lips were not moving. The Edison Diamond Disc was singing alone. Then—a greater volume—but *only* a greater volume—Miss Verlet joined her voice with the singing of the Edison Diamond Disc.

Two voices—exactly the same two—were singing together. No one among the 300 could tell which was the more clear or distinct, or more full of feeling.

The song volume decreased. The ear heard but one voice. The eye must tell again. *Miss Verlet's lips were moving.* It was she who was singing.

Faces were lit up with surprise—even with amazement—a modern miracle was happening just before them.

The phonograph and the lady continued their duet to the end. Enthusiasm, almost unbounded, ran through the audience.

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New Edison Diamond Disc Phonograph

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Unbreakable Records

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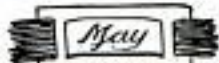
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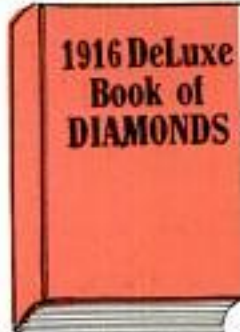
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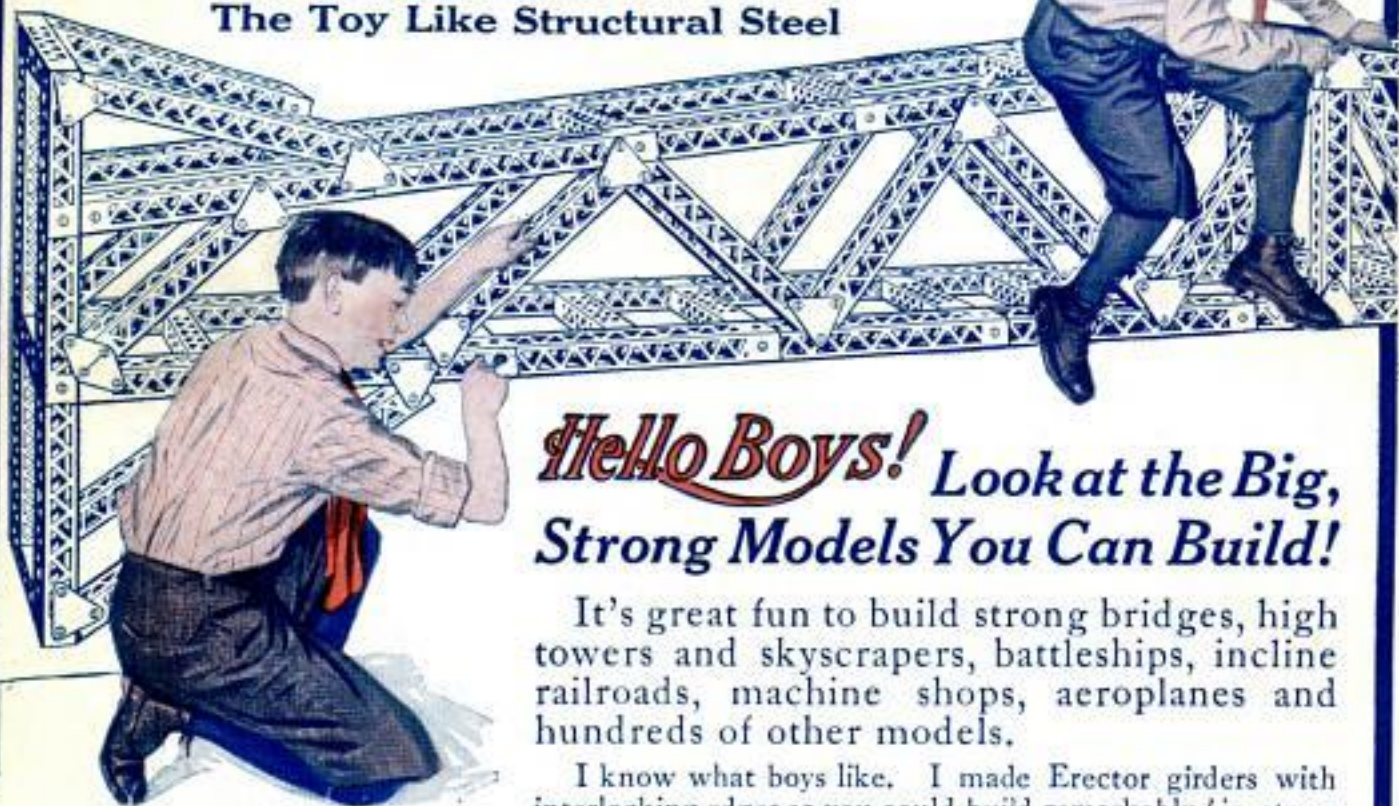
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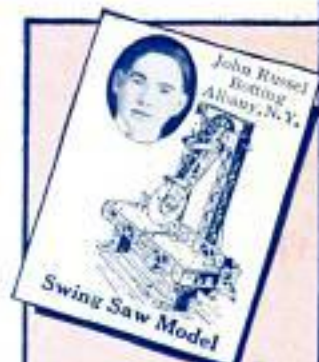
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