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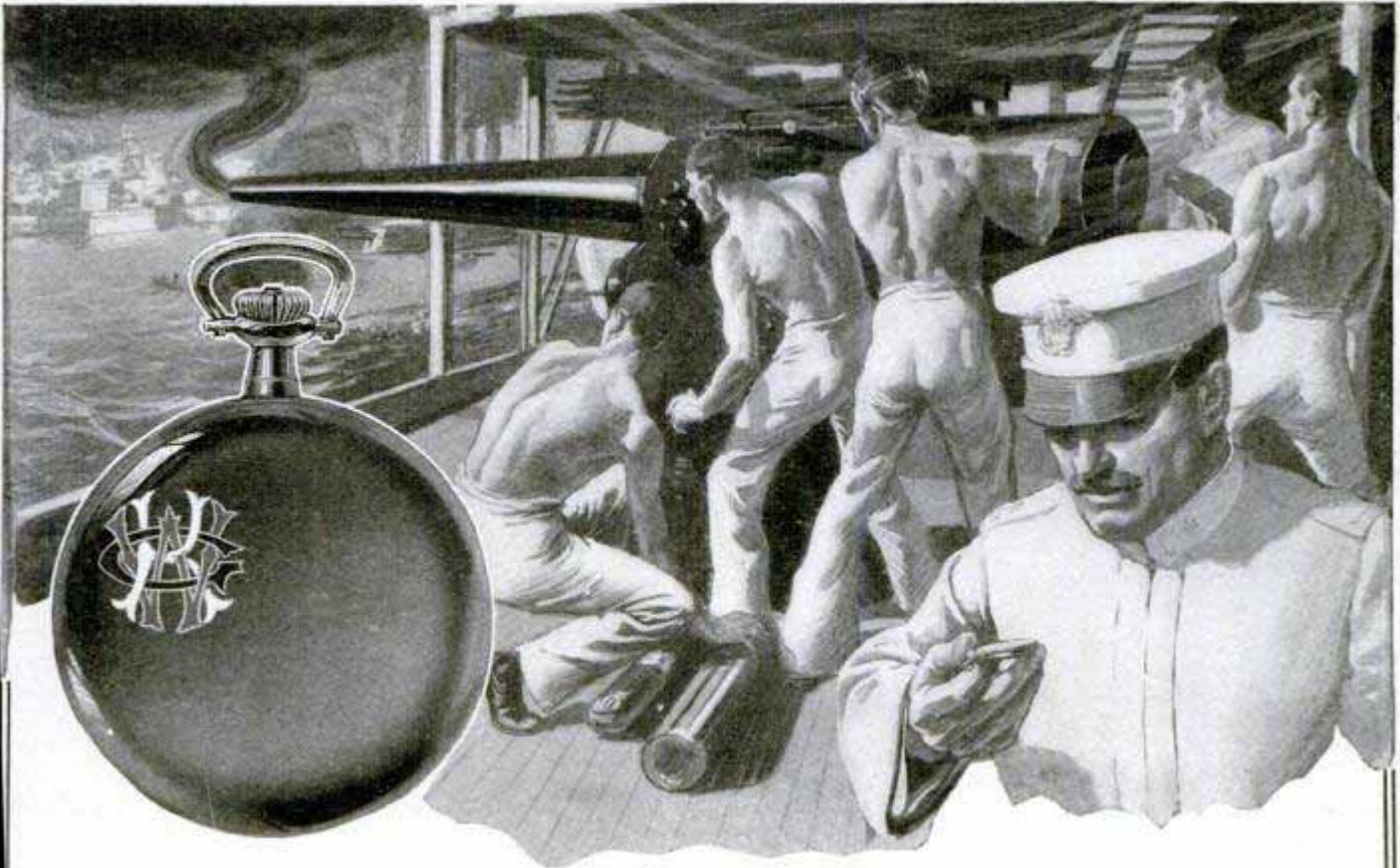
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Utah	- 119	Dolphin	- 37
Louisiana	- 116	Des Moines	- 27
Minnesota	- 170	San Francisco	40
Wyoming	- 125	Dixie	- 42
Florida	- 123	Birmingham	- 24
North Dakota	- 102	Charleston	- 11
New Jersey	- 46	Prairie	- 21
South Carolina	- 60	Jepkins	- 17
Delaware	- 83	Tripp	- 13
Mississippi	- 32	Ammen	- 12

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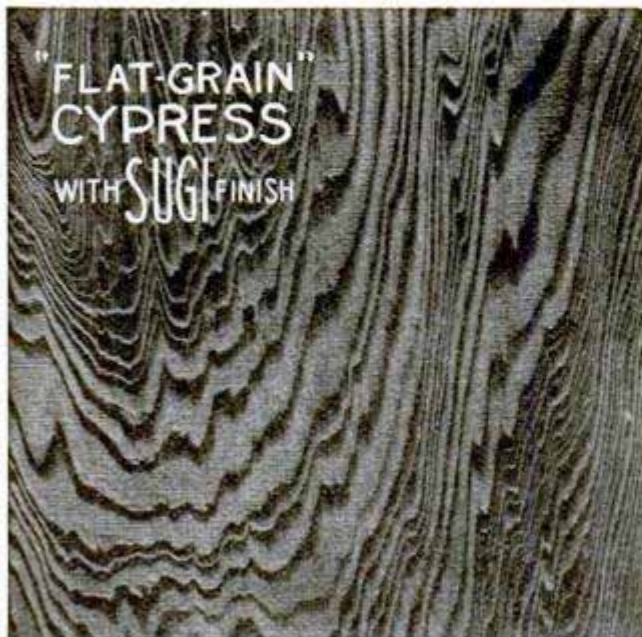
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"FLAT-GRAIN" CYPRESS for SUGI WORK

is preferred over the "curly" grain by many people of high artistic judgment because it



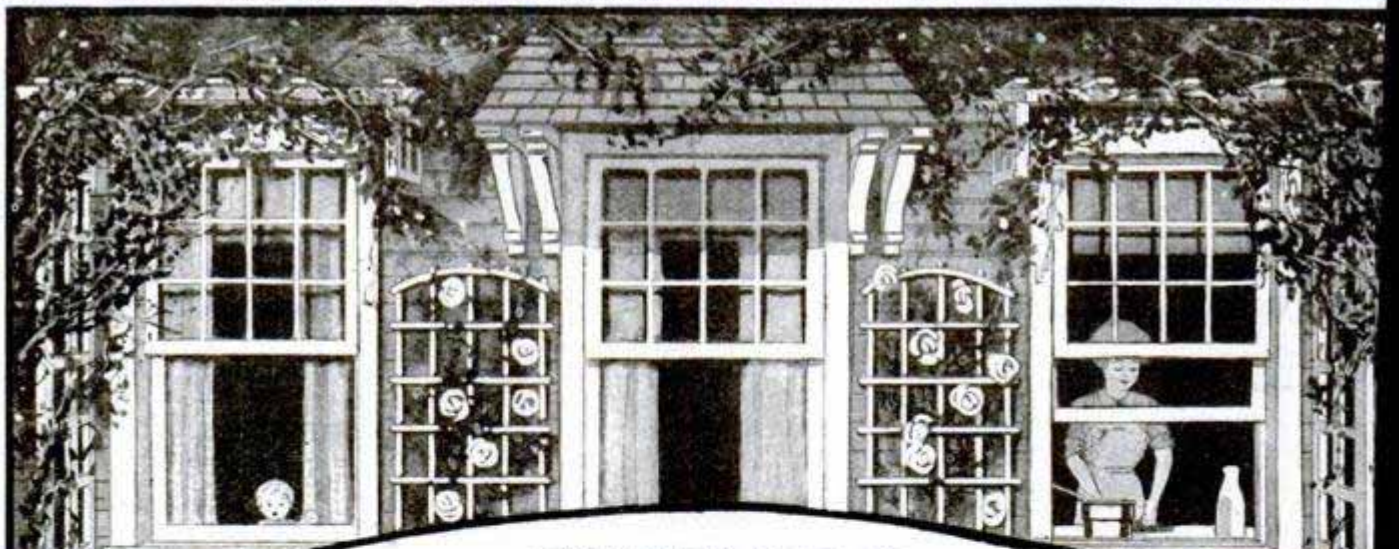
is so much simpler in effect. It undoubtedly is true that the super-convolute grain of the rarer examples of "curly" Cypress renders it wise to use it sparingly and only as the centers of panels or for small hand-made receptacles; it is so richly ornate as to tire the eye if shown in large areas. The "flat grain" as shown at the left, is a splendid relief when used in conjunction, and is in first demand by those amateur craftsmen who do the most "Sugi-ing" either for gifts or for their own homes. VOL. 26 of the famous Cypress Pocket Library tells all about the Sugi (Japanese Driftwood) effect which you can produce by simply scorching and brushing "a little piece of board," tells why it is successful only on "the Wood Eternal," and gives full directions and list of ideas of what to make

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Popular Mechanics Magazine

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

EDITED BY H. H. WINDSOR

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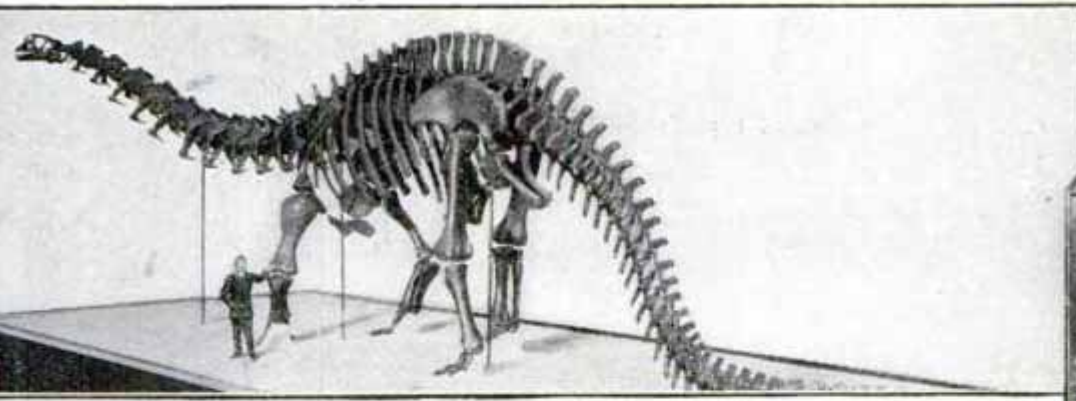
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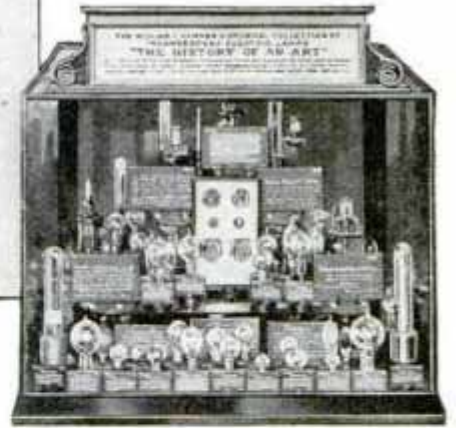
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Brontosaurus roamed the earth seven million years ago. He could not adapt himself to changed conditions. Nature scrapped him.



One of the cases in the William J. Hammer Historical Collection in New York, which exhibits the hundreds of lamps which were scrapped before MAZDA Service gave us the MAZDA lamp of today.

Evolution and the Scrap Heap

Talks about MAZDA No. 4

"Not the name of a thing but the mark of a Service."

ABOUT seven million years ago, more or less, a stupid, slow-moving lizard known to science as *brontosaurus* roamed the earth. He stood thirty feet high on his hind feet and was seventy feet long. He weighed over thirty tons. As he lumbered along, each of his ponderous feet left a track that occupied one square yard. No one knows why he became extinct. Perhaps the earth shrugged her shoulders one day, as we were; in other words, a cataclysm occurred. Dry land became water and oceans became dry land. *Brontosaurus* could not adapt himself to the change. Nature scrapped him.

This process of scrapping is what Darwin meant by evolution, "natural selection," and the "survival of the fittest." It is a process that finds its counterpart in the scrap heap of human industry. There are mechanical fossils as well as fossil lizards. Look in the scrap heap of any industry and you will find them. The bigger that scrap heap is, the more marked has been the evolution which it represents, the more perfect the product of the industry. If an industry has no scrap heap it is standing still; it is not evolving.

Next to agriculture and architecture the oldest of human industries is the art of lighting. Hence the scrap heap of light producers ought to be large. And it is. Think of the hairy, low-browed savage who rubbed sticks together, built a fire and thus made the first artificial light thousands of years ago. Then think of the incandescent electric lamp. What an evolution! What a scrap heap has been piled up of beacons, rush lights, candles and oil lamps, each with a little subsidiary scrap heap of its own representing the evolution of its particular line of light-producer!

When the incandescent electric lamp was invented the height of the scrap heap was more than doubled. In a few years lamps which represented the illuminating methods of centuries were discarded. And the end is not yet. The height of the scrap heap is growing more rapidly than ever.

All the science of our time is epitomized in the incandescent lamp of today—the MAZDA lamp. If you know its history you would know the history of modern science.

Study its scrap heap and you learn how far the art of lighting has evolved, even in your own time.

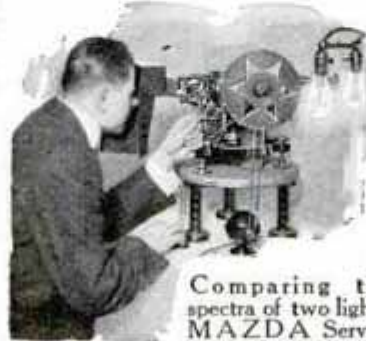
At the very bottom of the heap you will find a lamp with a strip of graphite in a poor vacuum. Farther up are hundreds of lamps with platinum filaments; still farther up lamps with filaments composed of the oxides of zirconium and titanium, and very near the present top, lamps with filaments of carbon, osmium, silicon compounds and tantalum. Then come many types of the metal filament lamp, including types of tungsten lamps.

All of them are as extinct as *brontosaurus*.

Let it not be supposed that the lamps of today marked MAZDA are the last word in incandescent electric lighting. Some day there will be other lamps, more efficient but still marked MAZDA.

They will be so marked because they evolved from the same unceasing systematic study and selection that gave us the MAZDA of today—a study and selection centered in the Research Laboratories of the General Electric Company at Schenectady and supplemented by learning from the leading experimental lamp laboratories of the world what progress they have made in the same direction.

The results thus obtained are communicated to the General Electric Company's manufacturing centers at Cleveland and Harrison, and also to the other lamp manufacturing companies entitled to receive them. This scientific investigation and the communication of the results obtained constitute MAZDA Service. All the lamps made by the companies in accordance with this service are marked MAZDA.



Comparing the spectra of two lights. MAZDA Service means the making of many such comparisons, tests, experiments and selections in order constantly to evolve better lamps. The aim is that MAZDA shall always be the mark of the furthest advance in incandescent lighting.

A lamp marked MAZDA is always the product of a scientific evolution; whether you buy it today, tomorrow, or at any future time, it is selected from types devised after months and even years of research; it is the one that has survived all tests, because it has been proved the fittest; it is a lamp that represents the latest commercial advance in illumination of its time.



GENERAL ELECTRIC COMPANY

We Assist Students Getting Actual Driving Experience



WOULD YOU GIVE 2 DAYS' PAY FOR A GOOD JOB IN THE AUTO TRADE?

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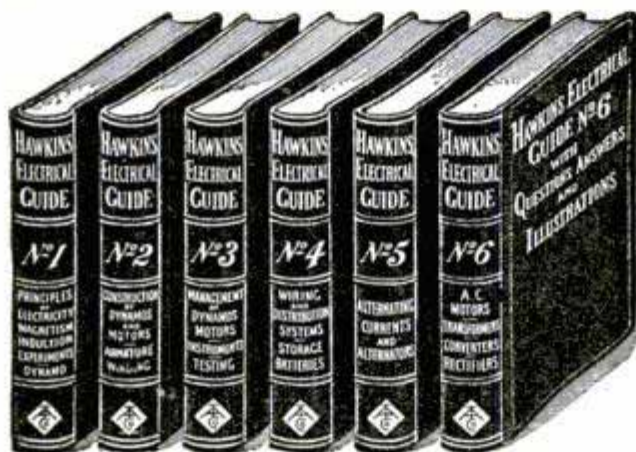
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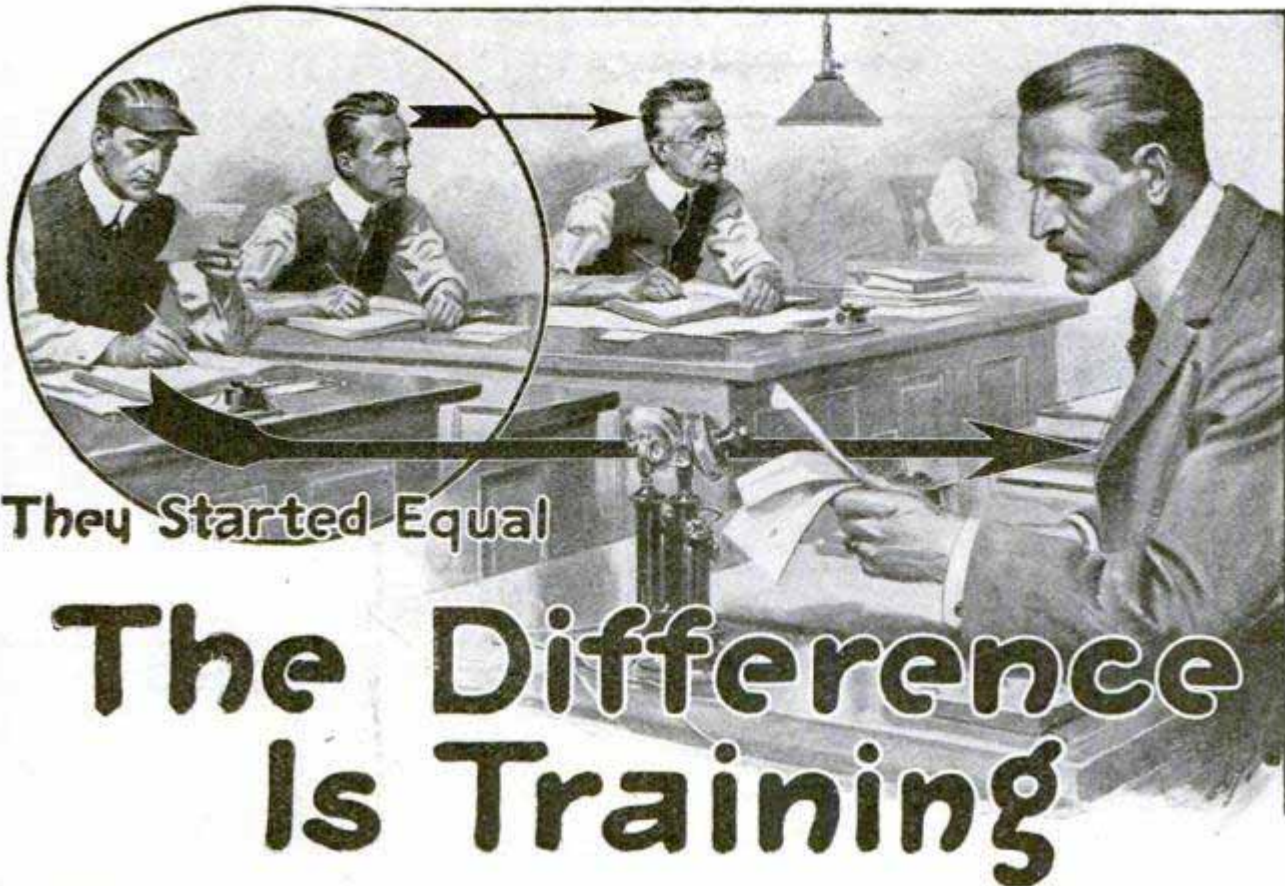
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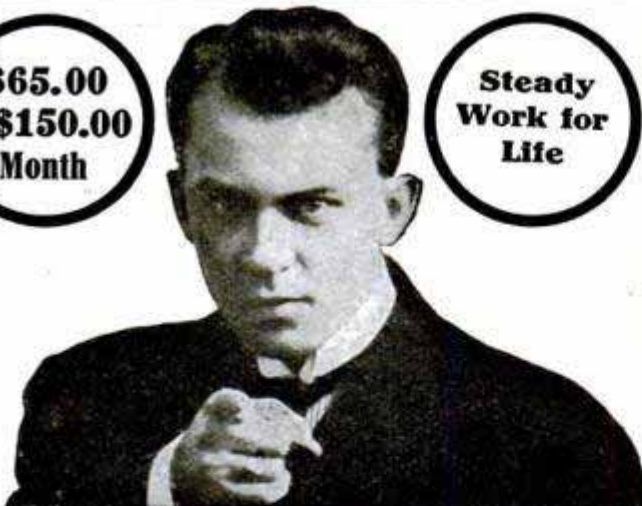
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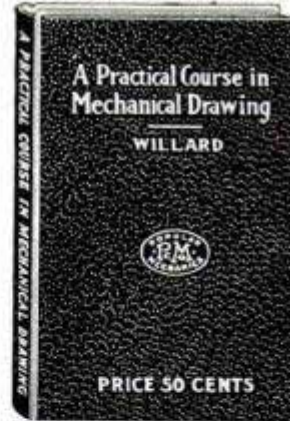
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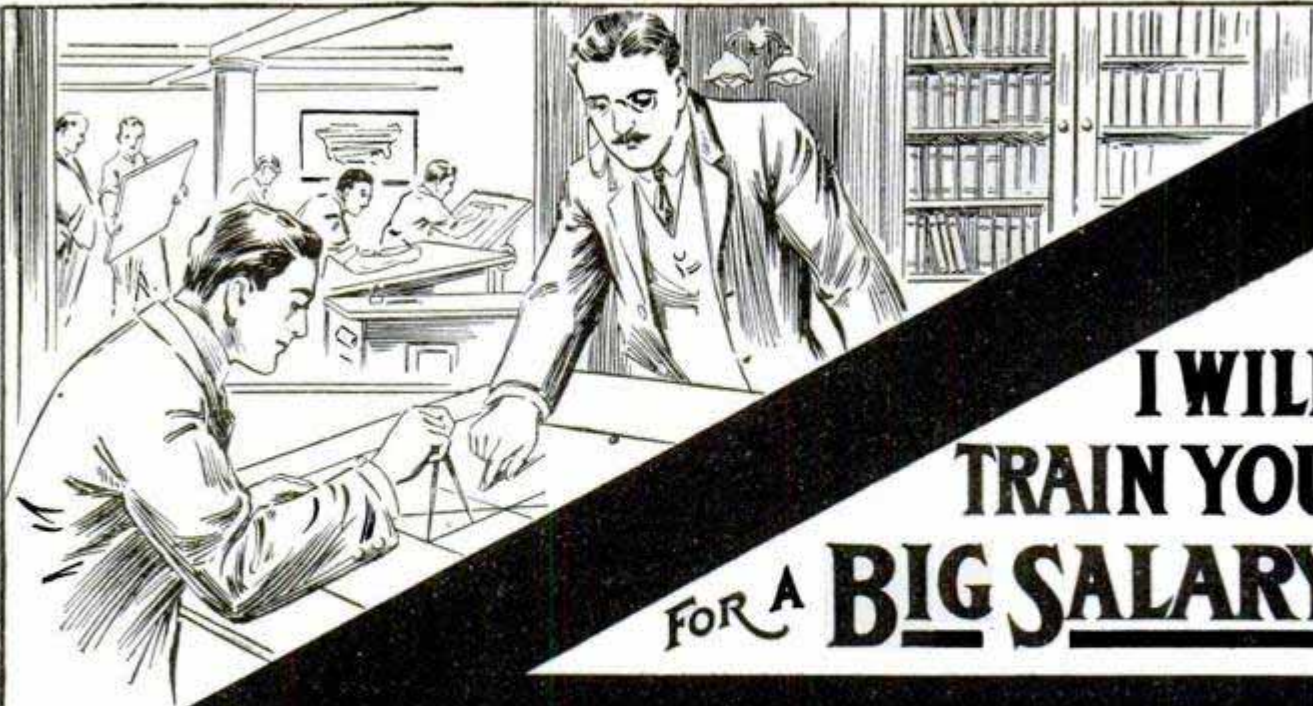
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YOU can clean and oil your own watch for a dime. Watch-cleane Disk, only 10c. Special discounts; Mail order, streetmen, canvassers, side-liners. Watch-cleane Disk Factory, Box 254, Denver, Colo.

SPLENDID weekly profits in spare time at home. Mail-order business; don't worry about capital. Boyd H. Brown, Dept. K,

MAIL Order Business—how to succeed—interesting, instructive articles every month by those who know, in "The Business Builder"—the different, distinctive magazine of mail-order and agency selling. 68 pages, standard magazine size. Sample copy, 10c, none free. The Business Builder, Randolph Rose, Publisher, 23 Rose Block, Chattanooga, Tenn.

SPARE Time Mail-Order Business. Complete trial outfits with free printed matter, mailing boxes, rubber stamps. Guaranteed big sellers. Small outlay. Particulars. Rollins, Box 5272, Boston.

WOULD you like to own a good-paying mail order business? We have a line that gets repeat orders all the time. You can start in spare time; invest a dollar or two a week and soon own a nice business of your own; write for particulars. Nadico, 1664 Belmont Ave., Chicago.

MAKE money renewing old dry batteries! Send 25c for complete guaranteed formula and instructions; regular price, \$1.00. If dissatisfied we'll return your quarter, you keeping instructions besides! Northern Supply Company, 154 Randolph, Chicago.

FREE—Big illustrated magic trick catalogue. Oaks Co., Dept. 76, Oshkosh, Wis.

THE Silver Black Fox industry of Prince Edward Island, Canada. Send for free booklet to Dr. Randall, Truro, Nova Scotia.

I MADE \$50,000 in five years with a small mail order business; began with \$5. Send for free booklet. Tells how. Heacock, Lockport, N. Y.

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.

WE Start You in Business, furnishing everything; men and women, \$30.00 to \$200 weekly operating our "New System Specialty Candy Factories," home or small room anywhere; no canvassing. Opportunity lifetime; booklet free. W. Ragsdale Co., East Orange, N. J.

MAKE \$200 to \$500 yearly in spare time. Our parcel post club book tells how. Organize a club and get the farmers to sell direct to the consumer by parcel post. Particulars free. The Brookline Company, Dept. P, Springfield, Mass.

BIG Money in Beauty Preparations. Booklet free. Walnut, Box H338, Philadelphia.

WONDERFUL invention, Vest Pocket Coat Hanger, Nickel-plated. Stamp for particulars. Hutchison, Elmira, N. Y., Foster Ave.

1,000 RURAL Names and Address, 25c. Guaranteed 98% Correct. L. Miller, 2012 Germantown Ave., Philadelphia.

ADVERTISE—21 words in 50 good weeklies, \$1; 100 syndicate monthlies, \$1; 20 big Sunday papers, \$5. Cope Agency, St. Louis.

CORPORATIONS organized anywhere in United States or foreign countries: Railway, Steamship, Gas, Electric, Telephone, Timber, Irrigation, Coal, Oil, Iron, Steel, Mining, Industrial, Stock and Bond Issues, \$100,000 upwards, prepared and negotiated. L. N. Rosenbaum, 80 Wall Street, New York.

LEARN electroplating—Practical results may be obtained by following the directions in our book on electroplating. This is a working guide for the beginner written by an old hand at the business. 112 pages, 62 illustrations, cloth, 50 cents, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

YOUR 21-word advertisement in 117 newspapers, \$1.95. In 100 magazines, \$1. Write for information. Central Advertising Co., Dept. 87, Topeka, Kan.

MR. Mail-Order Man: Get quick returns. Established corporation supplies fast mail-order sellers; factory prices. Classy proposition. Beginners or established firms. Copyrighted. Prospectus free. Mississippi Valley Co., Inc., Box M629, Pittsburg, Kans.

SIX months free. Our little Magazine describing splendid investment opportunities and other interesting facts concerning the Great Northwest. Send for your copy today. Hanauer-Graves Co., Spokane, Wash.

MAKE big money opening Safes and setting Combinations. Wayne Strong, Box 1430, Los Angeles, Cal.

CANDY making course, recipes and instructions, 10c. E. Easterly, Box, 148-D, Knoxville, Tenn.

MANUFACTURE Excelsior polishing cloth. Formula, 10c. Leroy Jipson, Rockland, Me.

GIANT Crop in Back Yard; \$16,000 per acre. No cultivation. Can't-Fail-Plans free. Great Fertilizer Co., P. O. Box 113, Chicago, Ill.

50 PER CENT profit in this business. Independent selling Typewriter ribbons Carbon papers. Small capital needed. Edward Harvey Co., Philadelphia.

A PRACTICAL business offer. Shop or exclusive territory on profitable concrete specialties, concrete marble, decorative concrete, sanitary flooring, etc. No machinery, small investment; home work. Increase your income. Art Stone Co., Box F, Waynesboro, Pa.

LEARN to collect money—by a easy system. Big income. Quick results. No capital required. Send today for booklet, "Skillful Collecting." Collected Assn., 249P, Cuyahoga Falls, Ohio.

MAIL Order Men—Just what you're looking for—real success for beginners—great success for those established. Particulars free. Huntsman, 6045 Summer, Philadelphia.

INCREASE your income selling "Quernlighting" cleaner for the hands to a moblilists, garages and machine shops. Big demand, exclusive territory, free sample. Joliet Novelty Co., Joliet, Ill.

USE your spare time to build up a mail order business of your own. We help start for a share in profits. 27 opportunities. Particulars free. Mutual Opportunity Exchange, Buffalo, N. Y.

WE analyze everything. Reliable formula furnished. Expert chemists, D. Laboratories, 721 East 161 Street, New York.

GREAT profits. Making twisted brushes by hand. No capital. Write for particulars. T. H. Petty, Dept. 420, Toledo, Ohio.

FREE Information "How to Succeed Mail Order Business." No fake schemes or outfits. B. Newnham, Waukegan, Ill.

BREED Mink. Big returns. Particulars free. George Norton, Pleasantville, N. J.

CALIFORNIA Tartaric Mirror Silver Process. Largest factories users. First offered public. Free booklet. Barstow Company, 514 23rd St., Oakland, Calif.

\$5 DAILY easily earned at home, spare time, silvering mirrors. No capital. Instructive booklet tells you how. Patterson & Co., Dept. 3, Brooksville, Ky.

MAIL Dealers, everybody's a prospect our big value leader; yields good profit, one cent to mail. Imprint circulars finished. Ajax Company, Bulletin Building, Philadelphia.

CASH for an Idea; Patent News, 28C, Washington, D. C.

INCREASE your sales. Place proposition before the readers of "Car Magazine," 23,000 copies every month. Classified rate 2c per word. Mail trial ad today. Cartoons Classified, 6 N. Michigan Ave., Chicago.

RESILVER Mirrors and make plain money. Guaranteed process and in 100s 25c. Service Bureau, 3311-85, W. Main Ave., Chicago.

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

KLENENE Kleans. A new idea, cheaper, better than gasoline. Send for sample and our profit-sharing. Gordon Walker Company, 5818 W. Main Ave., Chicago, Ill.

SPARE Time—No canvassing. Reproduction, news, names, etc., to us. Kets waiting. Enclose stamp. "N" HDB, Cincinnati.

MOTION picture plays wanted. You write them. We teach you. No experience needed. Big demand and good pay. Details free. Ass'd M. P. Schools, Sheridan Rd., Chicago.

IF you want facts instead of about Patents, address Benjamin & F. 140 S. Dearborn St., Chicago, Ill.

PATENTABLE Ideas Wanted—Send 3 free books. R. B. Owen, 30 Owen Wash., D. C.

SILVERING Mirrors and Auto-trim Plating tableware home. Plans free. Once Sprinkle, East Grant, Marion, Ill.

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

AGENTS WANTED

AGENTS Wanted—If you know a chance when you see it you'll see this one now. Big money—stylish, nifty clothes—little work—no experience or capital needed—can you beat that? We want agents everywhere to take care of our business in their localities and to advertise our nobby, nifty suits by wearing them. We furnish everything complete and charge nothing for agents' outfit. The swellest dressers everywhere are our agents and all we ask is that you tell people who inquire about your fine clothes where and how they can get them. You make big money—\$10 a day—without trouble. Just a postal brings you full outfit free. Big, new sample book of up-to-the-minute suitings sent so you can pick out your first suit; also measuring blanks and everything you need. We pay express on everything—not a penny for you to pay. Send quick before some one else gets the agency there—mail postal to-day to American Woolen Mills Co., Dept. 611, Chicago, Ill.

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., 406 N. Clark St., Chicago.

WANTED—Responsible party to take charge of our business in each county, handling sale of Automatic Combination Tool, a combined wire fence stretcher, post puller, lifting jack, etc. Lifts or pulls 3 tons, weighs 24 pounds. Sells readily to farmers, shops, contractors, etc. No experience necessary. Descriptive catalogue; prices and terms free upon request. Harrah Mfg. Co., Drawer B, Bloomfield, Ind.

AGENTS—Make money sure—quick—easy. New low-priced, self-heating iron. The season is now on. Sells itself. Every home a prospect. Three sales a day means \$40 profit a week for you. Write today for Money-making plans. Address, C. Brown Mfg. Co., 2847 Brown Bldg., Cincinnati, O.

AGENTS—Get particulars of one of the best-paying propositions ever out. The New Portable Oil Gas Stove for Heating, Cooking and Baking. Sells like wildfire. Light in weight—practical. \$25 to \$50 per week. A postal will bring our Money-making Proposition. The World Mfg. Co., 4745 World Bldg., Cincinnati, O.

OWN a business—be your own boss. Let us start you in Gold, Silver, Nickel, etc., plating. Prof. Gray's New, Low-price Plating Outfits. No experience required. We teach you and furnish recipes, formulas and trade secrets free. Every home, store a possible customer. Don't delay. Send today for particulars. Gray & Co. Plating Works, 895 Gray Bldg., Cincinnati, O.

MR. Mail-Order Man: Get quick returns. Established corporation supplies fast Mail-Order sellers; factory prices. Classy proposition. Beginners or established firms. Copyrighted Prospectus free. Mississippi Valley Co., Inc., Box N629, Pittsburg, Kan.

WANTED—Agent to act as manager in each county. \$150 month easily made. No canvassing. Success guaranteed. Big, expensive samples. Instructions, plans and starter, all 10c postage. Manager (Dept. 48), Myers & Co., Cambridge, Ohio.

AGENTS in every town (five ones). Best selling household article. Start now. Big demand for goods. \$25 to \$50 a week. Write today. The York Specialty Co., Dept. P, Lock Box 243, York Village, Maine.

EXPERIENCED Aluminum Ware Crew Managers, Agents and Pot Men will find it to their interest to write us relative to our Spring and Summer Specialty Line. Unless experienced and a producer, don't write. Aluminum Factory Company, La Grange, Ill.

I WANT representatives in Factories, Foundries, Railroad Shops, etc. Also District Agents—handle "Dragon Hone for Self-Shavers;" sharpens all regular and safety blades. Sells for \$1. Legitimate Agents send for Hone, Terms and Quick-Selling Plan for 50c. Chas. P. Rice, 356 Marshall Ave., Columbus, O.

AGENTS—A Whirlwind Seller for summer weather. Concentrated soft drinks—7 kinds—orangeade, raspberry, grape, etc. Amazing sales, wonderful profits. Get it while it's new. Write quick. American Products Co., 3011 Sycamore St., Cincinnati, Ohio.

65% COMMISSION will be paid to a limited number of live-wire agents to sell and advertise our goods in unoccupied territory. Quick, easy sellers that are used in every home. Veribest Mfg. Co., Elkhart, Ind.

I NEED one energetic, dependable, representative in every county to take orders for our new Popular Mechanics book for boys called "The Boy Mechanic." This is not a story book, but a wonderful and interesting collection of 700 things boys love to make and experiment with. A very large attractive book for the price, \$1.50. Every boy's father or mother will want to buy it for their son. It sells itself. Good liberal commission and exclusive territory. You don't have to be a professional agent to be successful with this highly meritorious proposition. Work in and around your home town during spare time only if you cannot devote all your time to it. Write today for full particulars to Manager Book Dept., Popular Mechanics Co., 6 N. Michigan Ave., Chicago.

IF you live in a small town and have a little spare time, get our offer. Easy to make \$100 profit each season; still easier to get your own clothes out of the profit on a few orders. No extra charge for fancy styles, golf bottoms, pearl buttons, etc., makes sales easy. Write for free samples and our new offer. Knickerbocker Tailoring Co., Dept., 70, Chicago.

AGENTS, earn \$10 per day, sell three 50c ties \$1. Free Monogram gold cuff links and stick pin. Bowden cleared \$71—5 days. Cooper \$40—4 days. Free samples. Corner Neckwear Co., 101 First St., Dayton, 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.

AGENTS make good selling our patented household articles. Send for our illustrated catalog. Peter Van Woert, Oneonta, N. Y.

WE offer the most profitable deal of the season. Where are all the money-makers? Sample, twenty-five cents. M. & S. Specialty Co., Altoona, Pa.

AGENTS make \$5,000 this year. Be your own boss—dependent—abundant money—your time your own. All or spare time, at home or traveling. Write E. M. Feltman, Sales Mgr., 6718 Sycamore St., Cincinnati, O., today for full particulars.

AGENTS—Both Sexes—We manufacture and control fastest selling household article ever invented. Connolly, 123 Liberty St., New York.

IF we had your address we'd send free sample and show you how to make \$25, not one week, but weekly. G. Mfg. Co., 20H Warren St., N. Y.

AGENTS—Only one in the world. Kerosene (Coal-Oil) self-heating iron. Absolutely safe. Odorless. Women wild about it. J. E. Daugherty made \$300 in one month. Your territory open. Write quick for terms. Thomas Iron Co., 262 Neal St., Dayton, Ohio.

AGENTS would you take a steady job where you can clear \$20 to \$30 weekly to start and work up to yearly profits of \$3,000 or more? No experience required. Great crew managers' proposition. We manufacture. Middlemen profits saved. Get posted on our 1914 exclusive territory—business-building selling plans. Act quick. E. M. Davis, Pres., R64, Davis Bldg., Chicago.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

AGENTS—250% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Mathews, 1962 Third St., Dayton, Ohio.

AGENTS and Salesmen wanted to sell Morthanqk Parcel Post Calculator, 100% profit. Every tradesman a customer. Pocket sample free. Morgan Mfg. Co., Dept. U, Newport, R. I.

WONDERFUL New Household Specialty. Lightning seller. Agents wanted. The Guarantee Supply Company, K 201, Main St., Rantoul, Ill.

WANTED: If your time is worth \$50 to \$500 weekly, and you are a Patent Right Salesman, we want to get in touch with you. Write quick. Address Carthage Automatic Gate Co., Dept. L, Carthage, Mo.

AGENTS: Become Christyzed—Get into a permanent business selling guaranteed household necessities, saving consumer fourths. Enormous profits. Big Special Introductory Offer. Investigate immediately. Arthur N. Christy & Co., Dept. K, Newark, New York State.

NEW Patent Burglar Alarm. Agents make \$5 to \$10 per day. Sample 45c. C. F. Lee Mfg. Co., 1417 Belleplaine Ave., Chicago.

WRITE Moving Picture Plays. \$50 each. 1 or spare time. Correspondence course necessary. Details free. Atlas Publishing Co., 3946, Cincinnati, Ohio.

BIG money made. Baseball and football clinics. Sullivan Amusement Co., St. Paul, Minn.

ASK Bode! Anything! Especially about sales and Advertising! Get Particulars now! Bode, 2880p Main, Hartford, Conn.

EVERY Advertiser Needs our New Advertising Rate Book. Lists 2,000 best advertising mediums in America. Gives circulation and rates. Contains special lists of advertising snaps, including "Ads That Sell," sent prepaid for 10c. Dearborn Advertising Agency, 521 Dearborn St., Chicago.

WILL start you earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, and plans of operations. G. F. Redd, Dept. 306, Boston, Mass.

INDEPENDENCE and fortune quickly gained 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. Book—Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 127 Ward St., Syracuse, N. Y.

WE Sell Patents. Established 1900. If wish to add a new product to your list write us. Charles A. Scott Co., 596 Central Bldg., Rochester, N. Y.

TOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time canvassing. I furnish everything. Send for proofs. Voorhies, Desk C.R., Omaha.

MAIL ORDER SUPPLIES

WONDERFUL Invention, Vest Pocket Hanger, Nickel-plated. Something good seller. Stamp for particulars. Johnson, Elmira, N. Y., Foster Ave.

INCREASE your sales. Place your circulation before the readers of "Cartoons Magazine."—23,000 copies every month. Classified rate 2c per word. Mail in a card today. Cartoons Classified Dept., Michigan Ave., Chicago.

FOR ADVERTISERS

VERTISERS—Special—5c per word for your ads in 133 different magazines. Sample price, 7c. Lists free. Kings Magazine Box 13-P, Little Silver, N. J.

FOR 50-word advertisement in 16-page magazine reaching 7,500 boys, 25c. News display, 40c. Youths' Magazine, 80.

VERTISING rate folder, free. Rates, circulation. Jukes, 910 Walnut, Philadelphia.

WORDS in our big Postcard Monthly Display 50c inch. Elite Exchange, North Kenneth, Chicago.

REGAINS—15-word ad, one year's subscription 25c; extra words one-half cent. Circulation 25,000. Digest, Rapids, Mich.

Classified ad pages of the Denver Post will sell or swap anything for the human family uses. Reaches over 100 subscribers every week by Uncle Sam. No street or news-stand sales. A position not duplicated by any other paper. The largest and newest weekly paper between the Missouri River and the Pacific Coast. Classified ads—3c per line. Display—30c per line. \$4.20 per month. One ad convinces. Write for sample. Subscription price 35c the year.

Special Ad Offer—We will give you a free trial ad in the United Syndicate (magazines), and the Agents Companion, for 10c per word. A. S. Mankin & Co., Chicago, Va.

VERTISERS—Here's your opportunity. Your proposition placed before the readers of "Cartoons Magazine" for only 10c per word. Circulation 23,000 copies. Send a trial ad for our next issue. Cartoons Classified Dept., 6 N. Michigan Ave., Chicago.

TO MANUFACTURERS

WANTED—A well-equipped manufacturing plant to manufacture an entirely new Automobile Wheel, more resilient, and lighter than present type. Particulars only those qualified to handle this proposition. G. E. Loveland, Palm Beach, Fla.

AGENTS Wanted—Right here is the one big chance of your life. If you want to make good money—\$10 a day or more, as easy as rolling off a log, and get your swell clothes free besides, you can do it by acting as our agent. We are the biggest people in the business and want our agents to make big money and be nifty, stylish dressers. Send a postal today for free \$10 outfit, including a big book of nobby suiting samples to select your swell agent's suit from. Then take orders from people who admire your nifty clothes. They come to you—not you to them. This is the way to get rich—the sure, easy way. Remember, you need no money—everything is furnished by us free. We pay express on everything. Just send a postal, but do it today. You can't get started too quick, making this big money and wearing these stylish clothes. Address card to Paragon Tailoring Co., Dept. 614, Chicago, Ill.

YOUNG Man, would you accept and wear a fine tailor made suit just for showing it to your friends? Or a Slip-on Raincoat free? Could you use \$5 a day for a little spare time? Perhaps we can offer you a steady job. Write at once and get beautiful samples, styles and this wonderful offer. Banner Tailoring Co., Dept. 723, Chicago.

A PIPE for Agents who are smokers. Fastest direct or mail-order seller on market. Send fifty cents for sample pipe. Smoke it and others will buy from you. Write for liberal wholesale proposition and full particulars. Lane Sales Co., Park Row Building, New York.

YOU Vacuum Sweeper Agents owe it to yourselves to get our "direct from factory" prices and details of the newest and best machine on the market. Mfg., 510 D, Fisher Bldg., Chicago.

AGENTS—\$10 daily and more can be earned by everybody undertaking an easy agency as an extra; expert knowledge unnecessary. Write to Mr. Moritz, 696 Prinsengracht, Amsterdam, Netherlands. (Postage, 5c.)

AGENTS make big money selling our "Instant" Heatless Trousers Press. Sells at sight, 100% profit. Grasp opportunity. Write now. Sample 25c. Territories, D. Clifford Company, 10 Wall Street, New York.

ATTENTION, Manufacturers, Agents, Mail-Order general agents, Office Specialty, New: The Stenographers Friend—Bronx Note-Book Holder. Price, one dollar. Agent's sample 50c. Proposition Free. Bronx Manufacturing Co., Schofield Bldg., Cleveland.

GENERAL Agents establish a profitable "repeater" business, handling "Wil-Emi" Concentrated Tube Flavors, Soft Drinks, Toilet Preparations, Household Specialties, etc. Restricted territory. Liberal co-operation. Write quick. "Wil-Emi" Products Co., 665 E. 104th St., Cleveland, Ohio.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Photo China Plates. Rejects credited. Prompt shipments; samples and Cat. free to agents. 30 days' credit. Jas. C. Bailey Co., Desk B-1, Chicago, Ill.

VALUABLE Premiums and Big Profits to Agents selling our order getting line of Guaranteed Pure Aluminum Goods. Our \$200,000 capital backs you. Write today for territory. Wm. J. Dick, Mgr., Dept. K 21, 20 W. Lake St., Chicago.

AGENTS Wanted—Write for attractive proposition on button hook puzzle. Latest thing out. Sells at sight. K. & C. Specialty Co., Dept. F., 638 3rd Ave., Milwaukee, Wis.

SELL Art Show Cards. Everybody buys. 400% profits. Catalogue free. Powell Bros., 4150 Madison, Chicago.

MAKE and Sell Your Own Goods. Formulas by Expert Chemists. We obtain your Government Serial Number. Catalogue for stamp. B Mystic Company, Washington, D. C.

AGENTS Wanted—Rocker Vacuum Clothes Washer—Not a funnel pounder. Sells \$1.50, sample postpaid, \$1. Quick sales, big profits. Money back if requested. Ingram Co., 2 Stone St., New York.

AGENTS—Electric Sign—Flashes Changeable wording in radiant, sparkling beams of blazing electric light. Outselling everything at \$10.00. Valuable, exclusive territory. Sample free. Flashtrac Sign Works, Chicago.

AGENTS Wanted—"Sept. Morn" Goods. Send \$1 and we will send you 1 set of "Sept. Morn" goods, consisting of Stick Pin, Watch Fob and set of Link Cuff Buttons, and also send you sample and full particulars of a good mail-order plan.

AGENTS: Our \$3.00 machines earn from \$10 to \$35 yearly for users. Sell 1 to 5 machines in every home, school, church or place of business. Sell for \$1.00 cash with \$2.00 to be paid after the user is satisfied that it has earned him \$5.00. We want agents in every city and town. Big profits. Agents pay us 50 cents—balance when user is satisfied. Write today for proposition. Get the agency now. Hardware Specialty Mfg. Co., 4411 Ravenswood Ave., Chicago.

THE Greatest Mail Order Proposition Ever Placed in the Hands of People Desirous of Making Money by Mail. "The Medical Field;" "Building a Business With Beauty Preparations;" "Mail Order Book Business," and many other excellent plans fully explained in current Booster Magazine—the one bonafide publication devoted exclusively to Agents' interests and all Mail Order People. More read "Booster" than any other trade paper; this alone should convince you that today is the day to learn about Booster's money-making suggestions and principles. Join our ranks now. Let Booster put you next to money-making propositions—ones that actually make money! 10c brings two copies worth dollars. If dissatisfied we'll return your dime. Booster Magazine, Northwestern Building, Chicago.

AGENTS—A free course in General Salesmanship is given to every man of our Sales Organization. This organization is a body of successful men selling the Handy Light; that unique electrical device which cuts the cost of electric lighting in half. Sells for \$3.50, is used in home, office, store, factory; weighs only one pound. Sold by demonstration. All agents furnished with well planned methods for gaining interviews. A high-grade business for a man of ability and standing in his community. General Agents preferred. Inquire for our full proposition by addressing The Handy Light Co., 1103 Handy Light Block, Cincinnati, Ohio.

AGENTS—Something entirely new. A fluid that makes Automobile tires puncture proof. Does not injure rubber, will not harden or evaporate. Guaranteed to automatically seal any ordinary puncture. Costs fifty cents per gallon to make, and sells for ten dollars. You can make it in your own kitchen. Send one dollar for formula. Your money back if it fails. Address George Wack, Waterloo, Iowa.

CAPABLE Side Line Salesmen wanted in every locality to handle a nationally advertised Specialty line of exceptional merit. Sells on sight, patented and guaranteed. Liberal commission. Splendid incomes easily made by energetic, experienced workers. Give complete details, experience, present line, references, territory in first letter. Sanitax Co., 2359 S. Wabash Ave., Chicago.

AGENTS—\$200 monthly distributing Newell's needle cases. Sell 115 needles in book for 10c and make 200% profit. Approval Plan envelopes make talking unnecessary. Crew Managers write. Send 10c for sample book and particulars. Newell Company, 509N, Grand, St. Louis, Mo.

LIVE Agents. Our new Carpet Cleaning Machine, biggest improvement yet made in vacuum or suction cleaners. New type just out. No bellows. No electricity. Unequaled for speed and power. Low price. Exclusive territory. Feeny Mfg. Co., Dept. D-65, Muncie, Ind.

BUSINESS Opportunity—To only one M. O. Dealer in each State or one Agent in a County, our Special self-filling fountain pen with large No. 3 solid Gold Pen at \$6.00 per dozen. Special gross price with your own imprint. Guaranteed value, \$2.00. Single sample, 60c. The Van Winkle Pen Co., Franklin, Pa.

PORTRAIT Agents—Write for prices on Solar, Bromides, Convex Prints and Pillow Tops. We ship orders back promptly. Try us. Horne Copying Co., 113 S. Jefferson St., Chicago.

AGENTS' sample, 15c. Belmont \$1.00 Silver-plated Safety Razor, can retail for 25c. Guaranteed best on market. Rollins, Box 5272, Boston.

THE Agents Magazine will increase your income. Shows you how to buy \$2.00 Sellers for 20c; 15 choice money-makers. Two months subscription, 10c. Agents Magazine, Chicago.

KLEANOL Specialties pay you very large profits. We make highest quality all-year sellers. Also holiday lines. Write now for exclusive territory. Kleanol Brush Company, 65 Taylor St., Springfield, Mass.

WOULD 7½c for guaranteed, Self-filling Fountain Pen interest you? Retails for 25c. Offer 30 table pens. Sample 25c. Rollins &

GENERAL Agents—Capable of calling the big trade themselves and handling canvassers for the house to house and off to office business, to sell the newest electrical specialty on the market; sold everywhere there is electricity, in the home, office, factory, store, hotel; liberal profits; sale driving sample, weighs a pound, no experience or knowledge of electricity require shows how to use one light instead of 10 and get the same results; sells for \$2.50, \$3.50, \$5, and saves the purchaser an investment of \$25. Write for particulars. The Handy Light Co., 155 Handy Light Block, Cincinnati, Ohio.

BOYS! Sell Vest Pocket Mechanical Baseball Score Keepers. Every baseball fan wants one. Big profits. Send 3c for Sample. Chas. Klaber, 3408 North Kildare Ave., Chicago.

LIVE agents wanted for my patented slip polishing outfit. Best repeat order get on the market. Warren of Conn. average \$5.25 daily last month. You can do well. Write quick for particulars. All W. McKee, Dept. A, Plainville, Conn.

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

AGENTS—Salary or commission. Great seller yet. Every user pen and ink be on sight, 200 to 500 per cent profit. Agent's sales \$620 in six days; another \$32 in two hours. Monroe Mfg. Co., La Crosse, Wis.

EXCLUSIVE territory. New article. profits. Write for particulars. Sweet, 1 N. Main St., Los Angeles, Cal.

AGENTS—Get your name listed, many desirable propositions will be submitted to you without asking. Canvassers Agents' Registration Bureau, 123 Hart Providence, R. I.

AGENTS: New \$2.00 Automatic Add Sells easily. 100%. Get prices. N. Bass 5921 Indiana Ave., Chicago.

SANITARY Kitchen Aprons of wax proof cloth; agents, E. L. Co., 23 Columbus St., Boston, Mass.

SELL Dry Goods Remnants. Great bargains on earth. Remnant Store Cincinnati, O.

AGENTS to take orders for Visiting Business Cards; large profits; outfit for Forman Printery, Waterbury, Conn.

PRACTICAL Adding Machine, \$1; easily, accurately; capacity, 99,999. Order today; descriptive circular Spring City Specialty House, Waukesha, Wis.

VACUUM Cleaner Agents—See the U. S. new design; nickel-plated extended nozzle; swivel attachment; large profit; exclusive territory. U. S. Mfg. Co., Warren, O.

AGENTS—If You Can Sell Remedies our Home Remedies will net 100%. Schell Medicine Co., Mohawk, N. Y.

ANYBODY can earn \$30 weekly selling our household and office specialties. Shore Manufacturing Company, Michigan City, Ind.

PERFECTION Pocket Adding Machine Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R, Cincinnati, Ohio.

AGENTS, Canvassers, Mail-Order Patented Household Specialties that are different. Big profits for you. Sight sell Live wires wanted everywhere. Write for descriptive literature. The Pull-Mfg. Co., 20 E. Jackson Blvd., Chicago.

400% PROFIT selling our repeat goods. Free samples and catalogue. Coma Co., 7938 Bennett Ave., Chicago.

400% PROFIT selling our High Quality. Samples free. Gordon Co., Northwestern Bldg., Chicago.

100 MONEY-MAKING Opportunity Free. Hunter, 418 South Broad, Philadelphia.

ANCIENT Egyptian Secret—Royal cense. Most astonishing uses; a need and convenience; is attractively fragrant a mystery of centuries; large metal 25c; if not satisfied your money returned. No free samples. Agents wanted—town. The Traffic Co., 11370 Shadel Street, Pittsburgh, Pa.

SELL the newest and greatest household inventions. Absolute necessities. Two repeaters. Big money-makers. Manufacturing Co., 2313 Lyndale, Chicago.

AGENTS wanted to handle manufacture line of solid gold emblem rings, any \$2.15 for sample, retails for over \$10.00. Embler Department Book Lender Co.

REE—Big illustrated magic trick catalogue. Oaks Co., Dept. 76, Oshkosh, Wis.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there electricity, in the home and office; liberal terms; sales-driving sample, weighs a pound, experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; for \$3.50 and saves the purchaser an investment of \$25; write for particulars. Handy Light Co., 17 Handy Light Bldg., Cincinnati, Ohio.

MANUFACTURERS now assigning territory for new patent. Selling factories, stores, offices, houses. Every call a post-customer. Antiseptor Co., Minneapolis, Minn.

OLD Sign Letters. Immense profits. Available free. Johnston Co., Quincy, Ill.

AGENTS—100% profit—sell to saloons—line whirlwind seller. Free sample and franchise course. Two sales a day, 100% profit. Write, Simplex Mfg. Co., Chicago, Ill.

WANTED—Representatives in every town. Money and quick seller, for male or female. Send 10c for sample. Smith Manufacturing Co., 5547 Chester Ave., Philadelphia.

AGENTS—The lowest cut-price wholesale in the United States of late specialties and novelties. Catalogue free. Franklin & Co., Dept. 10, Canon City, Colo.

OPPORTUNITY for live agents; splendid hold specialty, suitable for either sex. Write for particulars, Keegan Supply Co., 101, East Providence, R. I.

AGENTS Wanted—Canvas mail box seller. Write for price. Mail Box 1803 N. Fairfield Ave., Chicago, Ill.

RICHARD Knives sell in every family. Profits. More agents, men and women, wanted. The Stephen Richard Co., South Boston, Mass.

50% PROFIT. You can't beat it. Sells everywhere. Free pocket sample. Our goods are orders. Wm. J. Dick, Mgr., Dept. 10 W. Lake St., Chicago.

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

TCARDS—90c to \$3.50 per 1,000. Each box, 500 for \$1. Fountain pens, pens, novelties. Write for particulars. Gross Co., 2147 Arthur Ave., New York.

AGENTS—500% profit, free sample Gold Silver Sign Letters for store fronts and windows. Anyone can put on. Big demand everywhere. Write today for liberal terms to agents. Metallic Letter Co., 406 W. 4th St., Chicago, U. S. A.

AGENTS, Streetmen, Canvassers, Demons in country fairs and expositions, sell your money quick. Brandnew wind-matchbox. Light cigar in any wind. Sold everywhere. Particulars free. Sample, 10c. Write for particulars. Address, 2139 Seventh Ave., New York.

HEY! Money! Money! If Bang Up and want easy money, send 10c for package "Quickbright" (none free) the best polishing device. Exclusive territory. Great selling plan. Non-Nac B Mfg. Co., Northford, N. J.

FLING man under 50 years wanted in every locality. To join this Society and receive our New Memberships. Part of fee—\$50.00 to \$500.00 monthly. Experience not required. Address, I-L-U, Springfield, Ky.

Use your spare time to build up a mail business of your own. We help you get a share in profits. 27 opportunities. Particulars free. Mutual Opportunity Exchange, Buffalo, N. Y.

EASE your income selling "Quik-King" cleaner for the hands to saloons, garages and machine shops. Big demand, exclusive territory, free sample. Joliet Novelty Co., Joliet, Ill.

AGENTS for automobile and motorcycle owners. Electric horns. Guaranteed for five years. Loud and penetrating. Our prices are low. Your profits big. Economy Gas Co., Utica, N. Y.

ET Lamp. No matches, no heat, ready. Adopted by French Government. Big money for agents. Sample and 5c. Pocket Lamp Co., 710 5th Avenue, New York.

E income selling Specialty Rugs. Illustrations and important information free. Sample rug forwarded free. Reference, Boylston Nat'l Station. Dundee Mfg. Co., 46 Chauncy Boston, Mass.

AGENTS—New premium proposition; make \$5 daily; experience unnecessary; 70c profit on \$1.20 sale; sample and particulars free. Le Beau Co., 3311 Belmont Ave., Chicago, Ill.

\$50.00 A WEEK guaranteed selling Pure Spun Aluminum Cooking Utensils. We are manufacturers of the largest line in the world. First Aluminum Cooking Utensils made bears our trade-mark. Wanted live men at once for protected territory. Answer quick. Divn. PM, American Aluminum Mfg. Co., Lemont, Ill.

(CELLULOSIA) Door Plates, new lettering pure gold. Send for sample case. Nothing invested. 100% profit, sell to every house. Public demands them. La Fontaine, Mfr., Sherburne, N. Y.

THE Fuller Dustless Mop and Furniture Duster are advertised in leading magazines. We need live representatives for unoccupied territory. These articles contain exclusive features. Fuller Brush Co., 55 Hoadley Place, Hartford Conn.

COST 1c, sell for 10c. Ready-made sign letters anyone can apply. Unlimited demand. Five samples, instructions, 10c. Particulars free. Everwrite Co., 982 Third Ave., New York.

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

AGENTS, get the latest. Combination egg separator, egg beater and cream whip. Agent's sample 25 cents coin. T. A. Burke, 203 S. Pearl, Galesburg, Ill.

AGENTS make \$5 profit daily. Name Plates, House Numbers, Signs. Particulars free. Roscoe Lynch, Bausman, Pa., Dept. B.

WE need live wire representatives for unoccupied territory to handle The Fuller Sanitary Brushes. Our product is nationally advertised and covers every need. Your territory is valuable. Write for particulars. Fuller Brush Co., 33 Hoadley Place, Hartford, Conn.

GENERAL Agents everywhere for our new "Sav-ice" Cloth; especially prepared for preserving ice in refrigerators. Reduces ice bills one-half; exclusive territory to good, responsible parties. Harsch Mfg. Co., Box 634, Indianapolis, Ind.

WOULD \$40 a week interest you? We seek a representative for old established brand of guaranteed hosiery; sold direct to consumers; protected territory; credit given. N. Parker Mills, 720 Chestnut St., Philadelphia, Pa.

AGENTS—Big money selling our combination aluminum beer pipe cleaners and water filters. Write for illustrated circular and terms. Criterion Company, Naugatuck, Conn.

STAMP Names and Addresses on Key, Checks, Umbrella Plates, Watch Fobs, etc. We supply blank stock and stamping outfits, sample with name and address, 10c. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

AGENTS Wanted—Ladies or gentlemen. Two big propositions; one needed by every business firm; the other by every family. If you can sell anything you can sell these. Inland Mfg. Co., Topeka, Kans.

AGENTS—\$50 weekly. We manufacture the best needle case made; a wonderful seller; 200% to 500% profit; talking unnecessary; our "Trust Scheme" Envelopes do the work; general agents can make \$100 weekly; particulars free; 25c sample outfit for 10c; buy direct from the factory. Paty Needle Co., 102 Davis Sq., W. Somerville, Mass.

HONEST man wanted in each town to distribute free advertising premiums; \$15 a week to start; experience unnecessary; references required. Address McLean, Black & Co., 11 S. Beverly St., Boston, Mass.

AGENTS wanted to handle remarkable money makers; easy to handle; easy to sell; many repeat orders; write quickly. H. Warwick, Dept. S, Box 306, Bridgeport, Conn.

MEN Wanted, Handle Branch Agencies paying \$5 day upward. Give references, experience. Modern Specialties, Racine, Wis.

AGENTS in every city to handle our Triplex Folding Handbag; big profits; exclusive territory. Write for terms and free catalog. Other big sellers. S. V. Diamond & Bro., 35 West 21st St., New York City.

AGENTS: We want, at once, a man or woman, one capable of earning good salary, in every community where we are not represented. Write us. Sun Mfg. Co., 309 Dean Bldg., South Bend, Ind.

SOAP and Perfume Agents, write us. Big Profits. Goods Guaranteed. Hopfinger and Roth, 212 N. Second St., St. Louis, Mo.

WIDE-AWAKE, active agents or crew managers can secure special concession and reap the benefit from the best money-making agency proposition on the market by writing immediately for full particulars. Hugro Manufacturing Co., Chicago, Ill.

HOUSEHOLD necessity recently invented sells at 75c. Costs distributors 25c. Nothing like it on the market. Tested and approved by Good Housekeeping Institute. Get your territory now. Hugro Mfg. Co., Chicago, Ill.

\$1,000.00 OR \$400.00 a month—which? Agents make \$20.00 a day. Start in small way, grow to big money class. Koehler made \$12.00 first day, \$16.00 second day. "Positive Proof Sales Plan," combined with "Shakti," makes big money certain. Make your friends wonder at your success. Act Quick; particulars for postal. Nat. Dist. Co., 1674 Belmont Ave., Chicago, Ill.

WE have agents making \$200 weekly, selling our new specialty to merchants. Retail \$7.50, your profit \$5.00. No competition; exclusive territory. Samples and descriptive matter free. Sayers Co., 408 Olive St., St. Louis, Mo.

MAIL-ORDER Opportunities: 25 new Propositions. No competition! Make 95c profit on dollar order; complete outfit 10c. Mail Dealers Wholesale House, 521 Franklin Bldg., Chicago.

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.

\$5.00 RAINCOATS—Agents wanted everywhere. You and many others in your section need Raincoats and would gladly pay Agent \$5.00 for one. Why not be that Agent? Boston Raincoat Company, Sales Dept., Boston, Mass.

AGENTS sell rich-looking imported 36x68 rugs \$1 each. Carter, Tenn., sold 115 in four days, his profit \$57. You can do as well. Write for sample offer and selling plan. Sample rug by Parcel Post, prepaid, 98c. A. Condon, Importer, Stonington, Maine.

AGENTS make \$5.00 to \$10.00 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.

I WILL start you earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

300 TO 400% Profit to Agents selling our guaranteed U. S. Fire Extinguishers. Tremendous demand. Orders repeat. Exclusive territory to county and district managers. United Mfg. Co., 1025 Jefferson, Toledo, Ohio.

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., 1605 Hyde St., San Francisco.

YOU can make \$\$\$\$ 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 Redd St., Newark, N. Y.

AGENTS Wanted—Mechanics and shopmen make over \$100 a month in spare time selling transparent handled novelty knives and razors. Big profits. Sales easily made. Write for terms today. Novelty Cutlery Co., 67 Bar St., Canton, O.

MEDALLIONS—300% profit. Make up your own goods and be independent. Catalogue free. Resag Co., 1265 Randolph St., Chicago.

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.

OUR Agents make good money and get repeat orders easily. Dept. A, Consumers' Direct Supply Co., Boston, Mass.

AGENTS—One cent invested in a postal card will bring you a \$35 to \$60 a week proposition. Sterling Aluminum Co., Carpenter Station 77, Chicago.

HELP WANTED

WE seek the services of several men of practical experience and responsibility in factory system work. One of the largest and strongest Manufacturers in the Automobile Industry expects to have to fill several positions connected with Storekeeping, Operation and Machinery Layout, Study of Speeds and Feeds, Factory Planning Work, Material Specification and Allied Lines. We wish growing men who have shop experience as a foundation, and whose study has been to increase the efficiency of the shop by means of the above branches. Automobile connection is not essential in all cases. All communications will be considered in strictest confidence. Address P. O. Box 839, Detroit, Mich.

YOUNG Man Wanted, between 21 and 30, to learn production engineering and public accounting in office of prominent New York concern. No salary first year, but exceptional opportunity for man of real ability. Address Institute of Business Engineers, Singer Building, New York, N. Y.

SALESMEN, Agents, \$6 to \$10 day. Household necessity to dealers and others. We mean business, do you? 10c brings sample, etc., ready to start. Freck Concern, Flr. 3, 197 E. Main St., Columbus, Ohio.

GET a Government Job! See ad on page 23. Write now—today. Patterson Civil Service School, Rochester, N. Y.

FIREMEN, Brakemen, all Railroads, \$120. Experience unnecessary. Send age, postage. Railway Association, Dept. 298, Brooklyn, N. Y.

WANTED by a large company, an experienced and capable man who thoroughly understands his business, to take charge of department working about one hundred men, making elevator cars and enclosures. G. A., 11th Floor, 78 E. Madison St., Chicago.

A MONEY Proposition—Co-operate with me in a profit-sharing mail-order business. Will place trial advertisement, furnish printed matter, goods to fill orders and divide the profits. Particulars, Desk 153, Hazen A. Horton, Tekonsha, Mich.

WANTED—Young men and boys whether employed or not. A cinch for those working in factories or mill. At least \$2.00 to \$4.00 per day. A card will bring particulars. C. A. Stewart Co., 26 Kingsbury St., Worcester, Mass.

FREE Illustrated Book tells of about 300,000 protected positions in U. S. service. Thousands of vacancies every year. There is a big chance here for you, sure and generous pay, lifetime employment. Just ask for booklet S29. No obligation. Earl Hopkins, Washington, D. C.

BE a Handcuff King! Enormous salaries paid in vaudeville. Interesting, mystifying. Full instructions, 25c. Particulars free. Mack Co., Colling, Mich.

SPLENDID weekly profits in spare time at home. Mail-Order business; don't worry about capital. Boyd H. Brown, Dept. K, Omaha, Neb.

THE Apprentice Department of the General Electric Company of West Lynn, Mass., offers excellent opportunities to Grammar School Graduates to learn one of the mechanical trades. Apprentices receive adequate wages from the beginning, both for shop and classroom work. Apprentices are admitted at all times. Write for illustrated catalogue. All applications should be sent to the Educational Department of the Company.

PLEASANT spare-time work; mailing circulars. Good pay. No scheme. Details free. Home Pub. Society, 46 N. 12th, Philadelphia, Pa.

MAKE money writing short stories. Big pay. Free booklet tells how. United Press Syndicate, San Francisco.

USE your spare time to build up a mail order business of your own. We help you start for a share in profits. 27 opportunities. Particulars free. Mutual Opportunities Exchange, Buffalo, N. Y.

MOTION picture plays wanted. You can write them. We teach you. No experience needed. Big demand and good pay. Details free. Ass'd M. P. Schools, 671 Sheridan Rd., Chicago.

BECOME Detectives—Earn big money; easy work; wonderful opportunities. Write Wagner, 1243 Lexington Ave., New York, Dept. 301.

300 TO 400% Profit to Agents selling our guaranteed U. S. Fire Extinguishers. Tremendous demand. Orders repeat. Exclusive territory to county and district managers. United Mfg. Co., 1026 Jefferson, Toledo, Ohio.

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

SPARE Time—No canvassing. Report information, news, names, etc., to us. Markets waiting. Enclose stamp. "Nisco," HDB, Cincinnati.

WANTED—Circular distributors; enclose stamp. American Distributor Co., Blairsville, Pa.

"MY Lady of Dreams." The coming big song success. A great song with an attractive title page. Ten cents in stamps or coin. Marks-Goldsmith Company, Department D, Washington, D. C.

BE a detective. Earn big money. Write John J. Gilles, Licensed and Bonded N. Y. State Detective. Retired Member N. Y. Police Dept. 22 years Experience. 254 Huguenot St., New Rochelle, N. Y. Investigation solicited.

WRITE Moving-Picture Plays. \$50 each. All or spare time. Correspondence course unnecessary. Details free. Atlas Publishing Co., 3045, Cincinnati, Ohio.

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.

BE a Detective—Earn \$25 to \$75 weekly; chance to see the world with all expenses paid. Loraine System, Dept. 304, Boston, Mass.

\$3,000 YEARLY in your back yard! No ginseng, mushroom dope. New industry you never heard of. P. and S. F. Magazine explains; editor helps you. Trial copy with Editor's Special "tip," 10c. Mark Walter, Editor, 42 Hanselman Bldg., Kalamazoo, Mich.

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

WANTED—Distributors, Men and Women—to give away free pkgs. Perfumed Forax Soap Powders; no money or experience needed; good pay. S. Ward & Company, 218 Institute, Chicago.

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.

I WILL start you earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operations. G. F. Redmond, Dept. 306, Boston, Mass.

LEARN automobile repairing, driving on up-to-date cars; electrical, civil engineering, surveying; methods most practical; room and board while learning; positions secured; satisfaction guaranteed; catalog free. National School of Engineering, 2110 West Seventh, Los Angeles.

SITUATIONS WANTED

LICENSED chauffeur wants position any place in United States. References furnished. Seven years' experience. Lock Box 495, Greene, N. Y.

FOR SALE

FINE French field glass; originally cost \$30, for \$10; very powerful; nearly new; will send for examination by addressing 131 W. Fifth Street, Cincinnati, Ohio.

ELECTRIC sixty-pound pressure pump cheap. Address M. Becker, Brillion, Wis.

PIERCE Arrow four cylinder, guaranteed good as new; must sacrifice, \$200. Herbert Kellam, Heron Lake, Minn.

FOR Sale—Outfit machinery making all kinds typewriter, multigraph ribbons; first-class. Bargain. E. E. Bushnell, Los Angeles, Cal.

FOR Sale—One No. 50 Connerville blower. Never been used. Will sell cheap. Address Union Traction Company, Anderson, Ind.

\$250 NATIONAL Cash Register, used short time. Good as new. Price \$175. Guaranteed. Angsten-Koch Company, Chicago.

\$45 PURCHASES \$150 mail-order Stock; owner accepted advertising position. Rose, 631 Hanover, Baltimore, Md.

LUGER 30, complete outfit \$22. Grant Peffer, Watsonstown, Pa.

FOR Sale or Royalty, automatic and garment holder, Pat. Big m. maker. A. Johnson, 2455 Vermont St. Quincy, Ill.

ROOFING canvas painted one side; made. Otis, Columbia St., Boston, M.

MACHINE Shop and Foundry—Completely equipped with modern machin. Plenty of room for garage. Excellent portunity. Terms, Smith & Au Durango, Colo.

SHAPER—Stroke 16". Cross Feed 18. Vise opens 8". Complete with counters \$225. Grammes Sons, Allentown, Penn.

SALE OR EXCHANGE

ONE Hundred articles to exchange. free. Seaco, York, Neb.

WILL trade a Powers 5 Edison Unive and Homers Oddysey, 3 reels, for a property. Want MP Camera Ticket Cl per or electric sign suitable for picture at Oscar Anderson, L. B. 305, Newberry, M.

FOR Sale or Trade—American razor safety blade sharpener. Good side. Kansas Cutlery Works, Hutchinson, Ka.

FOR Sale—10-volume library on photography, wireles outfit, violin. Want Rem ton typewriter or kodak. Sargent, Abri Wis.

WILL Exchange Jewellers' Lathe screw-cutting lathe. Seaco, York, Ne

WANTED

WANTED—6 inch vibrator induction Trippe, Toms River, N. J.

WANTED—Second-hand stone cru to crush rock to size walnuts and sma Material wanted for building driveway private estate. Machine must be in class condition and preferably in New land, as crusher will be used in M Address with full particulars, "W." Popular Mechanics Magazine, Chicago.

WANTED to purchase complete fill magazine (Wayside Tales) year Address W. T. c/o Cartoons, 6 N. M gan Ave., Chicago.

GUNS, SPORTING GOODS, ETC

STEEL Fishing Rod, 78c post. Send for our bargain list. Gould & G Box 5143, Dept. 9, Boston, Mass.

FREAK Fish Food. They bite gre Fisherman's delight. Guaranteed sun luck. Postpaid, 12c. Angler, 422 Albany Ave., Chicago.

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PARTNER, \$2,000 investment. Side active. Have patented, perfected pra household utility. Pills recognized Appeals irresistibly. Innumerable me boys. Will manufacture wherever tions most favorable. Sell through partnership absorbing entire profits, transient novelty. Opportunity securing stantial, permanent income from investment. James Mackay, 149 E. St., New York.

MACHINERY, TOOLS AND SUPP

FOR Sale—30 hp. Hamilton Gas with flyball governor, \$150. 35,000 lb. wagon-scale, \$50. Two force pumps inch plunger, 1½-inch suction, 1½ discharge, belt drive, high pressure \$25 each. Used canvas belting 10-in. 15c; 12-in. 4-ply, 18c; 14-in. 4-ply 24-in. 6-ply, 60c per foot. P. O. Box Milwaukee, Wis.

500-LIGHT Gas Generator for sal 500-light Sunlight Omega Acetylen Generator in first-class condition, pra as good as new. Will make price att For particulars write The D. Wilco Co., Mechanicsburg, Pa.

FOR Sale—Two return tubular size 72"x20", with down draft furnac lowable working pressure 135 lbs. Engineer, Rice-Stix Dry Goods Co St. Louis, Mo.

FOR Sale—One 2 cylinder gasoli gine, 10 hp. One 3 k. w. direct generator. One Rheostat volt am meter, and switchboard, complete. One 2 hp. marine gasoline engine, complete, \$30. Plummer's Garage, wood, Ill.

PULLEYS, Gears, Sprockets, S Hangers; see page 124. W. A. Jones dry & Machine Co., Chicago.

1913 Evinrude detachable rowboat
rs \$45 each. Badger Motor Comp'y,
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ALL screw cutting lathe at bargain.
Arrasmith, Bayard, Iowa.

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JUSTABLE mould for casting soft
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00 DRILLS, 200 milling cutters, half
and less. Bicknell, Janesville, Wis.

VACUUM cleaner pumps, tanks, hose
tools for stationary plant for house,
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VE for sale several sizes of lathes,
ng machines, drill presses, punch-
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INE Lathe, swings 9½", takes 25"
n centers. Complete set gears cut-
all size threads 3" to 40". \$43.50.
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W to Run a Lathe. A 50-cent book
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Wagner \$53; 1 H. P. Wagner 1200
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C. MOTORS, 1, 2, 5, 7½ horse, 60
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RLY new marine gasoline engine, 2
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ILT Engines—We have on hand a
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SPECIAL bargains in second-hand At-
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Box 129, Muncy, Pa.

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COMPLETE working drawings of 8 H.
P. vertical engine. Price \$1. Mechanical
Design & Engineering Co., Alfred L. Car-
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GASOLINE Engine Castings, with draw-
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BRASS, aluminum and bronze castings
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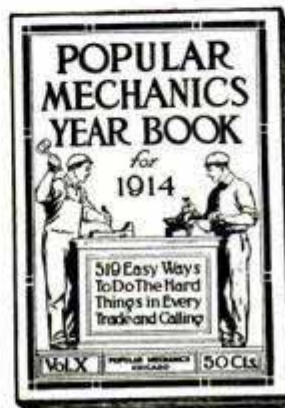
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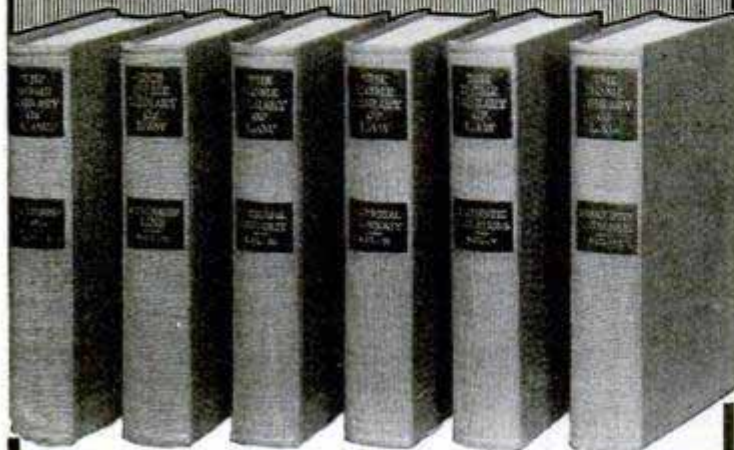
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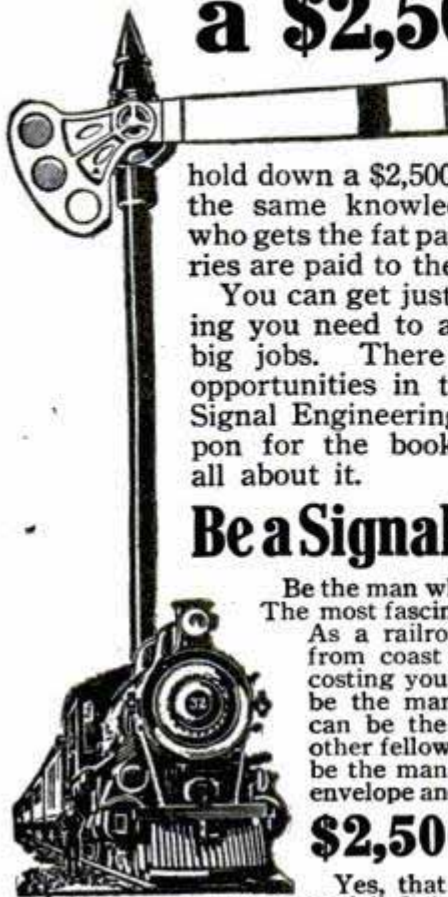
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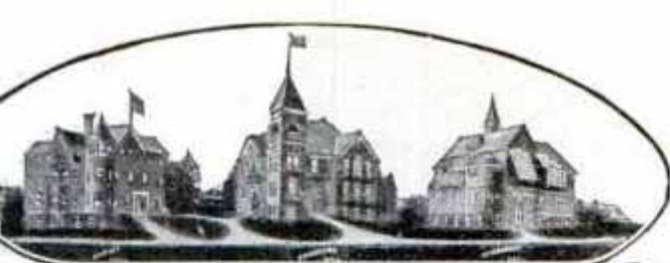
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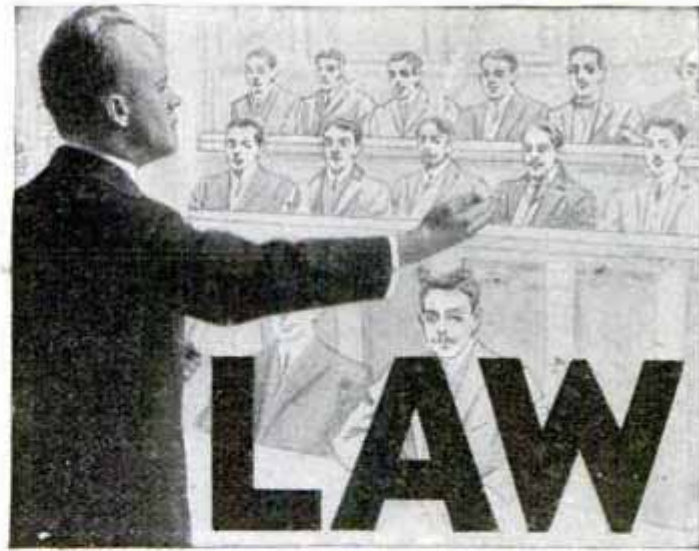
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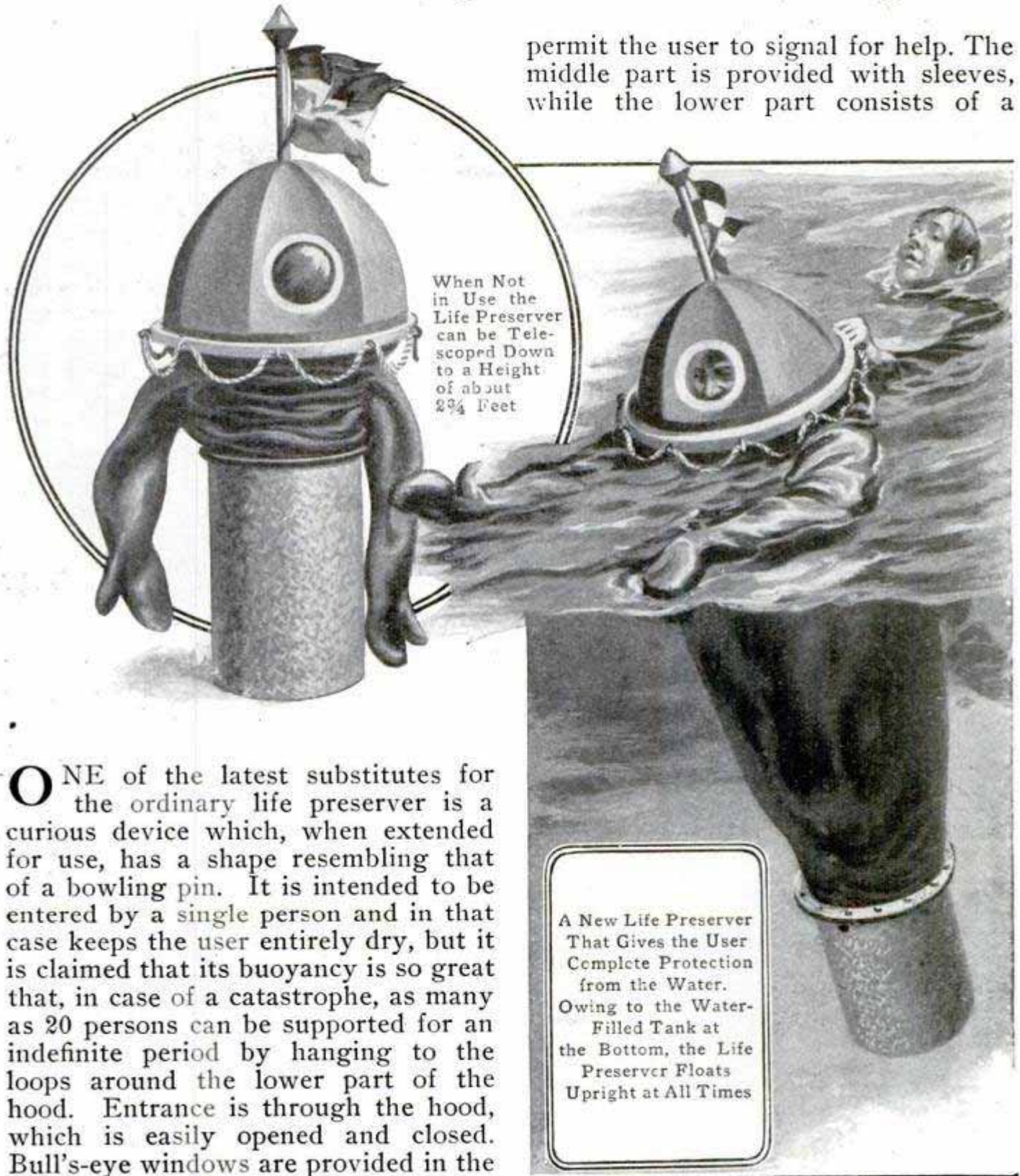
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Life Preserver Shaped Like Bowling Pin



permit the user to signal for help. The middle part is provided with sleeves, while the lower part consists of a

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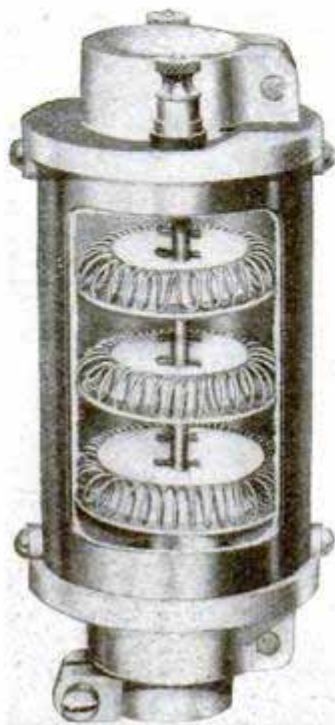
ONE of the latest substitutes for the ordinary life preserver is a curious device which, when extended for use, has a shape resembling that of a bowling pin. It is intended to be entered by a single person and in that case keeps the user entirely dry, but it is claimed that its buoyancy is so great that, in case of a catastrophe, as many as 20 persons can be supported for an indefinite period by hanging to the loops around the lower part of the hood. Entrance is through the hood, which is easily opened and closed. Bull's-eye windows are provided in the hood, as well as an air vent at the top, the latter being so arranged that it is impossible for water to enter. The windows may be opened from the inside to

A New Life Preserver That Gives the User Complete Protection from the Water. Owing to the Water-Filled Tank at the Bottom, the Life Preserver Floats Upright at All Times

water tank, which keeps the device vertical. When not in use it telescopes to a height of about $2\frac{3}{4}$ feet.

ELECTRIC VAPORIZER WARMS AIR FOR MOTOR

An asbestos-lined steel cylinder containing resistance coils which are heated by the electric current from a battery is a late accessory made for the automobile, the purpose of which is to overcome the difficulty encountered in attempting to start a motor in cold weather.



The new device is attached to the intake pipe between the carburetor and the air supply. By turning on a switch the coils become highly heated, and on cranking the engine the heated air drawn through these coils is drawn over the spray nozzle in the carburetor, causing the gasoline to vaporize instantly. Thus starting is no more difficult in cold weather than in warm.

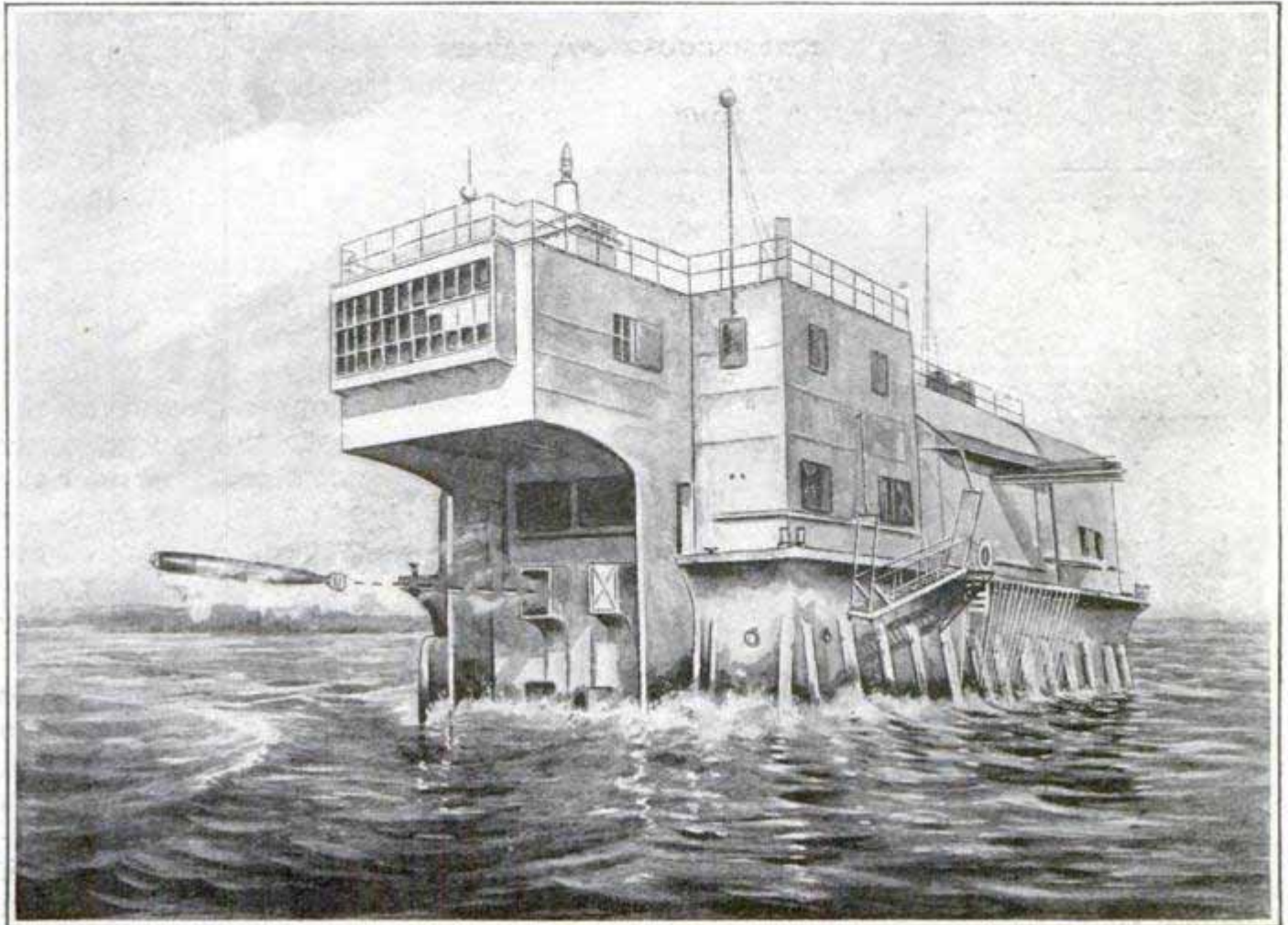
NEW ARMY MACHINE GUN IS A TERRIBLE WEAPON

A new weapon has been provided for the U. S. army which is far more efficient than any heretofore adopted. It was invented and is used by the French military authorities, and already nearly a hundred have been purchased by the United States. The new gun weighs but 35 lb. and can easily be carried by a soldier. Two men are required to operate it, both of whom lie flat on the ground, presenting a small mark to the enemy. One man feeds the cartridges into the breech of the gun in clips of 25 each, while the other aims the weapon and directs the firing mechanism. The gun will fire separate shots or will operate automatically, in which case 300 shots may be fired per minute. At long range a third soldier ascertains the range by the use of binoculars, and reports the effect of the bullets. The machine-gun platoon consists of two machine guns and 22 men. The ammunition wagon carries 45,000 rounds, while six mules carry the guns and about 9,000 additional rounds. The machine-gun has an effective range of about one mile.



This New Machine Gun Rests upon a Low Tripod about a Foot above the Ground. It may be Made to Fire 300 Shots a Minute

FRENCH BUILD ARTIFICIAL ISLAND OF CONCRETE



Courtesy La Science et la Vie

A Testing Station for Experimenting with Torpedoes has been Erected on the Floor of the Sea near Toulon

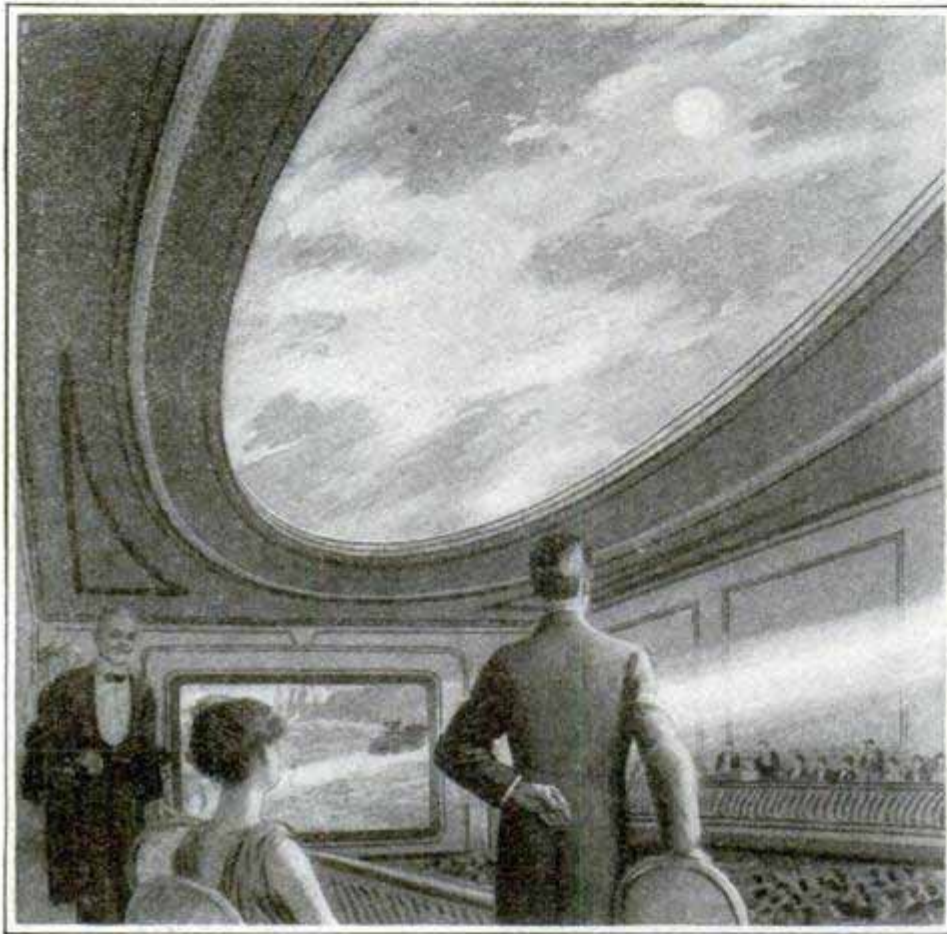
An artificial island of reinforced concrete has been built in the Mediterranean at Hyères Strait, near Toulon, the great French naval base, which is to be used solely for testing torpedoes. The island is not a large one, being less than 80 ft. long by about 50 ft. broad, and is built upon a reinforced-concrete caisson which was towed out from Toulon and submerged. It is divided into compartments by walls 4 ft. thick, in the largest of which, 10 ft. below the sea level, the torpedoes are handled. Projecting from this compartment are three torpedo tubes, while above the surface of the water, 10 ft. in the air, are two aerial-torpedo tubes. The operating mechanism, which uses electricity as a motive power, is all contained in the superstructure built over the caisson, and lighting and ventilating systems as well as wireless and searchlights are provided. An electric

crane extending out from one side permits the torpedoes to be lifted from the water and returned to their stations after practice. As is the general custom, the torpedoes used in practice do not contain explosives, but the miniature islet is so constructed that explosives may be stored within bomb-proof walls, if it ever should become necessary to use the artificial islet as a magazine.

MOVING-PICTURE THEATER WITH OPEN ROOF

There are no complaints about ventilation in the new moving-picture theater in Buenos Aires, which marks a distinct advance in architecture of this class of buildings. An oval opening is left above the center of the house, through which the clouds and stars may be seen, while an abundance

of fresh air is always obtained even in the most stifling heat of summer, when other places of amusement are deserted. The broad aisles, the wide and commodious seats and the pure air make this theater popular. A canvas



Plenty of Pure Air in This Theater

cover is arranged to be pulled over the opening in case of rain or inclement weather.

CONCRETE TELEGRAPH POLES FAIL IN STORM

A severe storm which crossed New Jersey in March this year proved the undoing of some reinforced-concrete poles erected for observation purposes in Burlington County. The wind reached 50 miles an hour in velocity, and as the wires were loaded with ice, about a pound to the foot, the poles could not stand up under the strain, the concrete cracking off and the steel rods used as reinforcement bending over at a sharp angle, necessitating taking off the wires. The concrete poles were 28 ft. in length with 12-in. butts and 6-in. tops, reinforced with eight $\frac{3}{4}$ -in. rods, and were placed about 120 ft. apart. But 40 wires hung with ice proved too heavy a burden for them. The line was

repaired by splicing short lengths of ordinary pine poles, carrying the wires, to the tops of the concrete posts.

STUDENT MILITARY CAMPS UNDER ARMY AUSPICES

The new system inaugurated by the U. S. War Department last summer, for student camps for military instruction, is to be extended. The main purpose in view is the increase in strength of the present inadequate personnel of the military reserve. In this increase, coming as it does from a class of educated young men from which in case of emergency a large proportion of the volunteer commissioned officers will be drawn, the war department believes it has found the key to the solution of the grave problem of quickly molding an army of raw recruits. Last

summer, camps were established at Gettysburg, Pa., and at Monterey, Cal. The camps for the vacation season of 1914 will be located at Burlington, Vt.; Asheville, N. C.; Ludington, Mich., and Monterey, Cal.

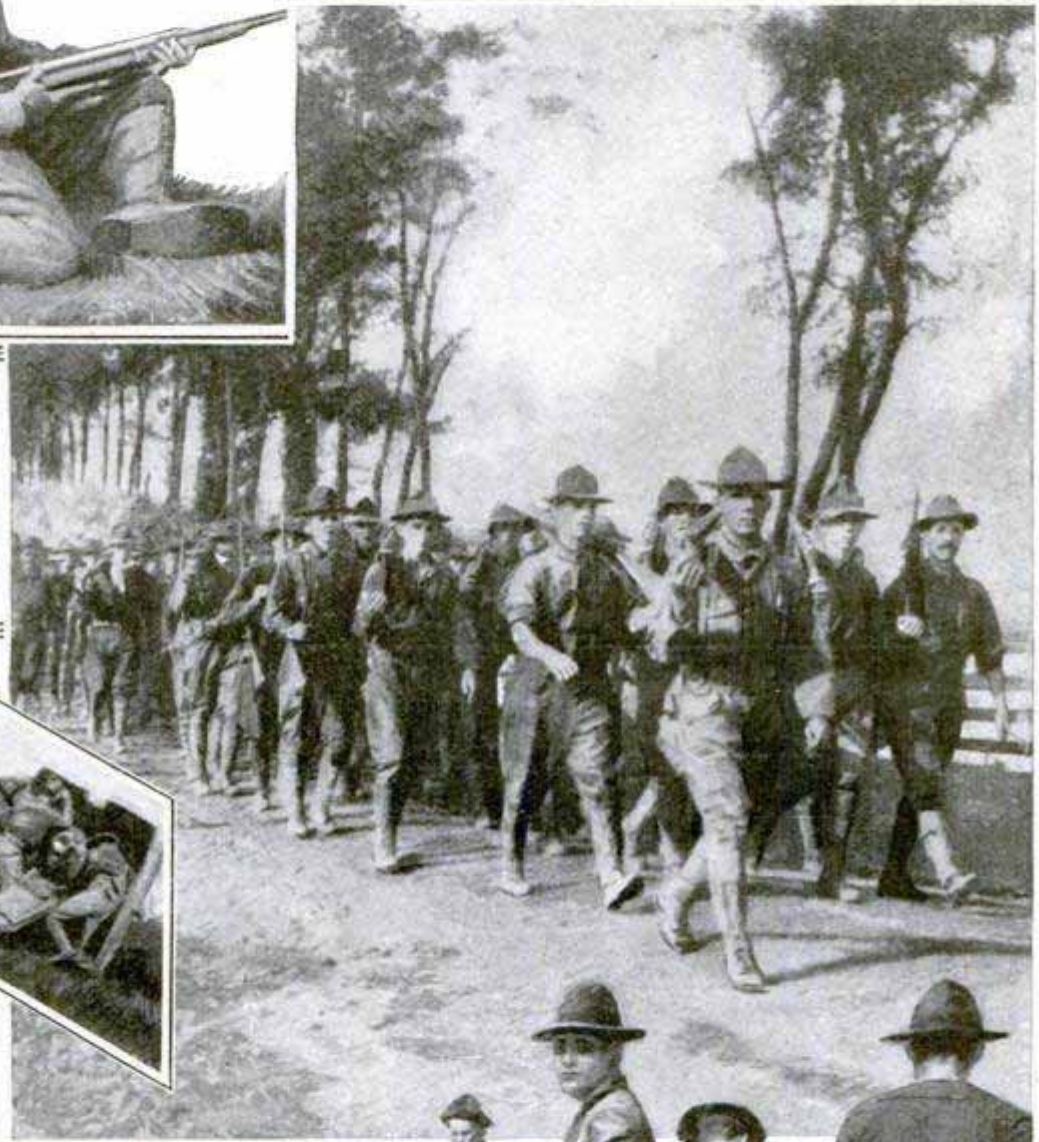
The men, to whom are offered the advantages of outdoor life, strict military discipline, and technical instruction in the theory, art and history of war, must be students or recent graduates of some high school, preparatory school, college or university, from 18 to 30 years of age, of good moral character, and physically qualified.



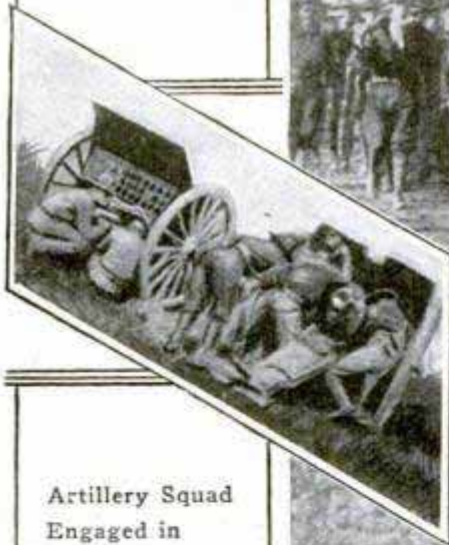
A Company Street in One of the Students' Military Camps



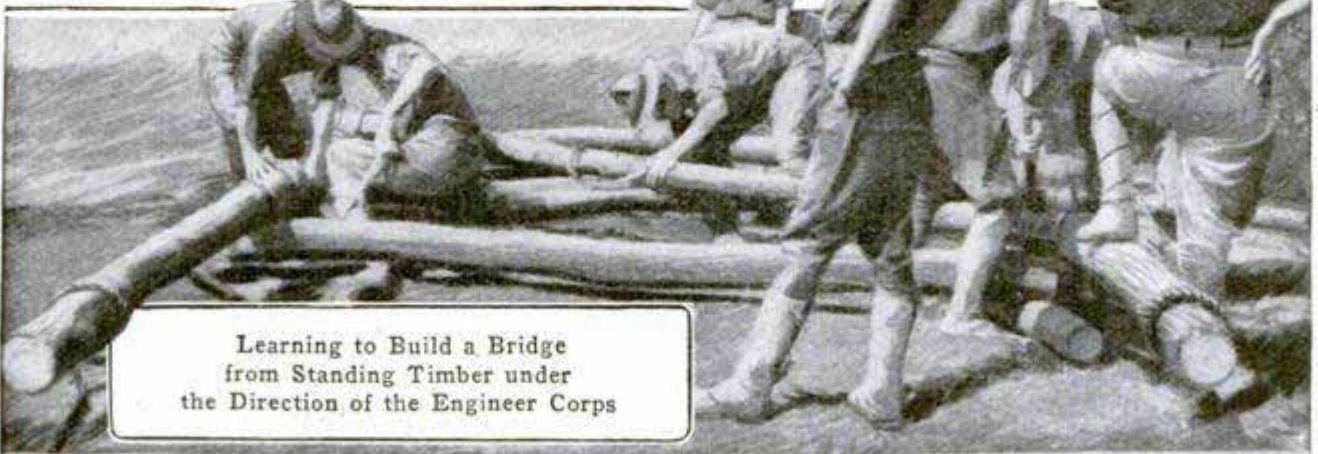
Young Student-Soldier Fully Equipped



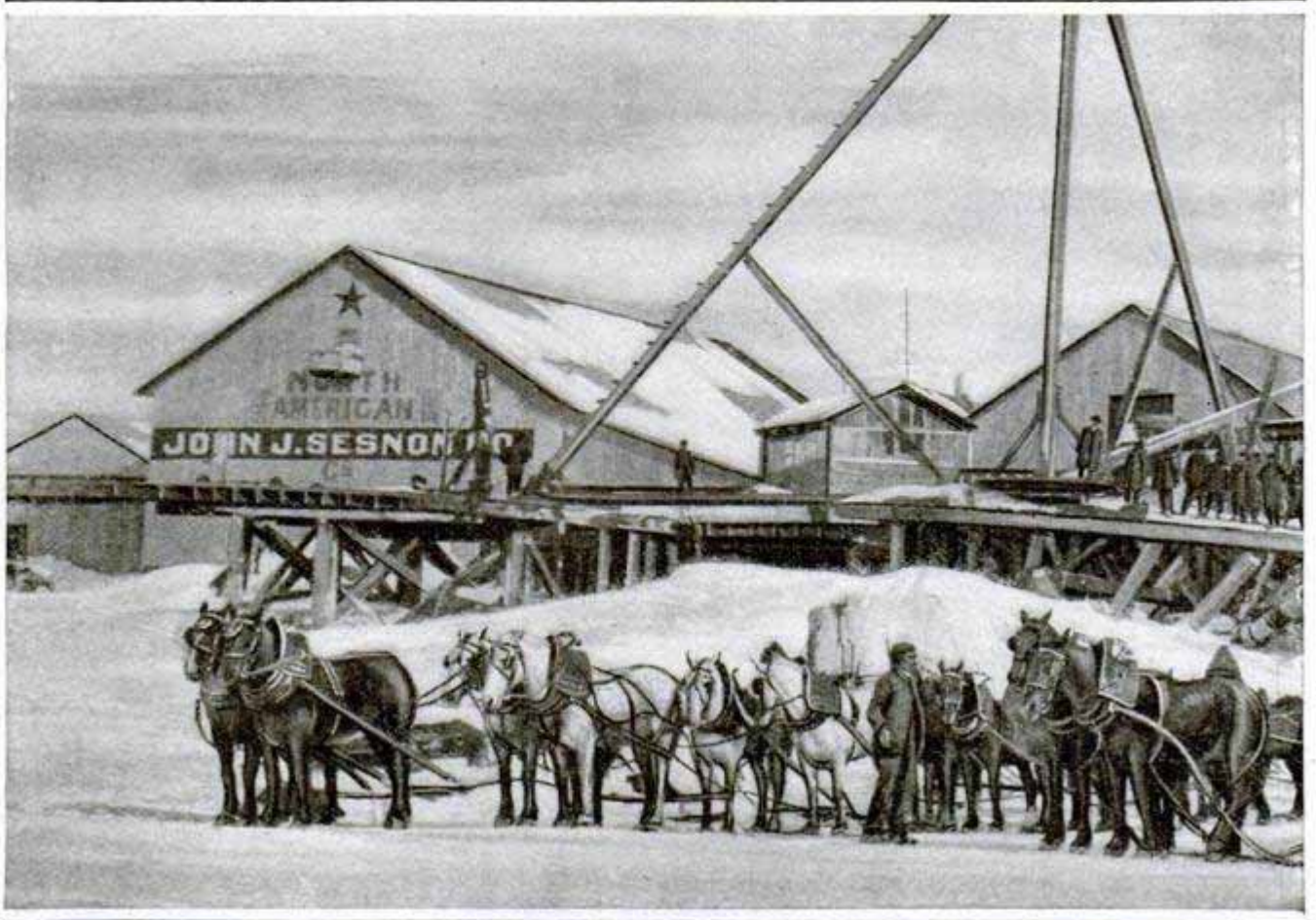
A Cross-Country Hike



Artillery Squad Engaged in Gun Practice



Learning to Build a Bridge from Standing Timber under the Direction of the Engineer Corps



A Remarkable Piece of Work was Accomplished Last Winter at Nome, Alaska, When a

The time selected for these camps, the summer-vacation period, is chosen to enable the men to attend with the least inconvenience and with the greatest instructional advantage. The physical benefits afforded by the active, healthful outdoor life of the military camp at less expense than is usually required when away from home, should make the plan attractive to young men fond of living in the open. The army officials in charge of the movement disclaim any purpose of military aggrandizement, but insist the ultimate object is a means of meeting in some degree a vital need confronting a peaceful and unmilitary people.

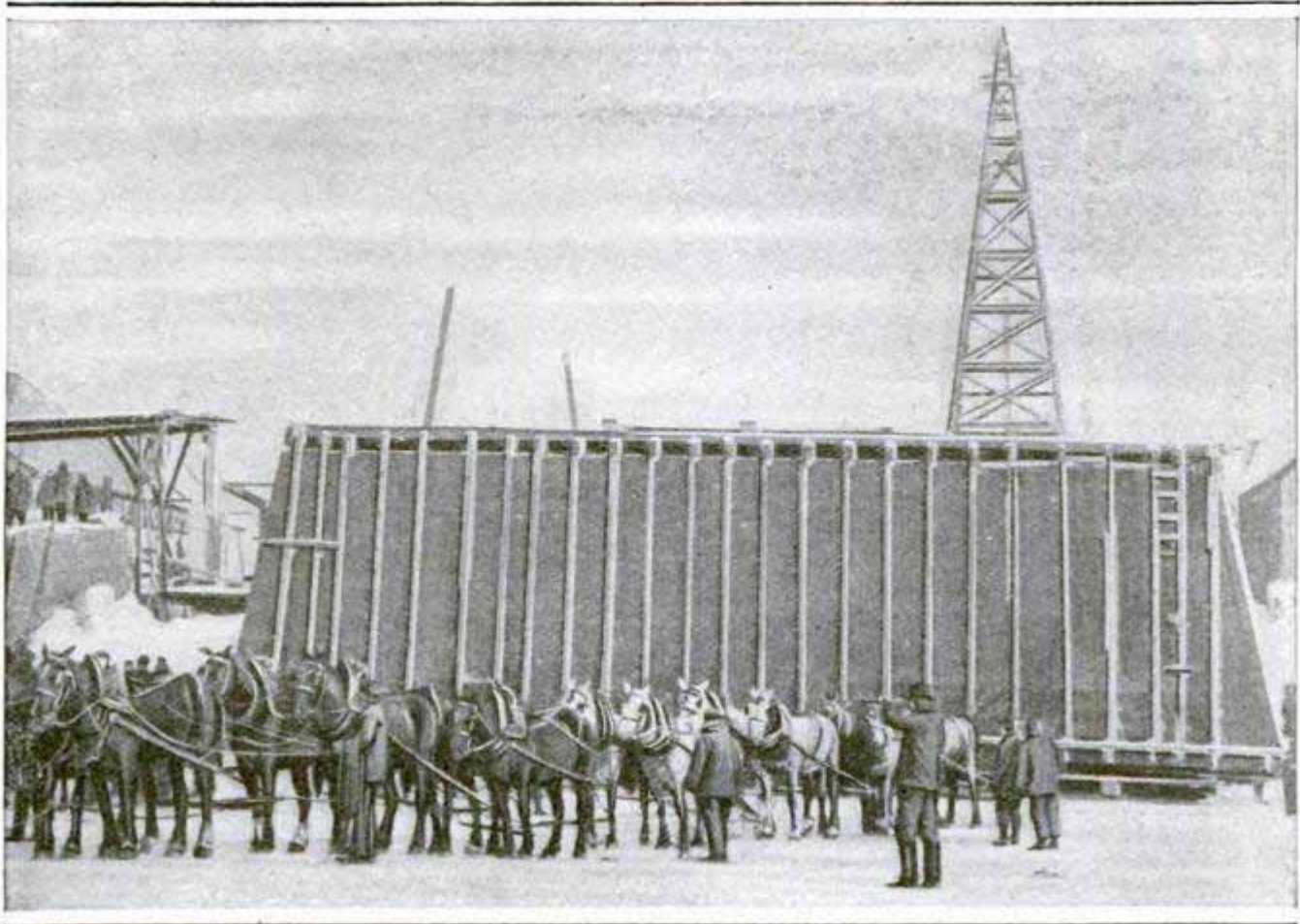
Such troops of the regular army as may be available will be in attendance and cooperate in the military instruction in the different field maneuvers, exercises and demonstrations. Probably both cavalry and artillery will be added to the infantry arm in such aid. Lectures and informal talks on the

theory and history of war, the conduct of famous campaigns, the working out of military problems, the mobilization and transport of bodies of troops, and such elementary teaching of the rudiments of campaigning as may be considered desirable, will form the instructional course.

OFFICER IN AEROPLANE GETS SPEEDER'S NUMBER

While riding as a passenger in an aeroplane over Golden Gate Park, San Francisco, a police woman noticed an automobile being driven at high speed along the boulevard. The aeroplane, at the request of the officer, dropped low enough to enable her to get the number of the speeding machine, and as soon as a report could be made to headquarters, the offender was arrested.

☞ More than 13,200,000 lb. of artificial silk is manufactured annually.



Heavy Caisson, Placed upon Runners, was Hauled across a Portion of Bering Sea on the Ice

RECORD LOAD HAULED BY HORSES

A caisson weighing 87 tons was hauled on the ice of the Bering Sea, opposite Nome, Alaska, and constitutes what is said to be the heaviest load ever moved on ice. The caisson was supported upon runners, and the whole braced and connected together so that the pull was distributed with some degree of equality. A long line of horses hitched in pairs was used. Once under way, it was no difficult thing to keep the big load going, for the ice was smooth. No ropes nor block and tackle were used, the haul being a direct pull.

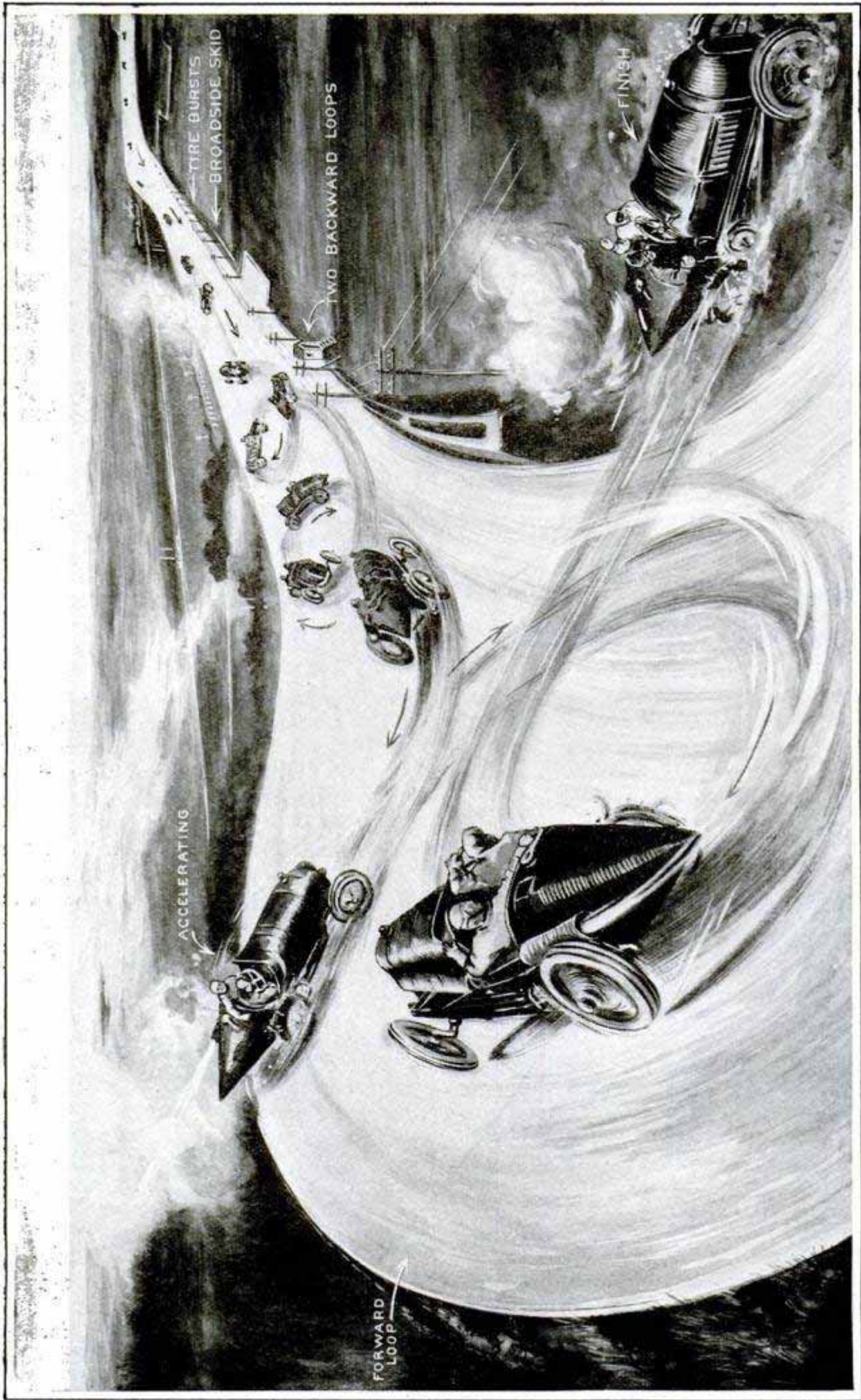
AIR-DRIVEN HYDROPLANE CARRIES 12 PERSONS

A new hydroplane in service near Paris is 26 ft. in length, with a beam of 9 ft., and, equipped with a 60-hp. engine and a full load, draws but 6 in. of water. There is room for 12 pas-

sengers in this newest "skimming dish," while the 8-ft. propeller of the aeroplane type makes 1,300 revolutions per minute. Provision is made for stretching a protective tent or awning over the seats. Gliding over the surface of the water, rather than cutting through it, this latest boat to use the aero propeller is speedy and easily handled.



Air-Propelled Vessel of Large Capacity



An Astonishing Skid at Brooklands, Where a Racing Car "Looped the Loop" in Puzzling Fashion While Running at a 119-Mile Clip

A MOST EXTRAORDINARY AUTOMOBILE SKID

One of the remarkable escapes from sudden death which relieves the grim record of fatal accidents in automobile racing occurred at Brooklands, the famous English speed course, recently. When approaching a turn at an estimated speed of about 119 miles an hour, a tire exploded and the car skidded sidewise. For eighty yards the car tore up the track broadside on, and then in quick succession turned two backward loops. By this time the banking of the track at the curve was before the occupants of the car, and up this slope the car ran backward to the very edge. The driver, who had declutched when the car started skidding, suddenly accelerated the engine, the clutch going in with a bang. Strips from the burst tire had become entangled in the chain, locking the right-hand wheel. The sudden acceleration tore these strips away, and down the embankment the car plunged, turning another loop, this time head-on, and dashed off the track, bringing up safely in a plowed ground near by.

CURIOUS FLOAT IN WATER PARADE AT MANILA

The carnival season at Manila is the occasion for numerous parades both on land and water, and many curious floats are prepared, Filipinos and Americans vying with each other for

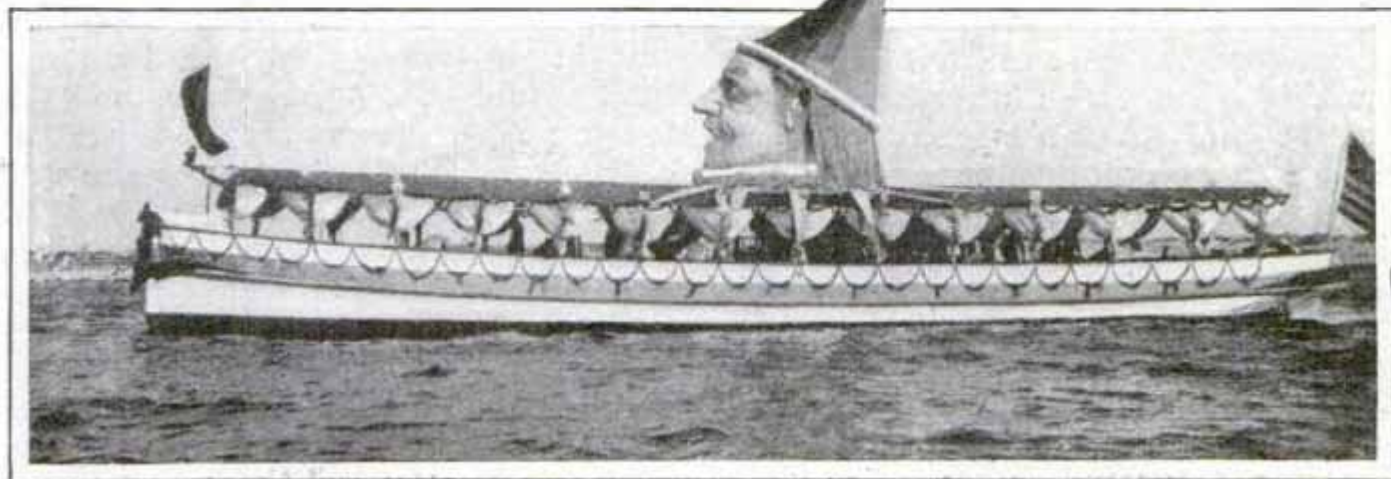
WIRE FLOWER POTS FOUND HELPFUL IN GARDENING

Gardeners in Germany are making use of wire pots for growing plants, and find that they can be easily transplanted even when in bloom, and, when the plants are returned to the greenhouse in the fall, repotting is unnecessary. Liberal-sized wire baskets, consisting simply of a spirally wound wire with the necessary connections between the coils, are filled with earth, and the bulbs, seeds or young plants are planted just as if they were in a garden.



ⓄThe modern incandescent electric lamp contains 25 separate pieces, and 46 operations are required to finish it.

odd effects. One float in the 1914 parade was conspicuous by reason of a huge clown's head placed on the awning of the boat, just over the smokestack. The unusual sight of the smoke issuing in a curling, black line from the tip of the giant's hat attracted much attention.



A Carnival Float in the Philippines

BOSTON FERN WITH FRONDS EIGHT FEET LONG

A North Carolina lady has succeeded in growing a Boston fern the leaves or



A Boston Fern with Fronds Eight Feet Long,
Nourished on Fish Scrap

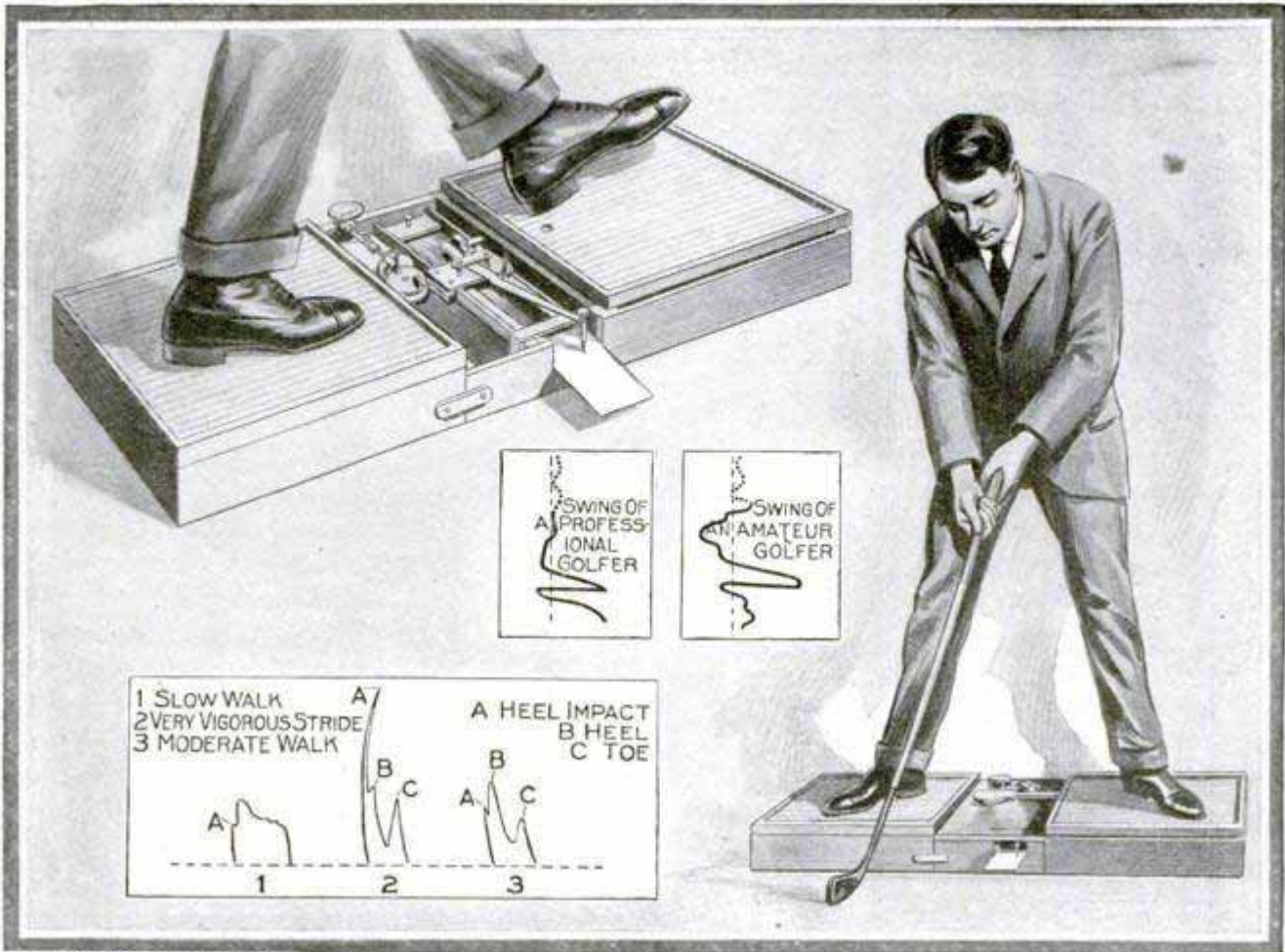
fronds of which reach the unusual length of eight feet. This result was obtained only with the utmost care and attention to the plant's growth. Twice a week the plant was carefully watered with a diluted solution of fish scrap obtained from a menhaden-oil factory, the part utilized being the remains of the fish after the oil is pressed out. A tablespoonful of fish scrap to a gallon of water provided fertilizing material in the proper proportion. Care was also taken to see that the "crown" of the fern, from which the leaves sprout, was well above the surface of the soil at all times, while the leaves themselves were sprinkled occasionally with tepid water. It took five years to grow this particular plant to this size.

COST OF SENDING WIRELESS MESSAGES

For sending wireless messages the following rates, which have a few unimportant exceptions, have been established: To vessels in transatlantic service, 12 cents a word, with a minimum of 10 words, but to vessels engaged in South American trade, the rate is halved; to this should be added the ship-station charges: on transatlantic service, 8 cents a word, and in coastal service, 4 cents. All charges must be prepaid, and no "collect" commercial messages are accepted. For any message between a ship and an interior point on land, three separate charges are made: the charge at the wireless station on board ship, the wireless coast-station charge, and the charge of the cable or land-telegraph company.

The Navy Department publishes a book of tolls for wireless messages at its station at Radio, Va., which is available for the general public. A charge of 6 cents a word is the usual sum for Navy coast stations to vessels on the Atlantic; 12 cents at Key West, and 8 cents on the Pacific coast. On the Lakes the commercial ship-station charges are 2 cents a word, with the usual 10-word minimum, to which must be added the coast-station charges of 3 cents; while the Marconi charges on the Pacific coast are, coast-station to ships in transpacific trade, 12 cents, and in coastal trade, 3 cents; with ship-station charges added of 8 cents and 2 cents, respectively. As an example, a message from Chicago to a ship at sea, via the Jupiter, Fla., station, would cost 6 cents for the land telegraph, 6 cents for the station charge, and at least 4 cents for the ship station, or 16 cents a word, or \$1.60 for a minimum message of 10 words.

Under the new postal money-order law, orders issued at any post office will be payable at any other post office instead of at one point exclusively. The new system will be in operation this year.



Courtesy Illus. London News

An Ingenious Contrivance Which Records the Movements and Pressures Exerted in Walking and in Golfing

NEW MACHINE RECORDS THE STEPS IN WALKING

The mechanics of the muscular effort used in walking, in golfing, or in playing other games may be recorded with exactness by means of a new device to which the inventor has given the name "kinograph." It consists of a system of levers connected with a recording pencil in such a way that a step upon a movable platform is registered on a strip of paper, which is propelled by clockwork. The difference of the step in walking and in running is marked, and the swing of a golf player makes distinctive impressions. The individualities of each pedestrian may be clearly noted by a study of his records as made by this machine.

Prizes of \$10,000 are offered by the Panama-Pacific Exposition for a motorboat race from New York to San Francisco by way of the Panama Canal.

SOME CURIOUS FASHIONS IN FEMININE HOSIERY

With the advent of the slit skirt fashion is beginning to pay even more attention to the details of feminine hosiery. Two of the latest Parisian

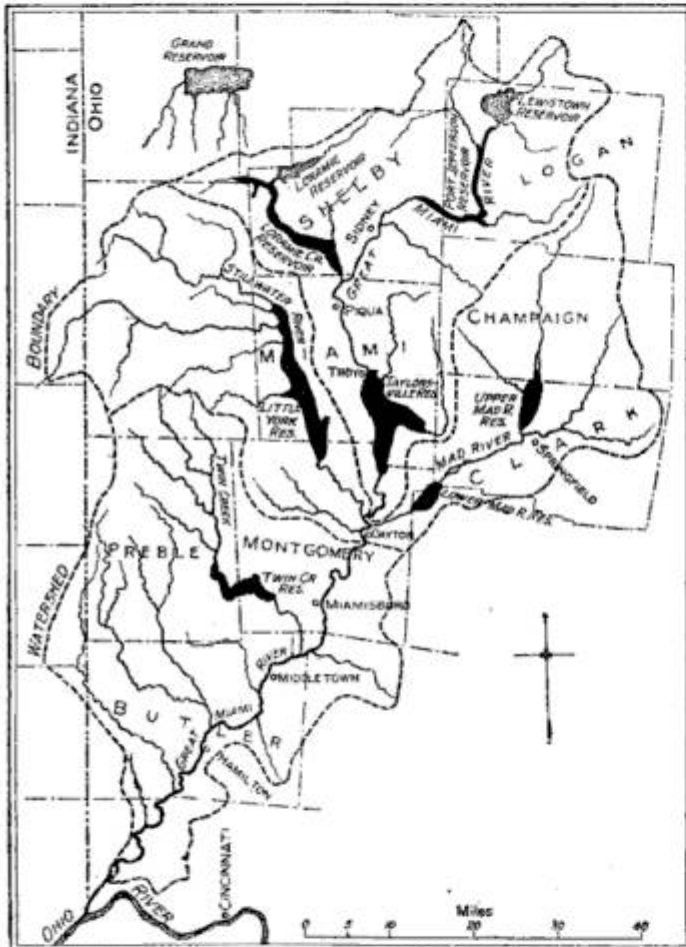


Two Recent French Suggestions in Hosiery

suggestions in this line are reproduced herewith. One is a spiral band of fur encircling the leg from the ankle to the calf; the other a jeweled purse or cigarette case attached to a broad garter.

TO PREVENT REPETITION OF MIAMI RIVER FLOOD

For protecting the Miami River valley in Ohio from future floods such as that by which it was devastated in the



Courtesy Engineering Record
Map Showing Location of Proposed Reservoirs That will Hold Back the Flood Waters of the Miami River Watershed in Ohio and Prevent a Repetition of the Flood That Devastated That Valley in the Spring of 1913

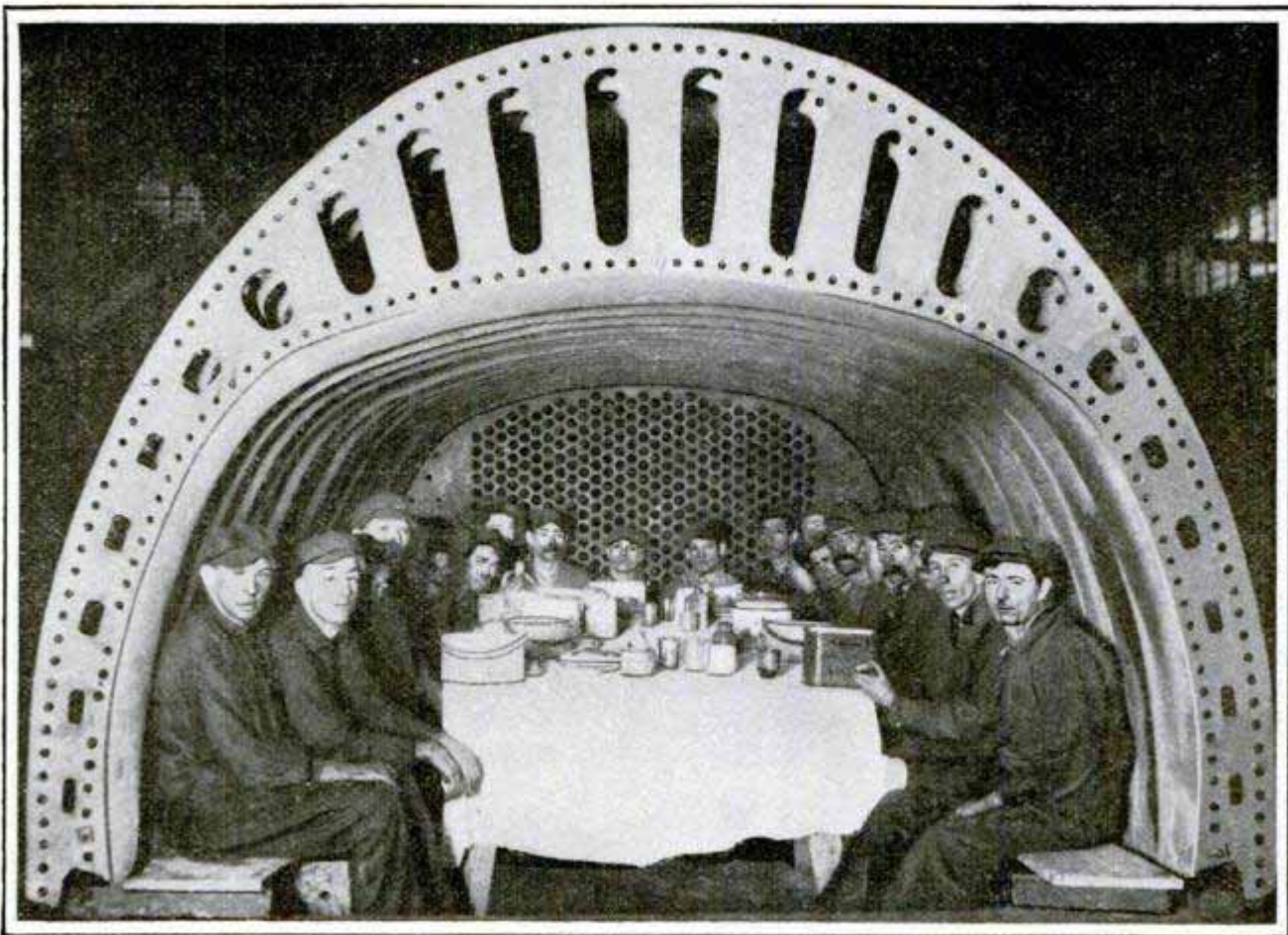
spring of 1913, a complete system of "dry" reservoirs has been planned, enabling legislation has been passed by the Ohio legislature, and the work of actual construction only awaits the necessary court hearings for determining relative benefits and damages to individual property holders. The work, as planned, is estimated to cost \$12,000,000. Great areas of farm land as well as eight cities of Ohio, having an aggregate population of about 200,000, will be protected by the system of res-

ervoirs. The property valuation of the protected district is estimated at \$250,000,000.

The fundamental idea of the dry-reservoir plan is to impound the excess waters of a flood and retard the flow until the crest of the high water has passed. From careful surveys and computations made by the engineers it is found that about 55,000,000,000 cu. ft. of water fell over the Miami basin above Dayton during the five-day storm of March, 1913. A system of six or seven dams has been planned with a sufficient capacity to hold back 40,000,000,000 cu. ft. These dams will be built of earth, will be from 40 to 70 ft. high, and will be placed across the valley from hill to hill in suitable locations. Reinforced-concrete tunnels, large enough to allow the normal flow of the river to pass through, will be placed through the bottom of each tunnel. These tunnels will be kept open at all times, and when the water coming in from the upstream side of the dam exceeds the normal flow of the river, the excess will be held back by the dam. When the supply is reduced the reservoir will empty automatically. To prevent the destruction of the dams in case of unprecedented floods, each will be provided with a spillway to relieve the dam of some of the surplus. The carrying capacity of the river channel is estimated at 8,000,000,000 cu. ft. per day, so that the system will afford ample protection during a heavier storm than that of last year. An expert has estimated that approximately 280,000,000,000 cu. ft. of water, or enough to have raised Lake Erie with its 10,000-square-mile area a height of 4 ft., fell in Ohio and Indiana during this storm.

TWENTY MEN DINE IN HUGE LOCOMOTIVE FIREBOX

The Philadelphia and Reading Railway has recently added a number of large locomotives designed for burning anthracite coal, necessitating large grate area. In one of these huge fireboxes, during the process of construc-



A New Kind of Dining Room Used by Railroad Employees

tion and before the door had been put in, 20 employes sat down at an improvised table for dinner. The firebox is made up of 15 channel-shaped sections, each 10 in. wide. The inside dimensions of the curious dining room are 13 ft. 2 in. in length, 8 ft. 8 in. in width, and 5 ft. 1 in. in height at the center.

AUTOMATIC-CLOSING JAWS MARK NEW TWEEZER

Jewelers and watchmakers are using a new tweezer which holds roll pins, watch jewels and stones firmly when picking them from a flat surface. The automatic-closing jaws grasp whole jewels while gauging or trying on a pivot or lock, and the article does not fall out when the tweezers are laid down. The device is patented.

☐ A class of 34 girls and 21 boys in the Bloomington, Ind., High School has taken up automobile engineering.

TWO INVENTIONS TO ASSIST THE ARMLESS TO WRITE

The loss of both arms below the elbow proved no obstacle to a courageous young stenographer, who demanded that a typewriter be provided for her use. Such changes in the arrangement of a standard machine were made as would allow her to insert the paper, manage the line-spacing mechanism, the two-color dial and the carriage return by simple pressure on padded levers. The shift key was adjusted so that it could be worked by the knee. Then two devices were made to be attached to her arms, one of which held a lead pencil



while the other was equipped with a rubber hammer for striking the keys of the typewriter. With courage and patience she set about to master the

new implements and has succeeded so well that instead of facing the world a helpless cripple she is able to earn her living.

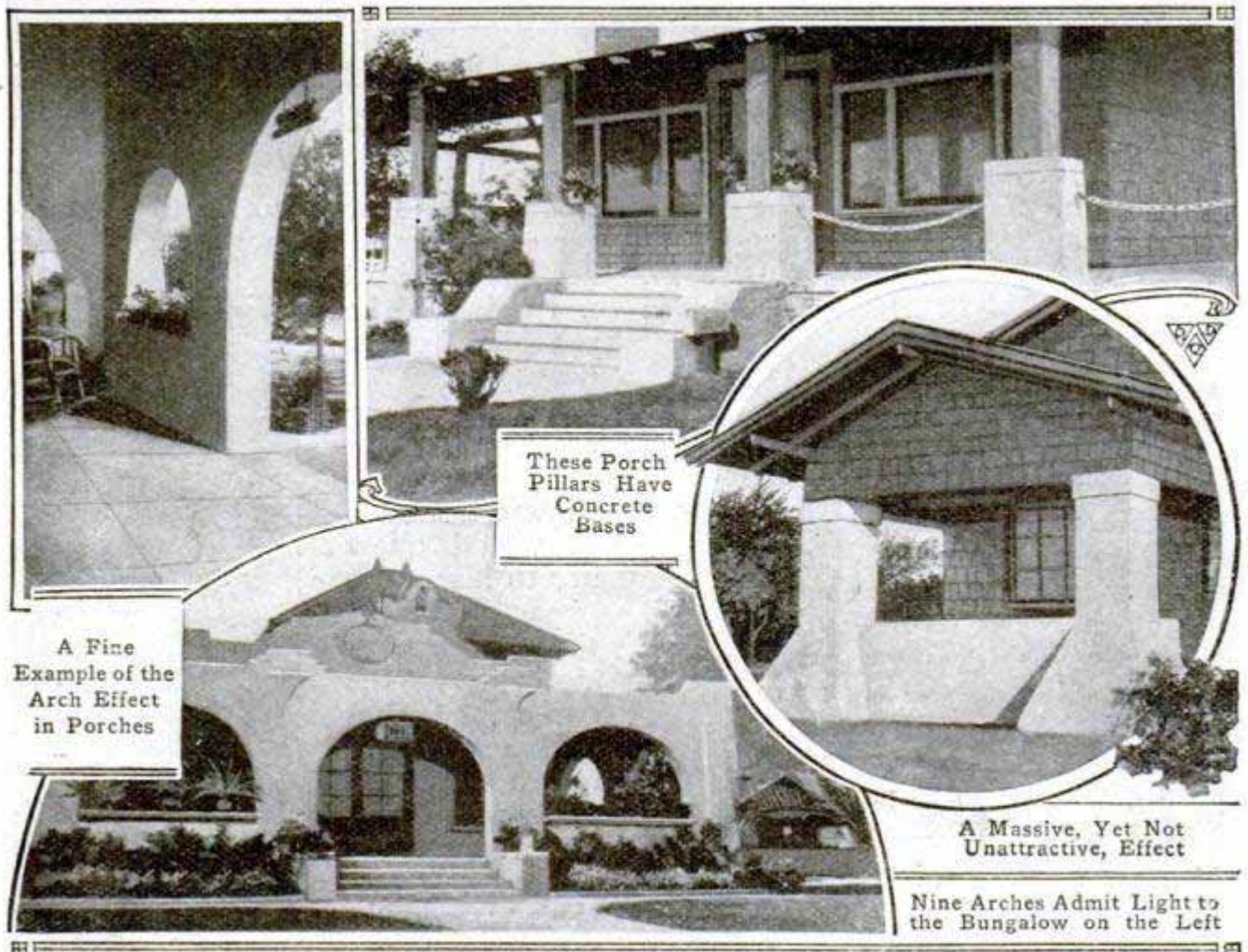
PORCHES ADD TO ATTRACTIVENESS OF BUNGALOWS

By ALBERT MARPLE

The two features brought from India which make the bungalow particularly pleasing are the porches and the overhanging roof, and of these the porches are susceptible of the widest individual treatment. Southern California is famous for its brilliant sunshine and equable temperature, making the bungalow an ideal form of residence, and the porches designed by the architects of that state show an advance over those of other localities in modern adaptation to local conditions. In the construction of these distinctive porches cement and concrete play im-

portant parts. Possibly this is largely because the light color of the concrete blends so well with the remaining portions of the low dwellings, where darker colors usually prevail.

Carrying the heavy timbered effect from the roof and eaves over onto concrete pillars is the usual form of handling these verandas, which may trail off in pergolas or even simple unshaded platforms. The pillars are sometimes mere piers of concrete, offering no support to the roof of the porch, and the piers are often linked together with heavy chains. In one case, low

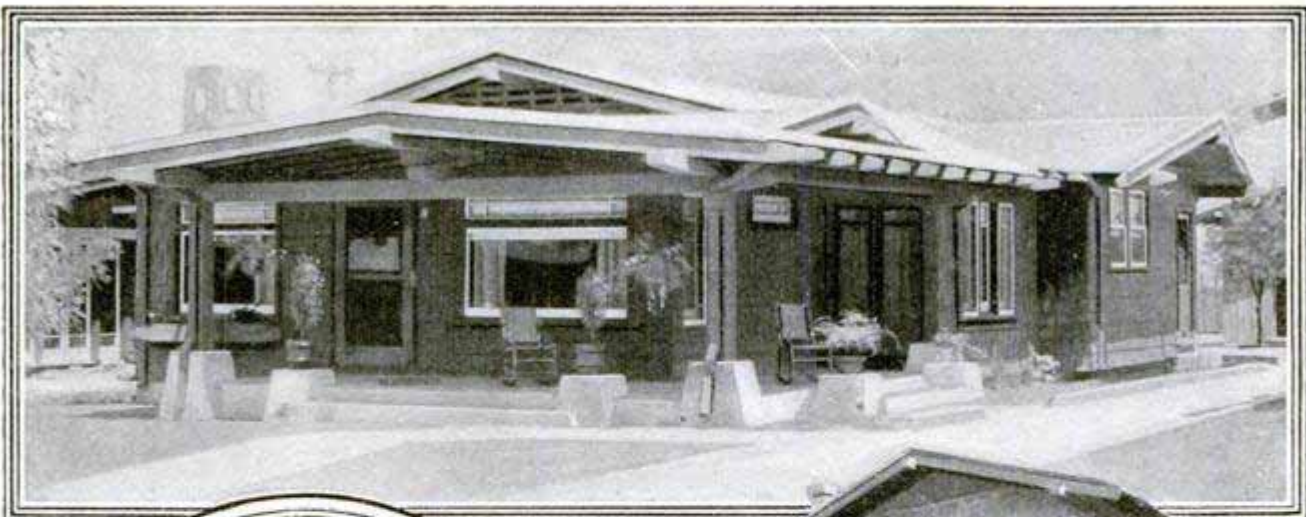


A Fine Example of the Arch Effect in Porches

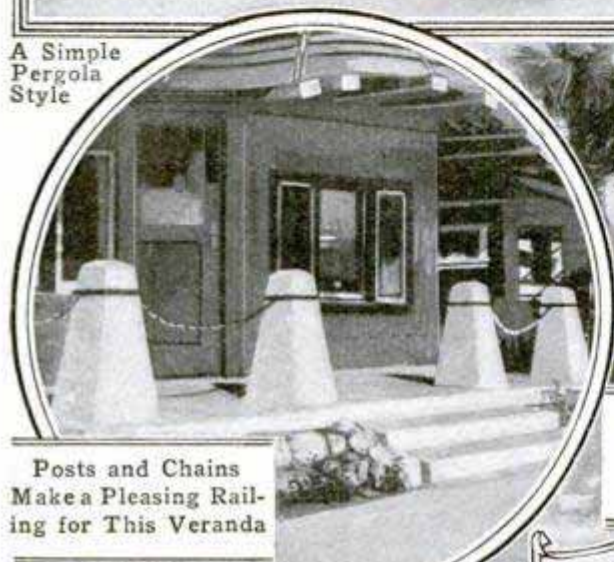
These Porch Pillars Have Concrete Bases

A Massive, Yet Not Unattractive, Effect

Nine Arches Admit Light to the Bungalow on the Left



A Simple Pergola Style



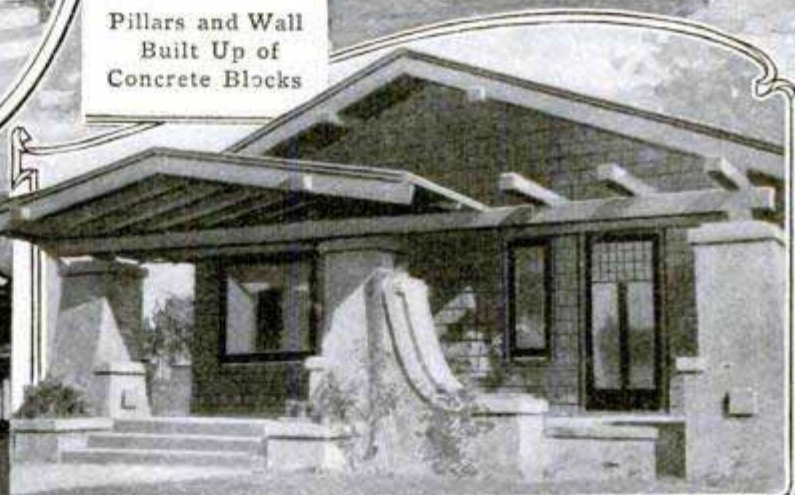
Posts and Chains Make a Pleasing Railing for This Veranda



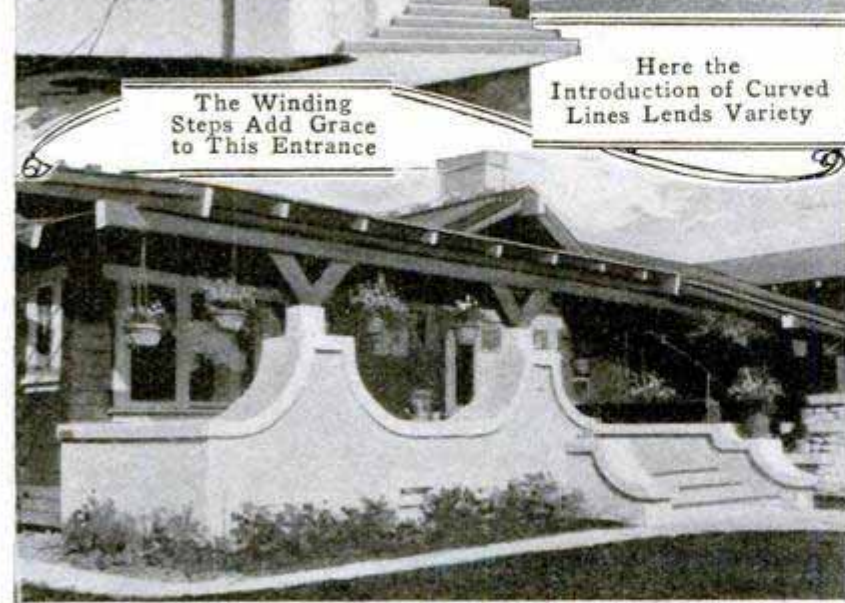
Pillars and Wall Built Up of Concrete Blocks



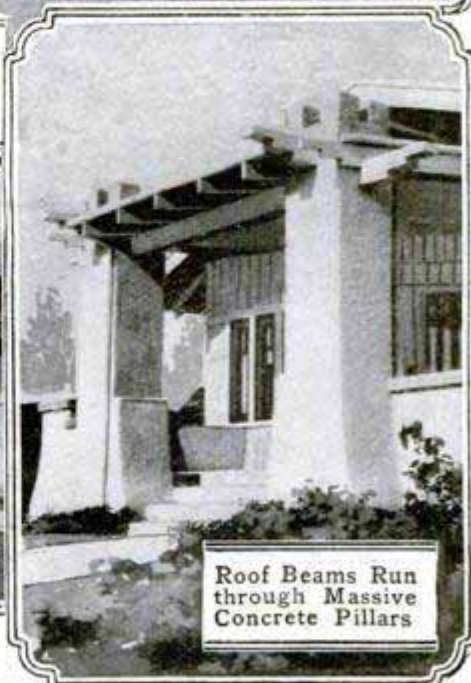
The Winding Steps Add Grace to This Entrance



Here the Introduction of Curved Lines Lends Variety



Wood and Concrete Combined in Ornate Forms Support a Wide Roof



Roof Beams Run through Massive Concrete Pillars

concrete pillars support wooden uprights which in turn bear up the roof, while chains connect the pillars, forming protective barriers along the sides of the porch.

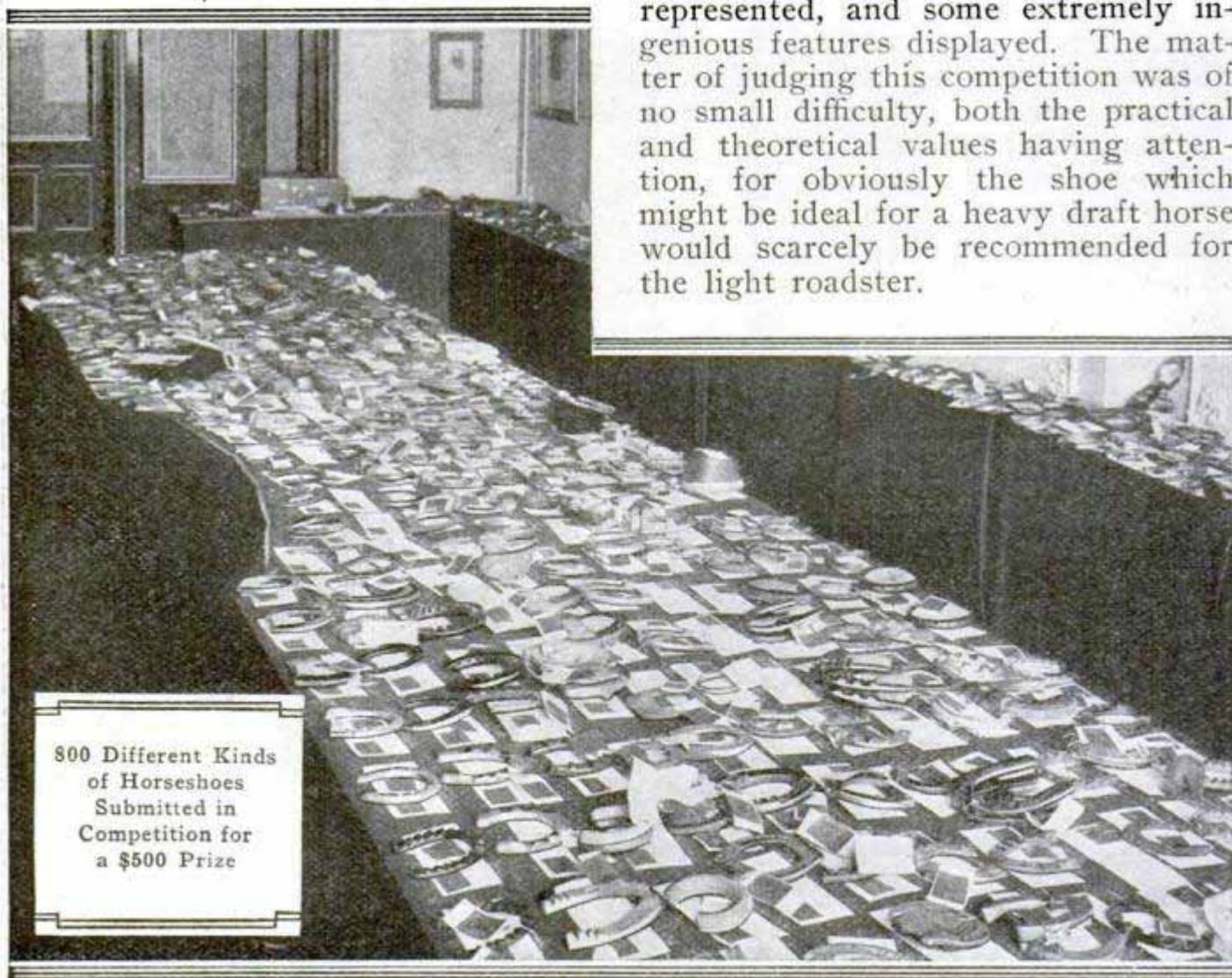
The porch with the arch effect is proving the choice of many home builders. This porch, which is shown in two accompanying pictures, consists of nine arches, and runs around three sides of the bungalow. The walls are a foot thick and are finished rough, while the floor and the steps are smooth. The photograph taken along the interior of the porch indicates the pretty effect secured when looking through the arches into the adjacent street. This type of structure may also be secured in cement-block construction, in which the exterior gives the appearance of genuine stone and the band about the top is finished smooth.

The walls, railings and pillars of some handsome porches are of solid

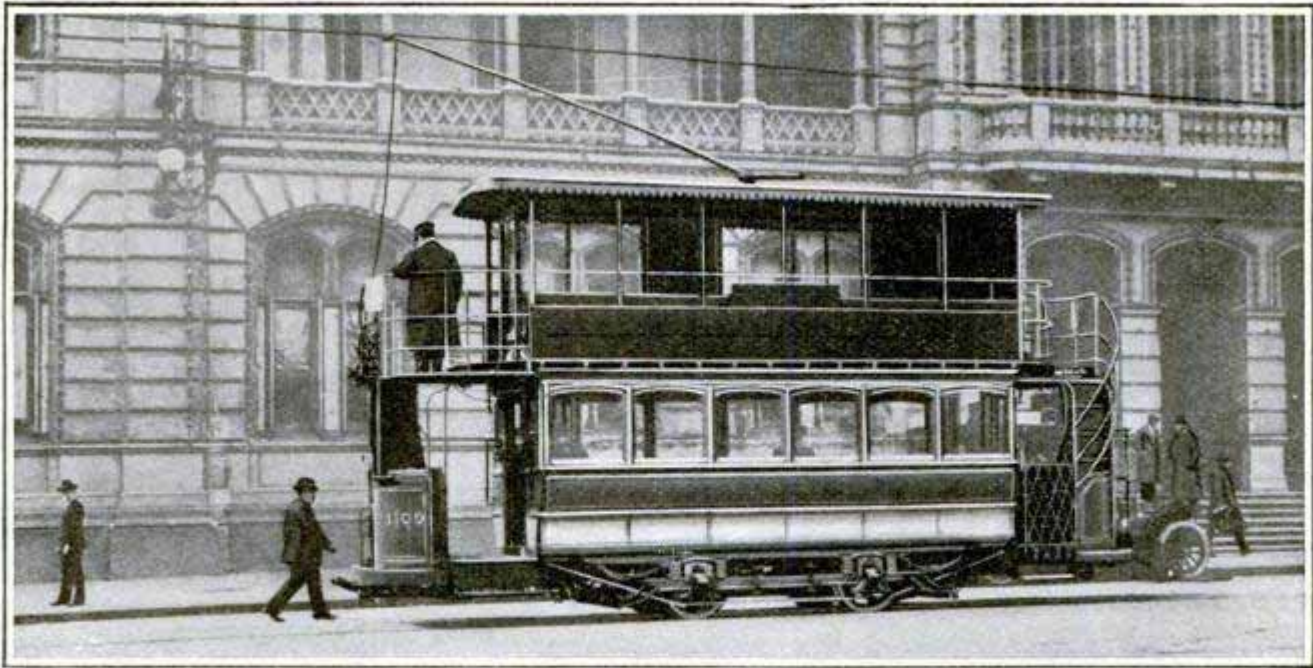
concrete, and in some rare instances a sloping effect is given which adds greatly to the beauty of the little dwelling. Another interesting and effective form is that in which the heavy beams supporting the roof are allowed to run through the tops of the pillars which form the corners of the porch. These piers and the sides of the porch have been given a rough sanded finish, while the smooth floor and cap are further contrasted by using a darker shade in mixing the concrete of which they are composed.

HUNTING FOR THE PERFECT HORSESHOE

The Roads Improvement Association of England offered a prize of \$500 for an ideal horseshoe, and 800 shoes were submitted for the competition. They were arranged on long tables, each appropriately marked for judging. Many curious shapes were represented, and some extremely ingenious features displayed. The matter of judging this competition was of no small difficulty, both the practical and theoretical values having attention, for obviously the shoe which might be ideal for a heavy draft horse would scarcely be recommended for the light roadster.



800 Different Kinds
of Horseshoes
Submitted in
Competition for
a \$500 Prize



A Curious Type of Street Car Seen in Buenos Aires

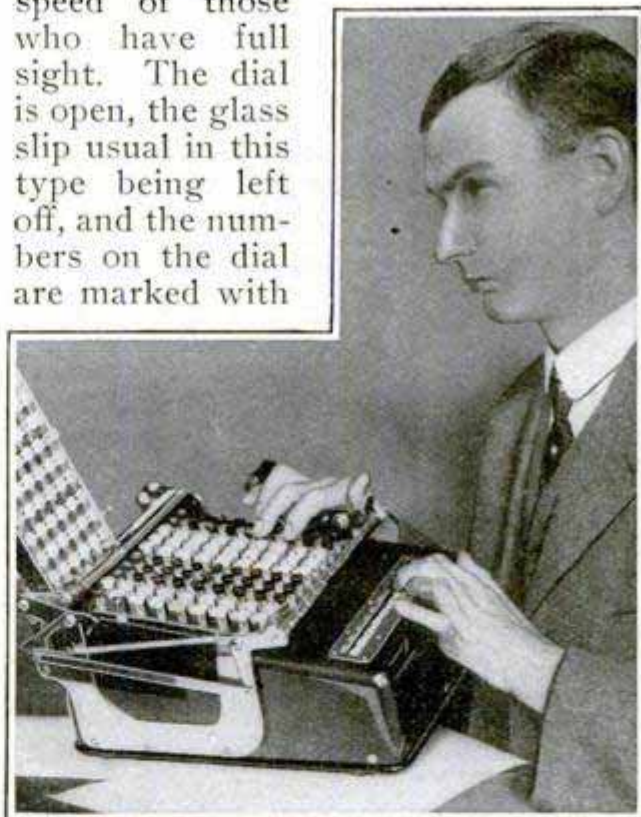
DOUBLE-DECKED TROLLEY ON BUENOS AIRES STREETS

The capital of Argentina has excellent street-car facilities, the most recent addition to which is a double-decked trolley car quite surpassing in its completeness those more or less common street vehicles having seats on top. The Buenos Aires double-deckers are really two cars, one on top of the other, the upper car as fully equipped in its fittings as the lower. The streets of Buenos Aires being rather narrow, the rails are necessarily close to the curb, the edge of the street car just grazing the elbows of pedestrians in many cases, and the double-decked cars appear huge as they sweep past.

NEW COMPUTING MACHINE FOR THE BLIND

A machine which will serve to develop the mathematical sense of those who have lost their sight has been invented by a Los Angeles man, himself sightless, who hopes to make other unfortunates of some use in the business world. The machine which has only recently been completed, differs but slightly from the adding and computing machines in common use in

most business offices. The keys are alternately flat and concave, enabling the operator to distinguish the different keys and work with almost the speed of those who have full sight. The dial is open, the glass slip usual in this type being left off, and the numbers on the dial are marked with

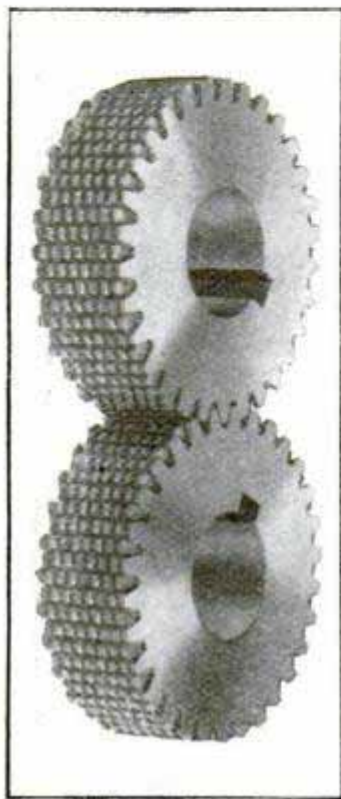


Recent Invention of Blind Man to Help His Fellows

raised patterns such as are used in the Braille system for the blind. By such marking the blind operator can easily read the result of the addition or computation.

LAMINATED GEARS WITH STAGGERED TEETH

The quest for silent gears in automobile construction has evolved a new type which can be made in any



metal, from brass to high-tension steel, and the transmission efficiency of which equals the highest grade of cut gears. Instead of taking a solid block of steel and cutting teeth in it by means of a milling machine, plates of steel or other suitable metal are punched with teeth on their rims. These plates are then clamped in a

frame, and the edges of the teeth heat-treated or casehardened. These plates or disks are then ready to be built up into a gear wheel, the teeth being staggered and the laminations separated by means of very thin disks or washers, which leaves a clearance for the teeth without friction. Not only are these new-type gear wheels remarkably strong, but the "ring," or hum, is entirely eliminated. Should any wear be observed on any particular plate, the disk may easily be removed and another inserted.

DISAPPEARING AIRSHIP SHEDS FOR HELGOLAND

The island of Helgoland, situated in the North Sea off the coast of Germany, is being rapidly made into a strong naval base by the German government, and an interesting feature in this development is the means used for making the air-craft fleet a strong and efficient auxiliary to the navy. A novel

installation now being planned is a revolving and disappearing airship shed. The shed turns on a pivot so that an airship can always enter and leave it with the wind, and it will be equipped with hydraulic machinery by which it can be quickly lowered into a concrete trench and made invisible from the sea and safe from gun fire. Many sheds for aeroplanes have already been built in concealed positions on the island.

HUNTING FOR BOOKWORMS IN PUBLIC LIBRARY

The New York Public Library, which now contains about 8,000,000 books, is being constantly augmented by additions from libraries, given by will, of rare old editions, and valuable books from the very ends of the earth. To preserve these intact, and to guard against the ravages of bookworms and other insects, which feed upon the paper, the glue on the backs and the



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cloth and leather bindings, a constant care is exercised, and a keen watch kept for any evidence of their activities. One woman is assigned exclusively to this work. When treating the books, she wears a huge apron which completely covers her gown. A cheesecloth veil protects her face against the germs which lurk in the musty documents, and even the air she breathes is screened against contagion. Close touch is kept with the Health Department, and books which have been returned from infected areas are fumigated before being restored to circulation. The frequent use of the vacuum cleaner is a great aid in keeping the books free from dust and germs.

RADIATORS OF GLAZED PORCELAIN

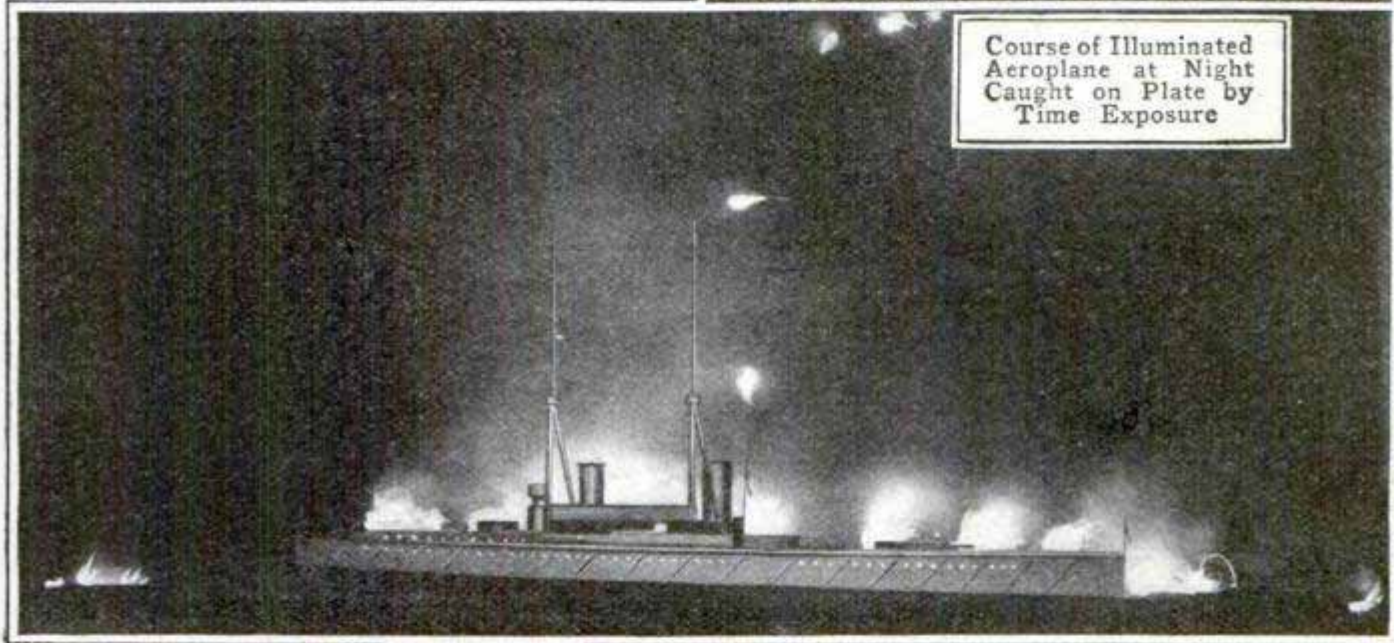
Cast-iron radiators, against which many objections have been urged, may give way to those made of glazed porcelain, which radiate a greater percentage of heat, retaining their heat for a considerable period after the steam is turned off, and are far more easily cleaned. The new type of steam-heating unit was exhibited at a building exhibition recently held in Leipzig, Germany. In form these new heating elements differed little from their cast-iron prototypes, although they necessarily had thicker

ILLUMINATED AEROPLANES IN NIGHT FLIGHTS

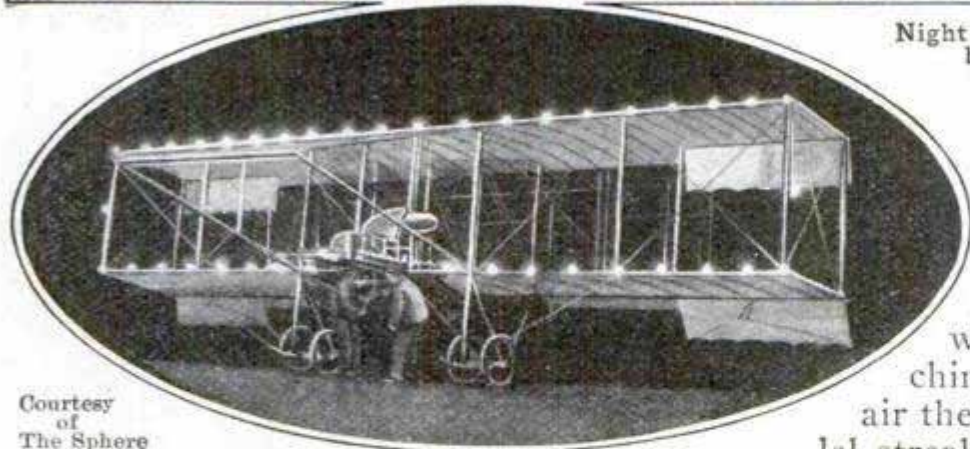
Highly spectacular effects were produced by some recent experiments, in flying illuminated aeroplanes at night,



Course of Illuminated
Aeroplane at Night
Caught on Plate by
Time Exposure



Night Attack on Dummy Battleship
by Illuminated Aeroplane



Courtesy
of
The Sphere

Aeroplane Equipped with Electric
Lights for Night Flight

walls, but from a sanitary and hygienic standpoint they are said to be preferable to those made of cast iron.

ⒸThe Manchester Ship Canal carried 5,780,000 tons of toll-paying freight during the year 1913.

in England. Three aeroplanes were provided with electric lights, the bulbs being spaced about the edges of the planes in such a

way that when the machines traveled through the air the effect was that of parallel streaks of light. An interesting

feature of the display was the destruction of a dummy battleship by bombs dropped by the airmen, demonstrating how a night attack on a naval force might be carried out.

The whole exhibition suggests interesting possibilities for future fireworks displays.

WHAT EDUCATION DOES FOR THE CONVICT

The school for convicts at the Maryland state penitentiary, known as the "Intra-Mural School," is a striking demonstration of the modern idea that reform of the convict through education is more profitable for the state

One of the greatest difficulties, particularly at the start, was to get illiterates to undertake the work voluntarily, their objection being due in most cases to a feeling of hopelessness, to which was often added a sense of shame and a disposition to hide their illiteracy. A peculiar case of this kind was that of an expert sign painter who could neither read nor write. This man knew all the letters of the alphabet, could reproduce them in many styles, but knew nothing of their meaning when combined into words, and was unable to read his



line mile 連 米亞
 judge store 短珠 市在
 It is a mile to 他 郊 地 米亞
 The red bit is his 李 惠 列 必 地
 go to 教

December 15, 1922.
 THE INTRA-MURAL SCHOOL.
 COMPETITION "OUR SCHOOL."
 Our school
 When I first began coming to this school I could not write my name. This school has been a great help to me. I am glad that this school has opened and I appreciate this schooling that I am getting. In here it will help me to get along in the outside world. If not in here when I heard that the warden was going to open a school in here I thought that was the best thing that he could do for me when I am in that school room I forget that I am in the penitentiary. I can put all my mind on this school I don't intend to miss a night in the week.

Convicts at School in the Maryland State Penitentiary; The Composition at the Right was Written by an Expert Sign Painter Who could not Read His Own Signs When Sent to Prison

and better for the individual criminal than is the vindictive and unintelligent treatment of prisoners formerly in vogue. The Intra-Mural School has been in existence less than two years, but the results have been such as to astonish even the founders of the school. Much of its success is attributed to the employment of educated convicts in the actual conduct of the school work, as a convict is better able than an outsider to understand the peculiar mental habits induced by prison life.

The Dog
 Dogs are very useful animals.
 Some dogs are very large.
 They love their masters and try to obey them.
 If you were lost in the mountains they would take you to their masters.
 These dogs are of the St. Bernard family.
 One of these dogs saved the lives of forty people.
 The Intra-Mural School

own signs after he had painted them. He attempted to hide his illiteracy by borrowing magazines and pretending to read them, and nearly succeeded with the aid of this ruse and through being able to sign his own name. When the deception was discovered he was induced to enter the school.

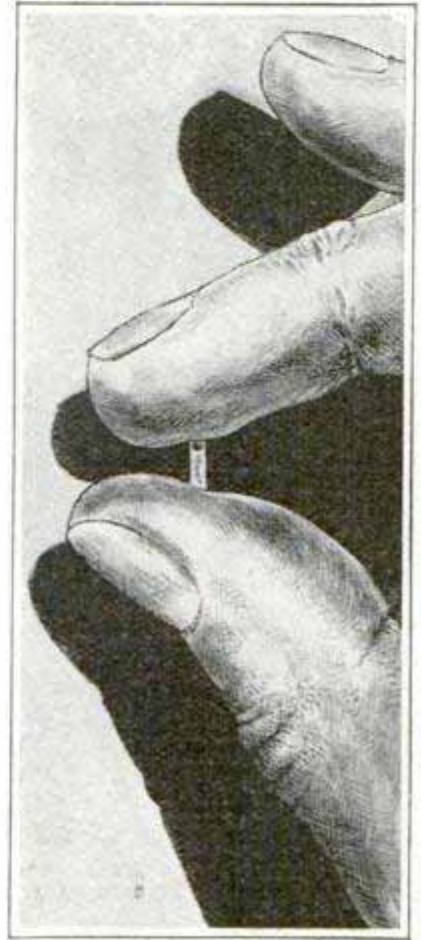
When he is discharged, there is little doubt that this man will be not only a better sign painter but a better citizen. Another case was that of an illiterate Italian, who, when asked to enter the school, refused on the ground that since he could not read nor write his own language, it would be foolish to try to learn to read and write English. He was finally induced to make the attempt, but only as a matter of personal loyalty to the warden. This man is now one of the most diligent students in the school, and particularly prizes his ability to write letters to his family and to read, without any help, the letters he receives from home. These cases are typical of many in which the convicts are having their whole outlook on life broadened by the work of the school. The first thing the average convict wants to do after learning to write is to write letters to his family, and the prison authorities encourage this, as it has been found that letters from home furnish the greatest impetus to further study and are an important aid in the work of reform. The school work is given in three grades, the first of which is for convicts that are entirely illiterate. But after these grades are passed the work does not stop, an institutional correspondence school being maintained for the more advanced students.

Prison atmosphere is kept entirely out of the school, each convict being made to feel, for the time being, that he is not in prison at all, but at school. Only one guard is ever stationed in the schoolroom, and he is given as inconspicuous a place as possible. During the entire time that the school has been in operation the guard has never had any duty to perform, as there has never been a case of disorder or trouble in the schoolroom.

Ⓒ Transatlantic wireless service at the rate of 5 cents a word is promised when the Poulsen system is in operation this summer between Denmark and Canada by way of Ballybunion, Ireland.

A MICROSCOPIC FORTUNE: \$25,000 IN RADIUM

Most people are familiar with the three-grain tablet or three-grain capsule of quinine. But quinine, powdery, fluffy stuff, is extremely light. Radium, on the other hand, is extremely heavy; so heavy, in fact, that three grains of this most precious metal, which is worth \$25,000, consists of but a few specks, almost microscopic. This little fortune, incased in a container of lead, is scarcely larger than a one-grain capsule of quinine, and, though it may be held between the thumb and finger, represents a greater value than the life savings of many an industrious man.



INFERNAL MACHINE PROVES TO BE RIVER GAUGE

Considerable uneasiness was caused in a city of Southern California when a device consisting of a clock mechanism attached to a brass cylinder and thought to be an infernal machine was discovered in the debris brought down by the flood of last February. After this supposedly dangerous instrument had been turned over to the government for investigation it was found to be the automatic river gauge that had been keeping the record of the rise and fall of King's River for 11 years for the United States Geological Survey.

THIS HORSE WEARS GOGGLES WHILE WORKING

A horse which is constantly employed in a California factory, where



Chemical Fumes are Prevented from Injuring Horse's Eyes by Curious Goggles

fumes irritate the eyes, is equipped with goggles. A leather mask fits over the head and ears and holds the glass pieces firmly in place, keeping the chemical fumes from attacking the delicate membranes. Of course, not the horse only, but the driver and other employes whose work brings them in contact with the noxious gas find protection in goggles of similar construction.

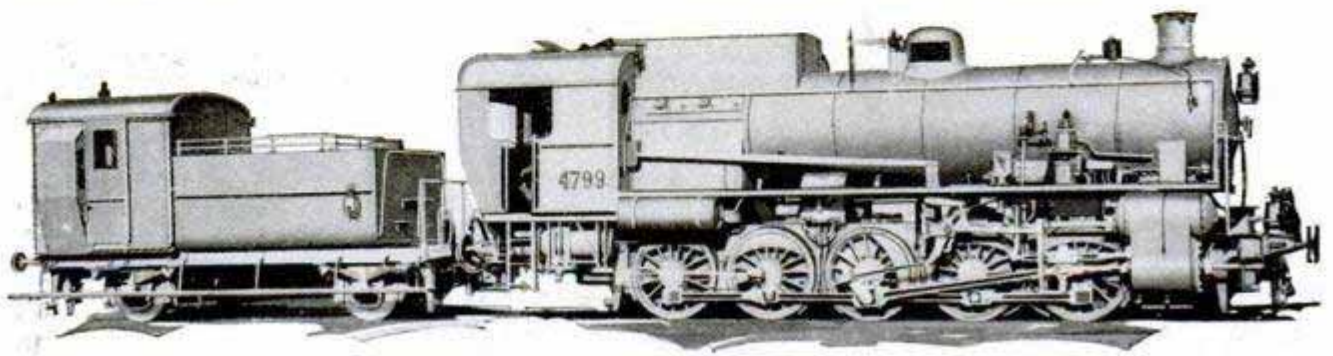
Many kinds of dyes are now made from sawdust.

FLAMELESS COMBUSTION TO PRODUCE HEAT

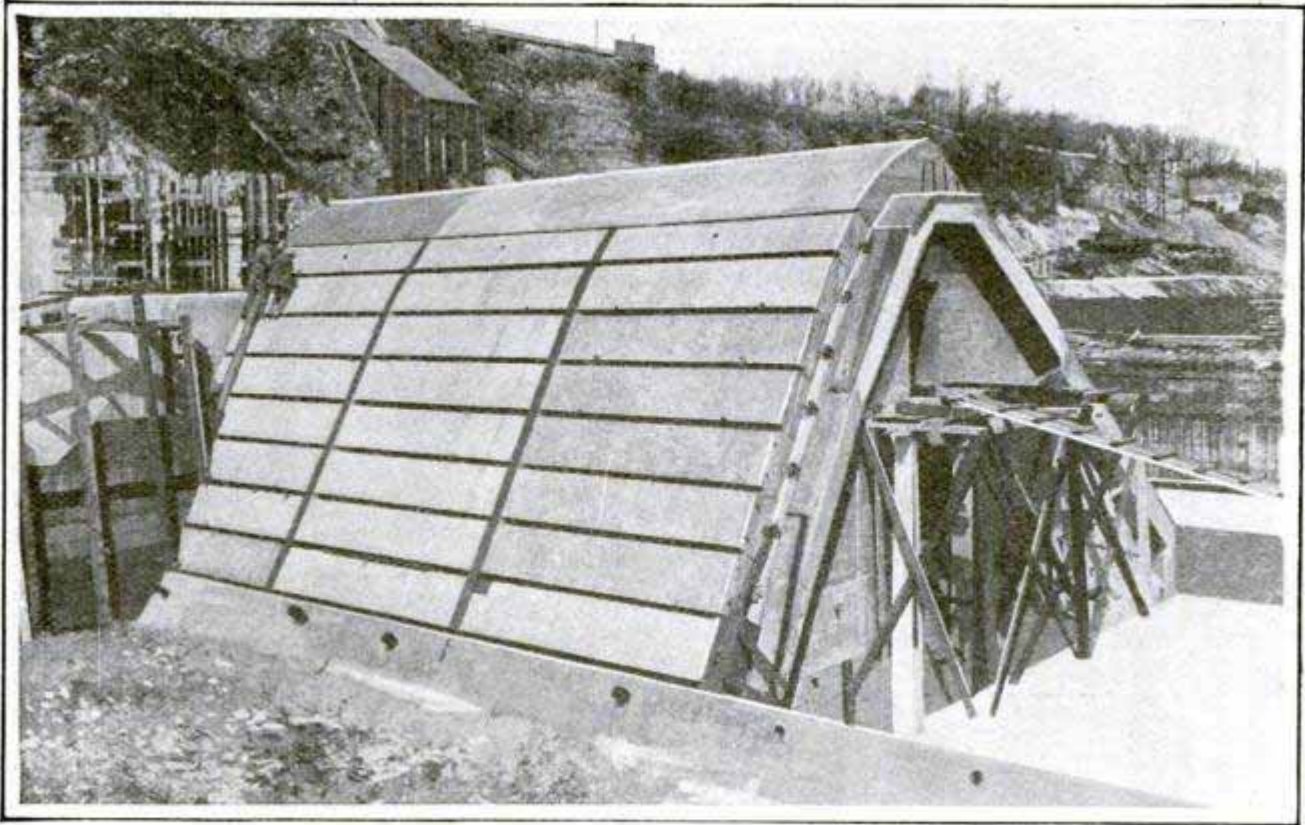
Flameless combustion of gas for the purpose of producing heat in usable form is made possible by a burner that has been patented by a Chicago inventor. The purpose of the invention is to obtain the highest possible temperature from the combustion of a mixture of gas and air without the danger of backfire or explosion that accompanies such combustion in a flame. The construction of the burner allows the current of gaseous mixture, flowing with great velocity, to pass through heated tubes made of a substance such as a combination of thorium and uranium oxides, which becomes incandescent through contact with the gas mixture, and gives off intense heat without flame.

NOVEL LOCOMOTIVE USED IN ALPS AND APENNINES

Freight locomotives of novel design are in use on the Italian State Railways for handling traffic through the Alps and the Apennines, where continuous grades having a rise of 1 ft. in $38\frac{1}{2}$ ft. are common. These locomotives are balanced compounds with 10 wheels, all of which are drivers, and they are therefore capable of exerting an enormous tractive force. The most unusual feature of the design is the placing of the coal bunker, with a capacity of 4 tons, on top of the boiler just forward of the cab. The tender, aside from having a brake compartment, is used only for carrying water, and can be coupled to the front or the rear of the locomotive as required.



Powerful Italian Locomotive with Coal Bunker Carried on Top of Boiler



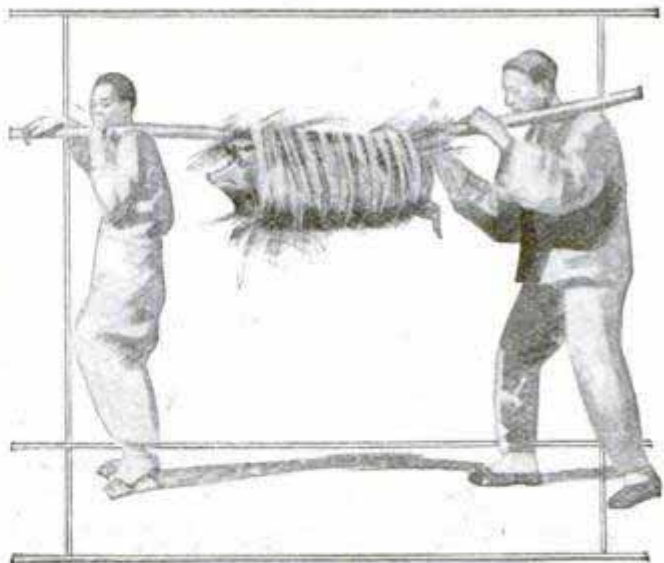
Downstream Side of Dam, Showing Removable Beams and Parabolic Concrete Crest

CONCRETE BEAMS FORM FACES OF NEW DAM

A novel type of construction was adopted for the concrete dam that has just been built across the Mississippi River between St. Paul and Minneapolis. Both faces of the dam, instead of being cast solid, are made of beams cast separately and bolted down after being placed in position on the solid-concrete supports. Each concrete beam is 16 ft. long, and on the downstream side, where eight beams are used, they are 18 in. thick. On the upstream side 19 beams, varying in thickness from 33 in. at the base of the dam to 29 in. at the top, are used. Each beam weighs about 5 tons and has bolt loops secured to the concrete at each end. The joints between beams are tightly filled, making the dam waterproof. The crest of the dam is parabolic in form and is of concrete cast in place on the concrete supports. One of the evident advantages of this construction is the ease with which a damaged beam may be removed and replaced without disturbing adjacent portions of the dam.

HOW THEY TRANSPORT PIGS IN CHINA

The philosophical Chinese long ago learned that the hardest way to change a pig's location is to drive it. In a land where fences are unknown, where low hedges separate fields of rice, a pig



Chinese Method of Transporting Hogs

on freedom bent will do an immense amount of damage when pursued at top speed by shrieking coolies. So a national custom grew up of tying the

pig to a long pole, covering it with wrappings of straw and marsh grass and carrying it bodily between two bearers. To this procedure the pig makes no objection, and the movement of stock goes on in peace and quietness. Whether the pig is to be taken from one pen to another, or to market ten miles away, no other method of transportation is thought of.

☞The Republic of Panama is planning, on the opening of the canal, to make Colon and Panama City free ports of entry for the merchandise of all the world, and to construct great storage warehouses on the isthmus.

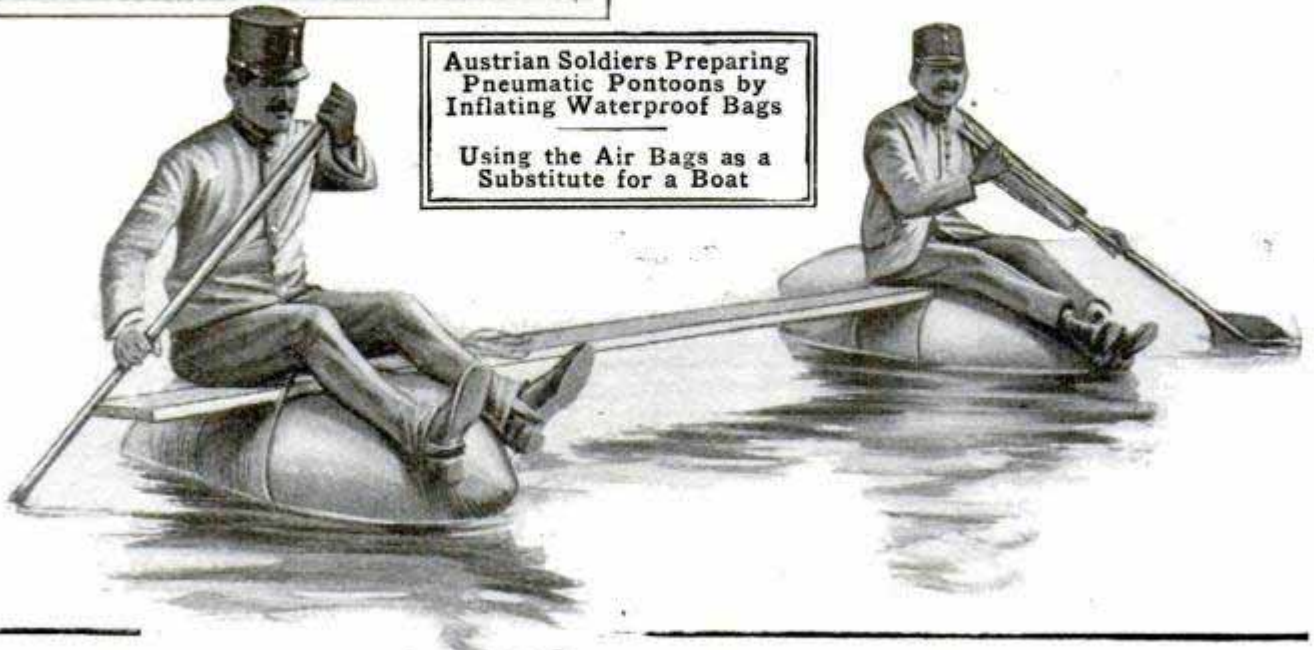


USING MOTORCYCLE AS A HOISTING ENGINE

Of the many uses to which a motorcycle can be put, that of using it as a hoisting engine is probably the most novel. An Australian farmer who was building a barn first hauled all his material from the railway station in a trailer pulled by his American-made motorcycle. There is nothing new about this, as motorcycles have been used as traction engines before. But when the barn was completed there still remained a 400-gal. steel water tank to be lifted to the roof. As there was no winch or suitable block-and-tackle equipment to be had, getting this tank into place looked like a difficult problem. Then the motorcycle was brought into use. Two poles with a crossbar at the top, a pulley and a strong rope were obtained and erected, and with the power furnished by the motorcycle the tank was easily lifted to its place on the roof.

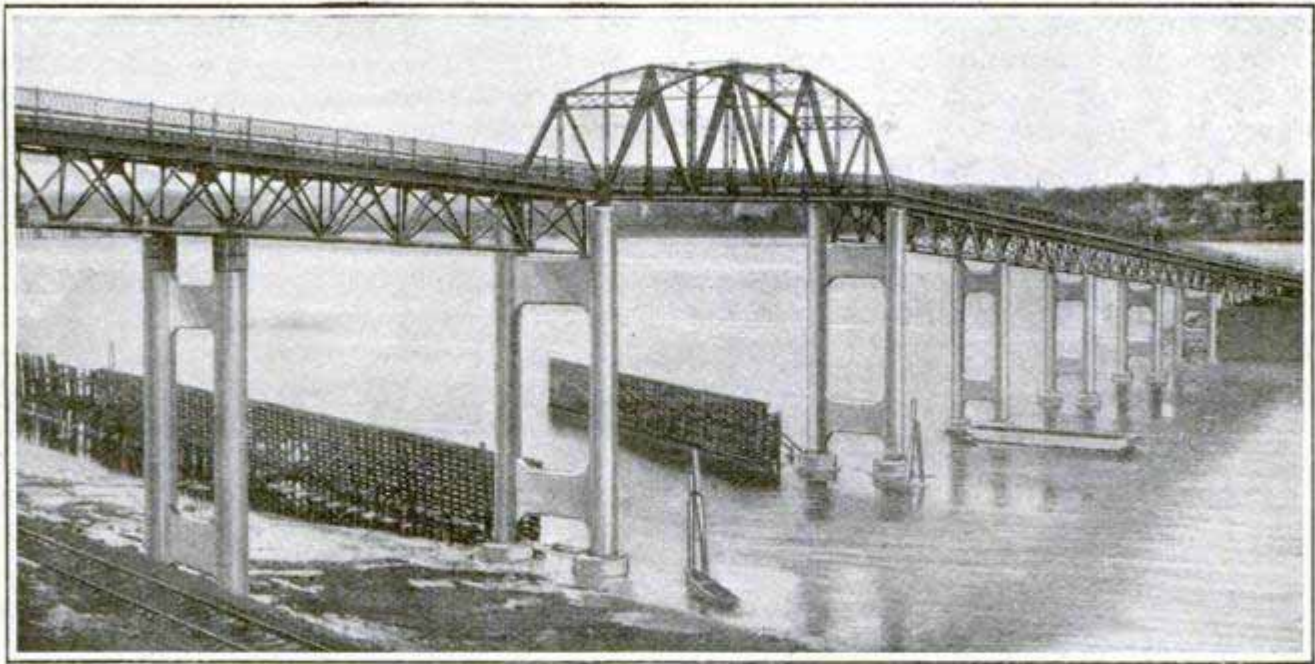
AUSTRIAN ARMY ADOPTS PNEUMATIC PONTOONS

Air bags carried by an advance force of the Austrian army are used for boats and floats to cross rivers and prepare bridges for following columns. The bags, made of waterproof canvas, are some 5 ft. in length and half as wide, and are rolled up when not



Austrian Soldiers Preparing Pneumatic Pontoons by Inflating Waterproof Bags

Using the Air Bags as a Substitute for a Boat



Knee-Braced Concrete Columns Support Highway Bridge

in use. On approaching a river the force unrolls the bags, inflates them by simply blowing them full of air, and seals the orifice with an air-tight clamp. A plank, 10 or 12 ft. long, is lashed to two bags and this improvised boat or float will support several men. When spaced at the right intervals, these bags form pontoons for the support of a temporary bridge.

NOVEL BRIDGE PIERS ON ST. CROIX RIVER

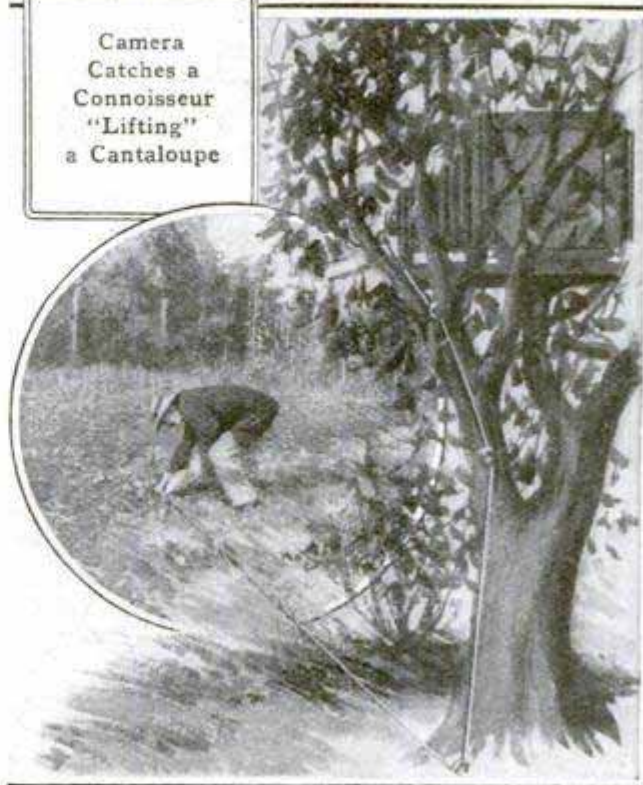
The reinforced-concrete column bridge which crosses the St. Croix River at Hudson, Wis., has recently been completed and presents some interesting features. It is a highway bridge, the riveted span trusses being supported on pairs of knee-braced, reinforced-concrete columns, each from 4 to 5 ft. in diameter and varying up to 60 ft. in height. The piers on which these columns are supported are 8 ft. in diameter and 12 ft. high, extending down about 7 ft. below the top of the foundation piles. The bridge is 1,016 ft. long, with a roadway 18 ft. in the clear, and at its highest point rises 48 ft. above high water. The pier columns were built in wood forms, 14 ft. high, raised without removing them as each part of concrete was laid. The

floating mixer was anchored abreast of each column site, and the concrete elevated in towers for dumping into the forms.

CATCHING A THIEF WITH A CAMERA

A North Carolina farmer who prided himself upon his cantaloupes found that his finest melons disappeared, but

Camera
Catches a
Connoisseur
"Lifting"
a Cantaloupe



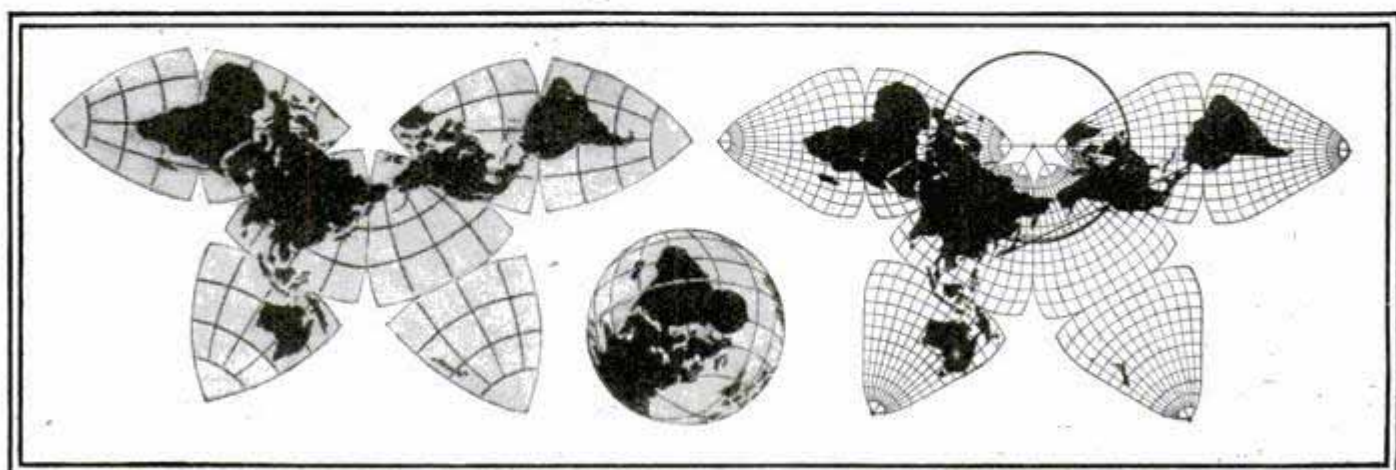
try as he might, he could get no clue to the thief. Having a photographic camera he hit upon a scheme to discover the responsible party. Concealing the camera in a thicket close at hand, he focused it upon a delicious banana cantaloupe that was just beginning to turn yellow, connecting the stem by a dark cord to the shutter.

When he returned to the patch that evening the melon was gone. He hurried the film to the dark room, and upon developing it, recognized the stooping figure as a neighborhood character. All that was necessary was to mail him a post card with his picture upon it, and the ravages stopped short.

NEW METHOD FOR MAKING MAPS OF THE WORLD

If one takes a hollow rubber ball on which the continents are indicated as on a globe, cuts this ball into eight equal pieces, and then spreads these pieces flat under a glass, he has the principle of a new method devised by an American engineer for making world maps. The cuts, of course, must be made at the right points, and the pieces must be assembled in the right way, if the map is to be of practical value as a world map after it is made. The purpose of this new projection is to avoid the extreme distortion that is the objectionable feature in Mercator's and practically every other projection used for representing the surface of the entire globe on a flat sheet of paper. Some distortion is bound to occur when any part of a sphere is laid out flat, but this is so small with the new projection that the paint used in marking the continents on the experimental rubber ball was not even cracked. In dividing the globe for making a world map, one cut is made along the equator, while for

the other cuts meridians are chosen that will miss important divisions of the land as nearly as possible. These meridians, of which there are four, are 90° apart and therefore lie on two great circles that intersect each other at right angles at the poles. The first meridian, which is at longitude $22\frac{1}{2}^\circ$ west of Greenwich, just misses the east coast of Greenland and passes south through the Atlantic Ocean. The second meridian, longitude $112\frac{1}{2}^\circ$ west, runs close to Salt Lake City, Utah. The third meridian, longitude $157\frac{1}{2}^\circ$ east, lies mainly in the Pacific Ocean and just misses the east coast of Australia, while the fourth meridian, longitude $67\frac{1}{2}^\circ$ east, passes east of the Ural Mountains and south through the Indian Ocean. These eight sections of the globe are then joined together in the manner shown in the accompanying illustrations, in which the heavy circle around the north pole equals the circumference of the globe drawn to the same scale as the sections.



A Rubber Ball Laid Out Flat to Produce a Globular Map of the World on a Plane Surface without Distortion: On the Drawing at the Right the Heavy Circle is the Same Diameter as the Globe, While the Straight Line Equals in Length the Direct "Great-Circle" Route from Panama to Japan

COMMENT AND REVIEW

COMMENT in these pages on the war situation is difficult, owing to the fact that nearly three weeks must elapse each month between the time when the last reading form goes to press and the appearance of the magazine on the news stands. Even before these words can be published, the war cloud may have cleared away or we may be in the midst of active hostilities.

The War

There is no question that the people are a unit in a desire to avoid the conflict, and that they are willing to strain points as never before in our history to maintain peace. While the war extras of the first few days were eagerly devoured, and there is no lack of real patriotism, there is no public tension or clamor for fight. We are not inflamed and insistent for the smoke of arms, as on several previous occasions, notably the Spanish war. We are less inclined in our sacrifice of young men, for whose death no acquisition of conquest can compensate. The great majority do not want Mexico, and even the opportunity of being the agency of civilization in a country which is so uncivilized as to fire on Red Cross tents fails to appeal strongly.

The Tampico incident is too insignificant, as compared with the many other insults which were overlooked, to be taken seriously as the apparently last straw. Other and far more potent influences will in time come to light as the *casus belli*, probably a notice from one or more of the great powers that unless we restored order they would. As compared with Cuba, conditions are very different. In Mexico, the work of the Navy would necessarily be limited; in Cuba, our land forces were fighting chiefly aliens to the island, while the natives regarded us as their savior. In Mexico, hatred of Americans is deep-seated and extends over two generations, which with a misunderstanding that has been fostered and scattered widespread, especially the past year, has inflamed the natives to fever heat. Add to this the physical obstacles of poisonous drinking water; fevers and other pestilence which lie in wait for the unacclimated; the inevitable guerrilla warfare in a vast mountainous country; and the result is a combination difficult to deal with.

With all this in mind, however, there is with the extreme reluctance to fight, a firm, deep-seated determination that if there is no other way, once the campaign is actually decided on, activities shall be pushed with that energy and effectiveness synonymous with American determination and enterprise. There will be no flinching, and the harder the undertaking proves, the greater effort will be made to grapple with it. Our national honor will be abundantly vindicated.

Perhaps the most unfortunate condition is the utter ignorance on the part of the Mexican masses—some 90 or more per cent of whom cannot read their own language—of the fighting abilities of our forces. They have no conception of what a thoroughly trained and disciplined, even if unseasoned, army can do, which in event of an engagement

means an unnecessarily large sacrifice of life. For there can be but one final result; how long a time would be required to accomplish that result is difficult to forecast.

If mediation should succeed in bringing order out of chaos, it would be not only something to be thankful for, but serve as a graphic example of the possibilities of the Peace Idea, of which thousands of its own followers have thus far had more hopes than expectations.



WITH the public mind so engrossed with the Mexican matter, we may get a brief respite from the deluge of reforms which, like the avalanche, seems to gather volume in its descent. That there

*Reform
the
Reformers*

are evils and injustices galore is not to be denied; but we really are not half as bad at heart, or even in performance, as we have allowed ourselves to be painted to our own eyes. We have had our shortcomings dinned in our ears so long and constantly that we have come to think of ourselves as much worse than we really are. The reform era found its opportunity when muck raking no longer offered either fame or money to frenzied writers. Persons who lacked the ordinary abilities to command public attention in any other way found their opportunity, and often a job, in so-called reform movements, and were able to gratify personal vanity by getting their names in newspaper headlines. With no broad knowledge of the subject, and without a careful study of the problem which serves them, they pose as experts. Far be it from this magazine to belittle the honest reform of any genuine evil; but while apparently nothing is good enough for the professional reformer, is it not wisdom to give equal prominence to our good men and good accomplishments?

Is it not a fact that never in the history of the United States were there so many honest men, honest businesses, and honestly made products as today? Was there ever, in any land, since the dry land appeared out of the wilderness of waters, as many or as large benefactions of every kind for suffering humanity, as today? Yet how few columns are devoted to the constructive story of the good things being done, and how many pages to destructive articles!

The Mexican trouble will not be without its compensation if it only affords some relief from the obsession of reforms, and even in a measure reforms the reformer.

H. H. WINDSOR.



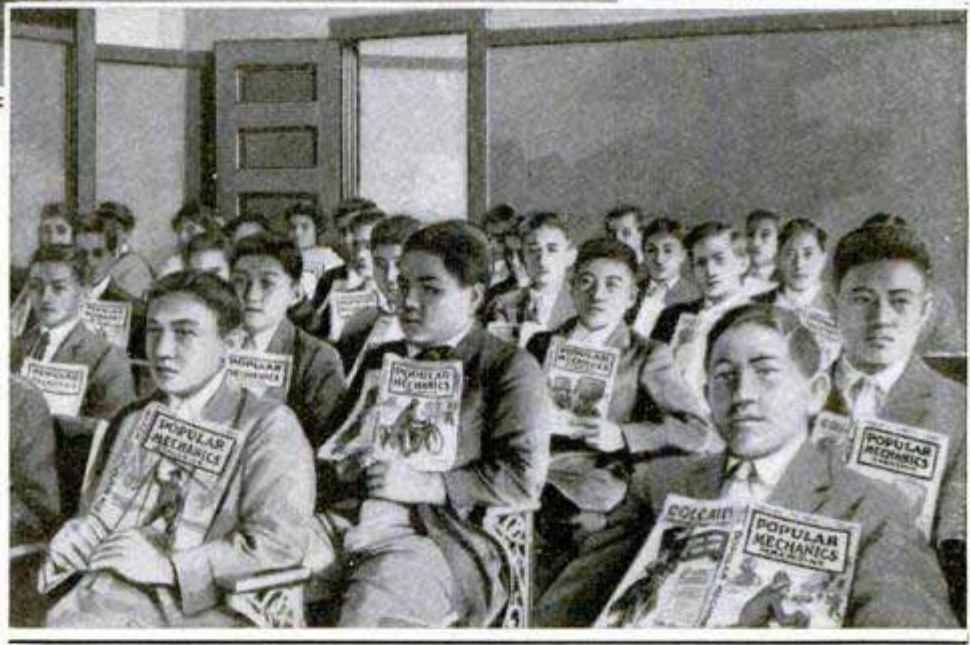
POPULAR MECHANICS AS A SCHOOL TEXTBOOK



chemistry and biology. It has been found that this magazine is useful in giving the students every month illustrations of the practical application of the principles of science which they obtain from their other textbooks and their classroom work.

High-School Pupils in Honolulu on Their Way to Recitation in General Science

The pupils of the McKinley High School at Honolulu are using Popular Mechanics Magazine as one of the textbooks in the course in general science. Under this head are included instruction in physical geography, geology, physics,



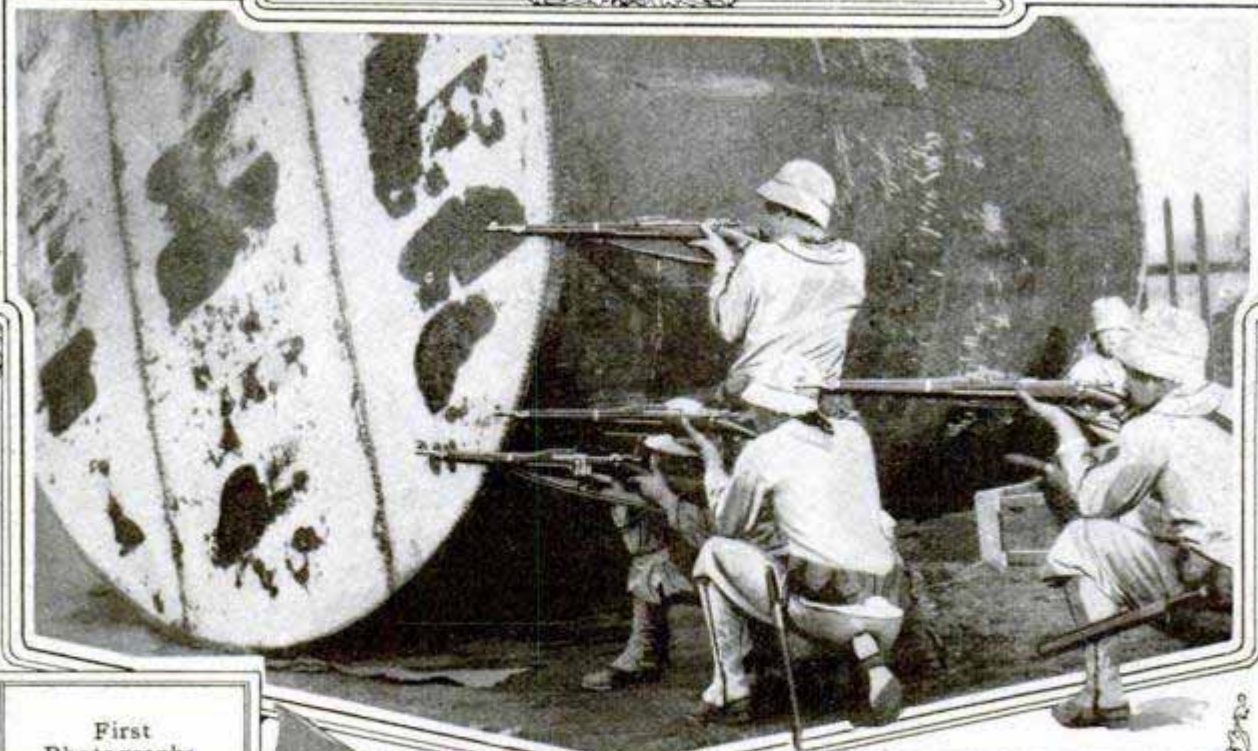
Study Hour in the McKinley High School at Honolulu

RUSSIAN BIPLANE REPAIRED WHILE IN FLIGHT

During the flight of the Sikorsky biplane "Ilja Mourametz," in which eight passengers were carried for a period of 2 hours, 6 minutes, as reported in the May, 1914, issue of this magazine, the reliability of this enormous craft was demonstrated in a remarkable manner. The carburetor of one of the motors was stopped by freezing, but this did not interfere with the flight, as would have been the case with any other aeroplane. A mechanician

climbed out on the wing and thawed out the carburetor, and in the meantime the airship was kept in full flight by the other three motors. As a result of this and other tests the Russian government has ordered 10 of these aeroplanes, which are to cost a total of \$500,000. The "Ilja Mourametz" is to be transformed into a flying boat.

☐ An American company has secured a concession for mining oil and minerals in the vicinity of the Dead Sea in Palestine.



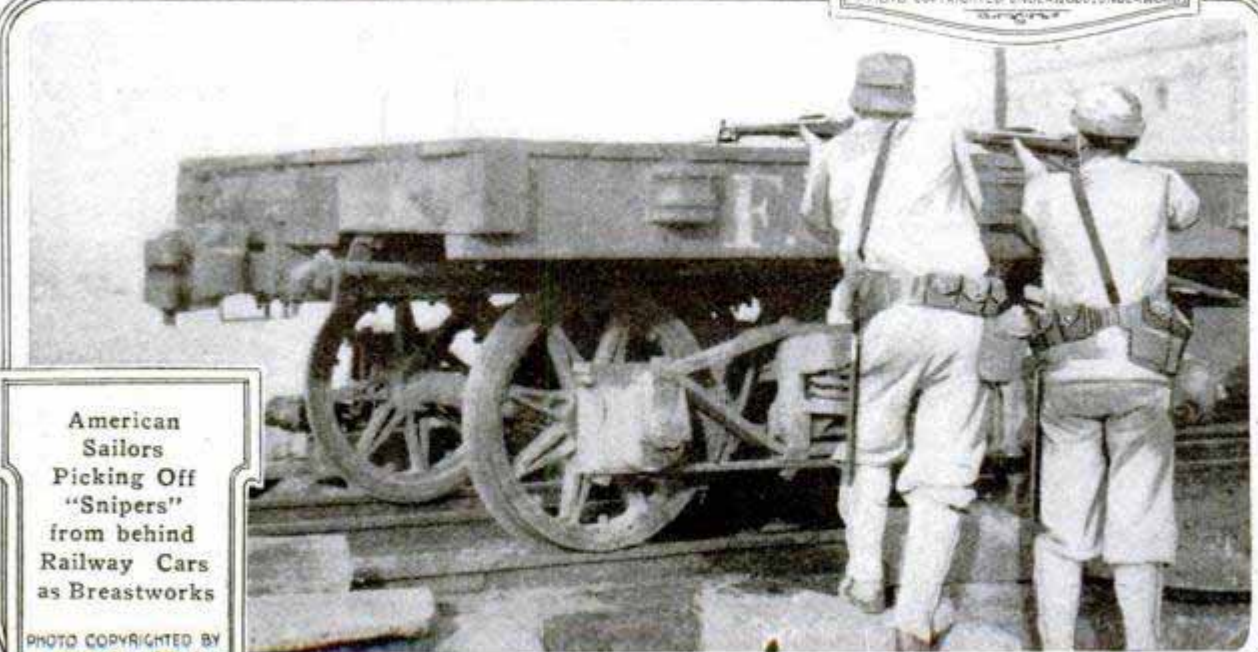
First
Photographs
of Fighting at
Vera Cruz:
American
Sailors Using
a Boiler as
a Barricade

PHOTO
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Mexican Troops
at Vera Cruz
under the Protection
of the Red Cross Flag

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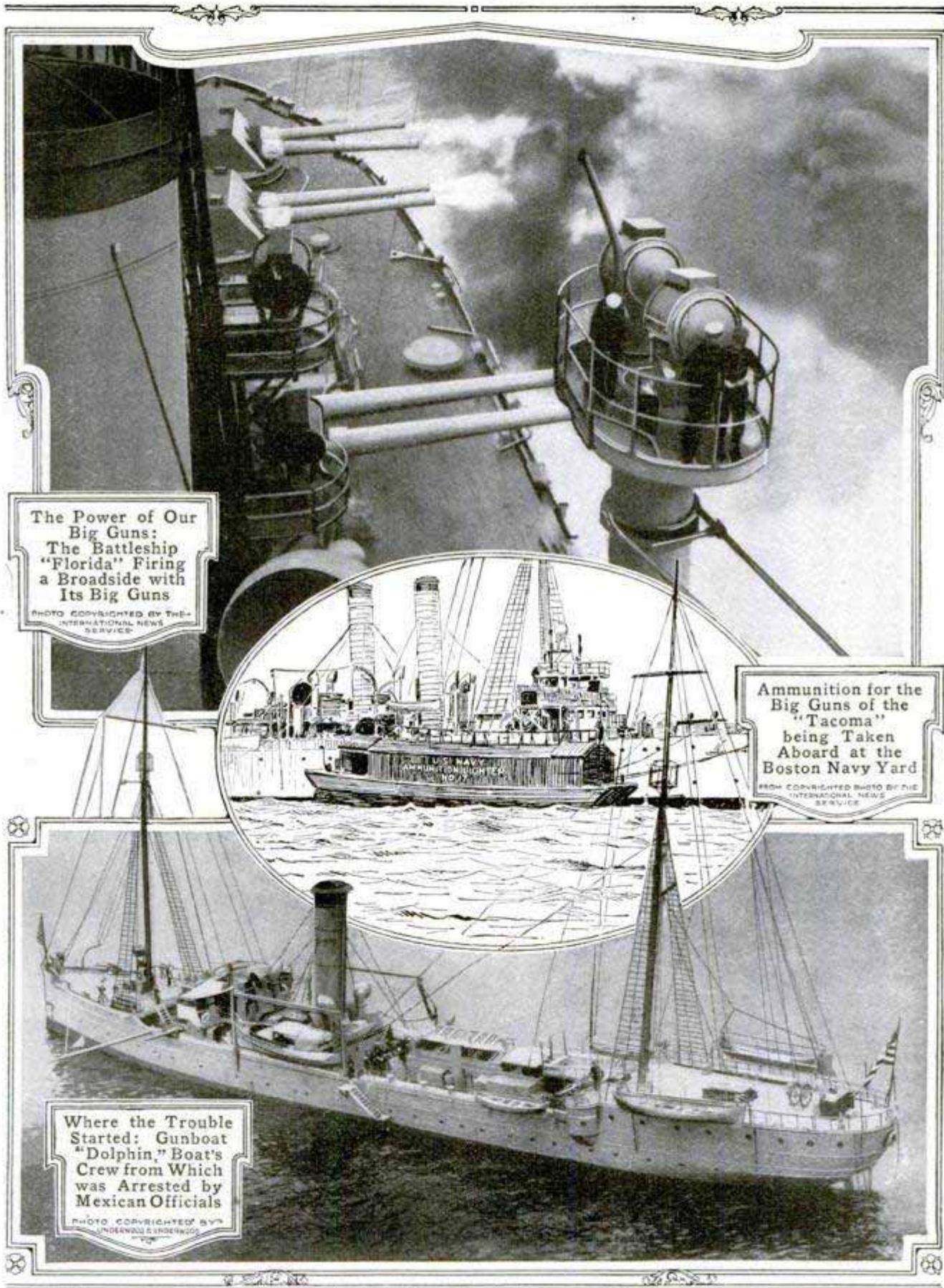
American
Sailors
Picking Off
"Snipers"
from behind
Railway Cars
as Breastworks

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THE AMERICAN ARMY AND NAVY IN MEXICO

What happens when a nation goes to war? The photographs on this and the following pages tell graphically the story of the American advance on Mexico. Army and Navy both are stronger and immeasurably more efficient than when the war with Spain was fought.

On the opposite page are the very first photographs of the fighting at Vera Cruz, received in the United States just as this issue was going to press.



The Power of Our Big Guns; The Battleship "Florida" Firing a Broadside with Its Big Guns

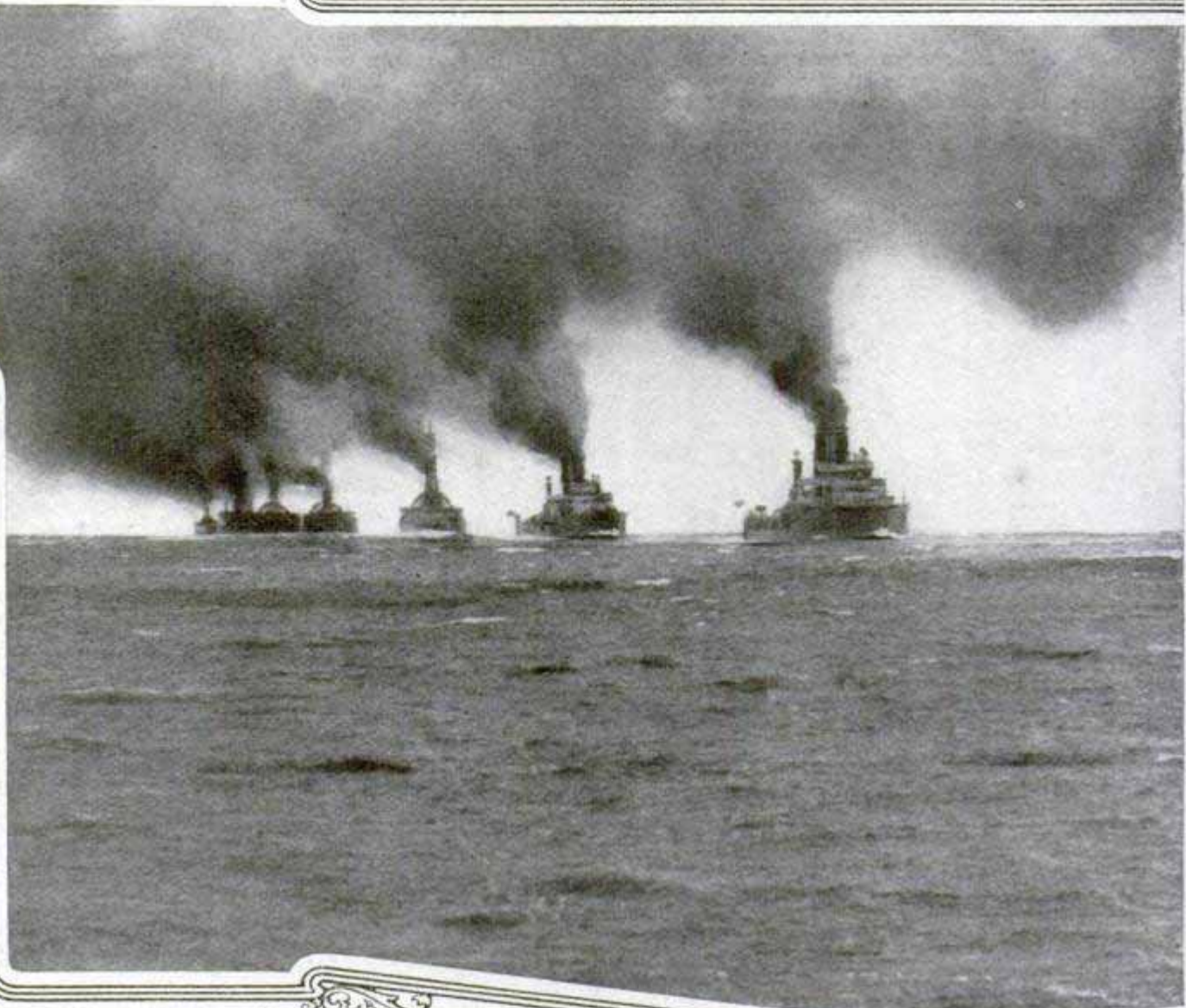
PHOTO COPYRIGHTED BY THE INTERNATIONAL NEWS SERVICE

Ammunition for the Big Guns of the "Tacoma" being Taken Aboard at the Boston Navy Yard

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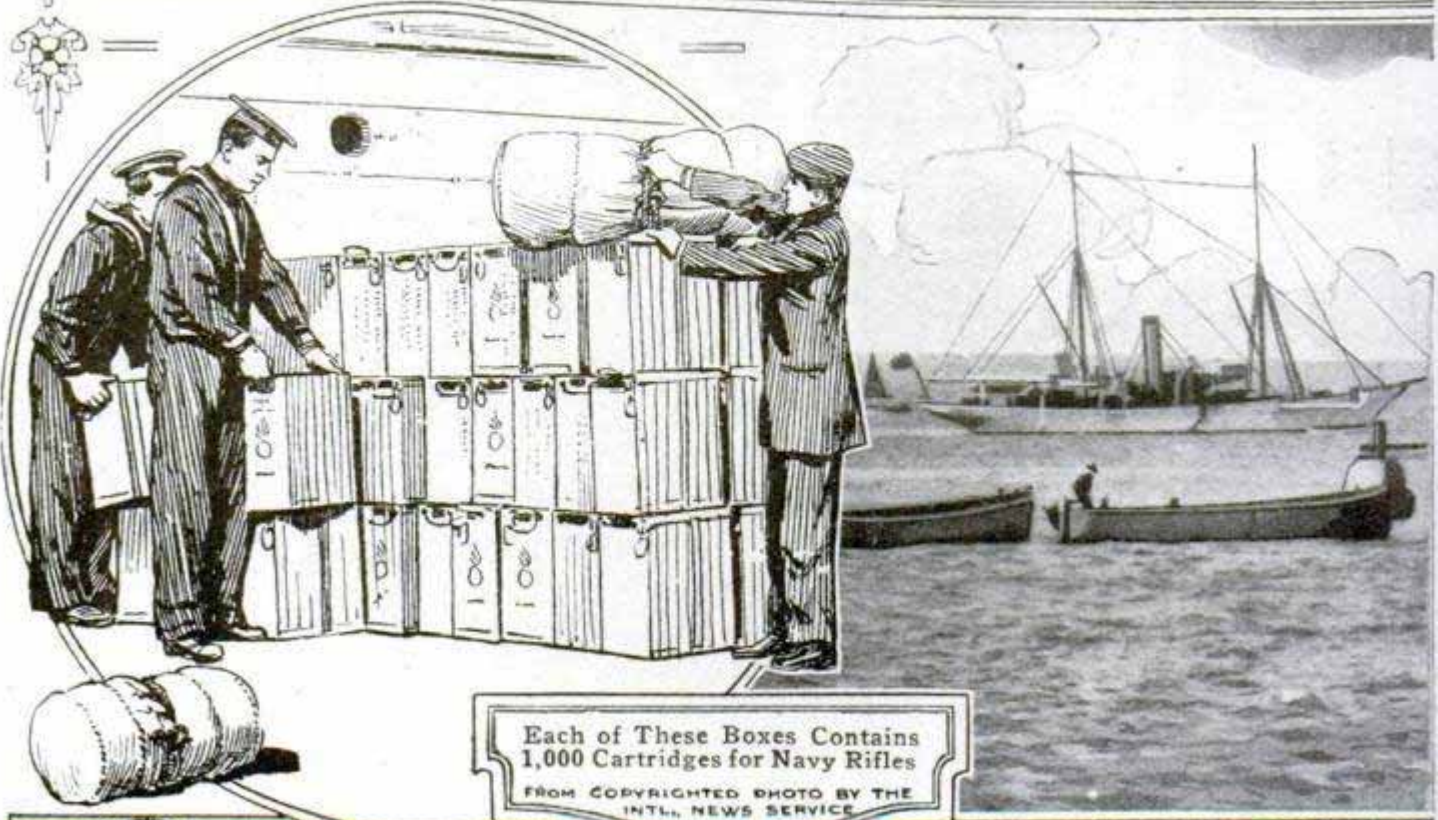
Where the Trouble Started: Gunboat "Dolphin," Boat's Crew from Which was Arrested by Mexican Officials

PHOTO COPYRIGHTED BY THE INTERNATIONAL NEWS SERVICE

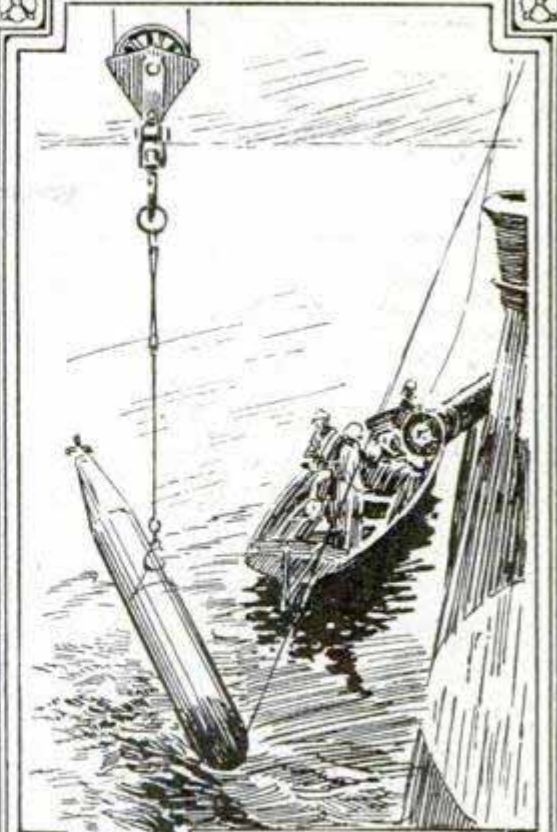


The North Atlantic Fleet of the United States Navy Cruising in Column Formation at "Full Speed Ahead":
Come the Battleships "Florida," "Utah," "Delaware," "North Dakota," "South Carolina,"

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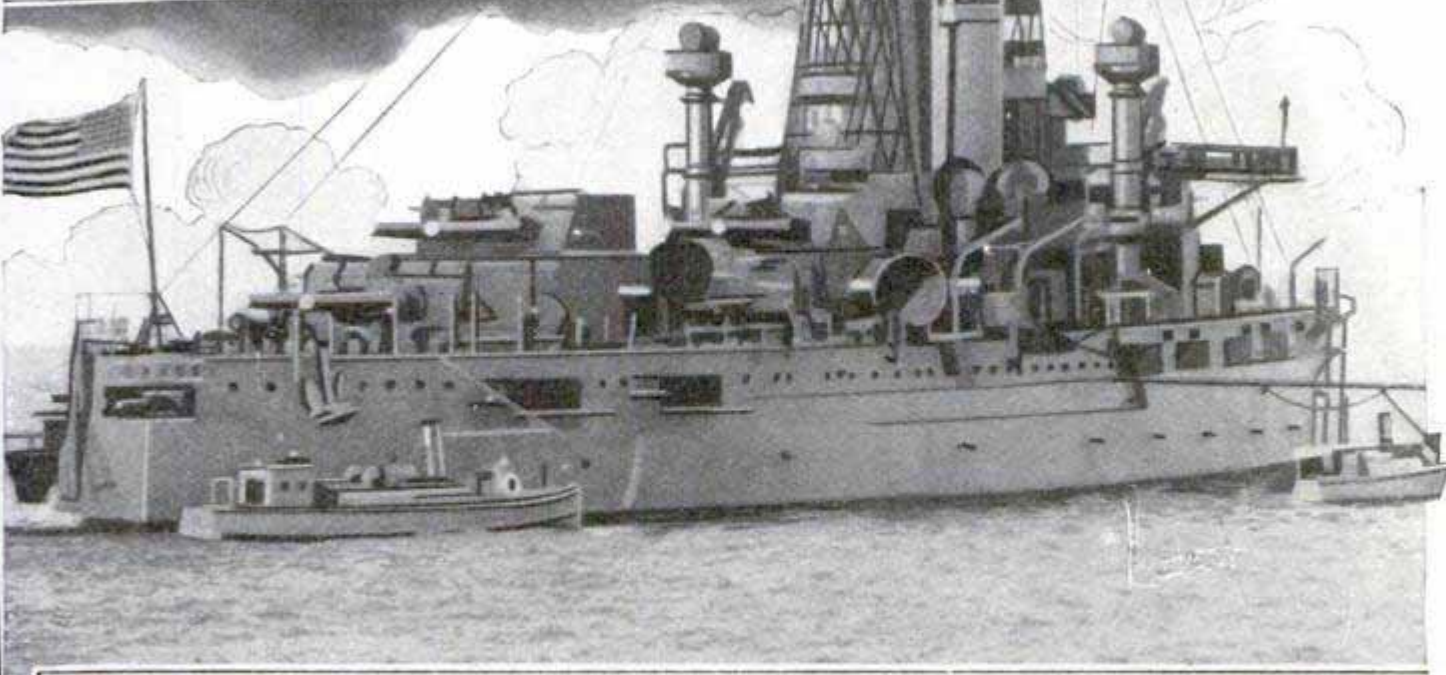


Each of These Boxes Contains
1,000 Cartridges for Navy Rifles
FROM COPYRIGHTED PHOTO BY THE
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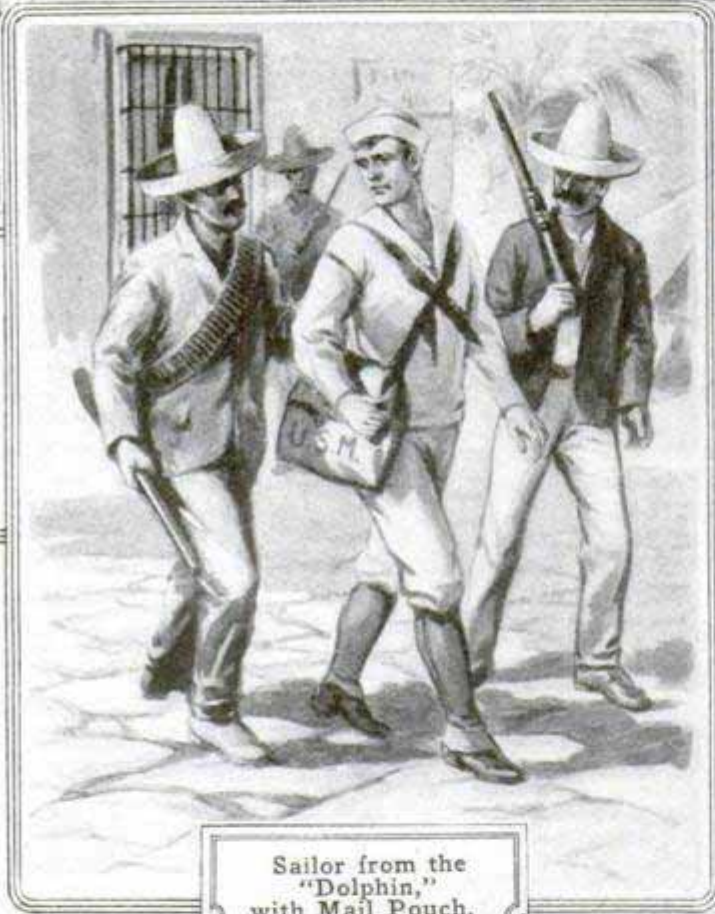
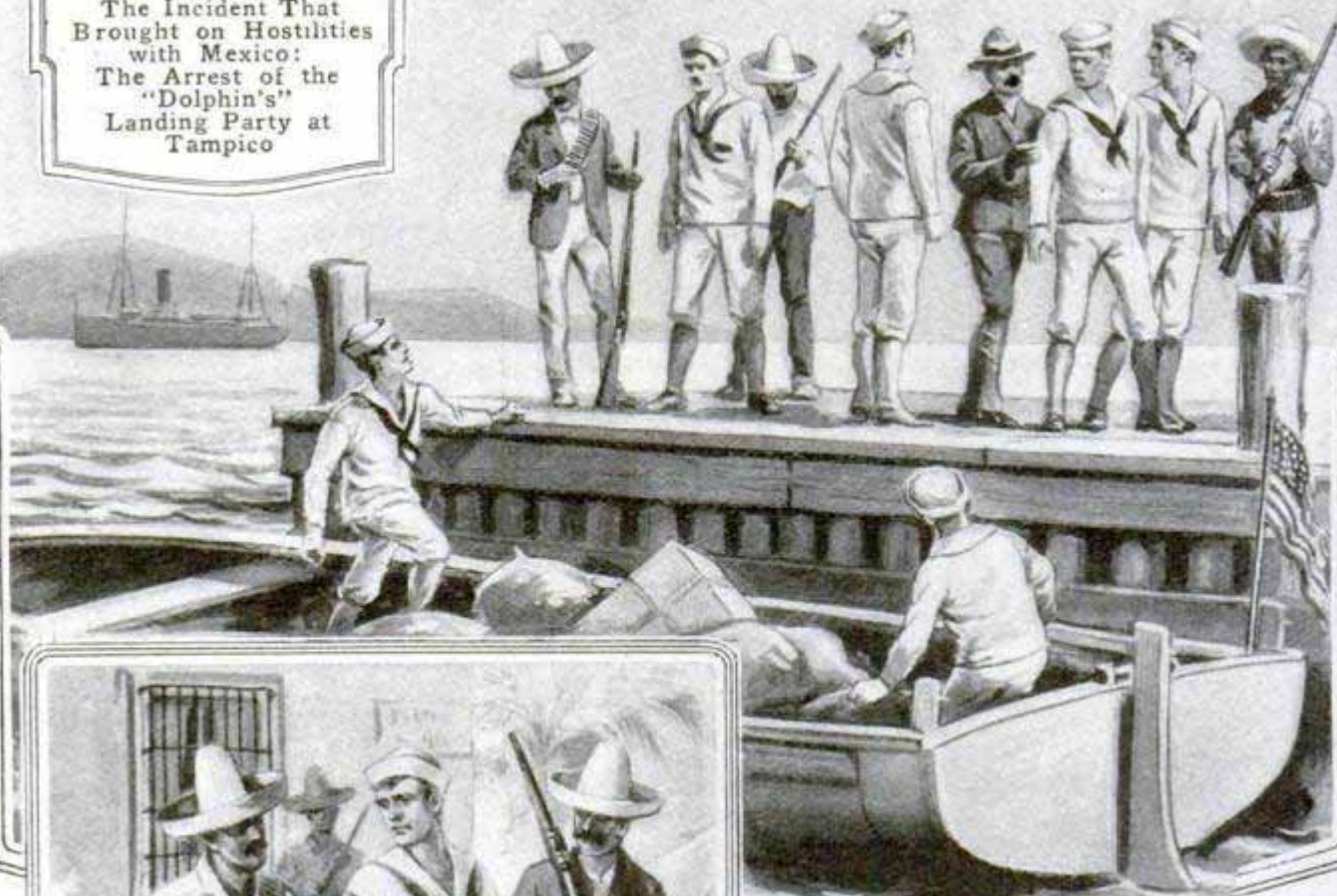
Hoisting Retrieved
Torpedo Aboard
the Battleship
"Wyoming"
FROM COPYRIGHTED PHOTO
BY INTERNATIONAL NEWS
SERVICE

The Dreadnought "Wyoming" Heads the Column; Then
"Rhode Island," "Georgia," and "New Jersey"
UNDERWOOD



The Battleship "Arkansas," Admiral Badger's Flagship at Vera Cruz: The Photograph was Taken
as the Great Fighting Machine was Getting under Way for the Voyage to Mexico
COPYRIGHTED BY UNDERWOOD & UNDERWOOD

The Incident That
Brought on Hostilities
with Mexico:
The Arrest of the
"Dolphin's"
Landing Party at
Tampico



Sailor from the
"Dolphin,"
with Mail Pouch,
being Taken to
Prison by Mexican
Federal Soldiers



Every Sailor
must Be a Soldier
at Times:
A Landing Party of
Bluejackets
in Action Ashore





MEXICO, the scene of the present international difficulty, contains 767,000 square miles, or about the area of the states of Texas, New Mexico, Arizona, California and Nevada. The city of Mexico, 7,415 feet above the sea level, is about 200 miles from Vera Cruz, its seaport, with which it is connected by two lines of railroad, with numerous tunnels and trestles that make it easy for the Mexicans to hamper the advance of an invading army. Vera Cruz is about 900 miles from New Orleans, and Tampico, about 800 miles. The boundary line between Mexico and the United States is 1,810 miles long, the Rio Grande comprising 1,136 miles.



Mexican Federals "Sniping" American Troops from Housetops

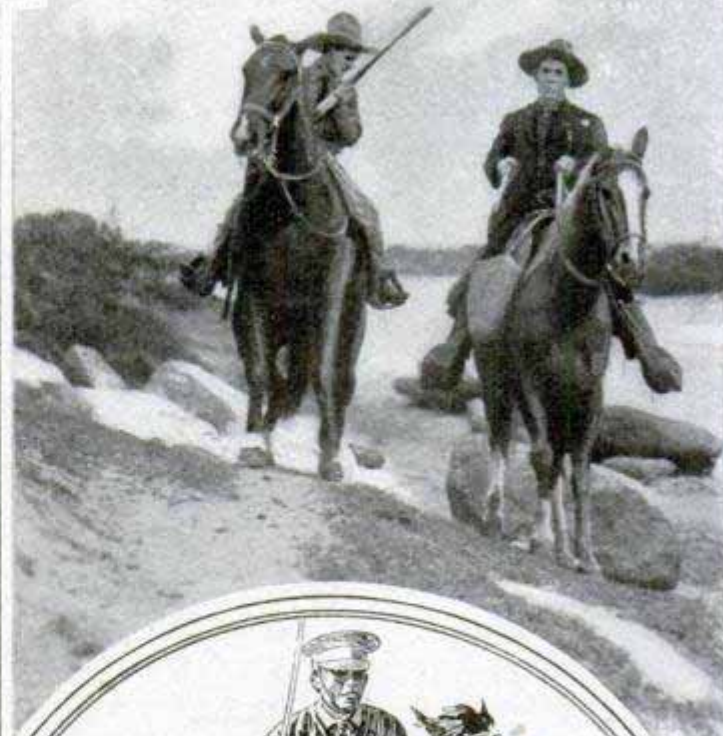


Sailors from the Fleet Advancing on an Enemy Ashore. Drawn from a Photograph



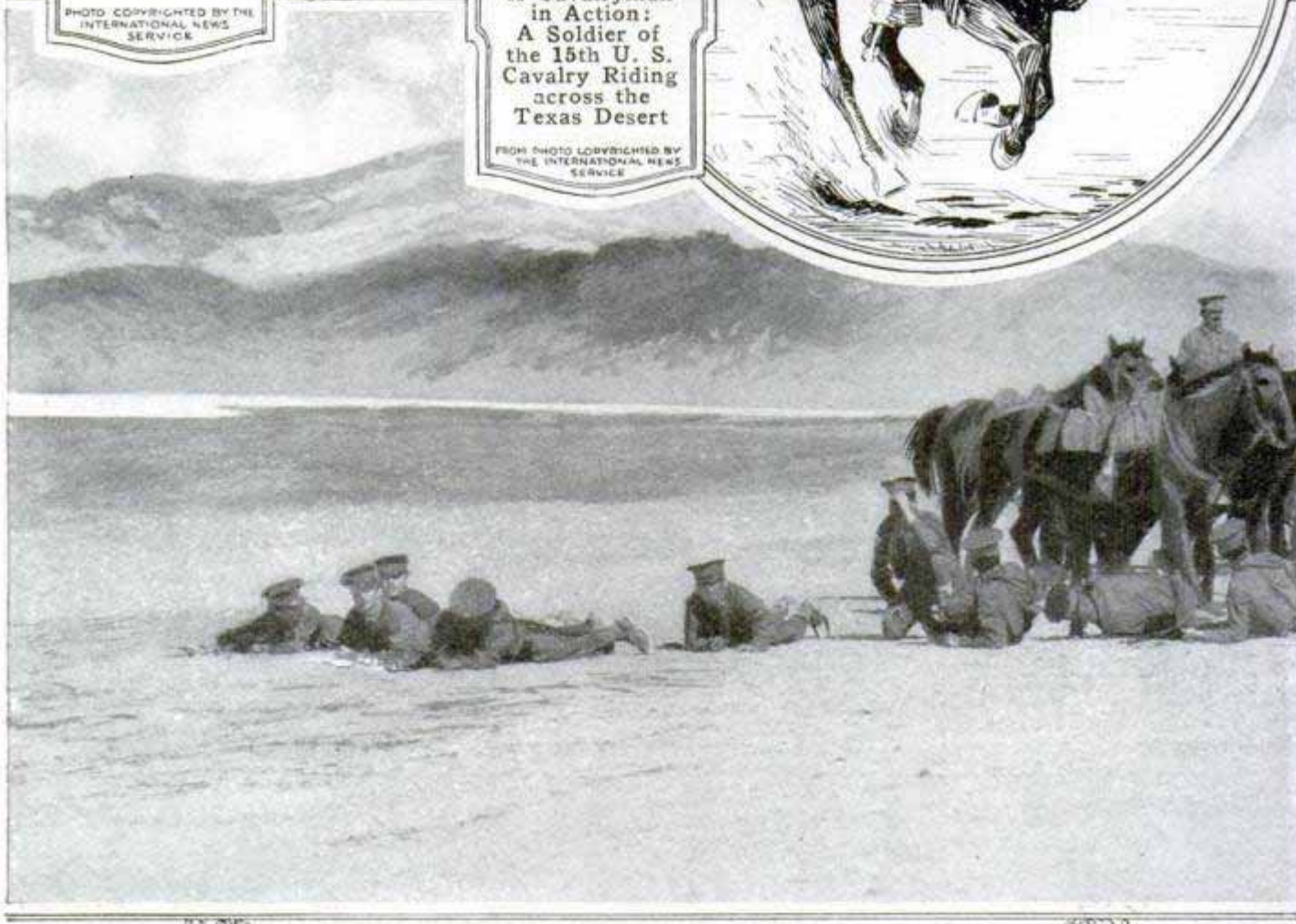
On the Mexican
Border: An
American
Artilleryman
Signaling from
a Gun Caisson

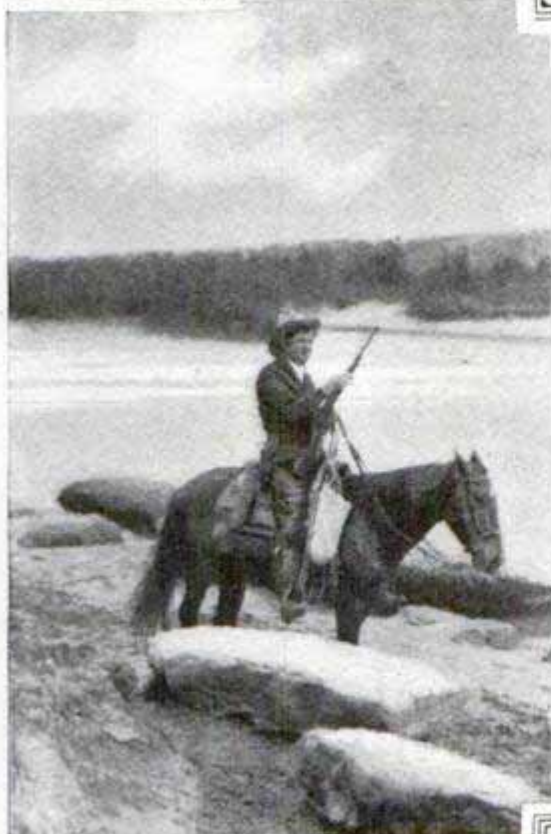
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A Cavalryman
in Action:
A Soldier of
the 15th U. S.
Cavalry Riding
across the
Texas Desert

FROM PHOTO LOBRICHTED BY
THE INTERNATIONAL NEWS
SERVICE





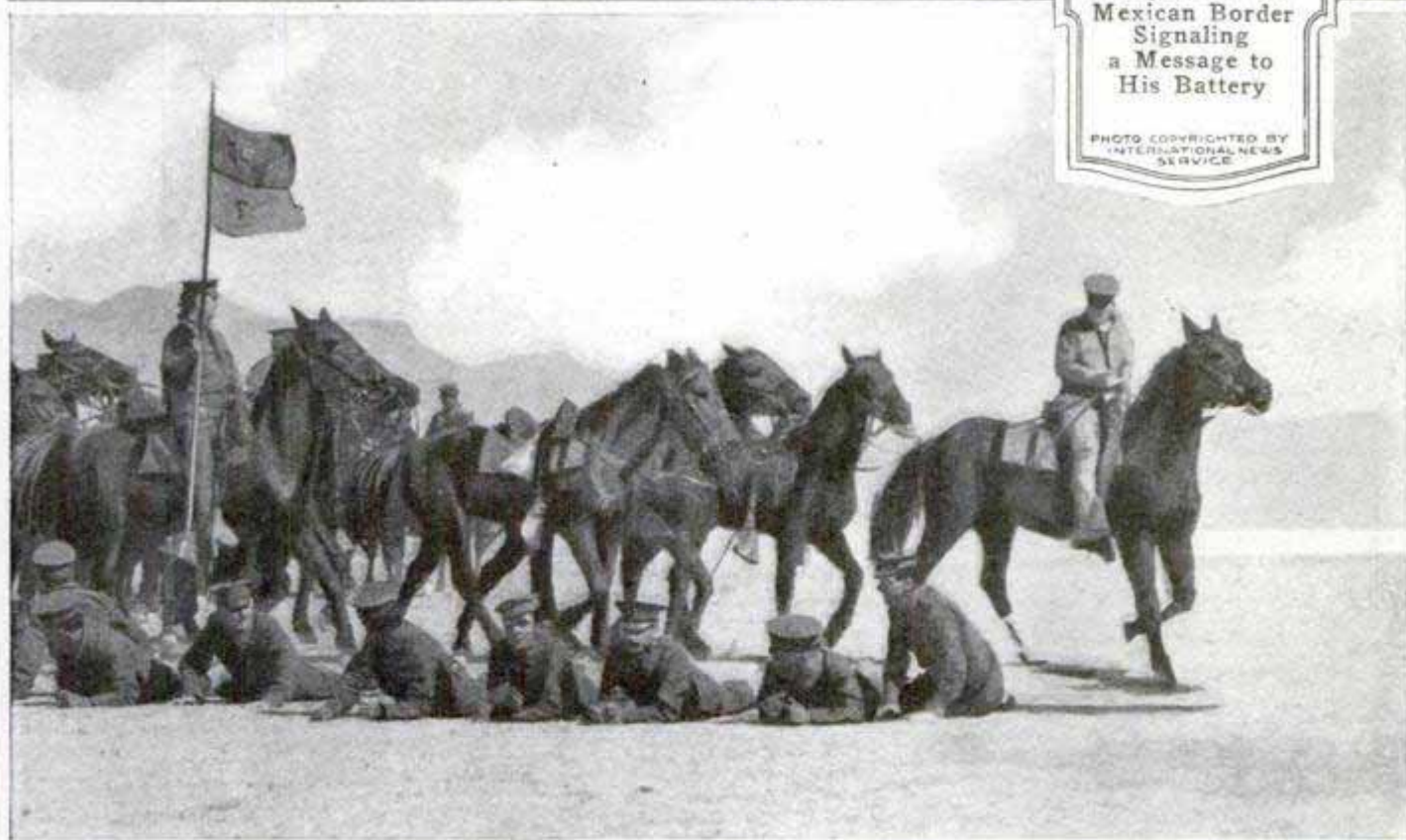
How the Border is Guarded: A Cavalry Patrol on the Banks of the Rio Grande. Every Point Where the River can be Crossed is Watched by Our Soldiers and the Texas Rangers

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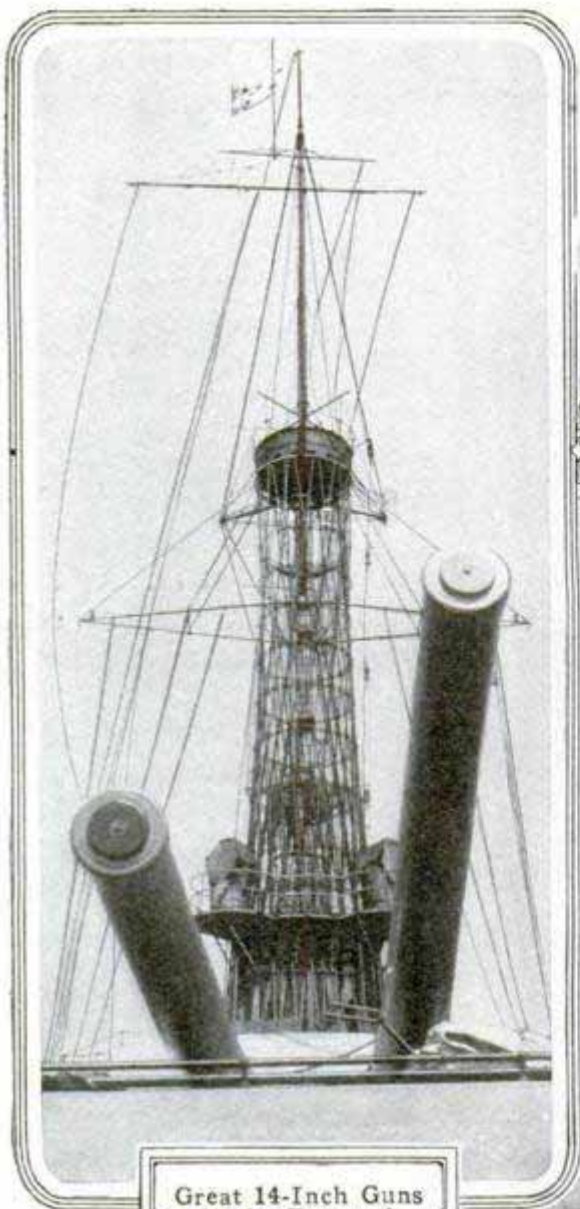
An Artillery Outpost on the Mexican Border Signaling a Message to His Battery

PHOTO COPYRIGHTED BY INTERNATIONAL NEWS SERVICE



A Cavalry Skirmish Line: This Photograph was Taken at Fort Bliss, Texas, and Shows Some of the Troops Comprising General Funston's Brigade, Now in Possession of Vera Cruz

PHOTO COPYRIGHTED BY THE INTERNATIONAL NEWS SERVICE N. Y.



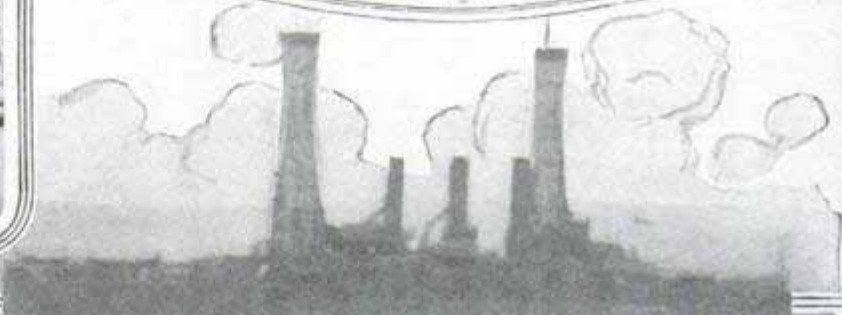
Great 14-Inch Guns
in the Forward
Turret of the
U. S. Dreadnought
"New York"

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A Draft of Recruits from the Naval Training Stations,
Carrying Their Dunnage, Arriving on Board
the Battleship "Louisiana"

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A Detachment of
Bluejackets
Hurrying a Boat-
load of Supplies
to the "Louisiana"

PHOTO COPYRIGHTED BY
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REVENUE-CUTTER SERVICE BLOWS UP WRECK

The revenue cutter "Onondaga" removed a menace from the path of commerce when she exploded half a ton



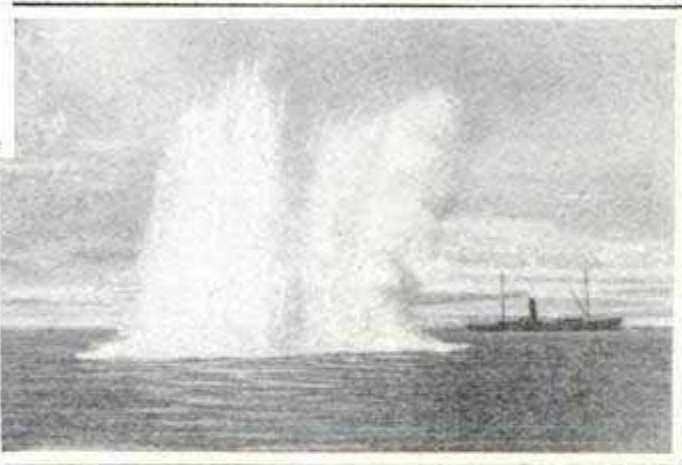
Crew of Cutter Placing Mines

of gun cotton in the upper works of the steamer "Monroe," sunk in collision with the "Nantucket" in a fog last January. The hull of the wrecked vessel is now resting on the floor of the ocean, safely below the keel of the biggest ship which may pass over it. The explosive was so placed that while the wreckage which threatened the safety of navigation was utterly destroyed, the hull, containing a valuable cargo of cotton, was left intact as far as possible, in the hope of salvaging it later.

PANAMA CANAL READY FOR WARSHIPS

In connection with the Mexican crisis a number of cruisers, gunboats, torpedo boats, destroyers, and colliers are to be passed through the Panama Canal, and the canal will thus be dedicated immediately to its most important use—the military protection of the United States. The locks are now complete and in working order, and, according to a statement by Governor Goethals, the entire canal is navigable for the largest ships of war with the exception of the portion at the Cucuracha slide. Even at that point the navigable depth is 28 ft., and the largest ships of war can be passed through by lightering the coal and supplies. A

practical test of the Gatun locks and towing locomotives was made on April 1, 1914, when the launch "Bal-



The Explosion Which Removed a Bar to Navigation

boa" with two scows was taken through. The time required for completing the lockage was 1 hour, 17 minutes, or 2 minutes more than the time specified in the schedule issued by the canal authorities.

ELECTRIC BRANDING IRON USED BY PACKERS

For branding hams, bacon, and other packing-house products, a new electrically heated iron has been invented, which receives its current from an ordinary lamp socket at a cost of but one-fourth of a cent an hour. The heating element is a strip of resistance ribbon sealed in the head, similar to



This Electric Branding Iron is Intended Primarily for Use on Hams, Bacon, Etc.

that used in electric flatirons. Around the edge are arranged the numerals which also receive the heat, and are used to mark the weight on the goods.

☞ Flying with a wind that was blowing at 62½ miles an hour, an aeroplane carrying two German military airmen recently made a flight from Hanover to Berlin, 160 miles, in almost exactly one hour.

TO RECONSTRUCT LANGLEY'S "AERODROME"

With the purpose of demonstrating the fact that a practical heavier-than-air flying machine was actually built by the late Prof. S. P. Langley, Glenn Curtiss proposes to build and Lincoln Beachey to fly an exact duplicate of the original Langley machine. It will be copied from the "aerodrome" of 11 years ago, which is preserved in the Smithsonian Institution at Washington, with the exception of the engine. The motive power for the replica of the now historic air craft will be an 80-hp. Gnome motor.

Both Curtiss and Beachey believe that Professor Langley had solved the problem of flight by heavier-than-air machines. Both feel that an act of justice would be done by showing the world at this time that only a succession of untoward accidents prevented the Langley machine from actual flight in 1903. Equipped with a modern motor, instead of the steam engine with which Langley achieved such remarkable power in his day, they both feel assured that the machine will soar successfully, vindicating the genius of the man who was laughed to death by the newspapers of his day.

Prof. Samuel Pierpont Langley, for many years secretary of the Smithsonian Institution at Washington, died in 1906 at the age of 72, heartbroken by the ridicule heaped upon him by the press because of the repeated failures of his big aeroplane to fly. For fifteen years he had devoted his time and his genius to the study of the underlying principles of flight. He devised new methods, built ingenious registering machines, recorded countless experiments, overturned old theories and developed mathematically the principles upon which heavier-than-air machines must fly. Indeed, on the 6th of May, 1896, his first model, containing a steam engine of less than 2 hp., did make two flights above the Potomac River, from the roof of the houseboat where he was conducting his experiments, and photographs were taken of the ma-

chine in the air by Prof. Alexander Graham Bell.

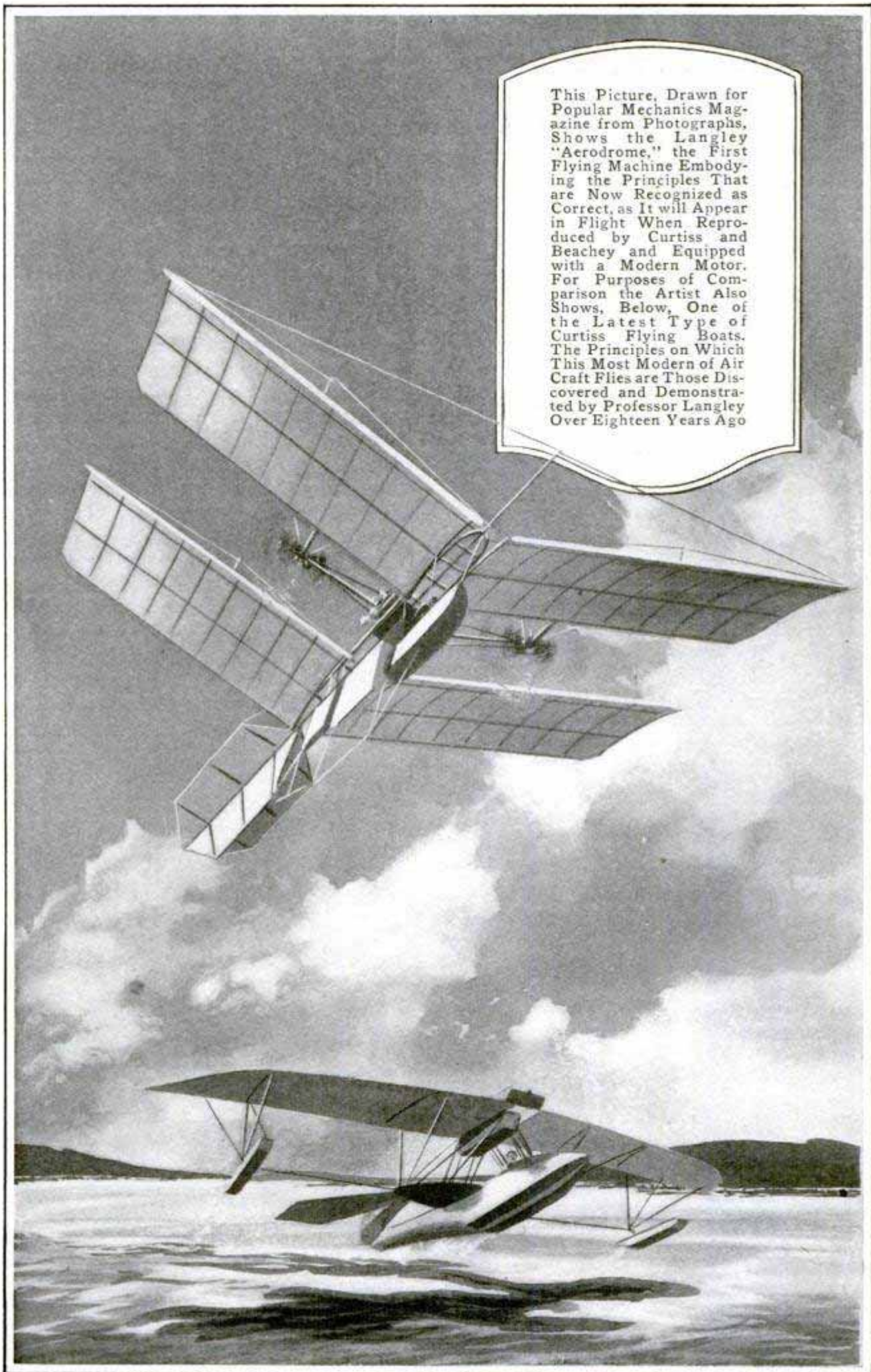
Two years later the Board of Ordnance and Fortifications allotted Professor Langley \$50,000 with which to build a man-carrying machine. The gasoline engine was now available, so he built a model, weighing 58 lb., having 66 sq. ft. of plane surface and equipped with a 2½-hp. gasoline engine. It made two magnificent flights on Aug. 8, 1903.

But the large machine, built upon exactly the same lines as the successful model, weighing 830 lb., with a 52-hp. motor, and carrying one passenger, never flew. Twice it essayed the air, on Sept. 7 and Dec. 8, 1903, and twice it plunged into the Potomac. Both times an accidental catching of the wings in the guy wires of the supporting elevated rail prevented it from leaving the ways, and it was thrown into the water, without, as Professor Bell said, "ever having a chance to fly."

Professor Langley was dependent upon the generosity of Congress for the funds to carry on his experiments, and Congress, after the failure of the big machine, refused to make further appropriation. Professor Langley himself was bitterly attacked on the floor of Congress for wasting public money "in such foolishness." So he was unable to proceed further, even to the extent of trying out again in actual flight the aeroplane upon which he had expended so much time and money.

Today all airmen acknowledge their debt to Professor Langley, crediting his long series of experiments with the discovery of the laws of aerial support and the fundamental principles of buoyancy in the yielding medium of air, which were hardly known before his time, and in estimating which even so famous a philosopher as Newton erred widely. Without the data collected by Langley, the Wrights would hardly have dared attempt their glides, as their early machines were constructed only after careful study of the Langley experiments.

This Picture, Drawn for Popular Mechanics Magazine from Photographs, Shows the Langley "Aerodrome," the First Flying Machine Embodying the Principles That are Now Recognized as Correct, as It will Appear in Flight When Reproduced by Curtiss and Beachey and Equipped with a Modern Motor. For Purposes of Comparison the Artist Also Shows, Below, One of the Latest Type of Curtiss Flying Boats. The Principles on Which This Most Modern of Air Craft Flies are Those Discovered and Demonstrated by Professor Langley Over Eighteen Years Ago



A REVOLVER IN HANDLE OF VALISE FOR PROTECTION

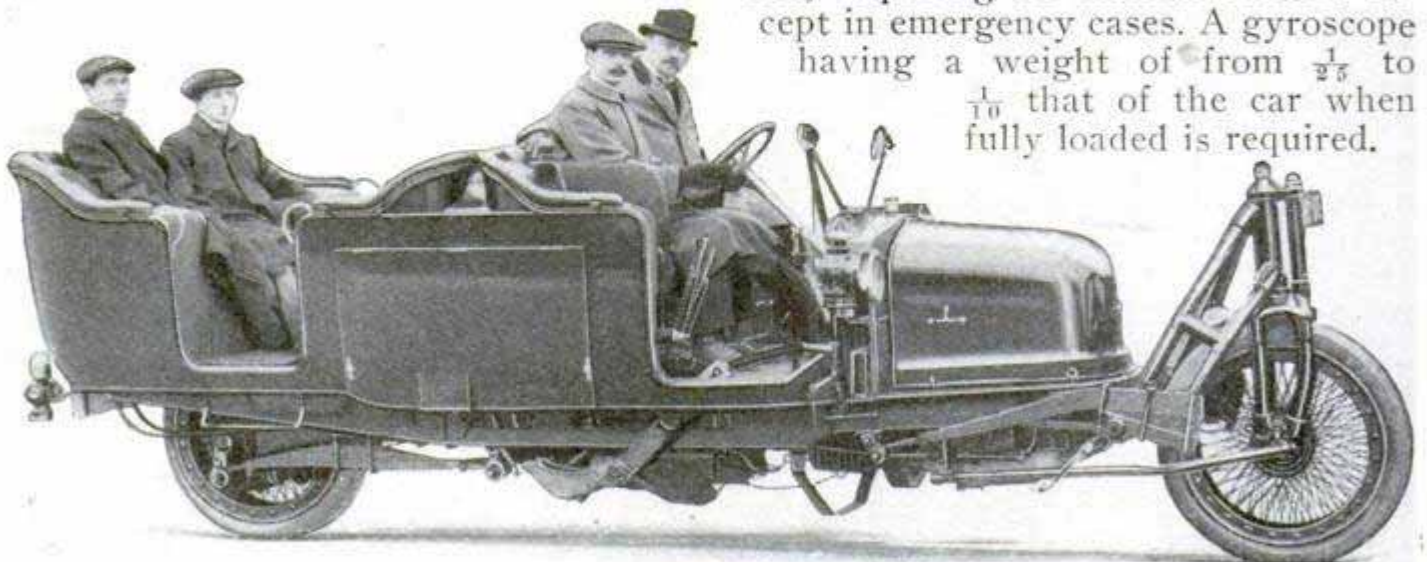
As a protection against those bold thieves who prey upon bank messengers and others carrying large sums



How a Revolver Concealed in a Valise Handle may be Used

of currency to and from the bank, an inventor of New York has patented a hand bag, in the handle of which a revolver is concealed, which may be aimed and fired readily without disengaging the hand from the handle of the bag.

CA canal, estimated to cost \$16,000,000, is planned to connect Leipzig, Germany, with the Stettin Canal and the Baltic Sea.



GYROSCOPIC AUTOMOBILE RUNS ON TWO WHEELS

A new gyroscopic apparatus for balancing two-wheeled vehicles, recently brought out by a European inventor, has reached such a stage of development that it is now being promoted commercially in England for use both on monorail cars and two-wheeled automobiles. In this apparatus the precessional power of the gyroscope is employed for maintaining the balance of the vehicle in the same manner that it is employed in stabilizing a ship, but with a mechanism that is remarkable for its simplicity in comparison with the precession engine and other controlling apparatus ordinarily used with an active gyroscope. The gyroscope rotates in a horizontal plane and is run by an electric motor at a speed of from 1,200 to 1,500 revolutions per minute. It is so mounted that it is not affected by any grade or horizontal turn, but acts instantly when the car starts to tip sidewise. The control and use of precession for bringing the car back to a level beam is accomplished in this apparatus by a simple system of pendulums and springs, which not only causes the car to resume its upright position, but leaves the gyroscope in a neutral position and ready for the next period of activity. The whole apparatus is hidden in the body of the car and is automatic in its action, requiring no manual control except in emergency cases. A gyroscope having a weight of from $\frac{1}{5}$ to $\frac{1}{10}$ that of the car when fully loaded is required.

Automobile with Two Wheels Arranged Like the Wheels of a Bicycle and Balanced Automatically by a Gyroscope

PLAYING THE GAME OF WAR

By LOUIS E. BROWNE

WAR is a game—a game where the stakes are the fate of nations. It is a frenzied struggle between great minds and brave men. Battleships and men are but pieces to be sacrificed. War is like chess. It is played according to definite rules and the leader who plays the best game usually wins.

American dreadnoughts are unequaled the world over, but we cannot risk the honor of the Stars and Stripes by placing unskilled players in command of the game. We must train our leaders, and it is for this that weather-beaten old captains take a severe course at the Naval War College at Newport, R. I.

Hour after hour, these future players of the real, terrible game of war, wage mimic battle upon a great checkerboard-like table representing the ocean, using as pieces toy dreadnoughts, destroyers and submarines. To the visitor, the sight of a score of men on bended knees, moving miniature ships about in an apparently aimless manner, gives the impression that they have reverted to childhood.

The game table is 20 ft. square and is marked off in inches, each square inch representing a square mile. The board represents a portion of the ocean's surface 240 miles square. Steel pins with colored flags, run through the tiny ships of painted wood, serve to hold the toys in any desired position on the table. Battleships are indicated by blue flags; cruisers, by red flags; destroyers, by white, and submarines, by green. The American fleet is represented by toy ships tinted blue, while the enemy is represented by red.

If the toy fleet steams at any given number of knots, the distance that it moves over the game board can be measured from a scale without computation. The headway lost by a ship when turning is also computed on the scale. A stick, 40 in. long, divided into units representing 500 yd. each—

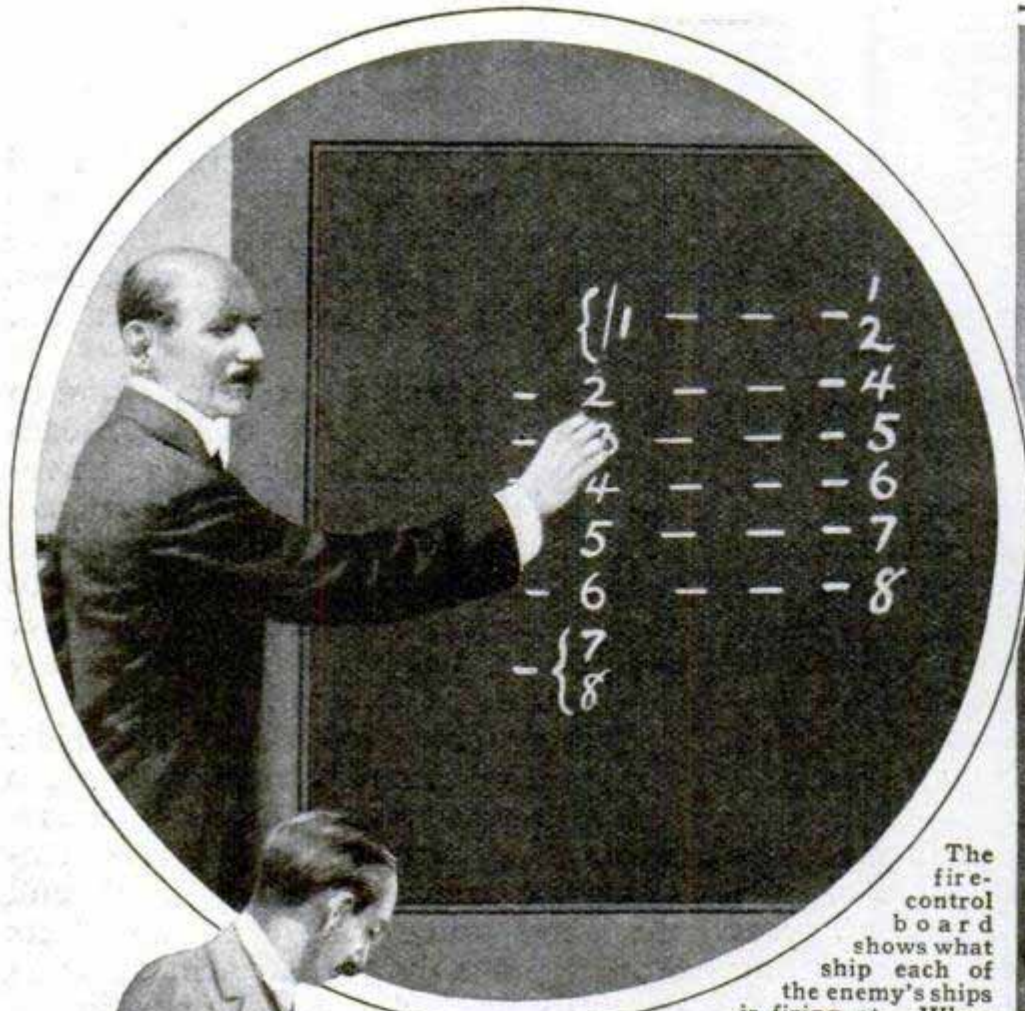
one inch representing a mile—is used to determine the distance between miniature fleets. This takes the place of the range finder on battleships, upon which the accuracy of gun fire depends.

Here is a typical problem. Late in 1916 a foreign fleet of 10 dreadnoughts, cruisers and destroyers leaves the North Sea to capture Guantanamo. The American fleet is scattered and taken unawares. How is it possible to save Guantanamo, and if a stronger fleet can be mobilized, force the enemy into battle and defeat it?

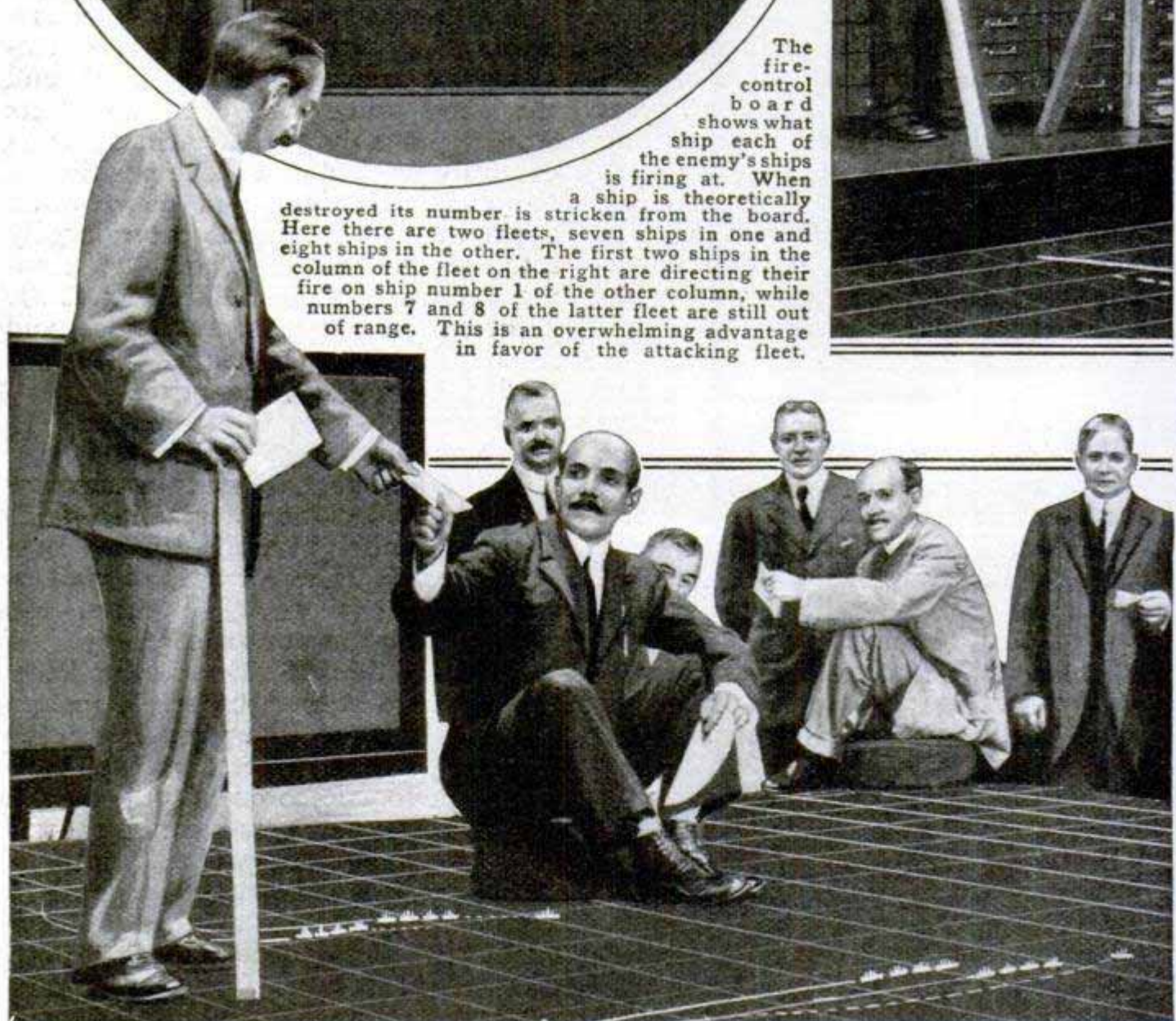
Officers are chosen on each side. They spend hours formulating plans which appear to hold chances of success. The strength and battle efficiency of each ship is estimated, and the time when the opposing fleets would probably sight each other is carefully worked out. The position of the sun, wind, sea, and many other apparently trivial facts, enter largely into the final result. The "blue" commander would mobilize his fleet at the point he thought most auspicious, and if the fleet were stronger than the "reds," he would force battle.

There are certain formations in which an attacking fleet may find itself able literally to annihilate a superior force—provided the commander of the latter permits himself to be outmaneuvered. These traps, as well as the means of avoiding them, are studied with the utmost care.

When within 16,000 yd. the fleets are in range of each other. To score the fire it is necessary to know the number of guns directed at each ship every salvo. Records of all of the navy's target practices have been compiled to show the probable hits at various ranges. If a dreadnought fires a salvo of 10 guns at an enemy 10,000 yd. distant, the records show that eight hits should result. It has also been estimated how many great crashing projectiles a dreadnought can withstand. The toy fleets exchange gun

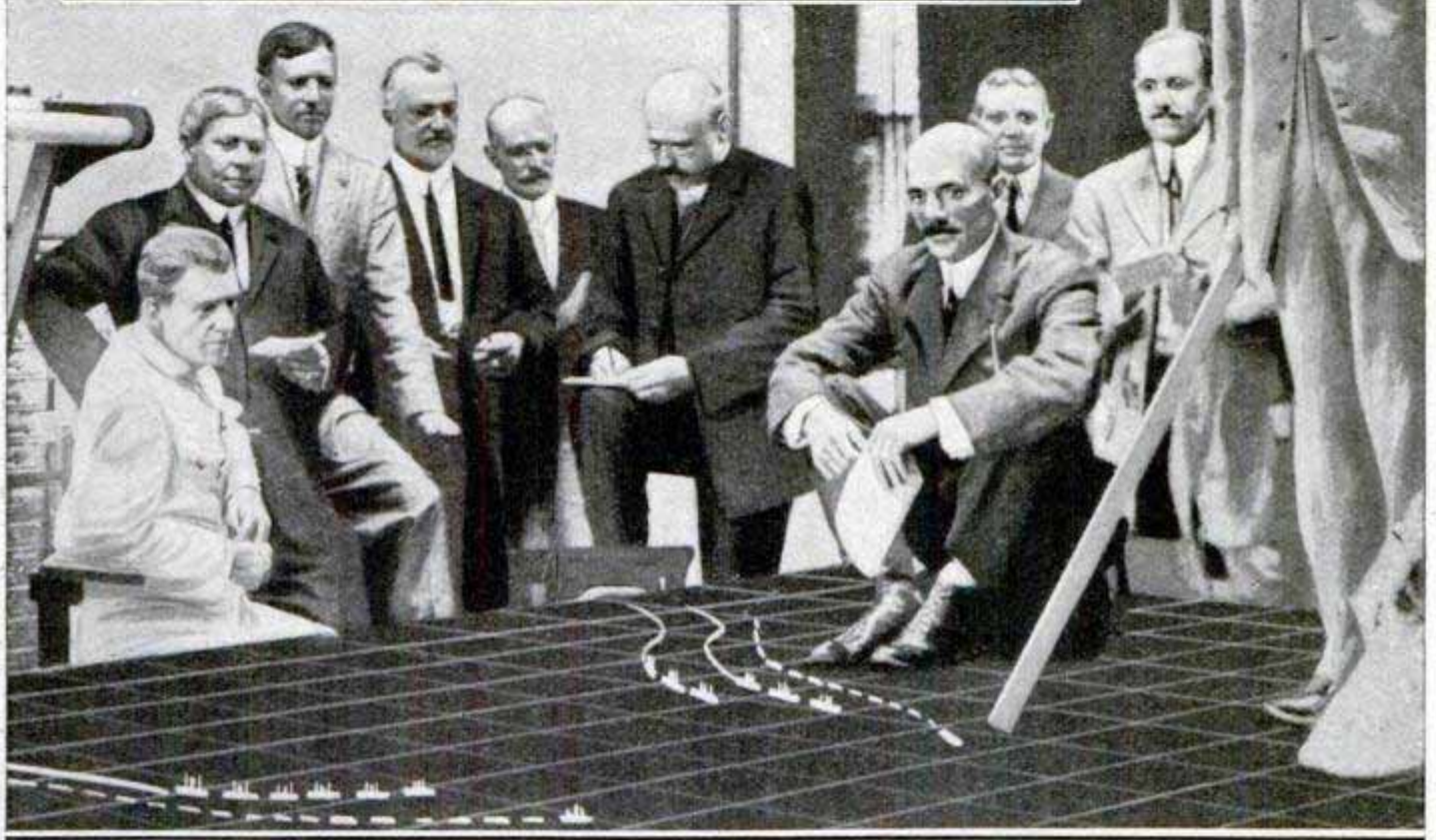


The fire-control board shows what ship each of the enemy's ships is firing at. When a ship is theoretically destroyed its number is stricken from the board. Here there are two fleets, seven ships in one and eight ships in the other. The first two ships in the column of the fleet on the right are directing their fire on ship number 1 of the other fleet, while numbers 7 and 8 of the latter fleet are still out of range. This is an overwhelming advantage in favor of the attacking fleet.

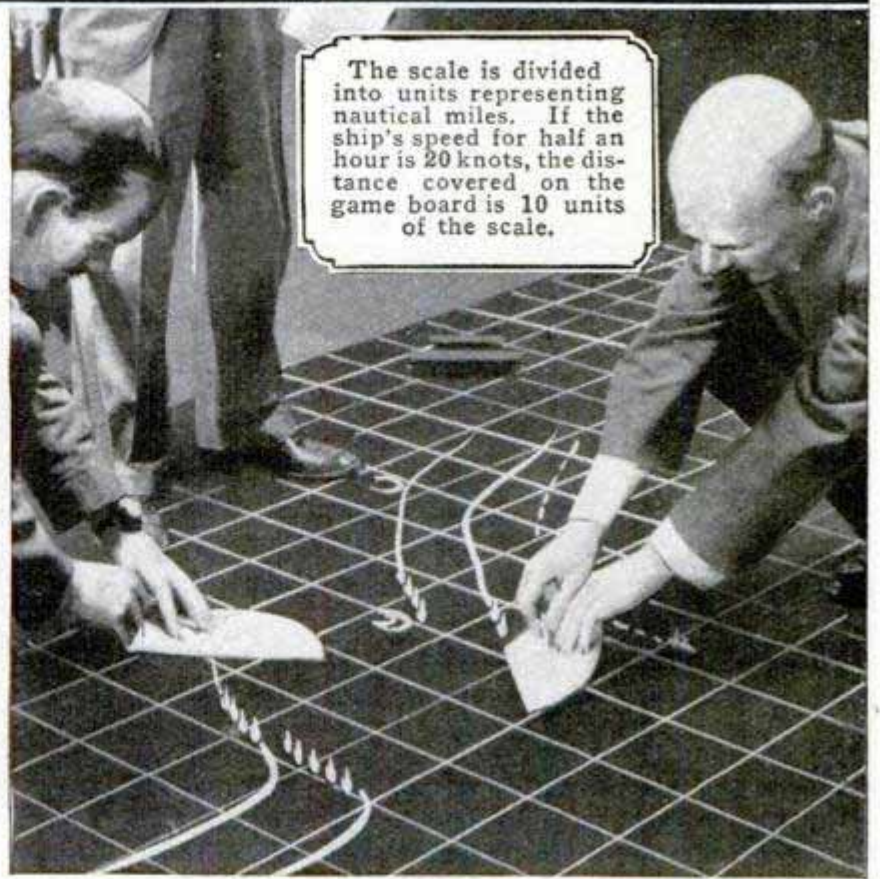


An officer sometimes has eight or ten moves planned ahead of the game. He must hand the umpire written before he can play. The officials of the game are the umpire, piece movers, range officer,

Here the rival toy fleets are approaching within range and the mimic battle is about to commence. On the left, the score keeper reads the chart which shows the probabilities and chance of the damage from gun fire. The chart is prepared from records of all of the navy's target practices. The officer on the extreme right holds the "range finder," a stick divided into units representing 500 yards when one inch equals a mile.



signals of his proposed third move ahead scorers, and fire-control officer.



The scale is divided into units representing nautical miles. If the ship's speed for half an hour is 20 knots, the distance covered on the game board is 10 units of the scale.

fire until one or the other is destroyed. The chances of smoke from the stacks bothering the gun pointers is about one out of ten. The umpire shakes a die. If a six is cast, 10 per cent is subtracted from the ship's hits.

Problems often center about such strategic bases as Gibraltar, New York, or Panama. The questions embrace situations that any admiral is likely to meet when leading a fleet into battle. He would proceed along the same lines as he did when playing the war game at Newport. With his staff he would prepare an estimate of the situation, estimate the strength and speed of the enemy, and determine where he had best encounter the opposing fleet, and at what time of day. It is possible that although he had a greatly inferior force, something he had learned at the War College while solving a similar problem would enable him to out-manuever the enemy and win the day.

BIG FREIGHT ENGINE FOR BAVARIAN RAILWAY

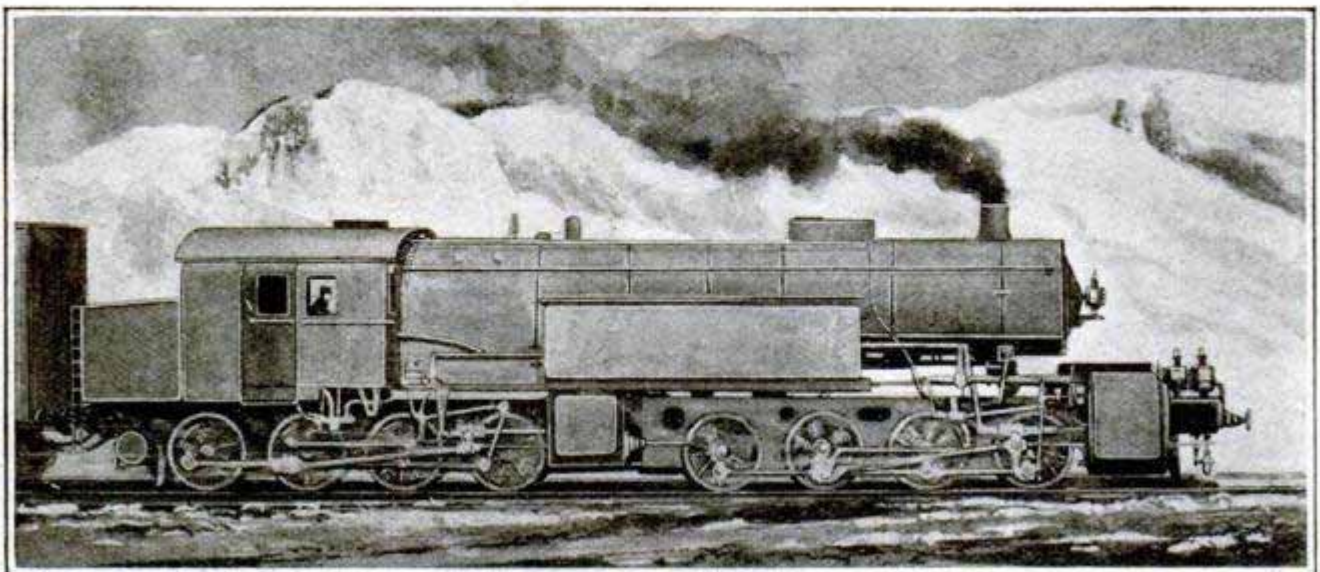
Weighing 135 tons, and nearly 58 ft. from buffer to buffer, a freight locomotive, just completed for the Bavarian State Railways, is the largest of its type in Europe. There are eight drivers on each side. Steam at a pressure of 225 lb. is used, the boiler capacity being more than 2,200 gal. The

steam is superheated and the efficiency of the high pressure is utilized in compound cylinders to the last degree.

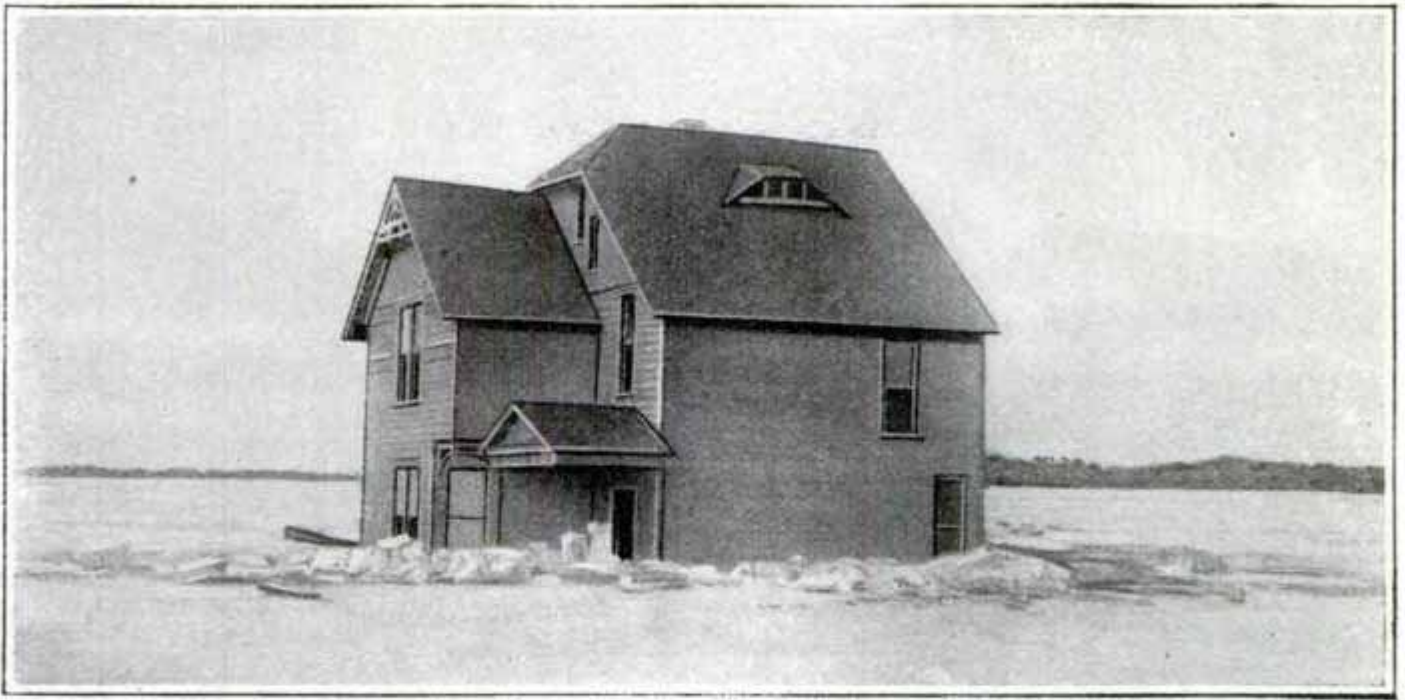
PARCEL POST BRINGS FARM AND KITCHEN CLOSER

By establishing direct relations between the ultimate consumer of farm products and the original producer, Postmaster-General Burleson believes that parcel post will solve many problems connected with the cost of living. He has directed that the postmasters at Boston, Atlanta, St. Louis, San Francisco, Washington, Baltimore, Detroit, LaCrosse, Wis., Lynn, Mass., and Rock Island, Ill., shall receive and register the names of persons willing to supply butter, eggs and farm produce at retail by parcel post. Printed lists of these names will be prepared from time to time, showing the kinds of commodities available, and will be distributed to town and city patrons who wish to buy direct. The farmer will be relieved of the necessity of carrying his produce to market, as the rural carriers will make daily collections at the farmhouse door, and the city carrier will deliver to the consumer.

ⒸThe thin paper used for cigarettes, called rice paper, is made from the trimmings of flax or hemp.



This Huge Locomotive is Built for Pushing



This Building Played a Strange Trick on the Moving Man

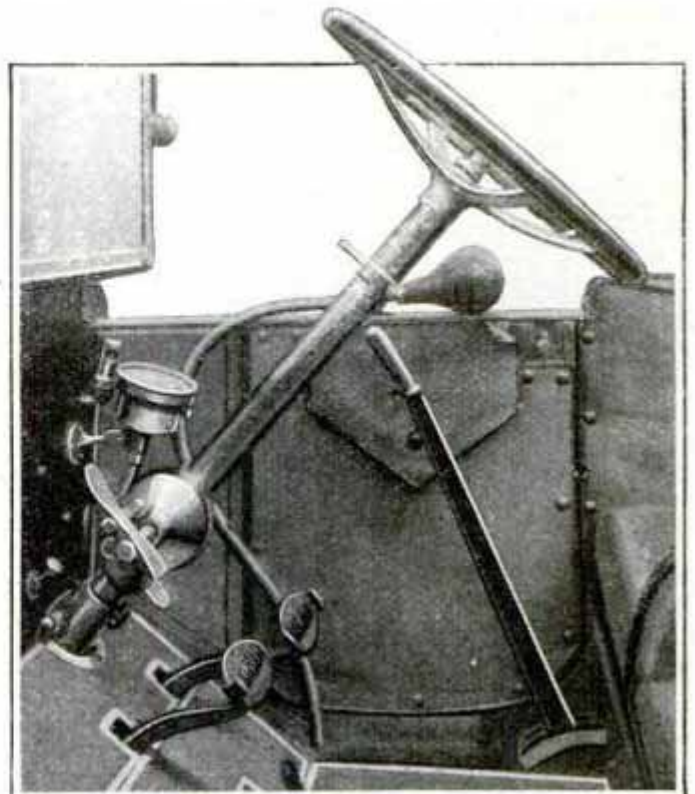
THE HOUSE THAT SANK IN A LAKE

While a moving contractor was debating the best landing place for a house which he was moving across a small Minnesota lake on the ice, the building unceremoniously sank through the ice in 6 ft. of water. It had successfully been moved from its former site and across half a mile of ice, which seemed abundantly strong to support it, but the dead weight of the building when it was brought to a standstill precipitated it through 10 in. of ice. As the weather was very cold, the water froze about the half-sunken house as well as inside, making it impossible to proceed. With the return of warmer weather, however, piling was driven close by, jackscrews lifted the building, and it was drawn ashore. The accident occurred about 150 ft. from the bank of the lake.

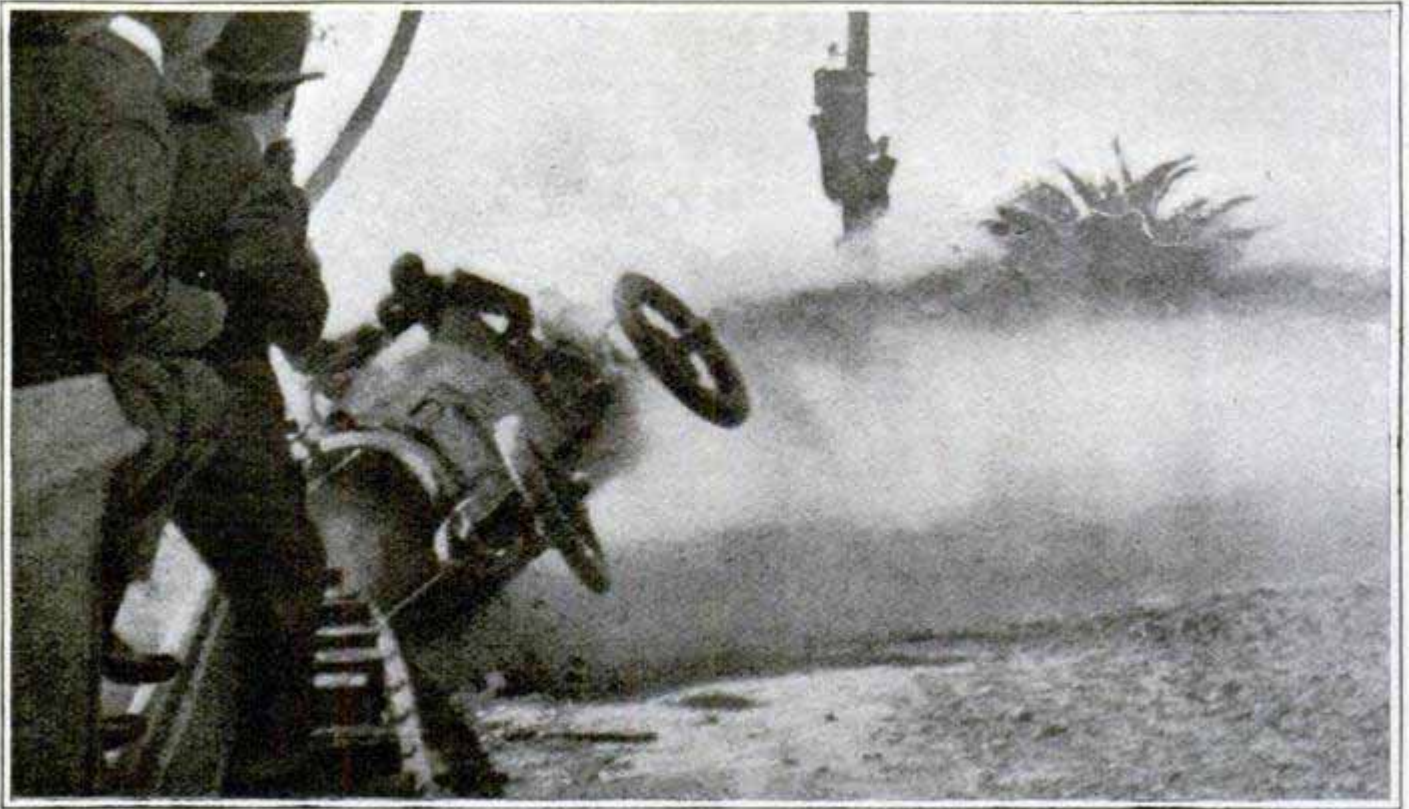
FOOT STEERING GEAR FOR AUTOMOBILES

A new feature in automobiles is an auxiliary steering gear operated by the feet. Drivers of motor vehicles are well aware of the tiresome strain upon the arms incident to the constant manipulation of the steering wheel,

and this new steering gear is intended to relieve this strain at intervals, as well as to enable the driver to use his hands in adjusting hat or gloves, curtains or robes, or any of the mechanisms of the car, while driving. This steering gear operates independently of the steering wheel. The weight of the foot throws it into engagement with the steering mechanism, and this engagement is broken the instant the foot is removed from the pedals.



Car may be Steered Independently of the Steering Wheel by Means of the Foot Pedals



A Crash at the Turn on the Race Track

HEAVY HAY CROP MAKES A DERRICK NECESSARY

So heavy is the hay crop in the districts where alfalfa is grown in the west that large stacks are the rule, and big machinery is essential in handling the crop.



Every farm growing alfalfa has a derrick of some description. The accompanying photograph shows one of the three types in general use. The central pole is from 25 to 30

ft. long, and is pivoted so as to swing freely with its load from the wagon or buck rake to the stack. The supporting framework rests on skids, so that the derrick may be readily moved from one stack to another. A man on the stack with a small guide rope swings the load to any desired place.

ⒸTraffic through the Suez Canal in 1913 was less than during 1912.

REMARKABLE PHOTOGRAPH OF AUTOMOBILE ACCIDENT

During the race for the Vanderbilt cup at Santa Monica, recently, a car, going at the rate of 60 miles an hour, at a turn lost a wheel and crashed into the fence. A photographer, perched a few feet from the scene of the accident, pressed the button the instant before he toppled off to avoid the awful blow. That the age of miracles is not past seems to be the only explanation of the fact that neither the driver nor his mechanic were injured and the machine had only an axle broken and the radiator smashed.

ELECTRIC SHIP PROPULSION PROVES SUCCESSFUL

The success of electric propulsion for ships seems to have been conclusively demonstrated by the recent full-power trial of the "Jupiter," one of the new colliers of the United States navy, and the first ship of heavy tonnage to be built with electrically-driven propelling equipment. During the 48-hour period of the trial this vessel maintained an average power output of 6,940 hp., and an average speed of a little over 17

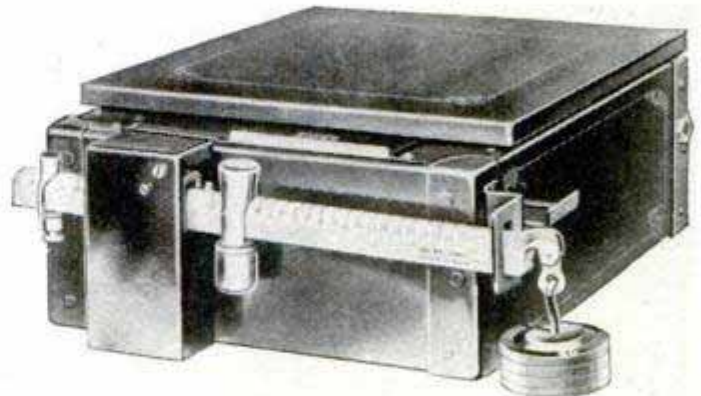
miles an hour, while the guaranteed speed was only 16 miles. The "Jupiter" is fitted with a single turbo-generator which supplies power for two separate motors, each of which drives one of the two propeller shafts. The placing of a dynamo and motor between the generator and the propeller shaft not only makes it possible to maintain the engine at its most efficient speed regardless of the speed of the propeller, but permits a more rapid and certain control of the ship's speed.

LAWYER STUDIES ACCIDENT WITH PLAT AND TOYS

A London lawyer, who specializes in personal-injury litigation, in studying a case to place the responsibility for the accident, and obtain a clear idea of the different phases of the affair, reconstructs the whole occurrence on a plat or plan of the locality, placing miniature vehicles representing the parties in such position that the question of right of way, traffic regulations, rules of the road, and such matters, are clearly shown. Thus equipped, he is able to place his case lucidly before the court.

NEW PARCEL-POST SCALE FOR POST OFFICES

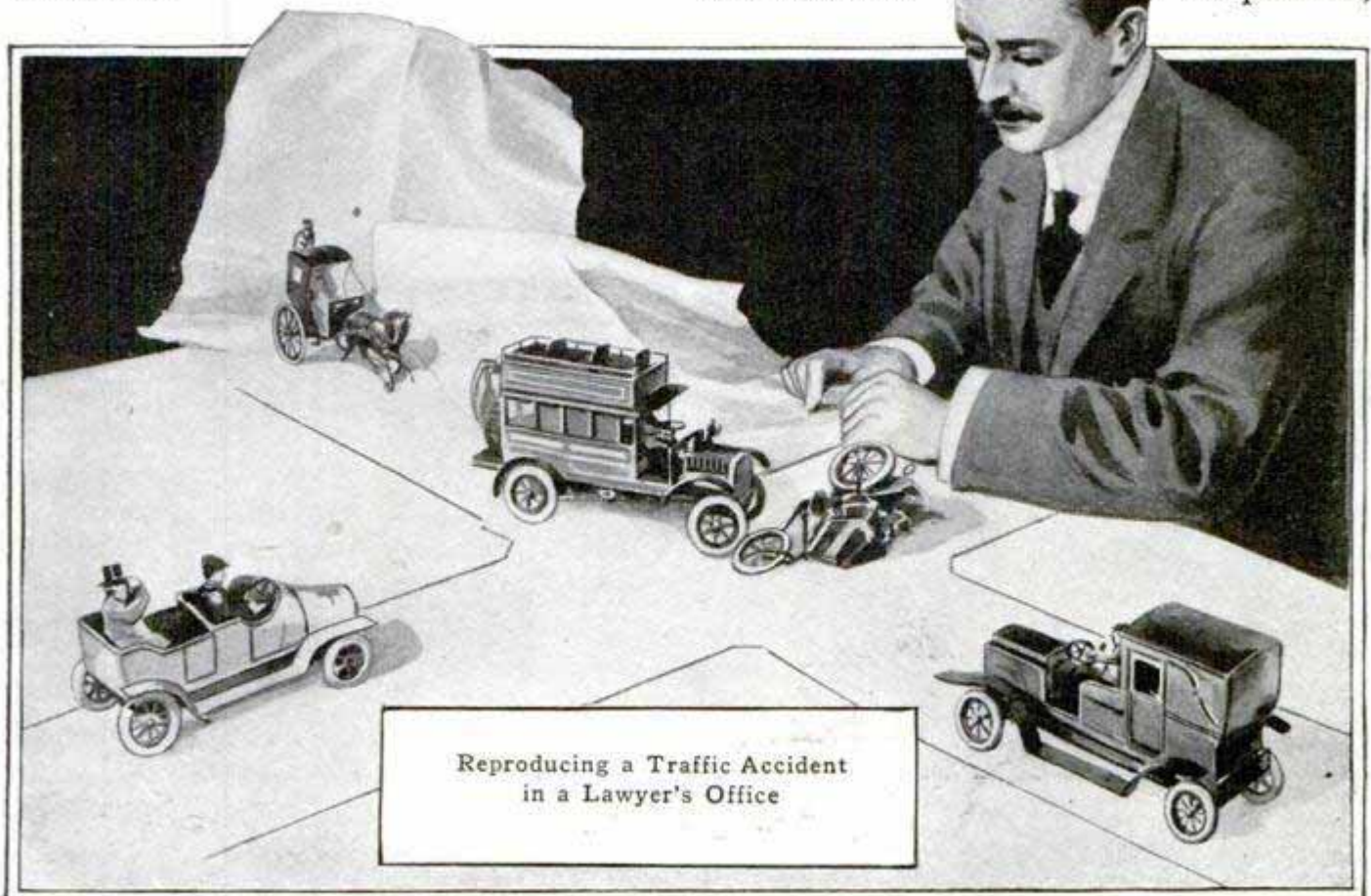
The demand of postmasters throughout the country for a practical, simple



Scale Designed to Meet Parcel-Post Requirements

and accurate scale for use in weighing the many-shaped packages sent by parcel post, has resulted in the adoption of a new model, the invention of a Chicago man. The new scale is low, entirely constructed of steel, and the beam is below the level of the platform, so that projections from odd-shaped packages do not hamper the easy read-weight. The set to one end and

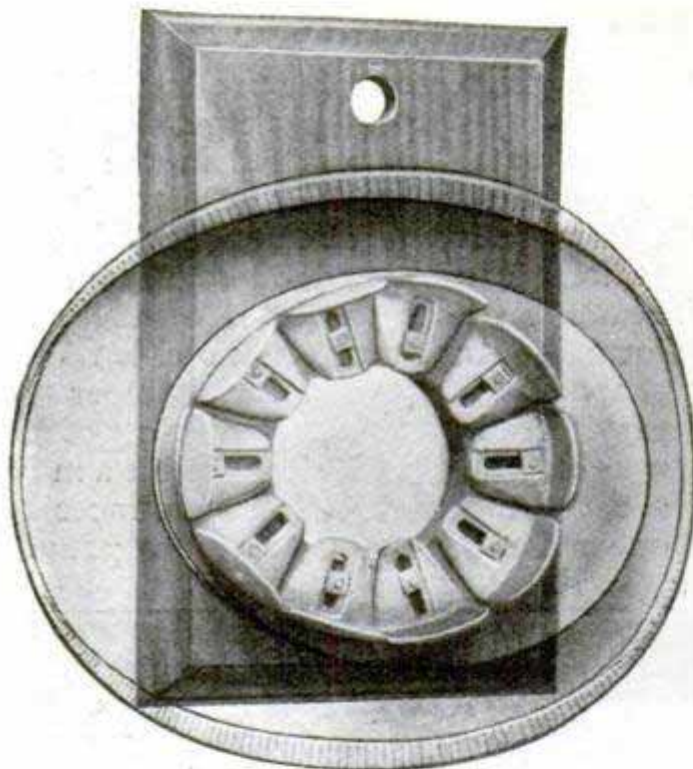
ing of the beam is ounces at to pounds,



up to 20, at the other. Solid steel weights, in multiples of 20 lb., are provided, with which to weigh up to the present limit, 50 lb., and also to the proposed limit of 100 lb. Some 30,000 have been ordered and will be distributed, so it is said, to every third and fourth-class post office in the country.

HOMEMADE HAT STRETCHER ASSURES COMFORT

An inventor who had been tortured by being obliged to wear a stiff hat which did not conform to the outlines



This Device Keeps a Stiff Hat Shaped
to Fit the Wearer's Head

of his head, conceived the idea of making a device which would enable anyone to adjust a new stiff felt or straw hat to the contour of his head. It consists of a series of iron flanges pierced for bolts and fastened upon a suitable board. An outline of the head is obtained by measurements or from an old hat. The flanges are then bolted into the required position, and the new hat is placed over the device and left for a time, no matter how stiff. It soon settles into the proper shape, and if the device is used as a hat hanger, the new headpiece will keep its shape and prove comfortable.

FIRST NEWSPAPER PRINTED IN ENGLISH LANGUAGE

The first newspaper printed in the English language, with its old-English type and its quaint account of events in foreign countries, was a pamphlet issued in 1621. Its title, "Corrant or Nevves from Italie, Germanie, France, and others places," is as curious as its contents. For many years it had been supposed that no copy of the Corrant was in existence, but recently a copy of this interesting document, which was the first step toward the modern newspaper, was discovered.

At the time the Corrant was published freedom of the press was a thing that did not exist. The publication of domestic news in England was forbidden by royal decree at that time and until 1641, and this accounts for the fact that all the news in the Corrant is from foreign countries. Even the privilege of printing foreign news was taken away by Star Chamber edict in 1632. But in 1641 the restrictions against both domestic and foreign news were removed. Crude as the Corrant may seem, it was the outgrowth of a long period of "journalistic" progress. Early in the sixteenth century news letters, each intended originally to keep some nobleman or member of the royal family informed, but later supplied to small lists of subscribers, came into vogue. These were written by hand. Then came the printed news book, issued at irregular intervals in a numbered series having a common title. The next step was the Corrant, which was followed by other pamphlets of the same class.

This copy of the Corrant is owned by a New York collector, who discovered it in a volume of miscellaneous pamphlets which he had bought at an auction of old books without suspecting its value.

Canada is considering the adoption of a postal library system by which books will be sent through the mail to card holders, and may be returned in the same way.

CORRANT OR NEVVES FROM ITALIE,

Germanie, France, and other places. 1621.

From N. polis the 28 of June.

That the Gallies being at sea under the coast of Liguria & Lusitania have surpris'd certaine Turkish ships and taken them.

From Venetia the 25 of June.

It continueth that the Turke having an armie of 350000, are the one halfe marched towards Poland, and that the rest he meanes to send into the parts of Hungaria, and Austria, the truth whereof will now appeare, and his intent, y^e summer being so farre spent, for in y^e winter they cannot hope such armies in those parts for want of provision, which is already there very scarce, and dear.

From Colen the 24 of July.

We understand by the latest letters out of Hungaria, that Bethelen Gabor notwithstanding the siege of Szechenesfall in Hungaria, by the Count de Bucquoy hath now got into the towne, so: the reliefe thereof 4000 men with store of provision, w^{ch} when Bucquoy perceiv'd, and understanding y^e Bethelen Gabor was on his march towards him, with his so great armie consisting of 70000 Hungarians, Dey-ouchs and Tartars, some letters in pass that Bucquoy thereupon with his army retired from the towne 3 miles backward, others write y^e he still continueth his siege afore the towne Szechenesfall, & that the passage is so beset one euer side by the Hungarians, as that neither he can retire, nor any provision of victuall be conveyed unto his army, whereby they are much distressed by want & dearth.

The Emperour understanding of the great forces of Bethelen Gabor wrote with all speed unto y^e Kings and States of Franckensland for their ayde & assistance, and withall whereas the Emperour was resolved to have gone for Prague, having also appointed a noble man, th^{at} was coming as Ambassador from y^e Kings State of great Brittain to take his course toward Prague, it is now concluded that he will as yet continue at Vienna in Austria, and the said English Noble-man is already here arrived, and shall very shortly have audience, what his message may be is not yet knowne.

From Vienna the 26 of July.

There came a Messenger out of Hungaria, from the siege of Szechenesfall with letters to his Imperiall Majesty, y^e contents whereof was kept secret, but howsoever it seemes unto the Emperour very unwelcome, so y^e few of us knowing what it might be, it was conjectured because of the battle lately fought, that Bucquoy was slayne, which as they write to their no small griefe is proved to true, as is generally reputed.

From Amberg in Bohemia 28 of July.

It is written that y^e Count of Spanheim his forces was exceedingly increase, that they are already 26000 men strong, and that he daily takes on more and more men to the great admiration of all men,

which his unlooked for strength, both encreas'd and quicken many that were formerly deterr'd at cast-dome, with the feare of these successe, he hath sent to his Kingly Majesty of Bohemia, desiring that he might have some money sent him, which was his onelie want, for the supplic whereof the Lords States of y^e United Netherlands have granted his Majesty much more then the somme Spanheim required, which is with all speede to be sent to him.

Whosoever they have granted his Kingly Majesty that he shal have twenty men out of every company in their provinces as well horse as foote, which shall shortly march by towards Bohemia, & toyme with the most courageous and resolute Counts of Spanheim, it is also thought that the Kings Majesty of Bohemia himselfe will march by with these men, for the chiefest of the Lords and States of the Kingdome of Bohemia, have written unto him with earnest entreatie desiring his returne.

The Marquisse of Rogereus Dorpe is already fallen into Bohemia with 2000 men horse & foote, being experienced old Soldiers, who is marching forward and bound to meet the Count of Spanheim at an appointed place betwene them determined, the issue whereof will be much longed after, but time will manifest what may be effected.

In the meane time it is very likely and generally thought that his Majesty of Bohemia shalbe possessed of his Kingdome againe: the rather because of the generall affection and love of his subjects their towards him, as also because of the crueltie shew'd upon those lately executed at Prague, and withall being out of hope of better dealing, their great overthrow of late in Hungaria, whereby as yet they have gone well forward in Bohemia, neither have any almost dared to resist them, the Emperours forces being still in Hungaria, but as it falleth out for the present to small purpose.

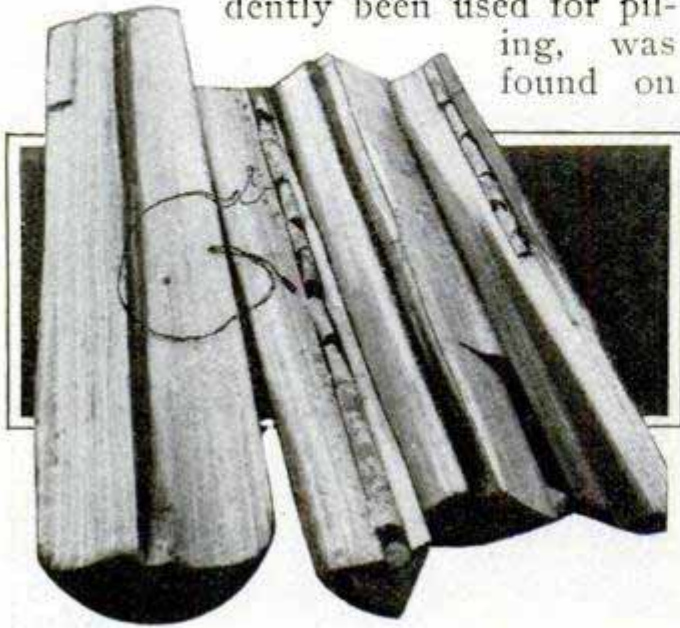
Some messengers out of Nabant signifie, that y^e Marquisse Spinola hath sometimes some strange fits, as in some sort distracted, the truth whereof will be knowne by the next letters, but whether it be so or no, this is certayne that the affaires of the Spanish Netherlands, goe at this time very ill forward without any good successe, and it is thought generally to be partly by reason of the death of y^e Arch Duke Albertus, and partly also because of y^e disagreement betwene Don Lewes De Valesse & the Marquisse Spinola, which is no small breach: but such as may work some unlooked for change there.

From the Palatinate 23 July.

It is written that the Marquisse Spinola leaveth his forces there, under the command of the Marquisse of Ansbach's brother, which Marquisse Ansbach, at the beginning was generall of the armies of the United forces, for the Palatinates defence, against the Spaniards, and now his brother Gen-

INFERNAL MACHINE FOUND ON BEACH

Loaded with enough dynamite to blow up the biggest wharf on the Pacific coast, a log, which had evidently been used for piling, was found on



Alarming Find by Beach Comber Who Was Sawing Driftwood

the beach near Port Townsend, Wash., recently. The stick was 30 ft. long and 2 ft. in diameter, and had been bored through the center nearly from end to end. Within the cavity thus formed, 30 sticks of dynamite had been placed, with an electrical detonator and insulated wires. A beach comber, engaged in cutting up old timbers for stove wood, had sawed one end off this piece of driftwood when he noticed the cavity filled with some kind of grease. While he was examining his find, a spectator noticed that the strange-looking "grease" was

dynamite, and after warning the man, took the sawed-off chunk to a neighboring laboratory for examination. The old piling had evidently been in the water a long time, and the cap, being badly rusted, could hardly have been exploded, but there was enough potential energy in the log to have blown a hole through the biggest steamer that sails Puget Sound. Where it had been used, and who had contrived the dangerous affair, is a mystery.

THE OLD GAME OF BOWLS RETURNING TO FAVOR

A healthy, clean and enjoyable sport is the game of bowls, played a thousand years ago on the greenswards of Great Britain, and again coming into popularity in America. Bowls is an outdoor game, played on a smoothly rolled turf, perfectly level, about 40 yd. long and preferably square, and affords excellent exercise. Bowling greens have been established by many clubs, as well as in the parks of Buffalo and other eastern cities, and the South Park Commissioners of Chicago propose to establish a green in Washington Park in that city next year.

The game consists in rolling hardwood balls toward a goal. But the balls used in bowls are not true spheres. They are slightly flattened on one side, and hence must be cast in such a manner as to roll in a curve which should bulge at least 2 yd. in 30. The goal toward which the bowls

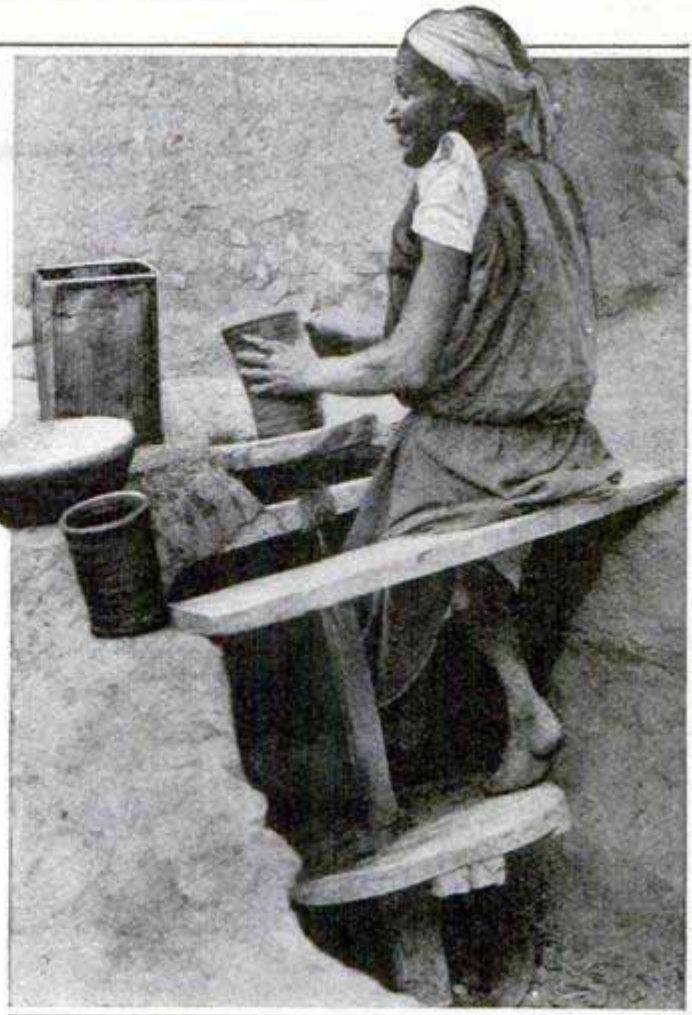


Delivering the Ball on a Green in the Old Game of Bowls



A Kiln Built of Sun-Baked Clay, in Which the Pottery is Fired

are cast is a smaller ball, called a "jack," white in color, which is first thrown forward down the rink to a point at least 25 yd. from the "footer" or starting place. The object of the game is to so place the bowls that they lie next to or in close proximity to the jack. In theory the game is very simple. Each player strives to cast his bowls to lie next to the jack, or to protect another good lie, or to dislodge an advantageous cast made by a competitor. The side whose bowls lie closest to the jack count one for every bowl lying nearer the jack than the nearest one of their opponents. But in practice it is found very difficult to control the latter movements of the bowls, which tend to roll in a circle. The field is divided into rinks of equal width, about 12 ft., the center and sides of which are marked with pegs at both ends. Around the edge of the green a ditch is dug, 4 in. deep and about 1 ft. wide. The bottom of this ditch usually has a wooden floor. There are four men in a team, or "rink" as it is termed, the leader being called the "skip," and he stands near the jack, directing the bowling of the men in his rink. He always bowls last. Each player has two bowls which he delivers alternately with his opponent. When all the bowls have been cast, an "end" is called, and the score counted. For the last two years the International Lawn-Bowling Tournament has been held in Buffalo, where the finest greens in the country are located. These greens are laid on a natural porous-rock foundation, giving them exceptionally fine drainage and a very level surface.



Egyptian Potter at His Work: The Wheel is Spun by the Bare Foot

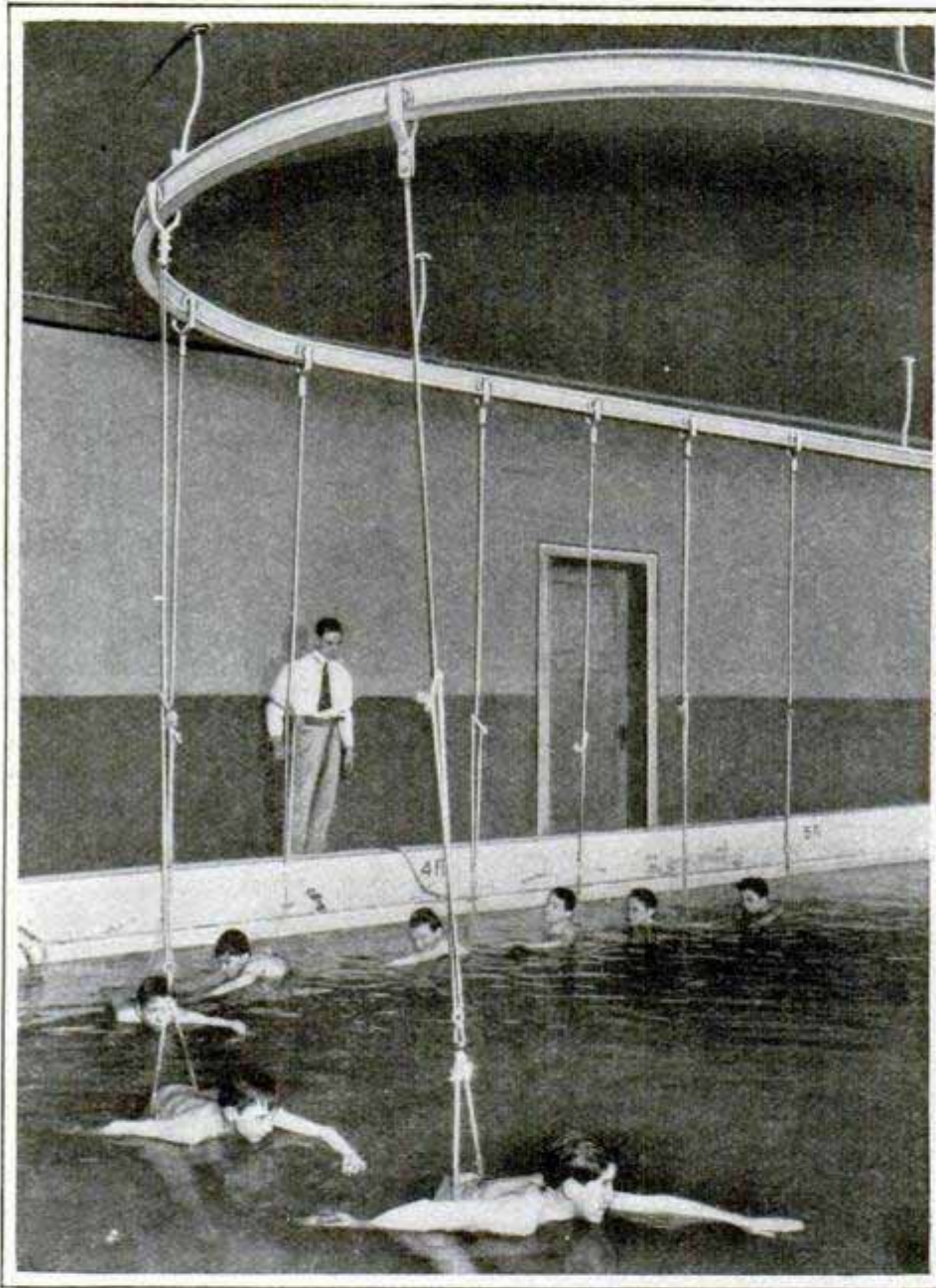
HOW POTTERY IS MADE BY NATIVES OF EGYPT

Among the native potters of Egypt the same devices and the same methods are in vogue that were used in the time of Joseph. The shaft of the potter's wheel is tipped at its lower end with an iron point which rests in a socket in the rock. Near the bottom of the shaft is a large disk. The potter spins this with his bare foot, while he molds the piece of pottery on the small disk at the upper end of the shaft. For turning out good ware quickly and accurately, all that is needed is a little water and a supply of the claylike mud found close at hand. After being fashioned to the right shape, the pottery is baked for three days in a kiln made of sun-baked mud.

☞ One American railroad in 1913 carried 111,000,000 passengers without loss of life in a train accident.

A WATER MERRY-GO-ROUND TEACHES BOYS TO SWIM

In one of the public schools of Cincinnati, having an 80-ft. swimming tank, an ingenious water merry-go-round has been constructed after plans made by the swimming instructor. It



Pupils Learning to Swim in a Cincinnati Public School

consists of an oval track suspended from the ceiling above the pool. Trolleys provided with strong ropes are attached to the track, and a harness is arranged at the other end of the ropes so that the boys may slip the broad belts about their waists and thus be supported in the water, while their limbs are left free. All a boy has to do on the merry-go-round is to relax

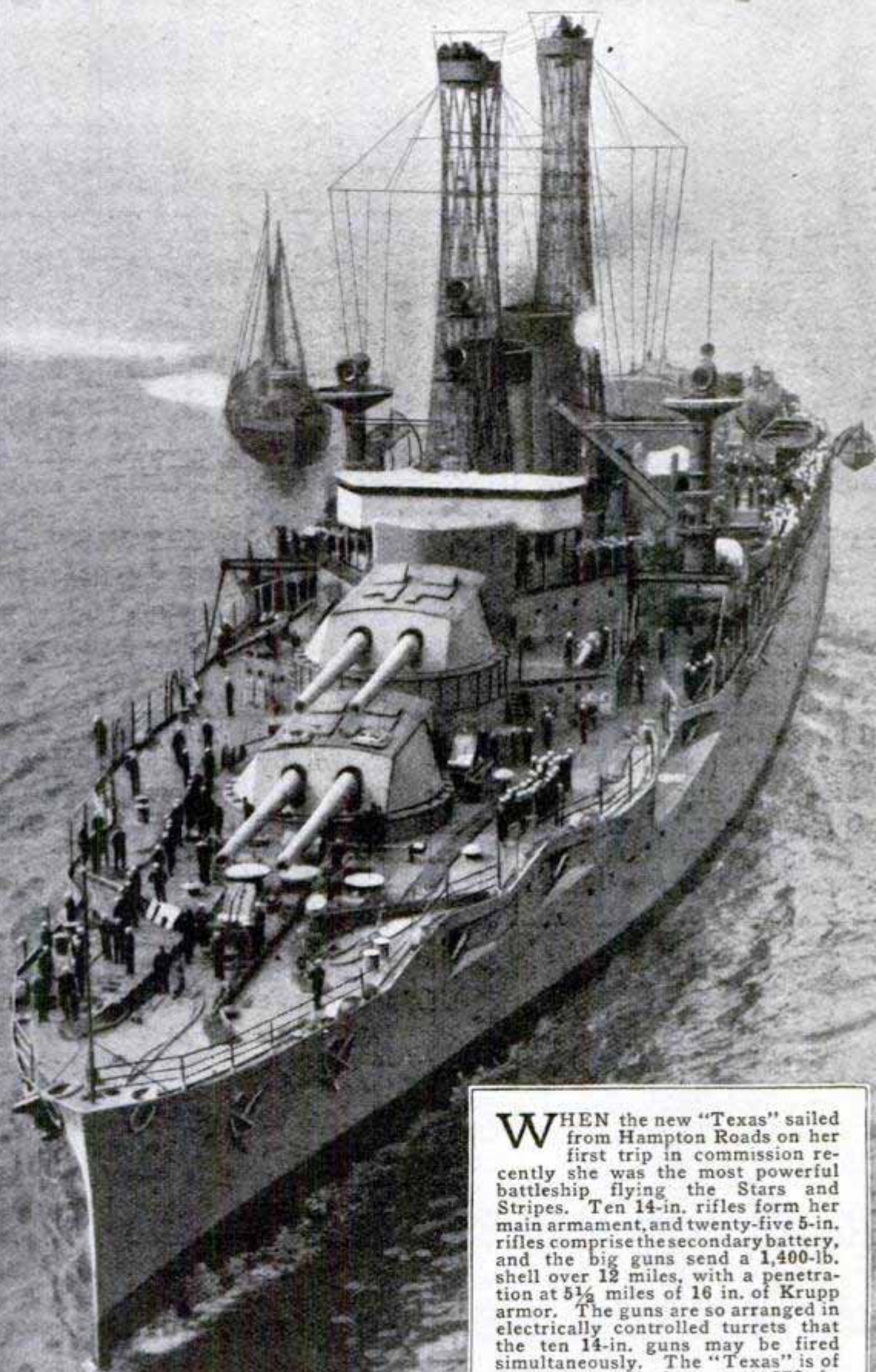
in the water. It would be impossible for him to sink. Consequently the fear of drowning or ducking under is removed, and the boy strikes out for himself with the stroke explained and demonstrated by the swimming instructor, who has but to walk around the edge of the tank and see that his pupils are making the right strokes. Pupils learn very quickly by this method to swim correctly.

MILK IS NOW VAPORIZED TO PRESERVE IT

Patents have been granted in Germany on a new method of sterilizing milk, in which the fresh milk is sprayed through a vaporizer into a container kept at a constant temperature of 170° F. by flowing steam. Thus the milk vapor is instantly raised about 110° F., remaining at this heat only about one-third of a minute, and passes on into the sterilizing cooler. By this means the milk, without undergoing any detrimental changes, is freed from certain objectionable bacteria which the ordinary pasteurization methods leave untouched. The new process is said to keep milk without change for a period of four days.

CA new sport indulged by Paris artists is relay racing in portrait painting. Six artists are each given five minutes on a portrait. As soon as one has finished, another jumps in his place and paints feverishly for his allotted time. The results are said to be remarkable.

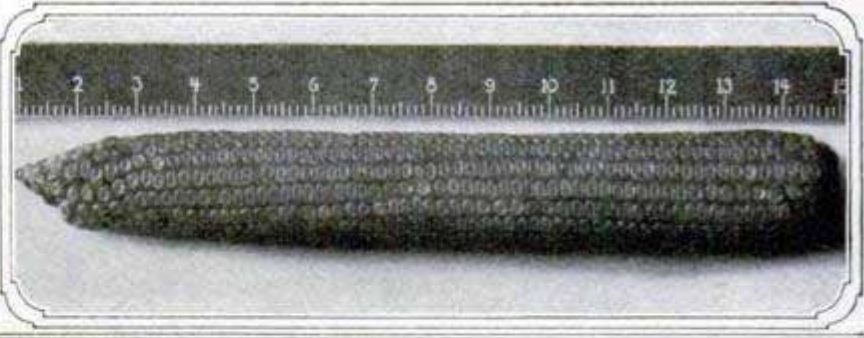
THE NEWEST SUPERDREADNOUGHT OF OUR NAVY



WHEN the new "Texas" sailed from Hampton Roads on her first trip in commission recently she was the most powerful battleship flying the Stars and Stripes. Ten 14-in. rifles form her main armament, and twenty-five 5-in. rifles comprise the secondary battery, and the big guns send a 1,400-lb. shell over 12 miles, with a penetration at $5\frac{1}{2}$ miles of 16 in. of Krupp armor. The guns are so arranged in electrically controlled turrets that the ten 14-in. guns may be fired simultaneously. The "Texas" is of 27,000 tons displacement, 573 ft. long and 95 ft. beam.



"Texas"
Saddle, Val-
ued at \$1,000,
Won in Riding
Contest



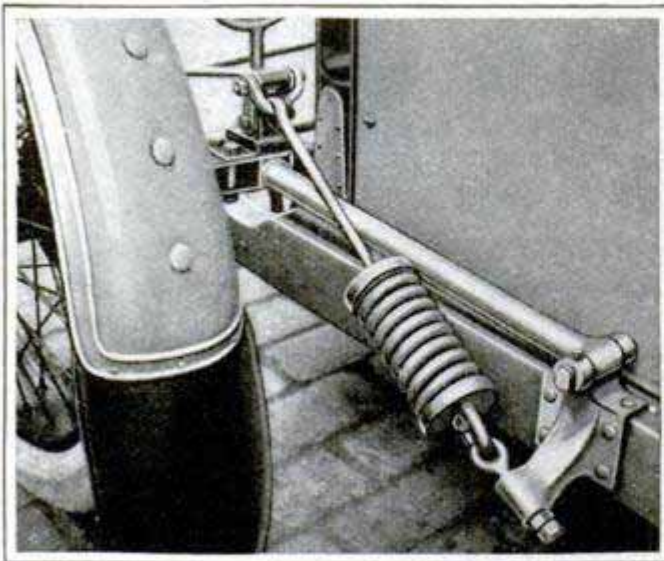
The Ear of Corn Which Won the Trophy at the
Dallas Corn Show



Game Rider
and
Game Horse
in Contest
of Skill
and
Endurance

A SPRING SUSPENSION FOR AUTOMOBILES

An automobile recently seen on the boulevards of Paris attracted much attention by reason of its novel suspension. The underslung body is supported by coiled springs, connected by a bracket to the frame, and to the axle by a hinge, giving great freedom of vertical movement. This arrangement permits a very low body, with road clearance of only a few inches. It is



French Suspension Device for Automobiles

said the coiled spring absorbs almost all the vibration, and that shock absorbers are not necessary with this springsuspension.

FINE PRIZES WON AT THE DALLAS CORN SHOW

From all over the United States contestants sent their best ears of corn to the Dallas Corn Show. The winner of the trophy, a cup worth \$1,500, was an Illinois man, whose offering, as shown by the camera, was an almost perfect ear of corn, 14½ in. long. Another prize, well worth the winning, was a "Texas" saddle, valued at \$1,000, a marvel of leather work ornamented with gold and silver, beautifully carved. To win this, contestants rode "outlaw" horses, as wild and as unmanageable brutes as ever stood on four legs. Their skill was sorely tried in these contests, and a snapshot was taken of one rider, poised in mid-air, all four feet of his "cayuse," or bucking pony, off the earth. A moving picture of this particular contestant would have shown him the next instant hurtling through the air and into the wire fence, while his mount pirouetted gracefully about the inclosure, evidently enjoying his victory.

CSawdust is now baked in retorts and illuminating gas extracted for street lighting in lumber regions. A ton of sawdust yields 30,000 cu. ft. of gas.

QUEBEC CAR FERRY HAS NEW TIDAL DECK

A novel idea for making a car ferry independent of tides has been put into practice in the vessel used by the Canadian government between Quebec City and Point Levis. A movable deck, capable of carrying a locomotive and a train of 1,400 tons on three tracks, has been provided, each track being 270 ft. long. The deck may be raised or lowered 20 ft. by means of gearing connected with the boat's engines, so that trains may be taken on or delivered at any time, irrespective of whether the tide is high or low. The ferry takes the trains across the St. Lawrence River, and is made necessary by the collapse of the first Quebec bridge, the new one being unfinished. The vessel is equipped with ice breakers, and a nickel-steel propeller is driven by a compound condensing engine.

CURIOUS STAIRWAY MADE OF GRINDSTONES

A well-known skate manufacturer in whose factory many huge grindstones



are worn away in the process of finishing, has built a curious stairway at his residence from the worn-out stones. The steps are laid in pairs, the novel circular form making an attractive addition to the landscape. An iron handrail is provided on either side.

SAFETY FOR STREET-CAR PASSENGERS

The streets of Washington, D. C., are broad, and persons waiting for street cars can scarcely stand upon the



Safe from the Menace of the Auto

curb, for it takes them some time to cross the intervening space when the car arrives. A more convenient way is to await the car at the side of the car tracks, but there they are exposed to the danger of swiftly passing autos and carriages. The street-car company has erected, as part of their "safety-first" campaign, iron railings separating the waiting passengers from the traffic. A neat sign advises, "Persons Waiting for Cars Stand Inside the Railing."

PANAMA REPUBLIC TO BUILD RAILWAYS

That portion of the Republic of Panama lying between the Canal Zone and Costa Rica is to have railway facilities by which the coffee from the Boquetta district may be readily brought to the coast. A 36-in. gauge road will be constructed from Pedragal to David, 5 miles, and thence to Boquetta, 28 miles. From David a 22-mile branch line will be built to La Concepcion. An American firm will build the road, which will cost about \$1,600,000.

SAILING IN WATER SHOES A NEW SPORT

Although there have been numerous devices for "walking" on water, a Boston man has



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A Summer Sport Which Breaks No Speed Laws

demonstrated a new form of sport by carrying a small sail while wearing water shoes, and thus making good progress without the violent physical exertion necessary in the laborious process of so-called walking on the water. Any form of sail may be used in this sport, from the simple sheet on two sticks shown in the photograph to a full-fledged lateen sail similar to that familiar to boys who have experimented with sailing on skates.

CA steam-driven air-compressor engine, weighing 900 tons, with cylinders 48 and 84 by 60 in., was recently built in 38 days in Pittsburgh.

MODERN MICA MINING IN INDIA

Some of the most valuable deposits of mica in the world occur in India, where for centuries they have been worked in the crudest possible fashion by the natives. Recently American capital has been interested and modern methods installed, and mica is today being mined in much the same manner as metallic ores. The rapidly increasing demand for mica in electrical trades, owing to its high insulating power, has resulted in considerable rise in price. Not only is the high-grade mica utilized, but the scraps are ground to powder and form an important part of the sparkling decorations seen in many wall papers. In the old days about the most important use for mica was for the windows in hard-coal stoves. It was often called "isinglass," although erroneously, as isinglass is really the thin gelatinous plates obtained from the air bladders of the sturgeon, and would not withstand the scorching heat of a hard-coal fire.

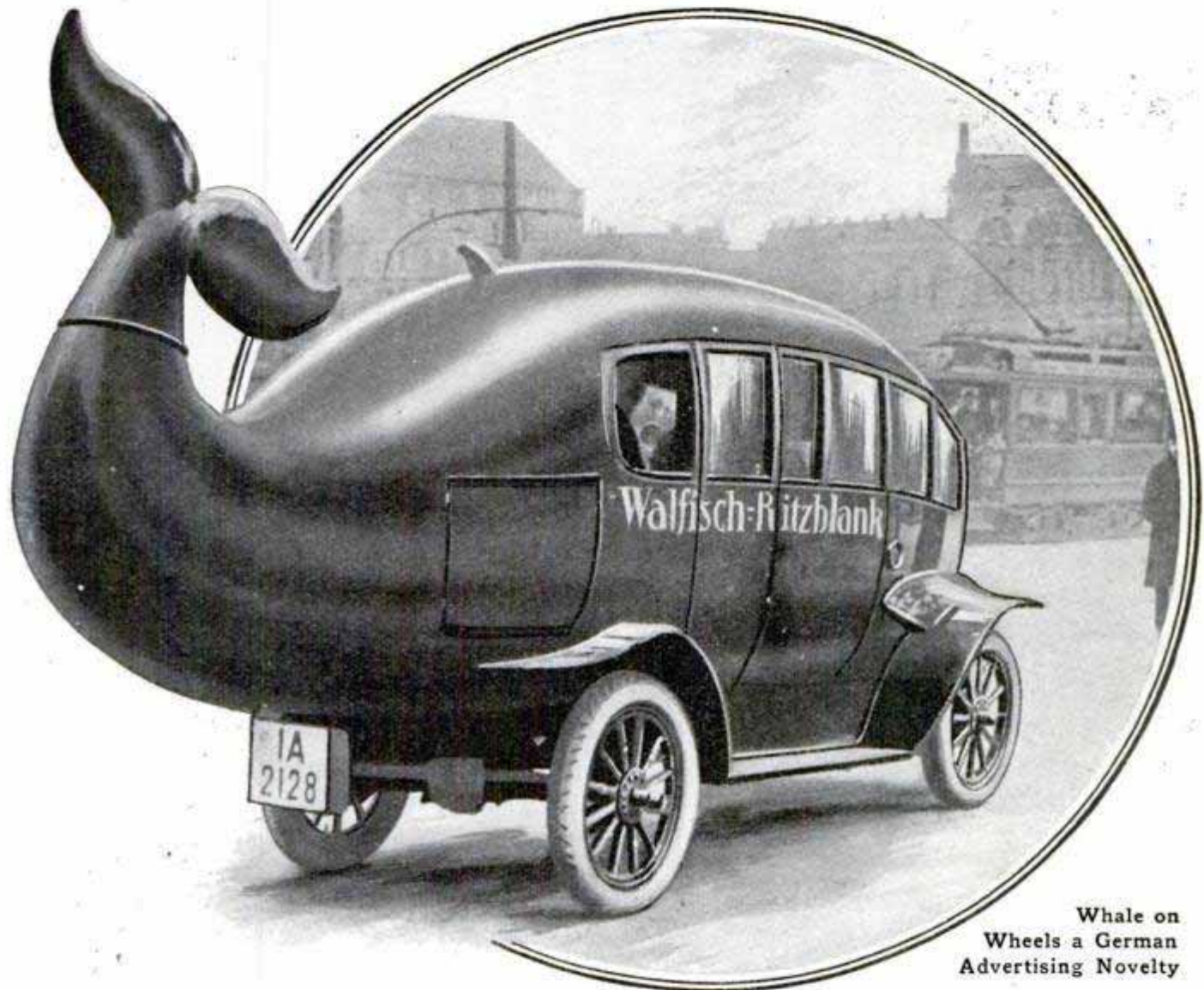
NAVY WILL USE OIL RANGES FOR COOKING

Oil will supersede coal for fuel in the navy, not only in heating the boilers, but in the ranges for cooking purposes. Careful investigation demonstrated the economy of fuel oil in the latter connection over both coal and electricity, while a saving of over \$8,000 in first cost was a strong factor in determining the installation. The amount of food cooked on a battleship each day is enormous; the flour for one batch of bread for the crew of a modern dreadnought amounts to six barrels. The daily cost of cooking by the different methods has been ascertained to be \$22.50 for an electric range; \$16 on a coal range, and only \$5.65 on a range using oil as fuel. The oil-burning range is clean, there is a complete absence of ashes, and the fuel is the same as that used by the boilers, so that no separate store is necessary.

LEVIATHAN ON WHEELS IS ADVERTISING FEATURE

A whale-shaped automobile is being used in Berlin to advertise a proprietary article, and attracts considerable

through information afforded by the card-index system maintained by the authorities of the port of New York. When the wireless brought word of the stranding of the steamer, giving its location, the card-index file was



Whale on
Wheels a German
Advertising Novelty

attention as it whirls through the streets of the German capital. The body of the automobile is shaped to represent the head of the whale, while an extension shows the tail raised, the flukes in the air. Windows afford plenty of light.

CARD-INDEX SYSTEM SAVES STRANDED STEAMER

When the British freighter "Queen Louise" ran aground recently near Sea Girt, N. J., she was quickly refloated through the combined efforts of a number of tugs and lighters brought to the scene of the disaster

quickly scanned, the names of available tugs and masters found, their telephone numbers and the names of the masters indexed with them, so that it was but a matter of a few minutes before a salvage fleet was organized and on its way to aid the distressed vessel. Lighters stood by and received such part of the cargo as it was deemed advisable to unload to lighten the steamer, the tugs were harnessed in tandem under the direction of the Revenue Cutter Service, and wireless apparatus transmitted the orders to each vessel, so that with a mighty "pull-all-together" the great freighter was easily moved out of the sand and out of danger.

AUTOMATIC CONTROLLER FOR GAS STREET LAMPS

The streets of Leeds, a large manufacturing city of England, are lighted with gas lamps, and lighting and extinguishing them has entailed a large expense. The city council has now adopted an automatic controller, which both lights and puts out the lamps at any predetermined time, without the need of lamplighters, the only attention given them being when the lamps are cleaned or mantles installed. The controller is a clock device, with a by-pass for a pilot light. Winding the mechanism once a week, the cleaning of the lamps being done at the same time, is expected to save the municipal-



ity many thousands of dollars each year in labor cost, in addition to other thousands saved in gas, as all the lamps are lighted and extinguished simultaneously.

OCEAN LINER FLASHES ITS NAME IN ELECTRIC LIGHT

Instead of hiding its name in small gilt letters at the bow, a liner running between Holland and South America has its name in letters 5 ft. high on a sign 22 ft. long, carried between its smokestacks. By day the name shows white, but at night the letters are illuminated by electric bulbs, red on the port side and green on the starboard side. While in port, the sign is brightly lighted all the time, but at sea, the current is turned on only while passing another ship.

ROCHESTER STREET RAILWAY HANDLED BY PHONE

A satisfactory handling of the street-railway service in Rochester is obtained through the use of telephones from every terminal direct to the chief dispatcher's office, enabling the train crew to keep in touch with the main office, reducing headway, if congestion is threatened, and permitting the sending out of special cars on any line when necessary. The street-car problem in Rochester is complicated by reason of the topography of the city and its division by the Genesee River, but by the installation of a telephone-dispatching service many troubles have been avoided.

"AIR MOTOR" BUILT BY BLIND MAN

What the builder calls an air motor, but which is in reality a system of nearly one hundred wind wheels of various sizes, all supported on a pole about 15 ft. in height, is one of the curious sights in an Ohio town. The builder is blind, and the whole collection of wheels was built with no other tools than a saw, hammer and knife. Each wheel is so beveled and arranged as to catch the wind,



no matter which way it blows, and either a light breeze or a tornado sets the wheels spinning so rapidly that they look like so many blurs. This "air motor" was built mainly for the purpose of frightening the sparrows away from the garden, but partly for the pleasure it gives the blind builder to hear the spinning of the wheels which he cannot see.

THE SIMPLEST POSSIBLE TYPE OF RACING "YACHT"

At many points on the Atlantic coast as well as in English bays and harbors, a popular sporting event is "yacht" racing with little flat-bottomed boats as the contending craft. For the true waterman there is almost as much sport in a race of this kind as in sailing a much larger vessel or even watching the big 90-footers compete for the "America's" cup.

Nothing could be simpler to build, rig and sail than these little boats, known in different sections by various names, such as "punt," "bateau" or "sharpie." Pointed at both ends, with sides 14 in. to 18 in. deep, they are ordinarily built about 14 ft. long and 3 to 4 ft. across at the widest part, amidships. Of course, such a craft is not designed for seaworthiness and is intended primarily for rowing in still, shallow waters, but rigged with a short mast and a spritsail, there is a fair degree of safety and much sport to be had even in fairly rough water. The certainty of a thorough wetting adds to the excitement.

It is not necessary to add anything to the equipment of the rowing "sharpie" to make a racing yacht out of it, except the mast and sail. Keels and rudders are considered superfluous by

the amateur sportsmen who pride themselves on their skill in handling these tiny craft. A short oar over the lee side, held firmly against the gunwale by the navigator's bare foot and manipulated by one hand, answers for steering as well as for a center-board. The sheet leads directly from the boom to a cleat within easy reach of the one-man crew, who also serves as ballast, throwing



A Flat-Bottomed "Sharpie"
Rigged for Racing, Showing How
It is Steered and Navigated

his weight as far to windward as possible when "reaching" across the wind, and varying his position as necessary.

In a stiff breeze these little boats make surprising speed, and regattas in which sharpie racing is one of the principal events furnish much entertainment and not a few thrills, for spectators as well as for participants.

ELECTRICAL MAP TEACHES GEOGRAPHY

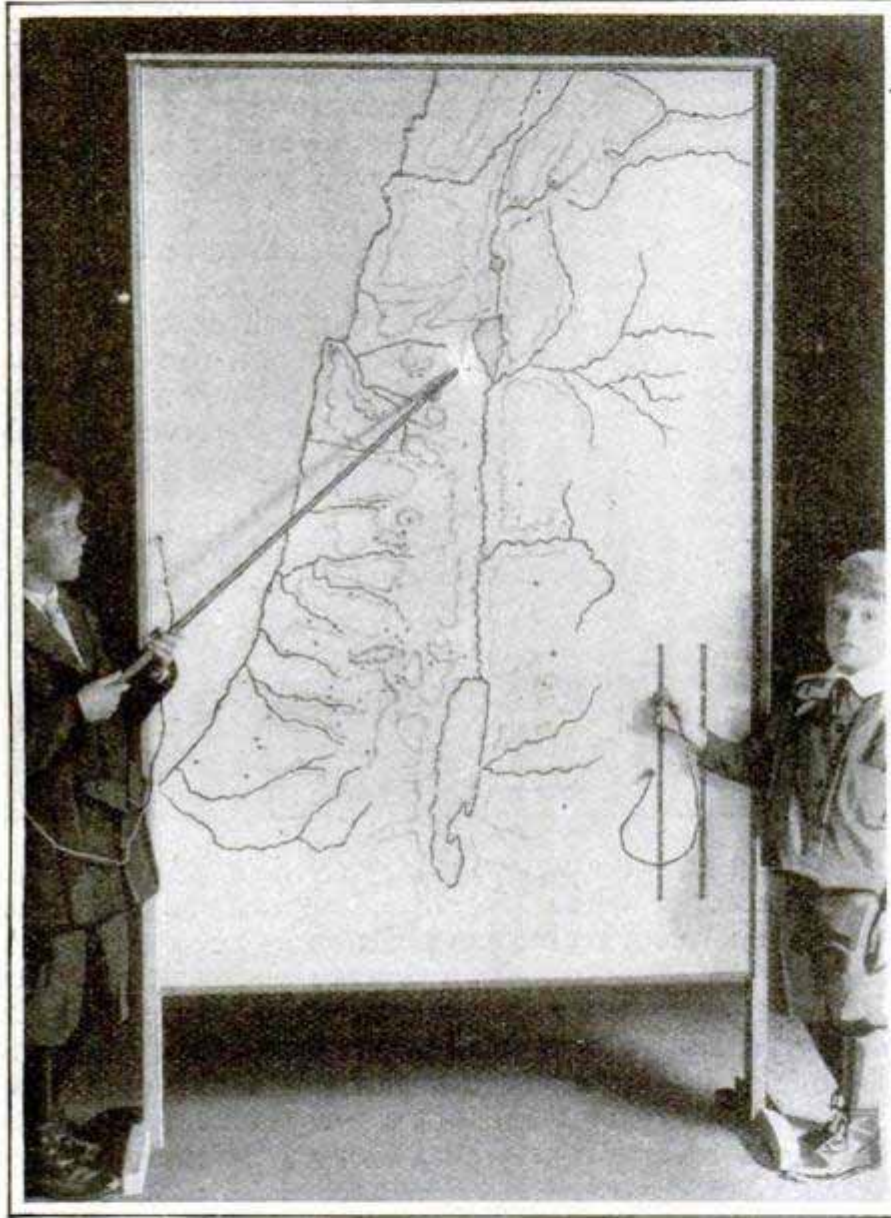
A Sunday-school teacher in California has invented an electrical map that has greatly aided in teaching the geography of Palestine to pupils. An outline of the country is drawn on heavy pulp board, and the principal points are indicated by brass-headed tacks. At the back of the map these tacks are connected by insulated wires to switch plugs at the lower end of the board, a name being printed oppo-

site each plug. Halfway up on one side of the board is another electrical connection into which is plugged a wire connecting with a wand used by a pupil to indicate the location of cities, towns, mountains and rivers. This wand terminates in a small electric lamp, surrounded by a wire cage, for the protection of the bulb and also for making electrical connection with the tacks. The process is simple, one

boy acting as switch tender, and another using the wand. The teacher asks a boy to locate Mt. Tabor. The switch tender puts the plug in the switch opposite the name "Mt. Tabor" and the boy with the wand places the end of it

MACHINE MEASURES GLARE OF BOOK PAPER

An instrument has been patented by which it is possible to measure the amount of glare from glazed paper, which is so objectionable to magazine and book readers. Highly calendered paper, that is, paper so treated that the light reflected when the paper is held in certain positions produces a glare, causes the pupils to contract, lessening the visual acuteness and producing eyestrain. In seeking to avoid this, publishers were confronted by the need for an instrument which would enable them to specify the glaze or gloss permissible. Investigation developed the fact that light reflected from glazed surfaces at an angle of 57.5° is polarized, and that the percentage of polarized light furnishes a measure of the glare. A closed box is provided with a screened light, fixed in one end in such manner that a certain definite amount of illumination is provided, which falls at the prescribed angle upon a piece of the paper to be



Electric Map Makes the Study of Geography Interesting

on the tack he thinks is the proper location for Mt. Tabor. If he is correct, the lamp immediately lights; if not, there is no light, for an electrical connection has not been made. Dry-cell batteries furnish the necessary current. Patents have been applied for on the device which, it is believed, will be largely used in the public schools.

☞ A statue in honor of De Lesseps is proposed for the Canal Zone.

tested. An eyepiece equipped with prisms provides a means of determining the amount of polarized light as compared with the part which is diffusely reflected, and hence not polarized, and the percentage of glare can be computed from the reading on a graduated circle. In this way a paper may be specified which will not exceed a certain per cent glare, enabling the printer to fit his product to the reader's eyes.

DETECTION OF ARTIFICIAL DYES BY ELECTRICITY

Difference in the electrical conductivity of dyestuffs, a Russian chemist has discovered, forms a certain test of the presence of artificial coloring matter in foods, preserves and beverages. Careful measurements of the resistance of certain coal-tar dyes has revealed the fact that they are far better electrical conductors than animal or vegetable dyes. With either water or alcohol as solvents the result is the same, and the new method furnishes a valuable means for detecting the addition of artificial coloring matter to articles intended for food.

AUTO TRAILER CARRIES BAGGAGE

To give additional space for carrying baggage an English automobile manufacturer has constructed an auto trailer, a device which can be attached to the rear of any car and is capable of carrying a considerable load. This form of trailer is attached to the rear of the automobile at two points, preventing it from turning over or "cutting corners" so long as the car itself remains on its wheels. It runs on a caster wheel, equipped with springs and pneumatic tire. It is of sufficient size to take on steamer trunks, suitcases, and the like.

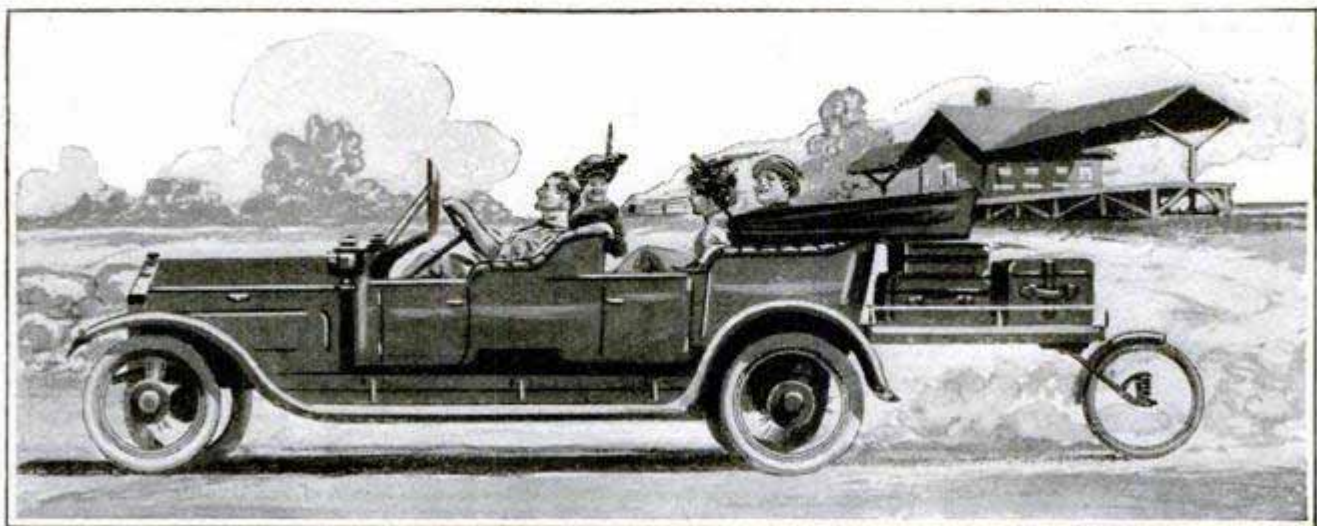
POSTAL AUTHORITIES TEST NEW LETTER BOX

A lidless letter box is being tested by the Post Office Department to determine if it is adapted to the exact-



Letters can be Put in This Mail Box without Lifting a Lid

ing demands of public service. Its advantage lies in the fact that letters may be deposited in this new mail box without lifting a lid. A system of troughs are arranged to carry off all water, so that rain cannot enter, and it is impossible for anyone to remove



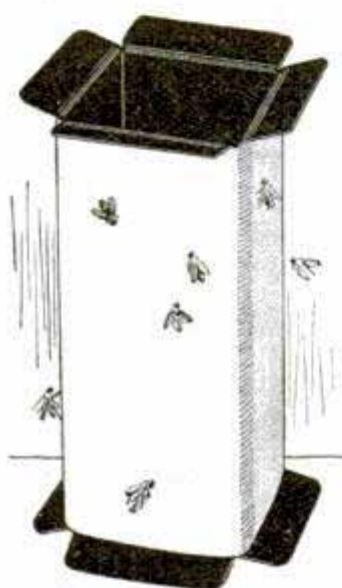
Courtesy of The Car

English Device Solves the Luggage Problem for Automobilists

a letter once dropped within the receptacle. Anyone who has attempted to deposit a number of letters in an ordinary street-corner mail box on a rainy day, while holding an umbrella with one hand, will see the obvious advantages of this invention.

NEW HOLDER FOR STICKY FLY PAPER

A novel contrivance for holding sticky fly paper securely, and keeping it in such position that tablecloths,



centerpieces and polished surfaces do not and cannot come in contact with the paper has recently been patented. It consists of a hollow box-shaped affair of thin metal, the outer ends of which extend outward, forming guards which keep the body of the device away from the surface of its support, while a full-sized sheet of sticky fly paper is folded about the center, and kept in place by projecting prongs thrust through the edges of the paper.

RADIUM-TIPPED ROD DRAWS LIGHTNING

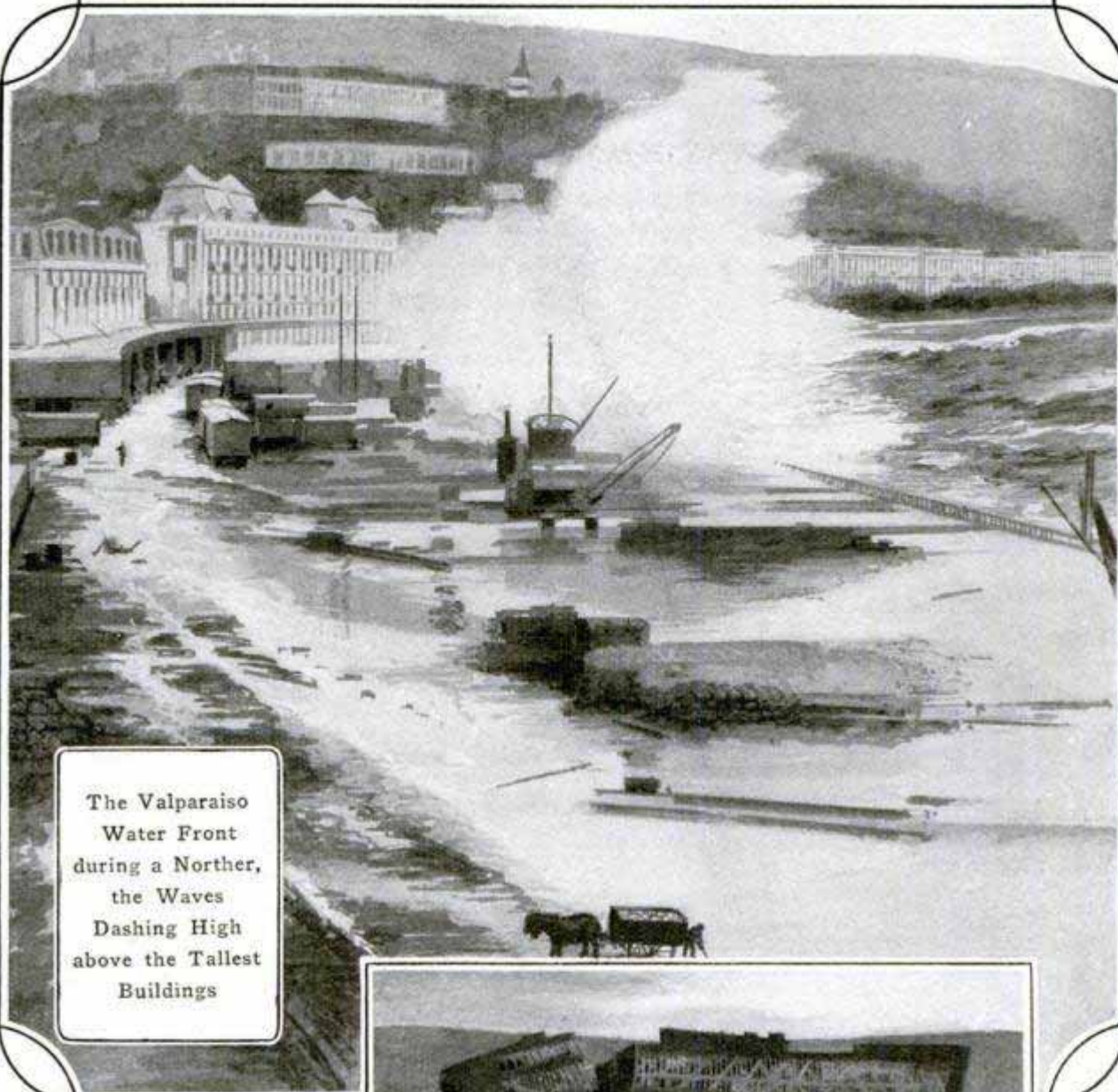
A French scientist recently constructed a novel form of lightning rod, the tip of which is formed by a ring of radioactive substances which, as is well known, ionize the air for a considerable distance in every direction. The principle underlying the invention is that the electric spark in its swift passage from the sky to earth, will more likely seek its path through the ionized air to the rod and thence harmlessly to the ground, than to some other conductor in the neighborhood.

EFFECTS OF A "NORTHER" IN A CHILEAN HARBOR

The west coast of South America is but a narrow shelf on the slope of the Andes, from which the ocean bottom sinks away at an angle of about 45 deg. At Valparaiso, on the Chilean coast, where most of the shipping centers, the shore slopes off so abruptly that it is almost out of the question to build a breakwater, and as the port is open from the direction of the approach of the deadly gales known as "northers," it sustains an annual loss of millions of dollars as the result of the damage inflicted by these storms.

The "malecon," or seawall of the city, is a solid mass of stone and railroad iron, but despite its strength, there is rarely a storm which does not break through in some place, as the mountainous waves rolling in from the Pacific break full upon it. And these waves are not merely huge "white-caps," but great masses of water, which dash in spray 150 ft. high, overtopping a modern 10-story building. Although great damage is done along the sea front, it is the shipping which must stand the staggering losses. The great fleet of sailing vessels which take nitrate from Antofogasta and Iquique, and bring coal to Valparaiso on the return voyage, feel the full force of the northers in the open roadstead during the winter season. Not infrequently as many as half a dozen ships are wrecked in a single storm through their moorings giving way, allowing them to drift and be dashed to pieces upon the seawall. Often, indeed, the seas are so heavy that ships founder even when their moorings hold.

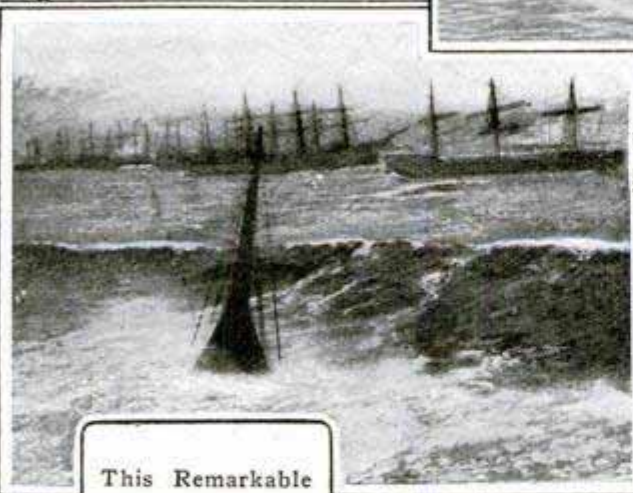
Normally, because the greater part of the cargo is carried aft, a ship will sink stern first, tossing its bowsprit skyward as it plunges into the sea. Foundering at its moorings, however, as shown in one of the accompanying illustrations, the anchor chains drag down the bow, the stern being the last part of the vessel seen as it disappears beneath the waves.



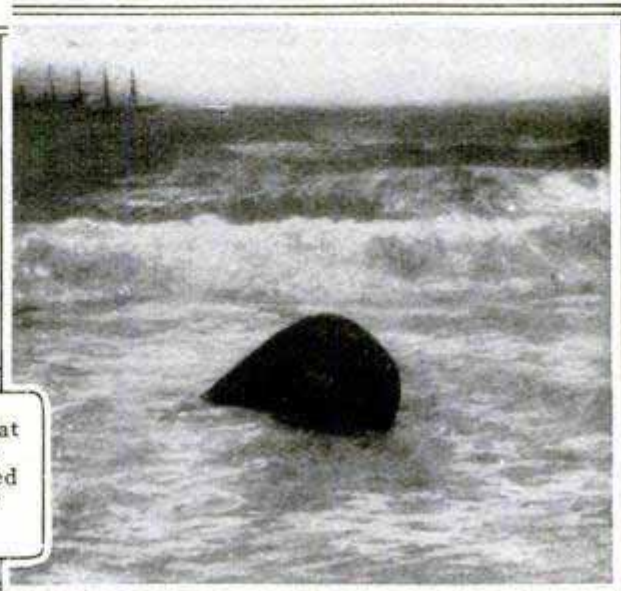
The Valparaiso Water Front during a Norther, the Waves Dashing High above the Tallest Buildings



Chilean Man-of-War Wrecked in Valparaiso Harbor by Norther



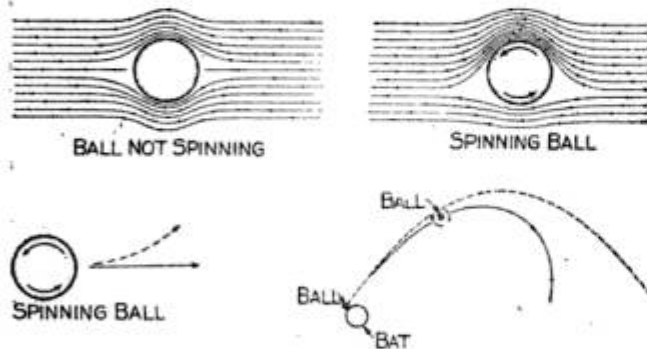
This Remarkable Photograph of a Sinking Ship Shows Only the Bowsprit above Water as It Goes Down Stern First



This Ship, Swamped at Anchor by a Norther, Sank Bow First, Pulled Down by Her Anchor Chains

WHY A BASEBALL TRAVELS IN A CURVED PATH

Every baseball enthusiast knows how a curved ball is thrown. If a fast ball is thrown with a whirl, it will fly in a curved path, the curve being in the direction that the "nose" of the



The upper sketches show how a spinning ball and one not spinning are affected by the air stream. A ball spinning as shown in the lower left-hand sketch will, when thrown, curve in the direction of the dotted line. The lower right-hand sketch shows how a high foul curve is in the direction of the spin given it by the bat.

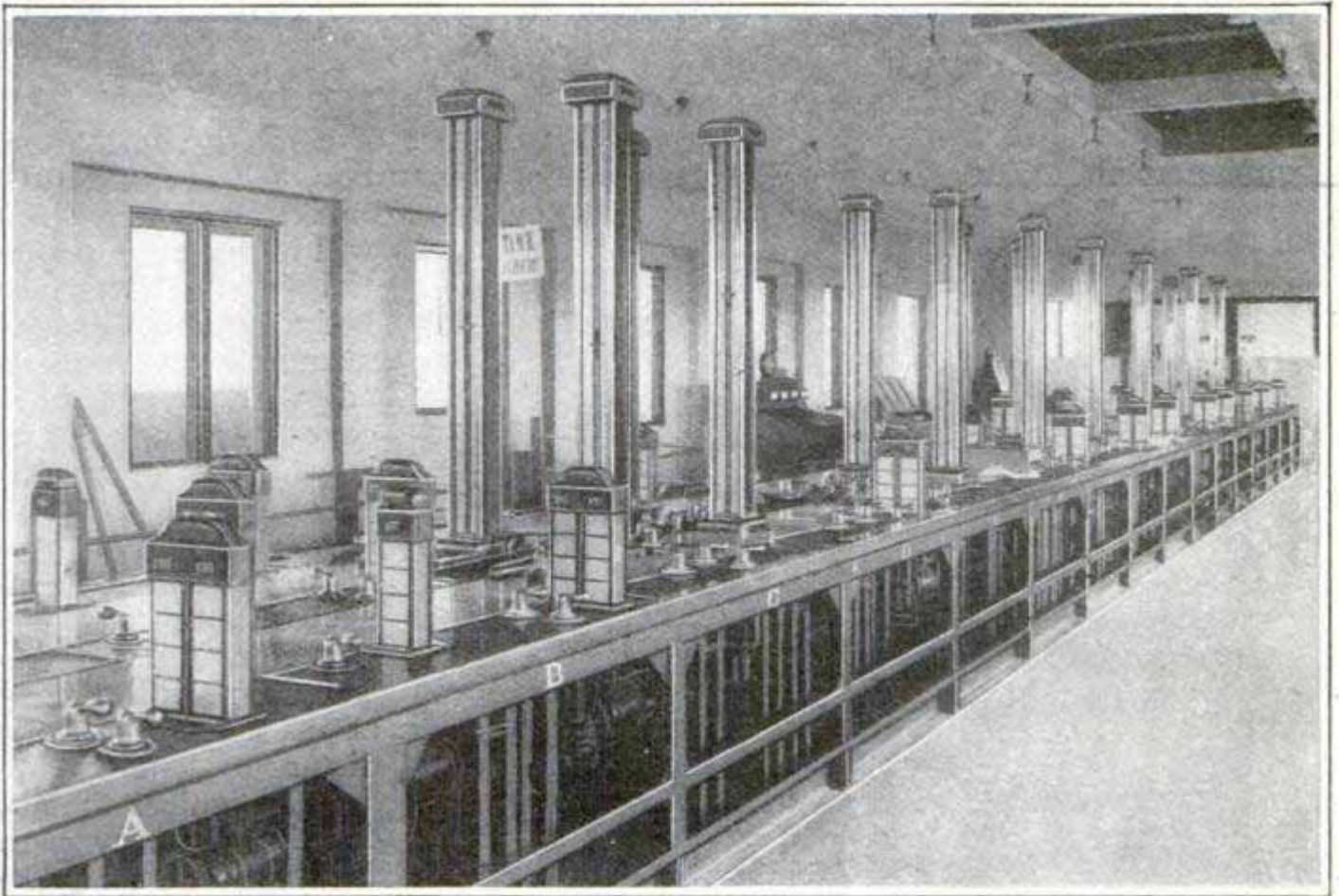
ball moves in as it whirls. The explanation usually given for this action is based on the "cushioning" effect of the air, but this is not convincing, as the air is too thin a medium to supply any great cushioning effect unless it is confined or is hit by a projectile traveling at a much greater speed than is possible in a ball thrown from the hand. A professor of physics in one of the eastern universities has offered an explanation that seems to be sound both from a scientific and a common-sense point of view.

A scientific investigator of the 18th century, Daniel Bernoulli, in experimenting with rapid currents of air and other gases, discovered the principle that when the velocity of such currents is high the pressure is low, and that when the velocity is low the pressure is high. On this basis the curving of a thrown ball is easily explained. When the ball is spinning rapidly a thin shell of air surrounding it is also set to spinning. Owing to the velocity of this shell of air the air pressure on the ball is reduced, but it would still be the same on all sides if the ball could be made to stand still while spinning. As it flies through the air the effect on the spinning ball is exactly the same as if it were standing

still in a swift current of air. Reference to the accompanying sketches will show what the resulting action is. With the ball spinning in the direction shown, the direction of the current of air over the top of the ball is the same as that of the shell of spinning air, so that the velocity of the latter is increased. This results in a reduction of pressure on that side of the ball. The opposite effect is produced at the under side of the ball, as the current of air is against the spinning shell and diminishes its velocity, and the pressure here is increased. Owing to the greater pressure on the under side, the ball is pushed out of a straight line and flies in a curve that bends upward. If the ball were spinning in the opposite direction the result would be a "drop" ball. In short, the curve is always in the direction that the "nose" of the ball moves in as it spins.

HOW A SHIP GETS THROUGH THE GATUN LOCKS

A vessel passing through the locks of the Panama Canal will have all its movements controlled in much the same manner that the movements of a train are controlled in entering a complicated railroad terminal. At Gatun, Pedro Miguel and Miraflores, an operator standing before a control board will open and close the gates, fill and empty the lock chambers, and perform every other operation necessary for letting a ship through, simply by throwing a succession of switches, and will know at any instant just what is happening in the locks without ever having to look beyond the indications shown on the board before him. Furthermore, the mechanism is so interlocked that it will be impossible for him to set any machine in motion except in the proper order and at the proper time. The triple flight of locks at Gatun extends for a distance of 6,200 ft., while the operating machinery is scattered over about 4,000 ft. of this distance. This is all controlled from a board, 64 ft. long, which is virtually a miniature of the



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Control Board for Operating the Gatun Locks: The Waterways are Shown by Blue Marble Slabs Running the Full Length of the Board, and over These Work the Miniature Lock Gates and Fender Chains. The Low Shafts Contain Small Boxlike Indicators Which Show by Their Position the Exact Stage of Opening or Closing of the Valves That Fill and Empty the Lock Chambers, While the Tall Shafts Carry Indicators for Showing the Level of the Water in the Different Lock Chambers. All Operations for Letting a Ship through the Locks are Performed by Throwing the Control Handles Projecting above the Board

locks and the operating machinery, and is located in an operating tower at the foot of the upper flight of locks.

When a ship from the Atlantic enters the forebay at the lower end, its way will be barred by a chain designed to protect the lower gates from damage. This chain cannot be lowered until the gates are opened, and after the ship has passed into the lock chamber the gates cannot be closed until the chain has been raised into position again. As the ship passes on to the upper levels, numerous machines and valves will be brought into action, but no movement can take place in any of these except in the proper order. These movements all show on the control board. As a guard chain drops to the bottom of the canal, a miniature guard chain stretched across the control board will drop out of sight into a slot, while miniature lock gates swinging across the blue marble panels that represent

the canal on the board will duplicate every movement of the 700-ton steel gates as they swing back to let a ship pass. Such operations as the raising or lowering of the water in the lock chambers and the opening and closing of valves will be shown by vertical indicators, but where it is only necessary to know when a movement is completed, this will be shown by a light. The whole installation is electrical and constitutes one of the biggest electrical-engineering feats of the time.

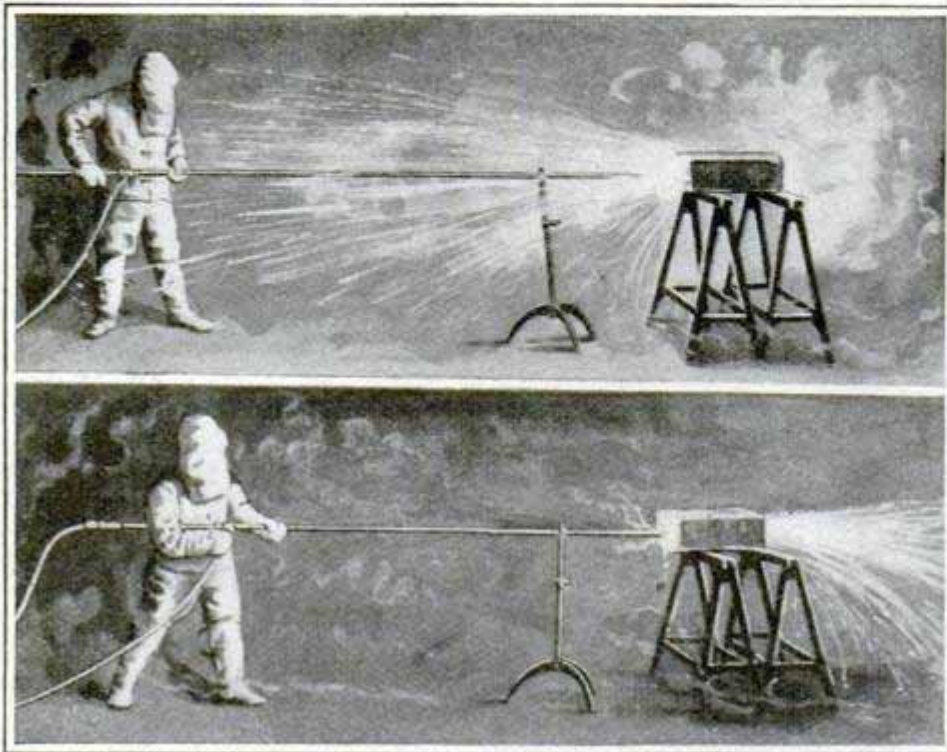
PIERCING METAL BLOCKS BY OXYACETYLENE

Melting its way through thick blocks of steel as easily as live steam would eat through a cake of ice, the oxyacetylene flame is utilized in many machine shops where drills were formerly employed to bore through metal. An adaptation of the oxy-

acetylene blowpipe is employed, the long pipe resting upon a ringed support, permitting the operator to stand at a safe distance from the spurting liquid metal. Clothed in asbestos garments, his head protected by a hel-

MEASURING ELECTRIC FORCE AT A DISTANCE

By the use of a microscopic bit of radium preparation, a French scientist has constructed an electrometer which will indicate the potential of an electrified body without in any manner being connected with it. A disk covered with a paste in which is incorporated one-tenth of a milligram of radium bromide, and suitably connected with the electrometer, is placed before an electrified body at a certain definite distance. The radioactivity ionizes the air, forming an easy path for the passage of electricity through the atmosphere to the disk and thence through the electrometer. As, for a



Boring a Hole in a Steel Block by Oxyacetylene Flame

met and his eyes shielded by heavy glass, darkened to exclude the blinding glare, the workman controls the size and intensity of the flame by levers on the he pushes flame pene In cases is applicable, quicker and with drills.

forward as the flame penetrates the block. In cases where this method is applicable, holes are bored more cheaply than

given distance between the disk and the electrified body, there is a constant relation between the reading of the electrometer and the potential of the source, the force may be readily determined.

PLUMAGE SHIELDS PHEASANT FROM NATURAL FOES

The Argus pheasant is a native of Borneo, and is a remarkable example of what naturalists call "protective coloring." Many birds and animals are

A Bird That Hides
in Its Own
Plumage



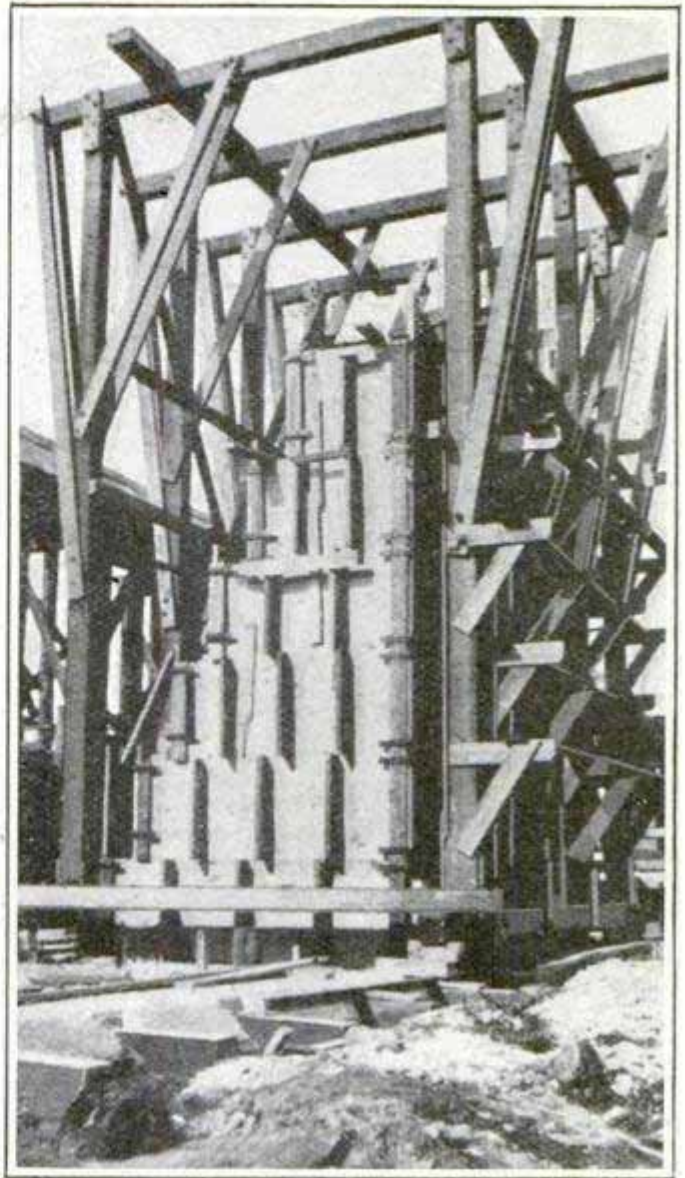
colored to harmonize with their surroundings, but few are able to blend so entirely into the grass and ferns which form its natural habitat as this beautiful pheasant. Living among a multitude of enemies in the fern brakes of the East Indian isles, the bird could not have long survived if dependent upon wings and legs. When in danger, it promptly spreads its ample wings, not in flight, but in simulation of the ferns about it, and becomes instantly invisible, melting into the background so that it appears to be just another clump of fern.

CHANGING SIGNS PRODUCED BY COLORED LIGHTS

Based on the fact that color is simply rays of certain wave length reflected from the surface of an object, a new departure in advertising and in stage setting is being produced by means of varicolored lights on specially adapted pigments. For instance, a red fabric is not inherently red. If the light thrown upon it contains no red rays, the fabric gives no appearance of redness, although it may be brightly illuminated. The peculiar hue of the human countenance when lighted by the mercury-vapor lamp is a familiar example of this principle. So the makers of illuminated signs, stage managers, and others interested in this transformation of representations in color, have been experimenting with the effects produced by grouping many-colored lights, which may be separately controlled, and bringing out prominently certain figures, words or scenes by the use of certain colors, which remain invisible when lights deficient in those particular rays are cast upon them.

BUILDING RETAINING WALL WITH MOVABLE FORMS

In building a concrete retaining wall, a construction firm adopted a novel expedient. They laid a track beside the proposed wall, and fitted a form, of such size as to make one section,



By Means of This Moving Form a Chicago Firm
Built a Retaining Wall Quickly

with wheels. As the work progressed, the form was pushed along from section to section, effecting a considerable saving in time, labor and material.

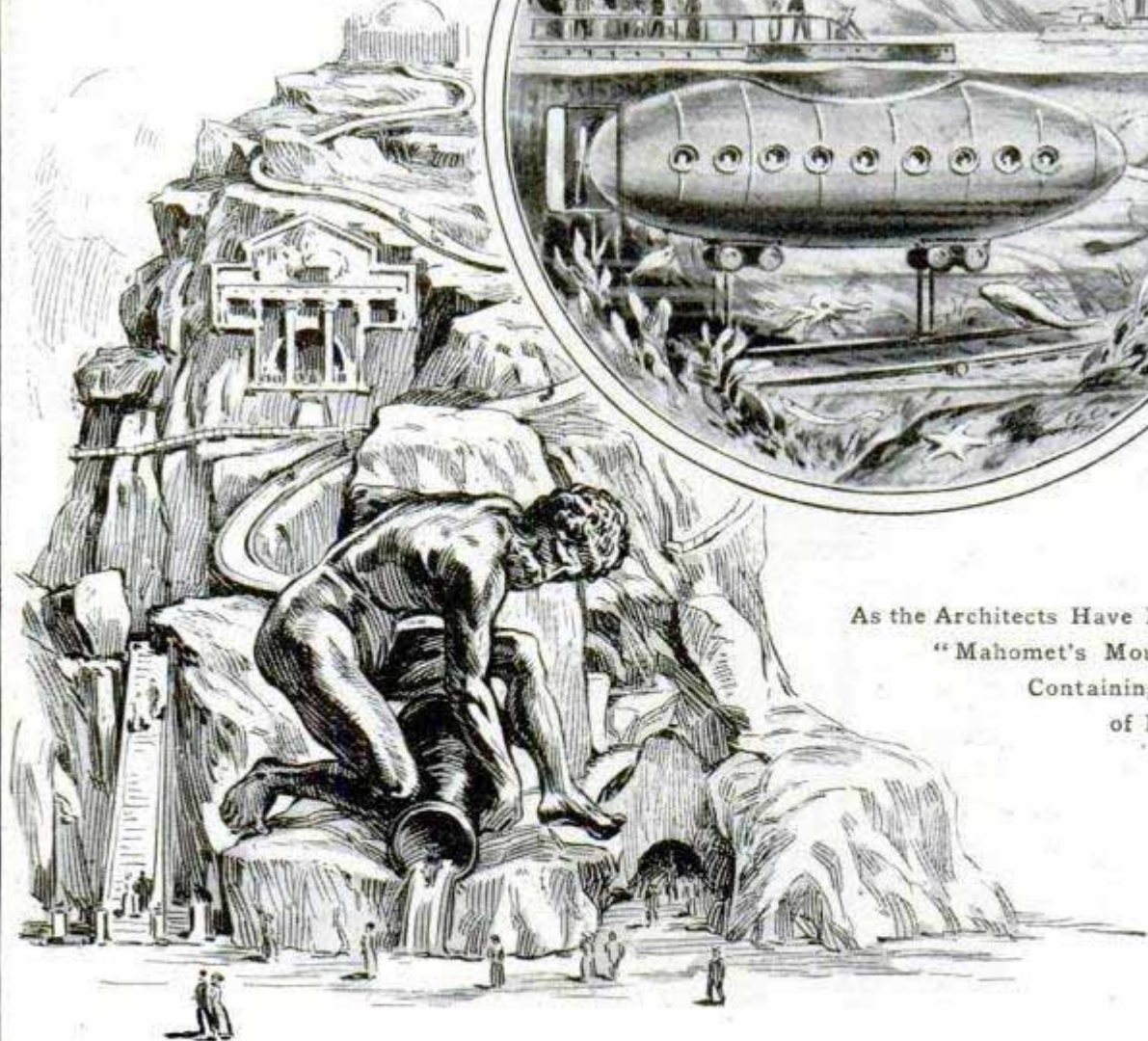
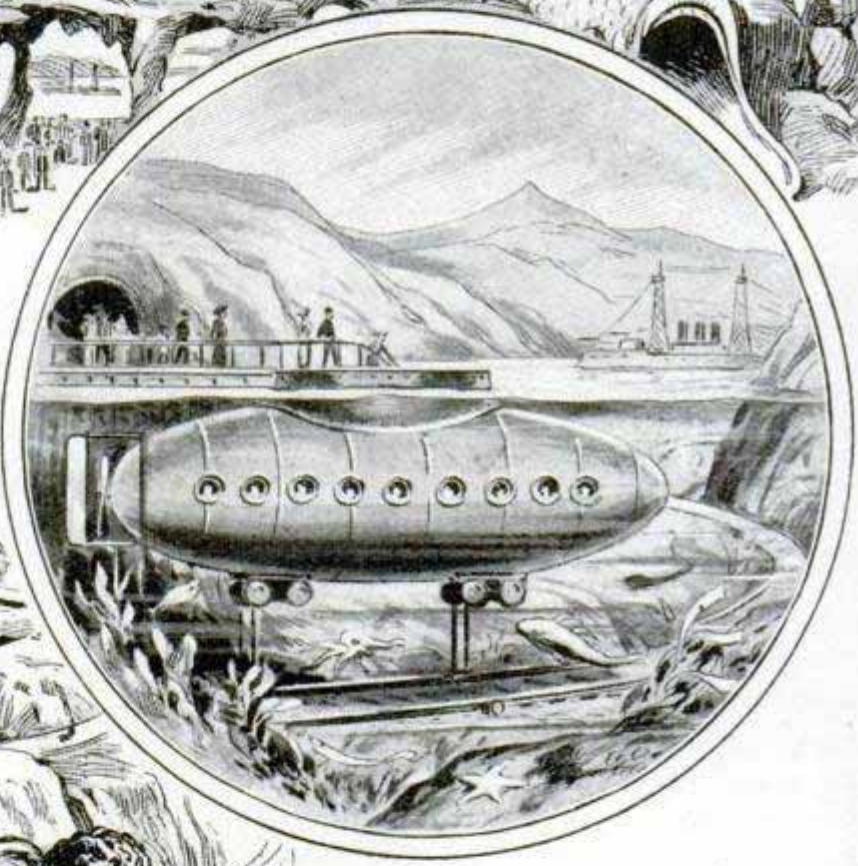
AMUSEMENTS AT PANAMA- PACIFIC EXPOSITION

The Panama-Pacific Exposition has set apart a tract of 65 acres, whereon more than \$12,000,000 will be expended, according to the estimates now before the director, in amusements for the exposition visitors. The main street, more than half a mile in length, will be lined on either side by such concessions as the "Forty-Niners' Camp," presenting the interesting phases of life in '49 in California, a real life-picture of gold mining and its rugged camps, shorn, however, of its drinking, its gambling, and its vice, but edu-

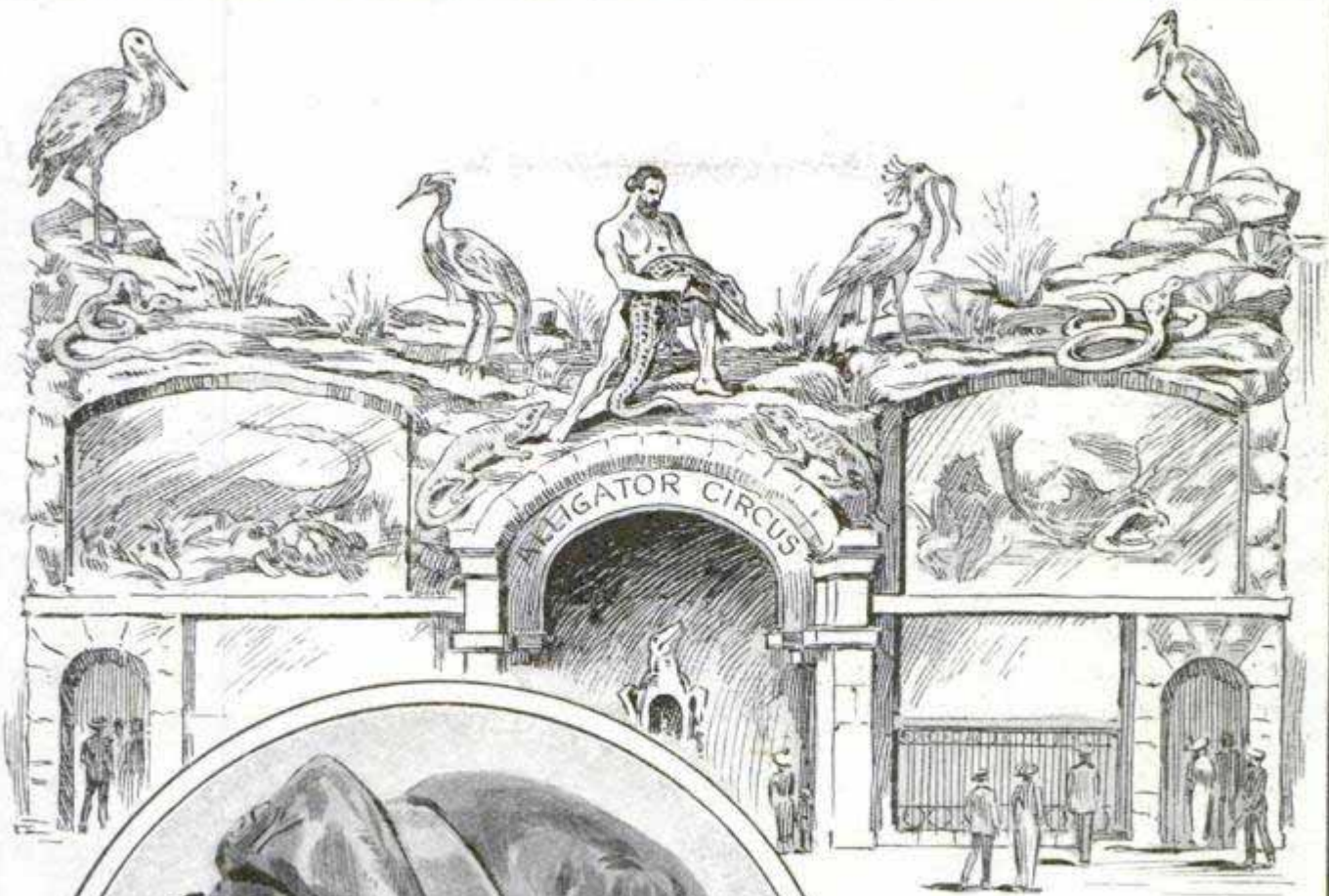
THE SUBMARINES



Captive Submarines will Navigate an Elevated Artificial Lake



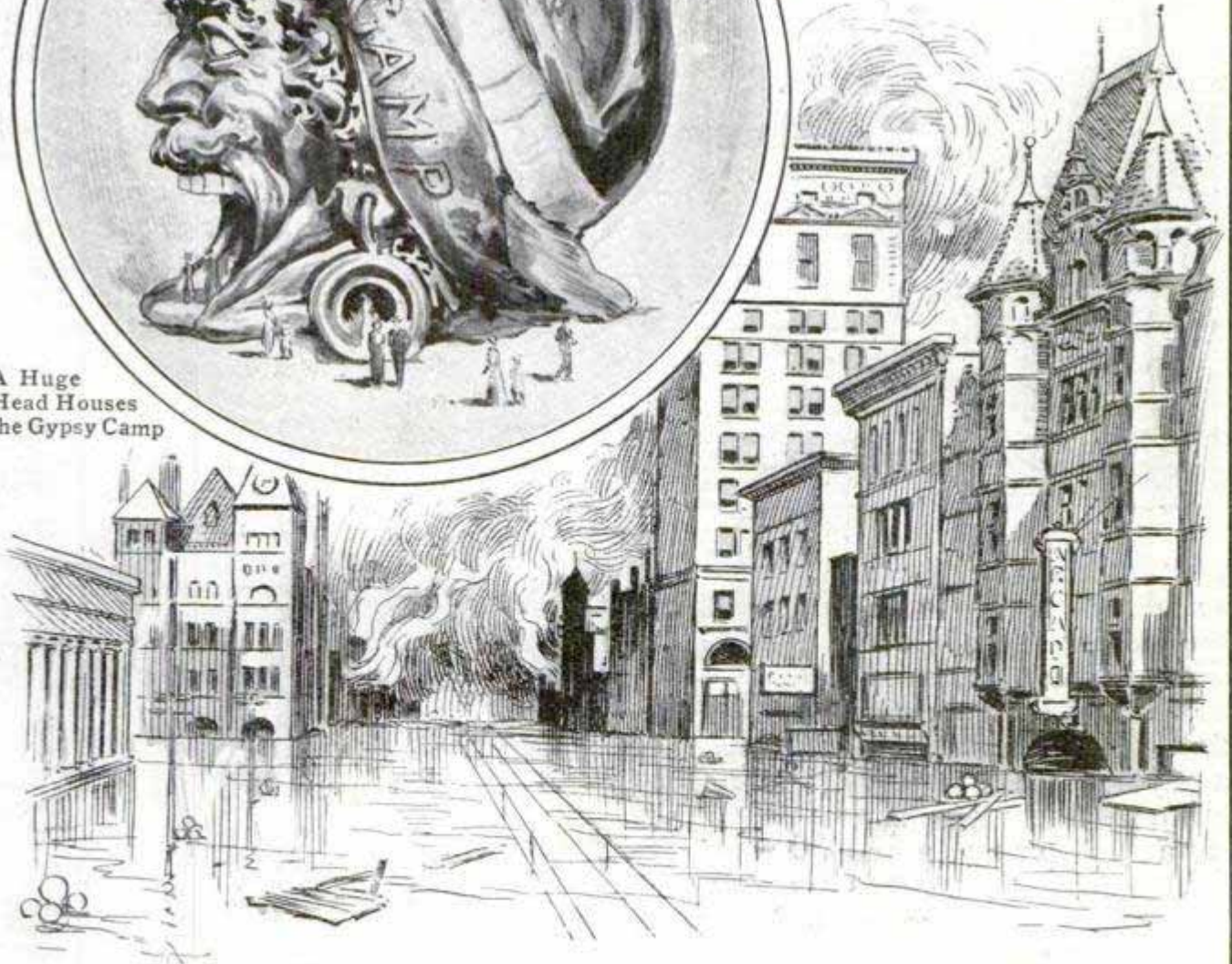
As the Architects Have Planned
"Mahomet's Mountain,"
Containing Caves
of Mystery



How the "Alligator Circus" will Look to the Visitor Outside



A Huge Head Houses the Gypsy Camp



How the Dayton Flood will be Reproduced at San Francisco Fair

cational in its presentation of the working conditions under which the "Argonauts" labored to produce the stream of gold which vivified the entire world of that day. Another entertainment of high interest will be the "submarines" in which the visitor is taken beneath the surface of the sea. Submarine boats will descend on tracks into the pool and visitors seated before the glass portholes will witness varied specimens of marine life in the lagoon. The "Panama Canal," a working model and panorama costing a quarter of a million dollars, will familiarize spectators with the great work, to signalize the completion of which this exposition was planned.

An elaborate series of scenic devices in the "Creation" will be used to visualize the Bible story of the birth of the world; "The Evolution of the American Navy" will depict on large scale the development from the wooden frigate to the modern dreadnought. An "Ice Palace," "The Battle of Gettysburg," the "Aeroscope," "Toyland," and "Mahomet's Mountain" are other amusement features.

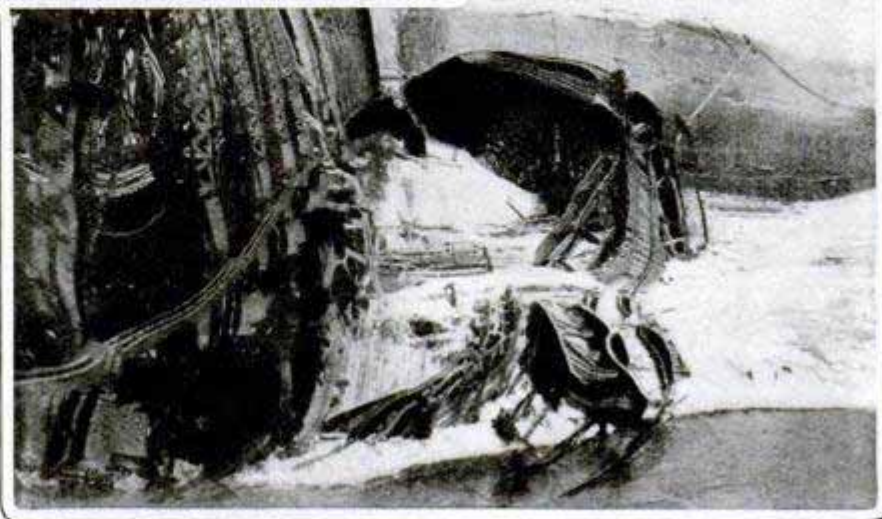
☞The Boise and Arrowrock Railroad, a standard-gauge line 20 miles long, owned and operated by the United States government in connection with the Arrowrock Dam construction, earned \$9,271 in 1913.

BRIDGE WRECK MAGNIFIED BY FREAK PHOTOGRAPH

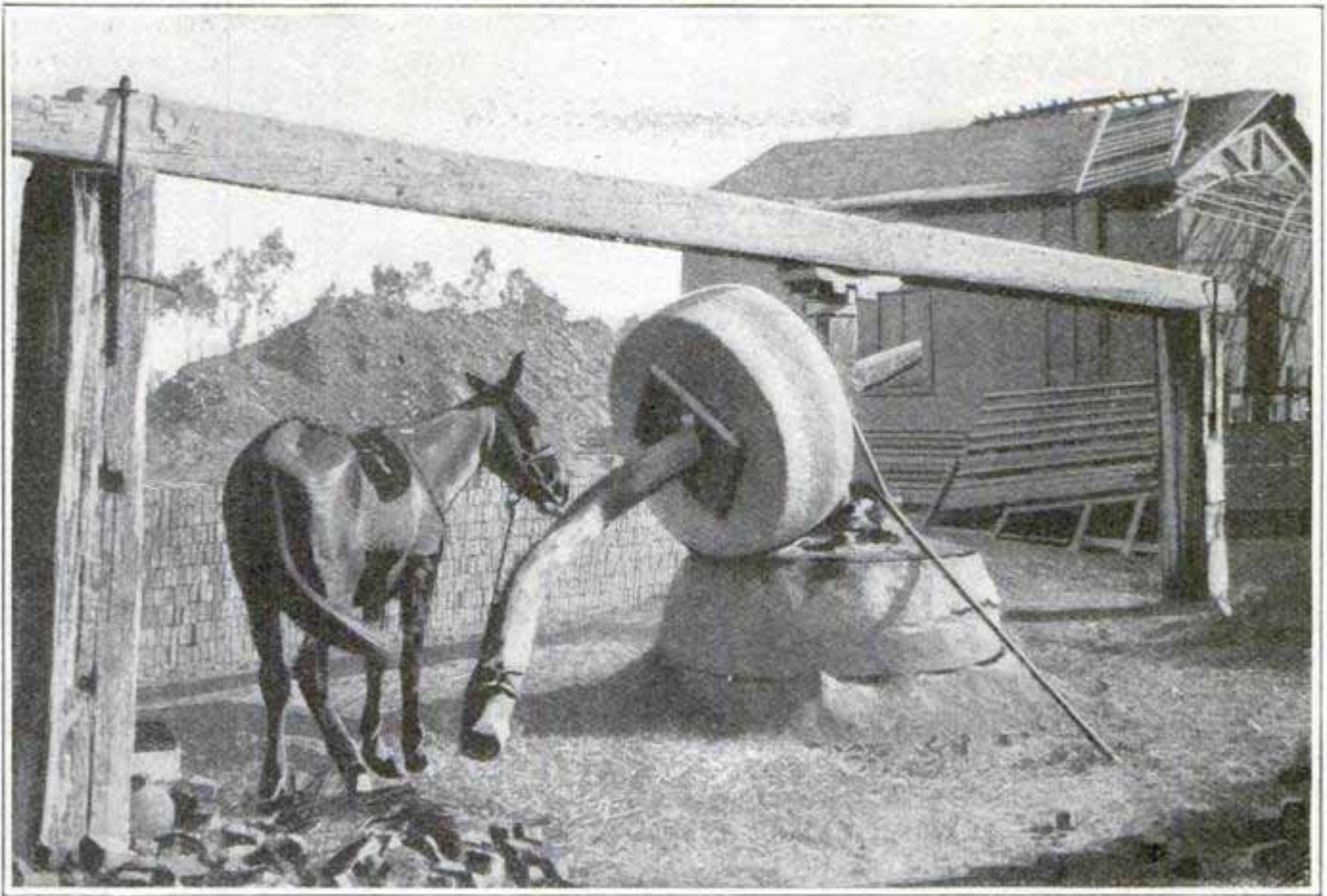


ing of the plate he held it too close to the stove, melting the gelatin. Upon printing the negative he was surprised to find both bridges apparently wrecked beyond repair. Another negative, however, escaped the overdose of heat, and gives a correct idea of the scene.

A temporary steel bridge had been erected for use while a new concrete structure was being built across the Wabash River, when an ice gorge formed and the resultant pressure wrecked the light bridge. A photographer snapped the wreckage, but in trying to hasten the dry-



Destruction of a Bridge Exaggerated by Ruined Photographic Plate



Grinding Clay in an Egyptian Brick Factory

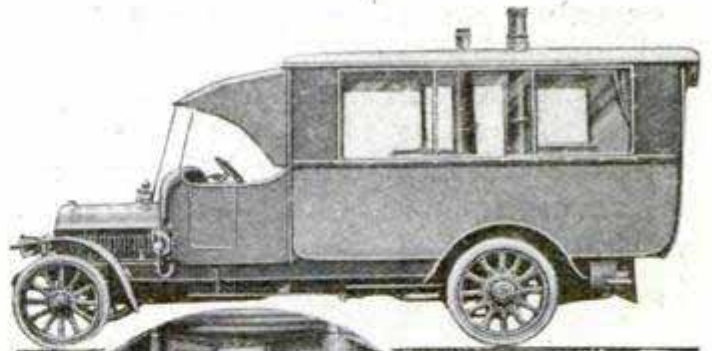
PRIMITIVE CLAY GRINDER USED IN EGYPT

On the banks of the Nile, numerous brick-making plants exist, of the most primitive description, in which methods harking back to the earliest dawn of history are still in operation. True, the sun-baked brick has been succeeded by those burned in a kiln, but the clay is still ground in crude mills, where a horse or mule draws around a big stone roller, crushing the lumps of clay into powder preparatory to removal to the mixing trough.

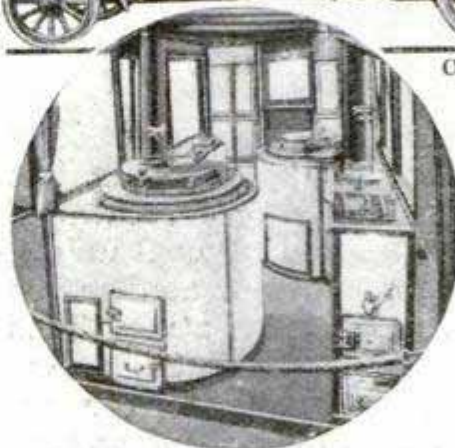
AUTOMOBILE KITCHEN FOR THE ARMY

A Swiss automobile manufacturer has built a portable field kitchen for army use which is capable of preparing food for 700 men. The interior arrangements are such that there is room for the military cooks to move about while the car is in motion, and the soldiers, fagged from a long march, will not have to wait while fires are being

built and food cooked, the meal being ready as soon as the order to halt is received. Two independent cooking stoves are contained within the car,



Courtesy of The Motor

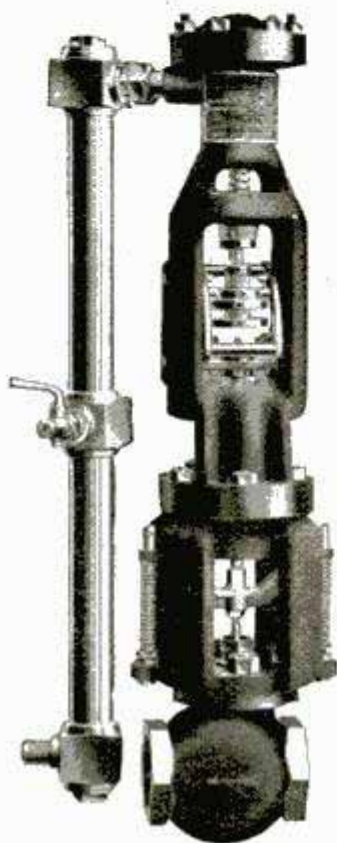


Swiss Military
Kitchen
for Preparing
Meals for Soldiers
while on the
March

with soup boilers, etc., of ample size. Fuel is carried beneath the body of the car, and every inch of space utilized with rigid economy.

DIFFERENTIAL PUMP GOVERNOR

An English concern has recently patented an automatic governor for controlling the workings of a steam pump, shutting off the steam at any desired pressure and re-



admitting it when the pressure falls below a certain predetermined value. The device comprises cast section-bearing pistons, spiral springs and triggers, which are operated by the water pressure in the feed pipe and control the throttle valve. A downward movement of the main piston and its rod depresses the spindle of

this valve, admitting steam to a small cylinder which actuates the double-beat throttle valve, closing the latter. When the pressure falls, the coil spring raises the main piston, and the process is reversed and the pump starts working.

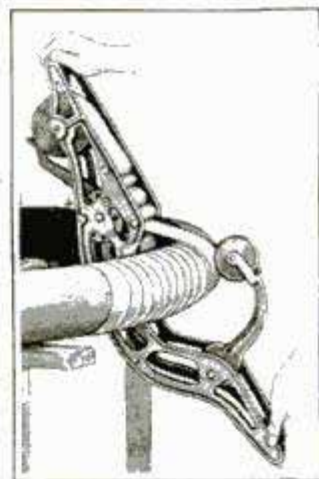
ELECTRICITY FOR HEATING DENATURED IN ITALY

Italy imposes a tax upon electricity for lighting and heating purposes, but as that country has enormous water-power possibilities and no coal mines, it is proposed to reduce or abolish the tax on current used for heating. This would open the door to fraud, unless some means were found to convert electric energy used for heating so that it could not be used for lighting. A method has been invented by an instructor in the Milan technological institute which accomplishes this result,

the current being "denatured" by a device which interrupts the current periodically, thus making it unfit to use for lighting while improving its heating qualities. Small installations, where the current does not exceed 25 amperes, are interrupted by the periodic expansion and contraction of a metallic rod, but in larger plants a solenoid or small electric motor is utilized.

AUTOMOBILE TIRES WRAPPED WITH HAND WINDER

Retreading an automobile tire is a laborious job, requiring a considerable degree of skill if done by hand. To make this operation easier in shops and garages where power-operated apparatus is not available, a hand winder has been placed on the market. In using this winder, the bandage is first placed in water and then wound tightly around the spool. The end of the bandage is passed through a recessed slot, and a pressure arm is released to bear



firmly against it, a short portion of the bandage being left free. The tire is secured in a horizontal position, the winder is clasped around it, and one turn of the bandage is taken around the tire. The remainder of the operation consists simply in rotating the winder around the tire, the bandage being pressed down firmly by the roller, as shown. The amount of bandage used depends on the size of the overlap, but as a rule the average tire requires about three 20-yd. bandages.

Switzerland, with 252,500 farms, most of them less than 25 acres, has a savings bank for every seven square miles.

HIGH ALTITUDE AFFECTS MUSCULAR POWER

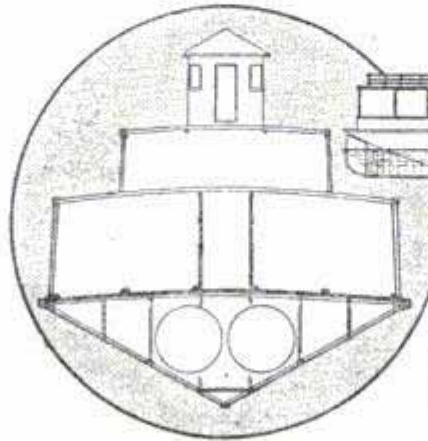
Two French scientists, after long tests with squirrels in rotary cages, recently determined that at the sea level a squirrel would revolve the wheel 6,700 times a day. The animals were then carried in their cages to the top of Mont Blanc, 15,782 ft. in altitude, and carefully observed. The squirrels made but 900 revolutions a day in the wheels. After a considerable time they were again brought down to sea level, where they regained some portion of their former strength, the number of revolutions rising to 5,000 per day. This series of experiments demonstrates that the fatigue felt by Alpine climbers is not due wholly to their muscular exertions, but that the altitude has a good deal to do with it.

COOLING BUILDINGS IN INDIA

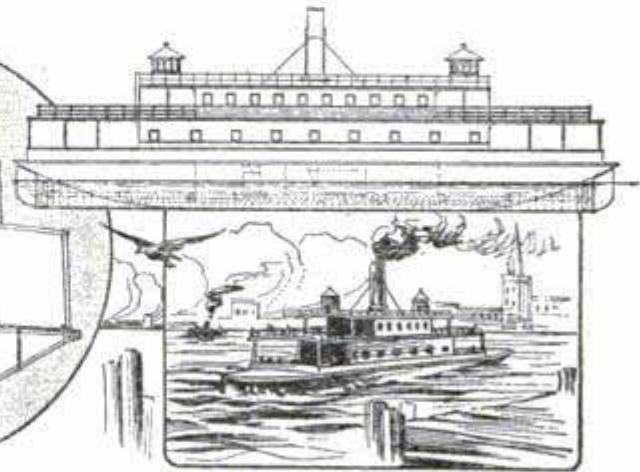
Seeking to make living in India less trying to Europeans, architects and constructors have long sought some means for modifying the dry, hot climate by building residences and office buildings of hollow tile, of peculiarly shaped brick, and of solid concrete. It is now proposed to force cooled air through hollow walls, electric fans being employed and the air at the intakes cooled by passing it through a water screen. By placing the fan at the highest point on one side of the building and the intake at the lowest point on another, it is believed a thorough circulation will be obtained. The side most exposed to the rays of the sun may be treated as a separate unit, with a greater flow of cooled air and a more direct outlet. Engineers estimate that the cost of the electric current would not exceed one cent an hour.

NOVEL HULL CONSTRUCTION FOR FERRYBOAT

A curious type of ferryboat, with a hull having a V-shaped cross section, has been placed in service for trans-



Midship Section, Showing the V-Shaped Hull



Side View of Ferryboat in Service at Jacksonville, Fla.

porting street traffic across the St. Johns River between Jacksonville and South Jacksonville, Fla. This unusual form of construction was apparently adopted because of its simplicity and cheapness in comparison with the usual hull construction, combined with the fact that little or no cargo space is required. This form of hull provides ample room for the boilers and machinery, which is practically all that is necessary. Each end of the boat is provided with separate pilot house, propellers and steering apparatus, the boat being designed for operating back and forth between docks without turning.

AMERICAN DOLLAR SIGN WAS ONCE "PS"

The abbreviation "Ps," to signify pesos, was the origin of the American



Evolution of the Dollar Mark

dollar mark, according to a Spanish-American scientist. When America was first settled, the Dutch and the

Spanish were strong competitors for the trade of the world. The word dollar is but a corruption of the Dutch "thaler" or "thaller," a coin much used in commerce at that period, and which superseded the "pieces-of-eight" of Spanish coinage. The peso or piaster, which was the Spanish name for the

"pieces-of-eight," was worth approximately the same as the thaller, and as the Dutch name was easier to say, it found a place in our language in the corrupted form, while the abbreviation for the peso remained as the sole reminder of the Spanish mintage in our financial records.

DROP ENDS FOR COMPARTMENT-CAR SEATS

With a view to increasing the comfort of passengers, Pullman seats with drop ends have been designed and are now being installed on some compartment cars. The outer end of the seat, the portion that ordinarily serves as an arm rest, is hinged to drop out-



Compartment-Car Seat with End That Drops Outward and is Supported by a Sliding Bracket to Make a Full-Length Couch

ward to a position level with the body of the seat and is equipped with a sliding bracket that supports it in that position. The seat is then practically a full-length lounge. A separate cushioned part is also provided which may be secured between the dropped ends of two facing seats, which makes it possible to make up a full-width bed instead of the usual narrow Pullman berth. This arrangement is adapted only to compartment cars, as the dropped ends would obstruct the aisles of an ordinary car.

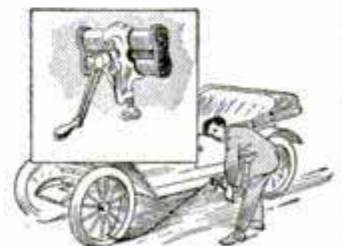
Ⓒ Sufficient quantities of crude oil are being produced in the Katalla district in Alaska to justify the establishment of a small refinery.

MODERN CITY-PLANNING IDEALS FOR NEW YORK

One of the principal ideals in modern city planning, that of the segregation of the different "functions" of the city's activities, was given a prominent place in the report of a committee recently appointed to consider building-height restrictions in New York City. As a beginning in the right direction it was recommended that the erection of business buildings in residence sections should be prohibited, and that certain businesses should be confined to certain sections of the city. According to the report, buildings of great height hurt rent values both in the tall buildings and in neighboring structures, and it was therefore recommended that the height of future buildings, including towers, should be limited to 18 stories.

ROTARY AUTOMOBILE-TIRE PUMP

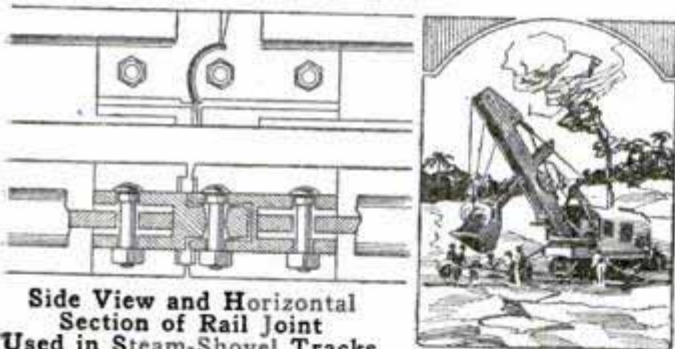
Four-cylinder rotary pumps for inflating automobile tires appeared in London early this season. They are easier to operate than the old up-and-down pumps and fill the tire much more quickly. Each pump has four cylinders, $1\frac{3}{4}$ in. by 2 in. in bore and stroke, operated by a crank. As the ratio of the gears in-



side is 2 to 1 and the crank is long, a large leverage is secured. The pump clamps to the running board when in use and can be folded up and packed away compactly in the tool case.

NEW RAIL JOINT FOR STEAM-SHOVEL OPERATION

A rail joint developed in connection with the construction of the Panama Canal is so made that either horizontal or vertical bends may be readily put in at the joints, a convenience often required in steam-shovel operations. As a steam shovel works ahead, the track behind it is taken up and laid ahead of the machine. The surface of the ground is always more or less uneven and this makes it necessary frequently to lay the track with sharper deflections at the joints than can be conveniently done with standard fishplates or angle bars. The new



Side View and Horizontal Section of Rail Joint Used in Steam-Shovel Tracks on Panama-Canal Work

joint consists of two cast halves which are joined together by a single bolt, the arrangement being of the tongue-and-jaw type. The bolt acts as a pivot around which the halves may be rotated vertically, while the inner edges of the jaws as well as the bolt hole in the tongue of the other half are so beveled as to permit a large degree of horizontal deflection without bringing any strain on any of the parts. At the opposite ends of these halves are jaws which fit closely over the webs of the adjacent rails, and to which they are attached by bolts. The rails are separated by a space of several inches, and the portion of the joint spanning this space is made with a head corresponding to the head of the rail.

TOOL USED TO REMOVE OLD PAPER FROM WALL

A practical tool has been invented by a German paper hanger, by the aid of which old paper may be more

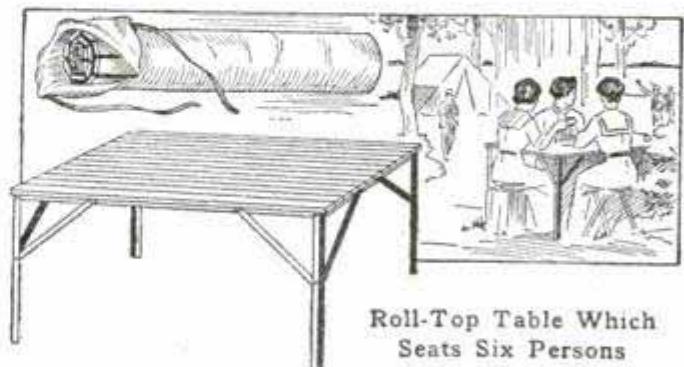


New Tool for Removing Wallpaper

readily removed from the walls of rooms, before hanging fresh wallpaper. A number of toothed disks are mounted on a shaft revolving in a yoke to which a handle is attached. By rolling this implement over the wall the paper is perforated, and when soaked in the ordinary way, the moisture penetrates between the wall and the old paper, making removal easy.

FOLDING TABLE FOR CAMPERS

Picnickers, automobilists and outdoor folk generally may be interested in a novelty recently placed on the French market consisting of a folding table which may be rolled up and carried in a neat package no larger than a golf bag. Folding legs of steel give support to a top of wood and canvas which may be rolled up quickly; the



Roll-Top Table Which Seats Six Persons

whole being carried in a bag 5 in. in diameter and about 2 ft. long. This table will accommodate six persons, and weighs but 11 pounds.

SAFETY CLAMP FOR SLEDGE HAMMERS

So many injuries are caused by loose heads on sledge hammers that a safety clamp has been invented to

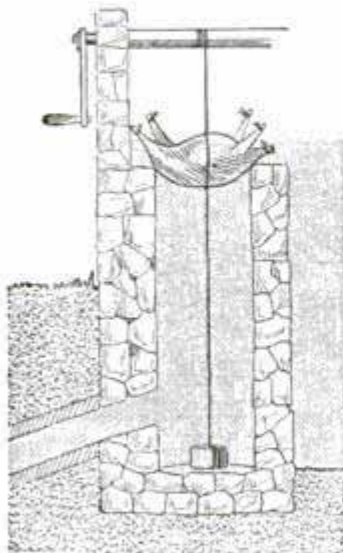


secure the head to the handle so firmly that it cannot fly off. It can be fitted on any sledge after two holes have been drilled through the head for the holding rivets. The safety clamp consists of a metal ring which slips over two semi-circular wedges

fitted to the sledge handle, close behind the head. Two rivets passing through the head hold the ring in place. The clamp not only keeps the head from flying off, but strengthens the handle at the point where it is most likely to break.

PRIMITIVE VALVE MADE OF A GOATSKIN

Near Yafa, the Joppa of the Bible, the most primitive type of water valve may be found in use today. It consists



of a goatskin, inflated with air, and is used to control the water supply in a crude mill and irrigation scheme near that city. Water in a reservoir is conducted to the waterwheels through wells, in the mouth of which the goatskin is suspended. A

weight, consisting of a stone, with a cord attached, anchors this remarkable valve in place, and another rope,

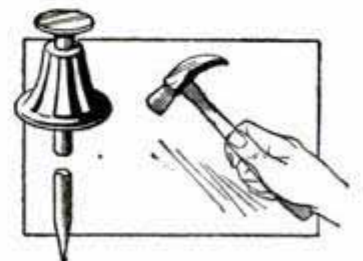
leading upward, is secured to a revolving post, by which it may be raised when the water is to be allowed to flow to the wheel. The yielding goatskin adapts itself closely to the mouth of the well, and prevents leakage.

ENGLAND MAY CONVERT HER CANALS INTO HIGHWAYS

It has been seriously proposed that England buy all the canals which form a network throughout the kingdom, and convert them into automobile trunk roads, for the more rapid and economical transportation of freight. The opinion is fast gaining ground that to maintain and to increase the capacity of the canals for satisfactory service will require the expenditure of such gigantic sums that it will be impossible for them to earn a profit on the investment. Even if water or rail transport were cheaper, automobile hauling would be far more elastic, and house-to-house delivery would be possible without rehandling. The financial burden of building special roads for automobile heavy traffic would only result, so it is claimed, in unbearable taxation, and the congestion of traffic on such roads would hamper their effective use. The undertaking would, according to the originator, be national in character, tolls for the use of the proposed roads being made low enough to result in depressing freight rates throughout the kingdom.

NAIL COLLAR FOR USE IN TEMPORARY STRUCTURES

A simple device designed to be used in connection with the building of concrete forms, scaffolding, and other temporary wooden structures, so that they can be easily taken down and without damaging the lumber, was exhibited at the recent Chicago cement show. This



consists simply of a metal collar which is slipped over the nail before it is driven, and which serves to hold the nail head away from the surface of the wood a sufficient distance to be easily grasped by the claws of a hammer.

NOVEL COUPLING FOR SHAFTS

A safety, self-aligning, self-seating, self-keying and self-fitting shaft coupler has been patented. A round casting, through which a hole runs lengthwise, into which the two ends of the shafts to be coupled are inserted,

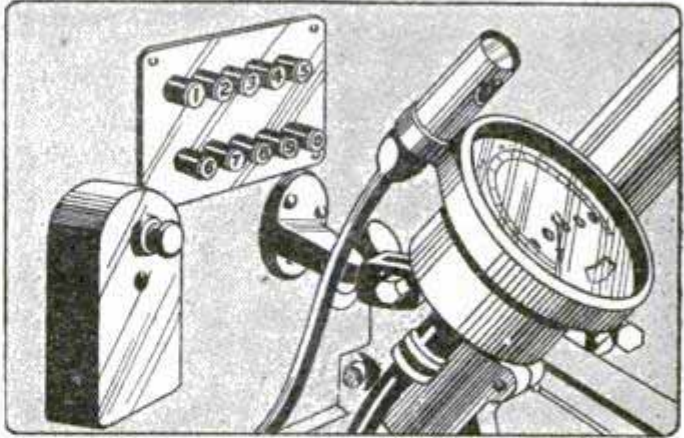
is the main element of the device. A milled space allows two bearing surfaces throughout the entire length of the coupling. At the side of the casting and

transverse to the bore are the keyholes, accurately laid out and drilled, entering a portion of the bore of the coupling, and into these keyholes specially treated cupped-end tool-steel pins are forced to a drive fit. These pins, when driven in, cut away a portion of the shaft which extends above the bed of the pin, and lock the shaft both ways, thus eliminating the machine operation of keyseating.

COMBINATION LOCK FOR MOTOR IGNITION

A "cut-out" that works on the principle of the combination lock and is designed to prevent the theft or unauthorized use of an automobile has recently been invented. This apparatus makes and breaks the connection between the batteries and the motor. The circuit is broken by pressing a dummy key, and can only be restored by pressing a succession of keys in a definite order. The combi-

nation can be made as simple or as complicated as desired. The keys re-

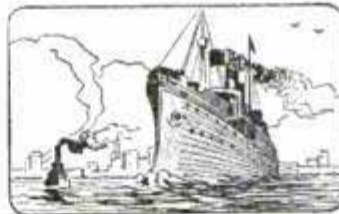


Combination Lock, Placed on Dash of Automobile, Makes and Breaks Connection between Batteries and Motor

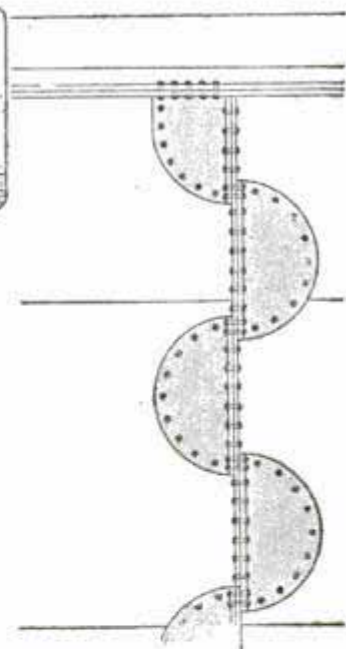
turn to their original position immediately when released, so that no clue is left as to which keys have been used.

NEW METHOD OF RIVETING MAKES SHIPS STRONGER

Ships break in two, says an English expert, where lines of rivets attach bulkheads to the outer skin, thus weak-



ening the shell of the vessel at the point where the stress and strain of wave motion is strongest. It is proposed to remedy this weakness by attaching bulkheads to the outer steel plates of the ship by semicircular flanges, the rivets running in half circles, as shown in the illustration. Not only are the rivets placed out of line, minimizing the danger of breaking in two, but they are placed twice as far apart.



Ⓒ Cinders are now used as bases for oyster beds in Puget Sound.

DEVICE FOR DETECTING MOTOR TROUBLES

Motorists will be interested in a new device for detecting and locating motor and transmission troubles such as pounding in cylinders, skipping, and worn or broken teeth in gears. The operation of the device is simple. The pointed end is placed against the running motor and the vibration is transmitted through



the staff to the opposite end where the sound is magnified by a sensitive diaphragm. In addition to this, the device is arranged to be used as a timing rod, the pointed end being provided with a sliding scale ruled in inches and eighths of an inch whereby the opening and closing of valves can be timed.

FRAGMENT OF GREAT WORK IN LONDON LIBRARY

There has recently been loaned to the London Library a beautifully bound volume, containing two sections of the great Chinese encyclopedia, considered the greatest literary work of all time. This is the Yung Lo Ta Tien, or Great Standard of Yung Lo, undertaken in the reign of the third emperor of the Ming dynasty, and upon which more than 2,100 scholars were employed continuously for five years. This monumental work, of which only a fragment remains, comprised 22,877 sections, covering four departments of knowledge, the Confucian canon, history, philosophy and general literature. Each section consisted of 20 leaves, and every page contained 16 columns averaging 25 characters apiece. These 366,000,000 characters represent a third more English words which will give an idea of the monumental character of this literary

achievement. Although it was the intention of the emperor to have this extraordinary work printed, his project was not carried out. Three copies were made, two of which have been utterly destroyed, while but a fragment of the third remains.

A COMPASS IN A WATCH STEM

A novel combination of watch and compass has been placed on the market in which the compass is set in a recess



formed in the top of the watch crown. This obviates the necessity for increasing the thickness of the case or distorting the appearance of the watch to accommodate the compass, while at the same time removing

the needle as far as possible from the steel parts of the watch, to reduce the deflection.

FOUNTAIN PEN IN SIMPLE FORM

A steel pen that is being made in Germany is virtually a fountain pen in very simple form. It cannot be used to carry ink, like a fountain pen with a barrel, but once it has been dipped in ink it takes up a supply large enough to last for some time. This is accomplished by a flap that is cut out of the butt and folded over the top of the pen in such a way as to hold the ink by capillary attraction. The entire pen is made from one flat piece of metal.



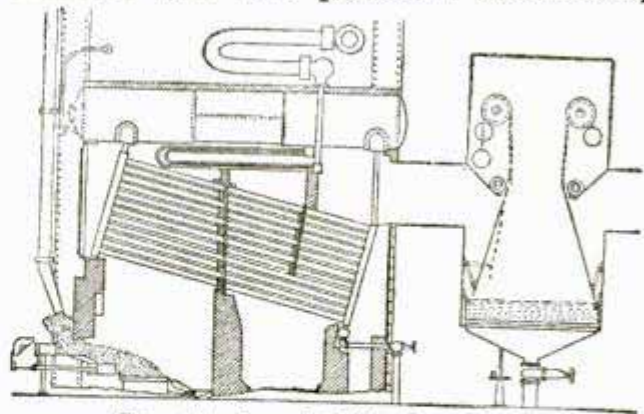
NEW VESSEL PROVES OBSTREPEROUS

The steamer "San Quentin," recently launched at Port Glasgow, Scotland, caused much trouble during her brief trip from the launching berth to Yorkhill, where her engines were to be installed. Three tugs took her in tow, but while they were changing their positions, the wind caught the hull and drove the vessel on a sand bank, about a mile and a half above the city. Here she was allowed to rest until the next day, when the tugs returned to their task, and succeeded in pulling her off, but shortly after she was afloat a hawser broke, and she grounded again and in a worse position than before. Here she stuck for five days, waiting for a high tide, during all of which time the weather was clear. A strong southwest gale rose, giving an abnormal depth to the river, and the tugs were summoned. The wind, having made it possible to float her, now rendered her unmanageable, dragging the tugs helplessly behind, and she drifted to the Cardross shore. Another grounding was only prevented by the interposition of the Cardross light tower, a substantial structure 35 ft. in height. Against this the vessel dashed, doing little damage to herself, but razing the tower to the water's edge. From this point the vessel proved tractable, and was taken without further incident to her berth at the engine works.

PURE AIR SECURED BY WASHING SMOKE

The campaign for cleanliness in New York has resulted in freeing the atmosphere from much smoke. An interesting method adopted by one of the large electric companies consisted in washing the hot gases as they came from the firebox. Investigation showed that much of the "smoke" which caused complaint was in reality cinders that were carried from the boilers to fall in showers in the near-by streets. To rid the gases

formed by the burning coal of these cinders was the problem demanded,

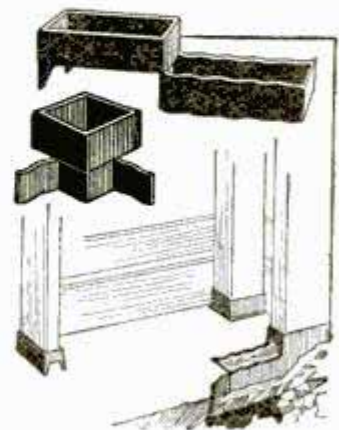


Cross Section of Boiler Installation
Which Catches Cinders

and a washer was installed consisting of a special damper and flue base where water was constantly flowing. The smoke, on leaving the firebox, is driven against the movable damper over which water is flowing and deflected downward, striking the water at the bottom of the smoke chamber, and then mounting upward into the stack. Some of the cinders are caught when the smoke strikes the damper, and the rest fall into the water at the bottom of the smoke chamber. This washing process cleanses the smoke to a remarkable degree, tests showing a 95-per-cent efficiency, equivalent to cleansing the gases down to .02 grains per cubic foot.

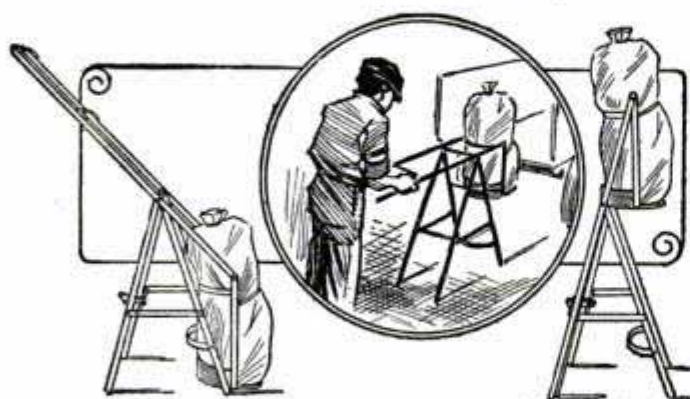
NOVEL POST SUPPORTERS FOR CONCRETE WORK

Iron-studded sockets to support the bottoms of posts, where concrete floors or foundations are used, add to the ease with which buildings like corncribs, granaries, barns, sheds and garages may be erected. These sockets do away with the necessity for sills. The illustration shows clearly the form and manner of use of these supports.



NOVEL DEVICE FOR LIFTING HEAVY SACKS

A German inventor has devised a contrivance for lifting heavy sacks. A wooden framework, substantially built,

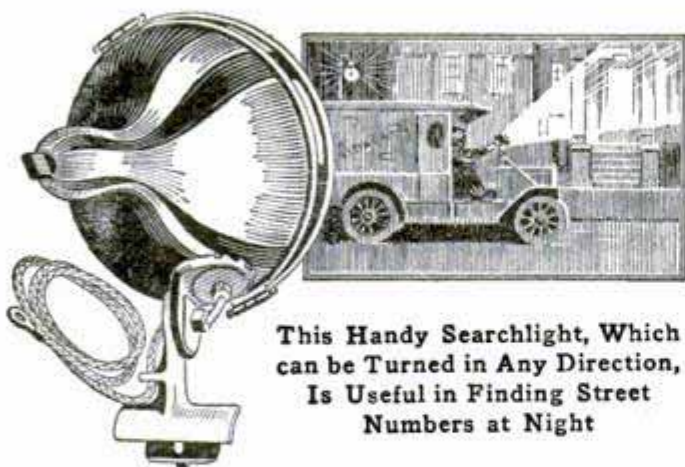


Courtesy Die Export Woche
New Sack Lifter Used in Germany

forms with its cross support a letter A. Balanced at the top is a hinged lever, with clips which may be fastened about the sack, holding it firmly. Upon grasping the end of the lever, which forms the handle, a slight pressure is sufficient to raise the filled sack to such height that it may be readily loaded into a wagon or truck.

ELECTRIC SEARCHLIGHT FOR AUTOMOBILES

A new type of electric searchlight, which can be instantly fastened to any windshield, has recently been patented.



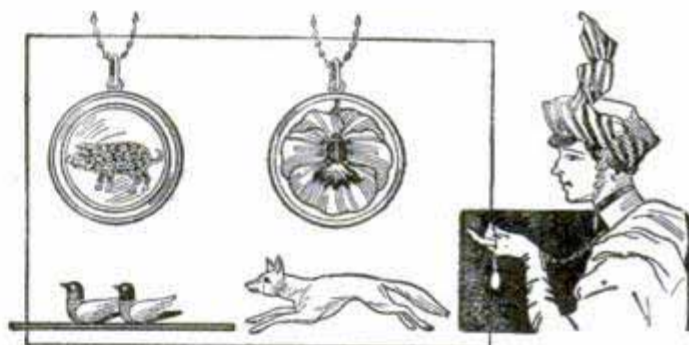
This Handy Searchlight, Which can be Turned in Any Direction, Is Useful in Finding Street Numbers at Night

The light can be turned in any direction and will stay locked at whatever angle it is placed. Drivers on delivery wagons can use this handy device for looking at the names on their packages and then locating

house numbers. The lamp has a switch within the handle, and no complicated arrangements are needed for installation.

NOVEL JEWELRY IN ENAMEL WORN IN LONDON

The vogue for enamel jewelry abroad has brought to the display cases of the jewelers exquisite designs in varied shapes and mountings. A pansy in purple and gold sports a life-like ladybug center; little brooches have ducks with bodies of deep blue and long pearl wings, and a pendant containing a pig in diamonds, for a mascot, or a fox either in diamonds or gold, is suggested as a suitable remembrance for a hunting woman. The



New Jewelry Shown in London Shops

adaptability of enamel, its delicate coloring and its rich effects contribute to its enduring popularity.

EMERGENCY DEVICE FOR SUBMARINES

The recent accident to the British submarine "A 7," where the entire crew were lost, has spurred inventors toward devising some means of enabling the imprisoned crew to communicate their whereabouts, and to receive air and assistance from those endeavoring to help them. One of the most practical contrivances which has been brought forward is a system of ventilation suggested by a French inventor, who proposes that there be attached to the hull of each submarine a hollow globe, which may serve as a buoy, and which may be detached

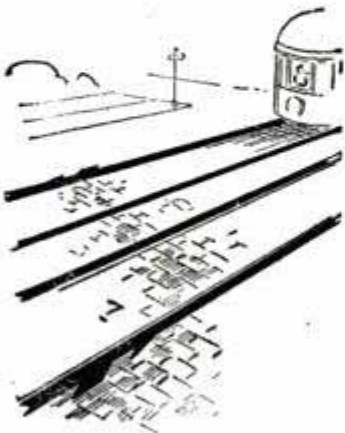
from the interior of the vessel by the manipulation of a wheel. The globe when thus set free rises to the surface, carrying a small cable, by means of which the rescuing party may draw up a flexible tube, attached at its other end to the interior of the distressed submarine. Fresh air may be supplied through this tube, which also affords a means of communication.

NEW WORLD-MAP SCALE IS FIXED AT 1,000,000 TO 1

It has finally been decided, at the second international conference on the world map, held recently at Paris, that the proposed map of the world will be drawn on the scale suggested by Professor Peuck of Munich some time since, of 1,000,000 to 1, which is approximately 16 miles to 1 inch. The international meter, which has been adopted as the unit of measurement, is, theoretically, one-ten-millionth of the distance from the north pole to the equator, and has been officially calculated to be 3.2808257 ft. in length. On the proposed map, therefore, with a scale of 1,000,000 to 1, the distance from equator to pole will be shown as 32.8 ft. long.

ARROWS TO TELL WHICH WAY THE CARS GO

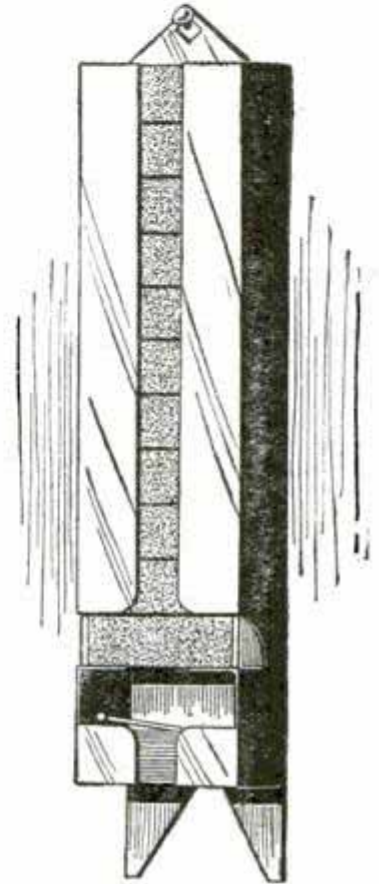
As an aid to strangers trying to find their way about on city street-car lines, a German inventor has suggested direction indicators on the tracks to tell which way the cars go. Near the signs which indicate a stopping place for the trolley cars, he would have a large arrow to show the direction of the traffic on each track.



The arrows, large enough to be seen from the sidewalk, are to be fastened to the outside rail of each track.

SAFETY BOX FOR SAFETY MATCHES

Now that explosive or "parlor" matches are to give way to safety matches, a convenient method of keeping a supply handy, near the kitchen stove or elsewhere, is provided by a recent invention which serves as a reservoir for the boxes, a convenient striking surface and a catch for burned matches. A magazine of thin sheet metal, which may be hung from a nail or tack, holds 11 boxes. A space beneath affords support for loose matches



taken from one box while the side of the lowest box in the tier is presented for striking. When the supply is exhausted, a fresh box is removed from the magazine, the matches extracted and placed in the open receptacle at the bottom of the case, and a new box drops down in position, presenting again a new surface for striking. Burned matches may be dropped in an old box placed at the top of the magazine if desired.

LOGS DUG UP ON PANAMA CANAL ZONE

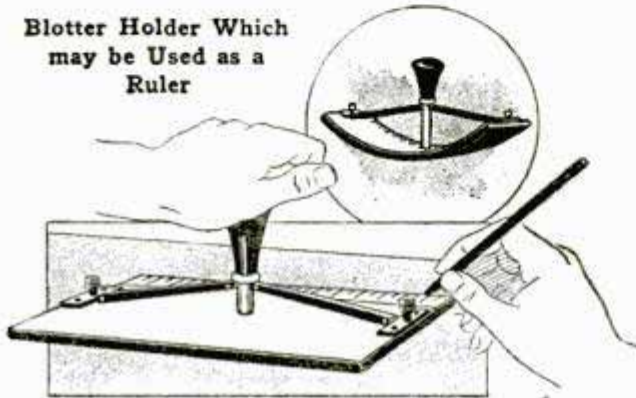
Pieces of wood in a good state of preservation were discovered at depths of 50 ft. and more below the surface when the caissons for the new wharves and pier at Balboa, in the Panama Canal Zone, were being sunk. In one case a log so large that it could not be removed, but had to be cut to pieces

with axes, was found at a depth of 67 ft. below the surface, or 59 ft. below sea level. This log was found in a black alluvial deposit a short distance above the bed of gravel that overlies the bedrock to which the caissons were being sunk. A section 20 in. in diameter with the bark intact has been shipped to the Bureau of Plant Industry at Washington for identification.

BLOTTER HOLDER WITH FLEXIBLE BASE

A blotter holder of the usual curved form has recently been designed by a German stationery house, with a stout

Blotter Holder Which may be Used as a Ruler



knob for a handle. By pushing down on the knob the blotter is straightened out, and in this position may be used as a ruler. One side of the metallic holder is marked with graduations, and the holder is in demand by draftsmen, as the pad of blotting paper does not smear the drawing, and on account of the heavy knob it can be held more firmly than an ordinary ruler.

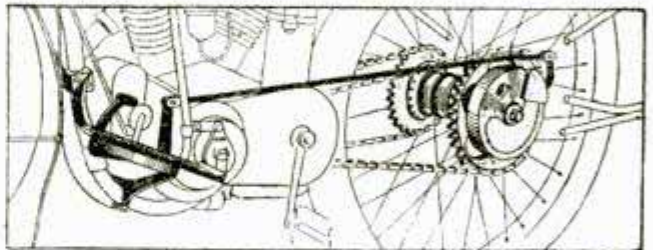
SURVEY STATIONS SHOT UPON FACE OF CLIFF

A great deal of ingenuity was required in making the survey for the new state highway across the face of Storm King Mountain, a steep promontory that juts out to the Hudson River at a point a short distance up the river from West Point, N. Y. In many instances it was necessary to lower men and instruments over the cliffs with ropes in order to make the required cross sections. But for a distance of about 400 ft. it was found im-

possible to use even this strenuous method, as the surrounding rock formations were inaccessible, and the engineers adopted a novel method for getting the measurements across the face of this part of the cliff. A field gun was obtained from the West Point Military Academy. This was loaded and fired at points selected on the face of the cliff, the projectiles used being cans of paint. The cans broke when they hit the cliff and the paint formed distinct targets on which the engineers could train their instruments. The location and elevation of each target were then found by triangulation and the taking of vertical angles. This highway is to take the place of the present road over the mountain, which reaches a height of 1,340 ft. and is a long and somewhat dangerous route both for horses and automobiles. The engineers estimate that the four miles of highway past Storm King Mountain will cost \$100,000 a mile.

COMBINATION BRAKE FOR MOTORCYCLES

Two distinct braking mechanisms are shown on a recent motorcycle model, either or both of which may be applied by the foot of the rider. A band brake fitted to the rear hub is applied by means of a lever connected with the footboard, while an internal brake is set by back pedaling. No matter what position the rider's foot may be in, he



Double Safeguard for Motorcycles

can immediately apply one of these independent brakes. If emergency demands, both may be set at the same time.

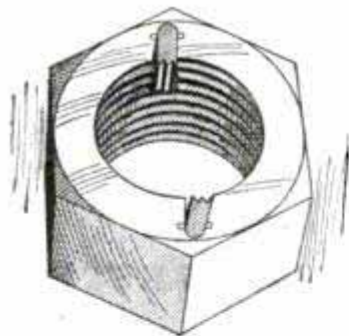
☞ Nile dams soon to be built will irrigate thousands of square miles of desert south of Khartoum, Sudan.

NEW TELEPHONE DEVICE ENLARGES SERVICE

A prepayment telephone station, based upon a similar device used by gas and electric-light companies, incorporates in the usual coin-slot instrument a provision for the deposit in advance of any convenient coin or coins, which are credited for service to be rendered later; the "nickel-first" phone may be used as an "unlimited-service" phone until the credit is exhausted. An indicator is provided which shows just how much unexpended money is on hand in the box. A lever, which is pulled after each coin is inserted, is so geared that it registers the appropriate amount, and each call thereafter is deducted automatically.

POSITIVE NUT LOCK HOLDS SECURELY

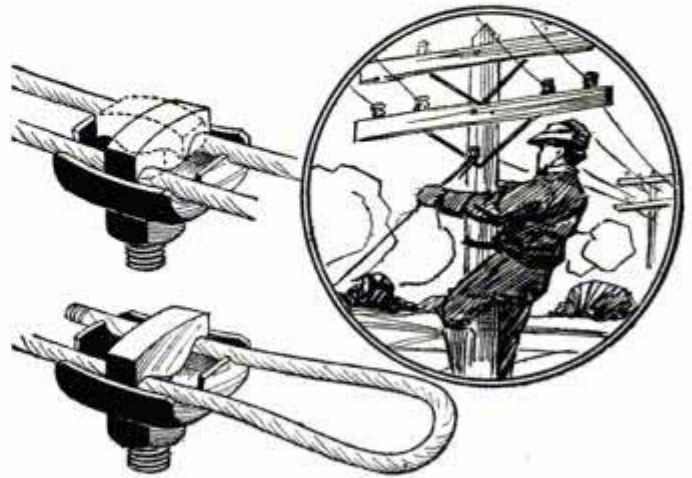
Loose joints are among the most prolific causes of accidents on railroads, and all progressive managers are seeking to eliminate these and other track defects regardless of first cost. The illustration shows a positive nut lock designed to obviate all danger from loosening of nuts. Within its aperture two small steel pawls are securely inserted. When the nut is screwed into position on the bolt a very slight back turn causes the pawls to rock and bite into the threads of the bolt, thus securely locking the two together, and the nut cannot vibrate nor loosen. The device is applicable to all kinds of mechanisms where positive nut locking is requisite or desirable.



☐ From seed sown broadcast on the snow in Idaho as many as 60 little lodgepole pine trees to the square foot came up after the snow had melted.

NOVEL CLAMP FOR WIRE CABLES

A late French invention offers a quick method of fastening wire cables to supports, as well as of splicing or



Novel Clamp for Fastening Wire Cables

making loops in them. A base, provided with a screw pin for inserting in the pole, is grooved so as to permit the insertion of the cable on either side of the central pivot. After the cable is in place, the turning of the pivot head locks the cable firmly in position. Thus either two cables may be secured or one cable may be looped and held by the same device.

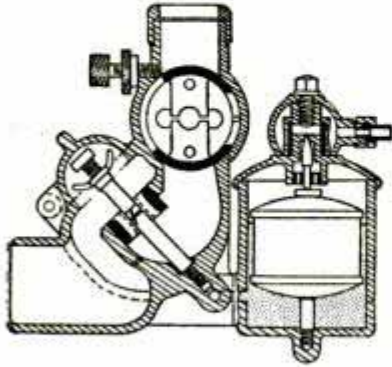
DRIPLESS TEA STRAINER OF NEW DESIGN

Tea strainers that will not drip or stain a tablecloth are now being manufactured. The perforated mesh for straining the tea is on top of one end of a deep bowl-shaped spoon which forms the bottom when the strainer is resting on the table. When in use, the strainer is held sidewise over a cup so that the tea flows into the bowl and then back through the perforations. Any liquid that is left in the perforations drips back into the bowl when the strainer is laid down.



NEW FORM OF CARBURETOR FOR AUTOMOBILES

A new form of carburetor, of the two-jet type, for automobile engines, is so arranged that all adjustments can



be made while the engine is running, and without the use of tools. An automatic air device, which works in connection with the throttle, prevents too rich a mixture at high speeds. This air device can be adjusted to come into action at any point in the throttle travel. Referring to the drawing, the air intake is shown at the bottom left side. The gasoline from the float tank passes up the jets and is sprayed out in a thin sheet at right angles to the incoming air.

NOVEL BINOCULAR GLASSES LEAVE HANDS FREE

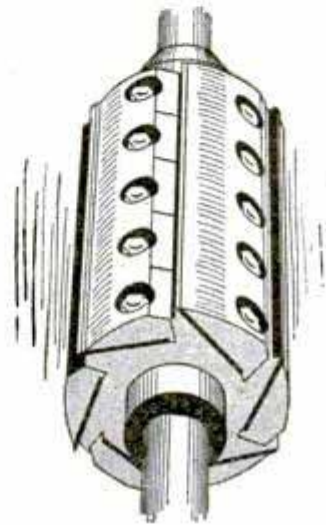
A magnifier having great power, and easily adjusted by means of a sliding bar, has been patented, which in form resembles a pair of spectacles, but which may be worn over ordinary spectacles or eyeglasses. A strong, straight-temple frame or with bows to go over the ears, has, instead of the usual round eyeglass frame, two springs protruding from the bridge, which are slotted to receive a sliding bar, by means of which the focus of the lenses, held at the end of the springs, is obtained. In working with these magnifiers, both hands are left perfectly free, and there is no ob-



struction to view of surrounding objects. The binocular is designed for watchmakers, engravers, eye surgeons and those persons needing lenses of high magnifying power.

SAFETY JOINTER PREVENTS ACCIDENTS

Woodworkers have suffered mutilation from whirling knives and saws until the safety-first campaign reached



out in their defense. A new jointer has just been put on the market which is designed to prevent accidents, as it is impossible for the fingers to be drawn into the knives. The cylinder and shaft are one solid steel forging, the knives

and pulleys being perfectly balanced. The knives are of high-speed steel, and there are slots between the bolts for the drift, furnished for setting out the knives.

ONE-PIECE METAL SLEEVE HOLDER

One of the new all-metal patent sleeve holders is shown in this illustration. As it is stamped out of one piece of metal, has no buckles, straps, or bands to wear out, it is practically indestructible. Its chief advantage is that it holds up the sleeves without binding the arm and stopping the circulation. The same device can also be used as a hose supporter.



ISLAND ROADS NOW OILED FOR MOTORING

The rapid increase in the use of automobiles in the Philippine Islands has wrought havoc with the light macadam roads, and the insular authorities have recently experimented with the use of a surface treatment of oil with happy results. The surface of the road is first brushed thoroughly, the loose dirt and dust removed, and crude oil to the amount of $\frac{1}{2}$ gal. to the square yard spread upon it. The oil is allowed to stand for a day or two until the surface is dry, when it is covered with dredge-run gravel. No roller is used, as local traffic has been found sufficient to consolidate the surface and binder thoroughly.

CABLE HAULAGE FOR BARGES ON FRENCH CANAL

A system of haulage for barges that is much like the old-style street-car cable system has been installed on a French canal. The steel cables work as endless chains, run on sheaves placed at the sides of the canal, and are operated independently of each other by hydroelectric power. Each covers a distance of 1,476 ft., with an interval of 164 ft. between cables. In operation, the hawser of the barge is attached to the cable and the barge is hauled at the rate of about 2 miles an hour to the end of the cable. The momentum of the barge carries it past the 164-ft. interval and the next cable is then picked up by the hawser. The system is so planned that only one barge at a time is hauled by each cable, so that the full capacity of the system, aside from delays at the locks, is about 6 barges an hour or 72 barges during a 12-hr. day. The cost of the installation was about \$5,000 per mile.

☞The first flight over the Strait of Gibraltar was made recently when a Spanish military aeroplane flew from Ceuta, Morocco, to Seville, Spain, in $2\frac{1}{2}$ hours.

TELEPHONE-CONVERSATION TIMING DEVICE

An accurate record of the time consumed in long-distance telephone con-



Device for
Recording Time of
Telephone Conversations

versation may be obtained by a clocklike device, recently placed on the market, which works on the principle of the stop watch. The device is provided with a minute hand and second hand, and is started and stopped simply by pressing a lever on the left side of the case. It is easily attached to the telephone or the side of a desk by means of a clip, and carries a pad for recording the time.

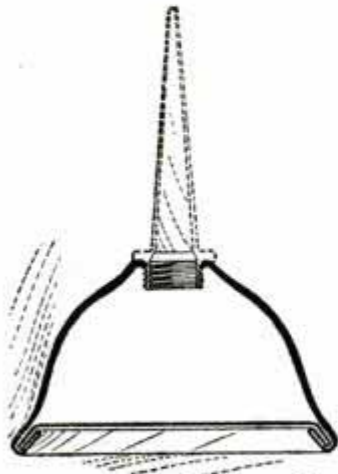
DRILL WITH DOUBLE-END DRILL POINTS

A new drill that has been specially developed for structural and railroad work is in effect two drills, since it is so made that both ends can be used for drilling purposes. This tool is held and driven by the flutes at the side and there is, therefore, no danger of damaging the drilling point that is placed inside the holder. It is made of high-speed steel of the best quality, rolled hot into a milled twist-drill shape.



OILING CAN OF ONE-PIECE CONSTRUCTION

To strengthen the two most vulnerable parts of an oiling can, the seams by which the bottom and the screw threads for the neck are held to the body of the can, one manufacturer is now making all seams of welded construction, the result being a practically one-piece oiler. The neck connection is formed by turning the top of the body down and then threading it and backing it with composition metal, while the lower edge is turned upward around the edges of the bottom and solidly welded, as shown.



FLOOD CONTROL IN CHINA BIG ENGINEERING FEAT

To reclaim more than 17,000 square miles of fertile land which has been annually devastated by the overflowing of the Huai River, the Chinese government has authorized a bond issue of \$20,000,000, and designated a New York engineering firm to undertake the construction of dams and reservoirs. The project is one of the greatest of engineering enterprises, even in this day of big things. An interesting feature of the matter is the fact that the general supervision of the work has been intrusted by the Chinese government to the Red Cross Society. The territory served by this project is larger than the combined areas of New Jersey, Delaware, Connecticut, and Rhode Island, with Long Island thrown in. The river Huai, also known as the Huai-Ho, 800 miles long, has been subject to violent floods for 2,500 years, and as in many places, even at low stage, it is kept within its course only by dikes of earth, its ravages during the spring floods are the source

of tremendous losses. The plan is to dredge the channel of the river and of the Grand Canal, which it feeds; to construct dams and reservoirs, and to store the surplus water against the time of drouth. Many tributary streams are to be diverted, and the entire project cannot be completed for many years.

COMBINATION KETTLE AND WASH BOILER

Turning an ordinary kettle into a wash boiler is readily accomplished by the aid of a French invention. The

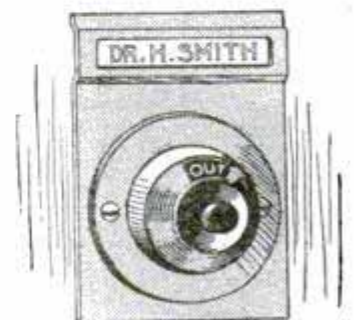


device consists of a conical false bottom with perforations around the edge and a tubular extension to the top of the kettle, where it spreads into a

funnel-shaped portion open at the end. The kettle is placed on the fire with sufficient soapsuds for the wash. The clothing to be laundered is disposed about the tubular part, and as the water begins to boil it rises in the tube, runs over the funnel at the top and onto the clothes which are thoroughly soaked by a continuous stream of boiling suds.

INDICATING PUSH BUTTON SAVES TIME

A new device which has recently been patented for use at the doors of clubs, apartment houses, doctors' and lawyers' offices, is shown in the illustration. It is an individual push button carrying the name of some one person, and the door bell is given more individuality by indicating to the caller the absence of the person desired without



having to disturb the other members of the family, apartment, or club. The unnecessary waste of battery current when occupants of a house are absent is also eliminated. To set the indicator, the cap of the push button is turned 180 deg. to the right or left, whereby the word "OUT" is exposed.

FLYING BOAT CHASES SHIP TO CATCH GEM THIEF

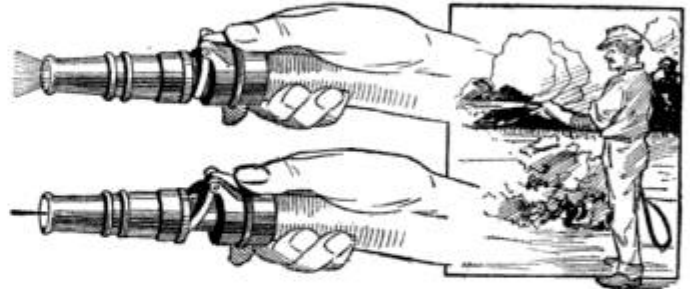
A flying boat and the wireless telegraph working together proved effective means of thief catching recently in preventing the escape of a gem thief from a Florida winter resort. A valuable diamond brooch had been reported lost by a woman prominent in New York society. Suspicion pointed to a negro hotel employe who disappeared on the day the "Miami" sailed, and who was reported to have been spending a great deal of money. By the aid of the wireless the negro was found to be on board the "Miami." A flying boat was then brought into service and started in pursuit of the ship. The negro was found on board and arrested and then brought back to port in the flying boat.

KANSAS WEED USED IN SOAP MAKING

What has heretofore been considered a pest by ranchers in western Kansas is now being cut and marketed for use in the manufacture of soap. It is a species of the Yucca, known locally as Spanish Bayonet, or soap weed, and spreads over large areas, killing other vegetation. Both the tops and roots are utilized by soap manufacturers, who pay about \$8 a ton for the plant at railway stations. After cutting, the weed is allowed to dry from 60 to 90 days, after which it is baled. Indian and Mexican women have long used this weed to make a decoction, soapy in character, used in washing their hair, for which purpose it is considered beneficial, as it contains no alkali.

NEW HOSE NOZZLE PRODUCES VARYING STREAMS

The latest thing in the way of nozzles for garden hose is one in which a va-



Hose Nozzle for Spray or Single Stream

riety of sprays and streams may be obtained simply by a varying pressure on a lever placed in convenient reach of the thumb. A slight pressure produces a fine spray, while a heavier pressure produces a straight stream, as shown in the illustration.

INDIVIDUAL WINDSHIELDS FOR REAR SEATS

The front seat of an automobile is usually protected, nowadays, by a windshield, but it affords slight protection to passengers in the rear of the car. A novel device for giving those in the rear seats equal protection consists of tonneau shields for each side of the car, which can be swung around to the side when the wind is in that quarter. The glass is set in an aluminum frame, and may be raised and lowered as desired. When not needed, the individual windshield may be re-



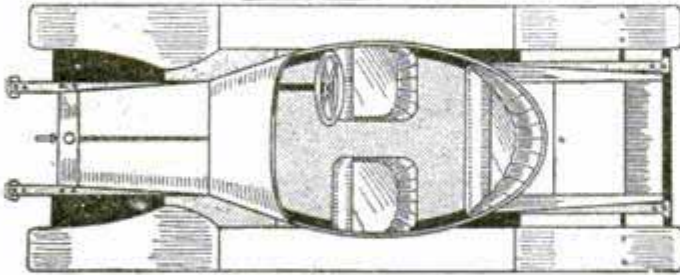
Individual Windshields for Motor Passengers

moved and carried in a leather case under the seat. The only tool required to put it in place is a screwdriver.

Waste wood from sawmills near Vancouver is utilized for making charcoal by an electric process.

THREE-PASSENGER BODY FOR AUTOMOBILE

A new design for seating three passengers in a small automobile or cycle-car is shown by an English firm. The



Compact Seating Arrangement for Small Car

front seats are of the semibucket type with sufficient space between them to permit easy entrance to the rear seat, which is intended for only one person. When the hood is raised it covers all the occupants, and the design has met popular favor abroad. The body is very light and there is but one door, that being on the left side.

TYPEWRITING MAKES PLAIN ILLEGIBLE SIGNATURES

A distinctive signature, even if illegible, has a certain value as a precaution against forgery. But the illegible signature is a source of unending annoyance in correspondence, especially in cases where the name does not appear upon the letterhead. Some business men have adopted the plan of having their stenographers write their names out in full in typewriting at the end of their letters, over which

Yours truly,

John W. Underhill
JOHN W. UNDERHILL

New Method Translates Hieroglyphics
into Names

they add their usual signatures, giving the letter authority, yet contributing to entire legibility. This plan forwards business, clears up filing mysteries, and reduces the chances of shipping errors.

FLAGS MARK ARMY CARS IN WHICH OFFICERS RIDE

The Quartermaster Corps of the United States Army has designated the flags to be carried by automobiles in official use by officers of the army. General officers of the army will be known by two white stars upon red bunting; artillery commanders will display two crossed cannon, with a medallion of a projectile in yellow, upon a red ground. The cars bearing chief umpires at maneuvers will carry white flags with two scarlet stripes, 3 in. wide, crossed diagonally from corner to corner. The flags are rectangular in shape, measuring 2 ft. 2 in. long by 1 ft. 6 in. wide, and are to be attached to small staffs set securely into the body of the cars.

NOVEL PAINT WHICH STOPS THE HEAT RAYS

There has recently been placed on the market an interesting chemical paint manufactured by a German concern, which has the property of intercepting the heat rays of the sun. It may be applied to tin, corrugated iron, slate, or glass, or, indeed, any material used in the roofing of buildings, and by its peculiar quality leaves the rooms beneath the roof comparatively cool. It is stated that the temperature of workrooms may be reduced from 15° to 20° F. according to the surface which can be covered, and the added efficiency of the workmen thus promoted is a direct and measurable gain. The paint is light blue in color, so that, if applied to glass, it does not appreciably influence the light. Its components are at present a trade secret, but the fact that many large electric and manufacturing companies in Germany are regular users, is cited as evidence that it is practical.

Over \$5,000 was paid by one railroad company in 1913 to passengers hurt by falling over grips in the aisles of passenger trains.



BRANCHED SEARCHLIGHT ON SUEZ CANAL

That the pilots of approaching vessels may not be blinded by the glare of the searchlights on vessels going in the opposite direction, a novel branched type of electric light is used, which throws its beams toward both sides of the canal, leaving the path directly in front in comparative darkness. As the marks which guide the pilot in making the turns in the canal are obviously on the sides and not in the channel, this method of throwing the bright rays on either side gives all the information desired, and the eye-strain and confusion attendant on the direct beam is avoided.

HOW SILK FISHING LINES ARE MADE

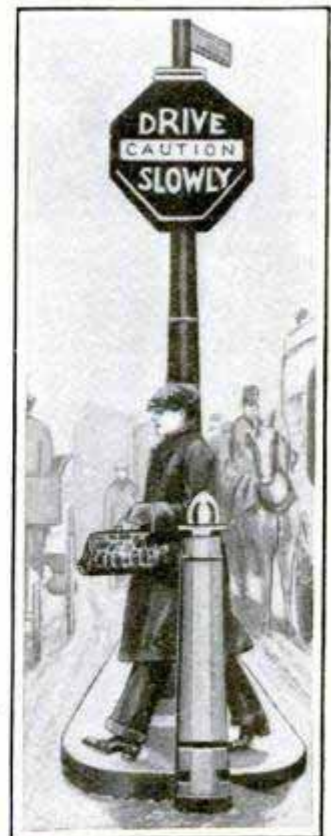
The familiar leaders for attaching fishhooks to lines, known as silkworm gut, is made from the caterpillars of silkworms, by placing the freshly killed worms in vinegar for several days. The caterpillar is then pulled apart in such a way as to draw out a glutinous thread formed by the silky secretion, 3 ft. long, which is then stretched on boards and dried in the sun. The silkworm from which this kind of fishline is made is a green variety about 3 in. long, feeding on the leaves of the camphor tree. Forty grades of this product are recognized by dealers, the price varying from 30 cents to \$6 a pound.

Two-Pronged Searchlight Used on the Suez Canal

STREET-TRAFFIC SIGN WARNS DRIVERS

At busy street intersections in London a new form of warning notice to drivers has been erected. Made of glass, it can be illuminated at night and on dark days, so that it may be seen before the corner is reached. It is attached to poles set in "islands of safety," now a part of all well-regulated street crossings.

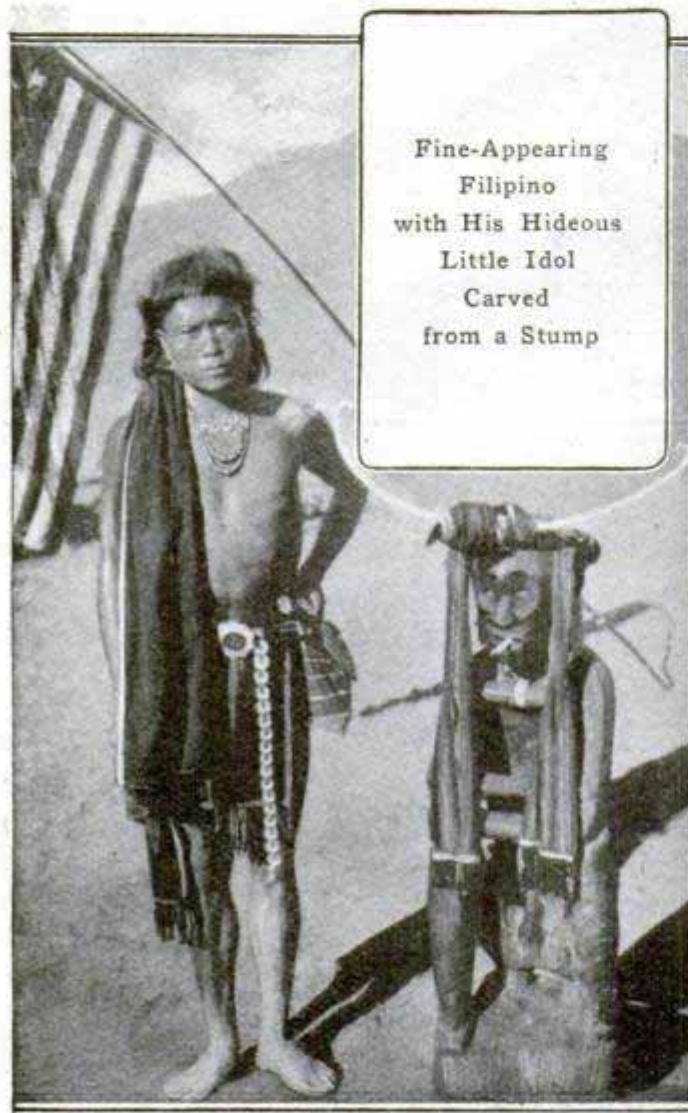
⌈The course of the Illesillete-wait River for nearly a mile will have to be changed before work can begin on the 5-mile Canadian Pacific tunnel under Mt. McDonald, in western Canada.



Courtesy of the Car

CURIOUS WOODEN IDOL OF FILIPINO TRIBE

Idolatry exists in the Philippine Islands among the lesser tribes, and many strange and curious images



Fine-Appearing
Filipino
with His Hideous
Little Idol
Carved
from a Stump

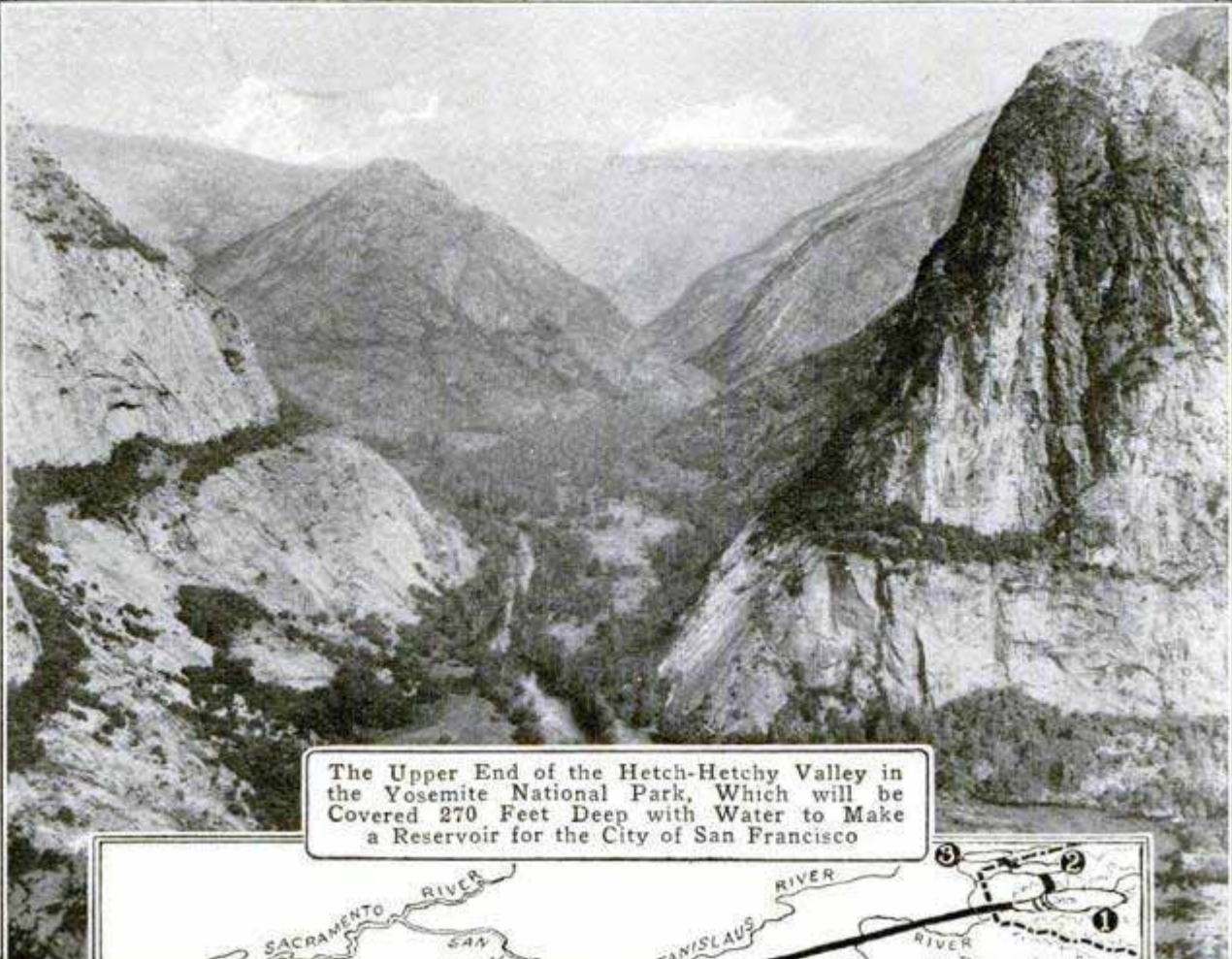
carved from wood are seen by travelers in Luzon, Mindanao and Panay. The Ifugaos, one of the unimportant tribes, profess a loyalty to the Stars and Stripes which is often exhibited in displaying the national flag above or decked about their idols. A photograph depicting this custom represents a "Little Brown Brother" and his tribal deity beneath the starry flag. A closer examination reveals the fact that between the lips of the idol has been placed a cigarette.

☞The New York fire department will buy no more horses, motor-driven machines having proved more efficient.

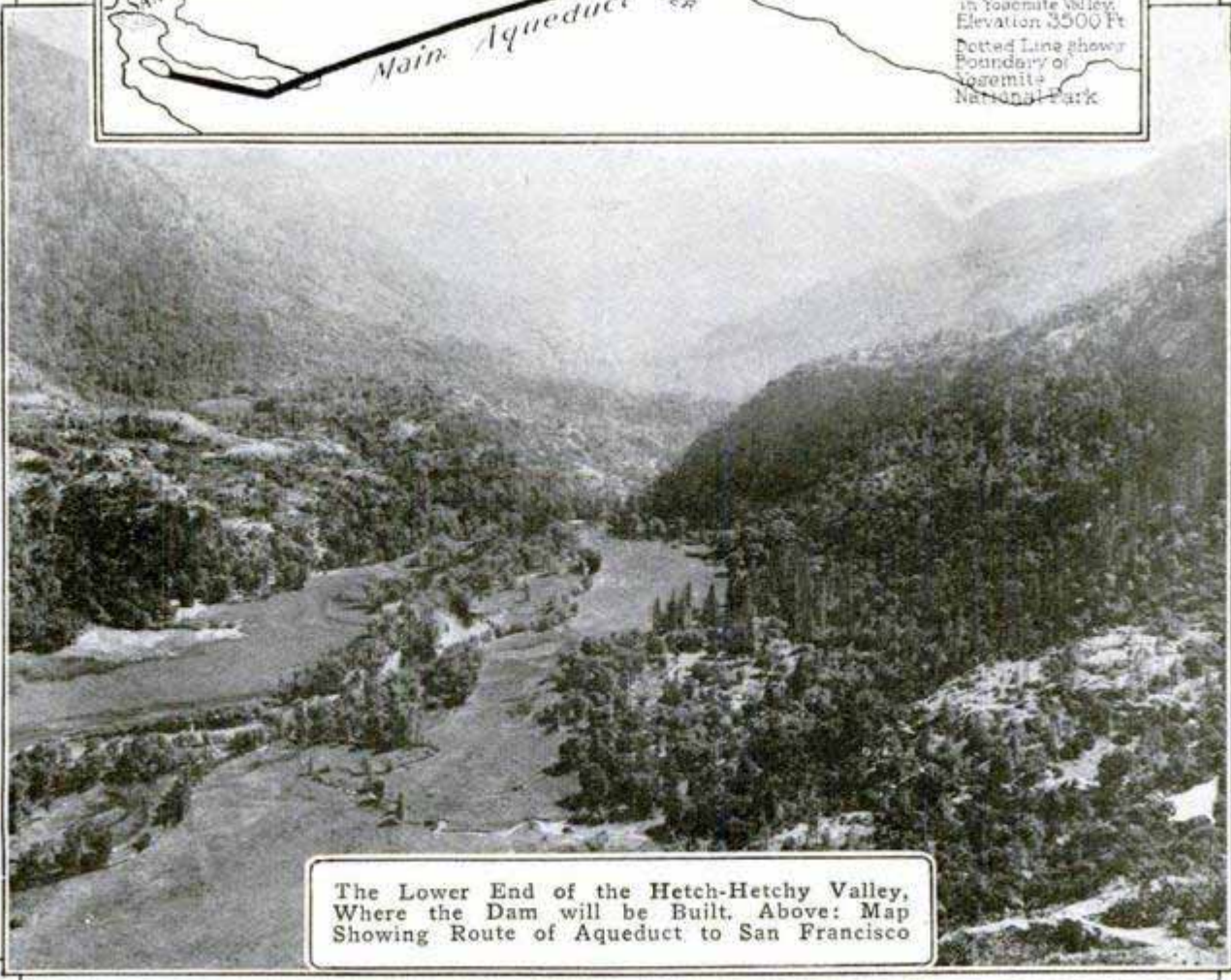
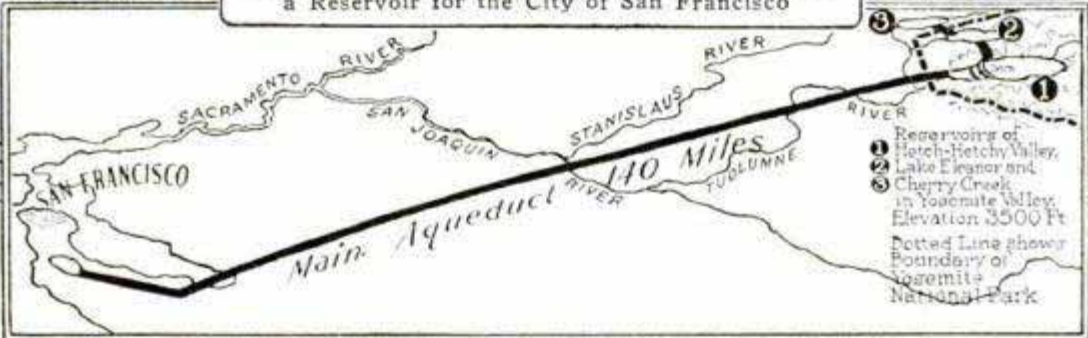
WATER FOR SAN FRANCISCO FROM HETCH-HETCHY

When President Wilson signed the bill giving the city of San Francisco the right to use the water from the Hetch-Hetchy Valley, Cherry Creek and Lake Eleanor, in the Yosemite Valley, that city was assured a permanent water supply sufficient to care for a population of from 4,000,000 to 5,000,000, a supply many times in excess of its present needs. This victory for the western metropolis was secured only after a long contest, the big fight against the project being based on the assumption that a reservoir in the Hetch-Hetchy Valley would spoil the wild beauty of that portion of the Yosemite National Park, although the project was favored by many famous "conservationists." Now that the contest is settled, surveys and plans for an aqueduct are being rapidly pushed to completion. This aqueduct will follow a practically straight line from the site of the proposed reservoir to the southern end of San Francisco Bay. The length of the main aqueduct will be about 140 miles, but the extensions necessary for reaching Cherry Creek and Lake Eleanor will bring the total length up to about 190 miles.

According to present plans a tunnel, about 10 ft. in diameter, will be built from the proposed reservoir to the easterly edge of the San Joaquin Valley. Across this valley will be laid, for the present, one steel pipe, 7 ft. 6 in. in diameter. Ultimately there will be two such pipes, laid side by side and each about 45 miles in length. From the junction of the Stanislaus and the San Jose Rivers, the aqueduct will consist mainly of a series of tunnels, 12 or 13 ft. in diameter, and will have its western terminus at a hillside overlooking the southern end of San Francisco Bay. At this point a terminal chamber and gate house will be built and branch aqueducts will be laid to distributing works in San Francisco, Oakland, San Jose, and other communities about the bay. A dam, 300 ft. high and 760 ft. long,



The Upper End of the Hetch-Hetchy Valley in the Yosemite National Park, Which will be Covered 270 Feet Deep with Water to Make a Reservoir for the City of San Francisco



The Lower End of the Hetch-Hetchy Valley, Where the Dam will be Built. Above: Map Showing Route of Aqueduct to San Francisco

for impounding the waters of the Tuolumne River will be built across the Hetch-Hetchy Valley, and a tunnel will then be built under the mountains for connecting Cherry Creek and Lake Eleanor with this reservoir. It is estimated that the work of developing the system to the point where water can be brought to San Francisco will require a period of from seven to eight years. Although hydroelectric power and irrigation form no part of the project at present, these may be-

come important considerations after the water-supply system is fully worked out. The fall from the Hetch-Hetchy Valley to San Francisco is about 3,500 ft., and it is estimated that with three power houses nearly 160,000 hp. can be generated, while for many years to come the available water supply will so greatly exceed the demand that it will be easily possible to irrigate a large part of the San Joaquin Valley with this surplus alone.

NOVEL SCHOOL EXERCISER FOR SMALL CHILDREN

A Cincinnati kindergarten has just installed a curious bicycle to develop weak chests and arms of children,



which the pupils delight in using. It is a very simple affair of wood, having two solid plank wheels with soft tires and worked by a handle, the whole machine being held in place by a 10-ft. arm fastened to a pivot. The youngsters travel around the 20-ft. circle, propelled by the muscles of their arms, backs and chests. The apparatus is easily disconnected from the pivot and stored out of the way when not in use.

SAVING THE WASTE WATER OF ENGLAND

A suggestion for replenishing the underground water supplies of England was made by the geological survey of that country recently, which calls attention to the fact that the water level in the London district has fallen 100 ft. or more within recent times, owing to the enormous quantities of water pumped therefrom daily. It is seriously proposed to impound the rains falling upon the impervious strata about London, and drain it into wells which will be extended down so deep that the water will find its way into the chalk water-bearing strata. A tremendous amount of

water which now runs to waste would be saved for manufacturing and commercial purposes. Experiments have already been conducted at Lea Bridge which conclusively prove the practicability of the plan.

⌈The Department of Commerce has held that flying boats are "motorboats" and are subject to government regulation and inspection.

HOW THE EARTH'S RIGIDITY IS MEASURED

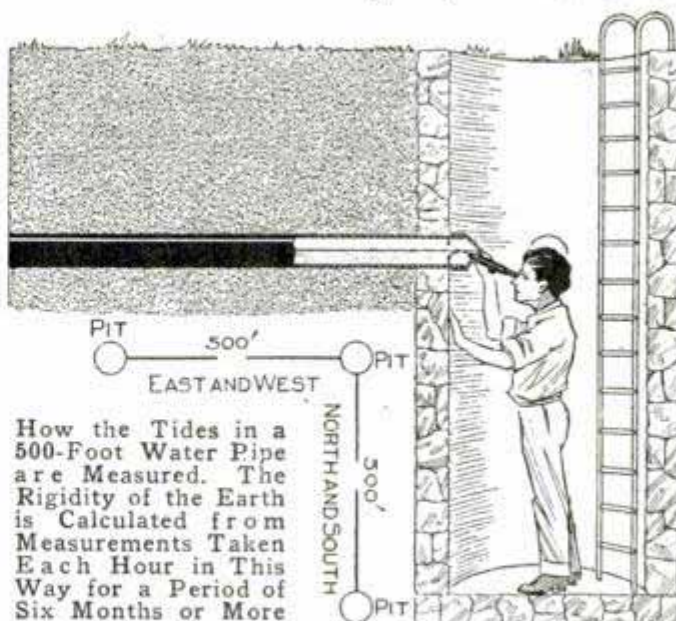
The theory that the earth is a hollow sphere filled with liquid fire was long ago discarded by scientists, and now, as a result of tidal measurements being made by the physicists of the University of Chicago, this belief is not only shown to be an impossible one, but it is announced that the core of the earth is more rigid than the hardest steel. For carrying out these measurements two 6-in. water pipes, each 500 ft. long, were placed underground at such a depth as to avoid all danger of freezing. One pipe was laid in a true north and south direction and the other in an east and west direction. Each was laid in a straight

line and in a perfectly level plane. These pipes are filled half full of water and hourly observations of the variations in the water level at the ends of the pipes, or the "tides" in the water, are being made with microscopic instru-

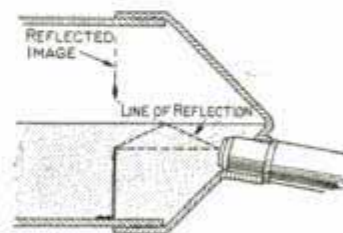
ments of the greatest precision. This work is being carried out at Williams Bay, Wis., where the Yerkes Observatory is located. It has already been carried out sufficiently to satisfy the average person as to the earth's rigidity, but it is to be carried much further than this. Science does not recognize anything in nature as absolutely rigid, and the final report on these experiments is expected to give some coefficient of great value in a scientific way, but expressing a degree of elasticity too inconceivably small to mean anything to the unscientific person.

An idea as to what these measurements consist of may be obtained from one of the accompanying diagrams, in which the tidal effect caused by the attraction of the sun and moon is

shown on an exaggerated scale. If the earth were a liquid, it would be



subject to a tremendous tide twice a day and would take the spheroidal form shown by the dotted lines. If it were absolutely rigid it would retain the nearly circular form shown by the full line. Since it is neither of these, it is distorted to a shape between these two. In other words, our solid old earth, with the rigidity of steel, yields enough under the tide-producing forces of the sun and moon to enable scientists to measure the amount of the "give." It is possible to calculate to the last degree of accuracy for any given hour and minute just what the difference in water level should be as the result of tide-producing forces acting on the water alone, as the water in the pipes used for this purpose adjusts itself to the same tidal curve that it would if it were a 500-ft. section in a pipe encircling the earth. Any difference between this and the water level at the ends of the pipe as found by meas-



urement, is caused by the distortion of the earth, which has the effect of changing the level of the pipe, and it is this extremely minute difference that the scientists are measuring.

The largest difference found up to the present time is .02 millimeter,

equivalent to less than .001 in. To make such measurements as this with any degree of accuracy a microscope of high magnifying power must be used. In addition to this, an ingenious method of doubling the change of level is applied before it is magnified by the microscope. A pointer supported on the bottom of the pipe has its top just below the surface of the water, and the microscope is so placed as to include a view both of the pointer and its reflection from the under side of the water surface. As will be seen from one of the sketches, the distance between the pointer and its reflection is twice that between the pointer and the surface of the water. The reflected image is clear and distinct, as the water surface, when viewed from below, acts as a practically perfect mirror. Even with the accuracy secured in this way, the scientists are not quite satisfied and are arranging to make future measurements by the interference of light rays, a method in which the making of delicate measurements is carried to the last degree of refinement.

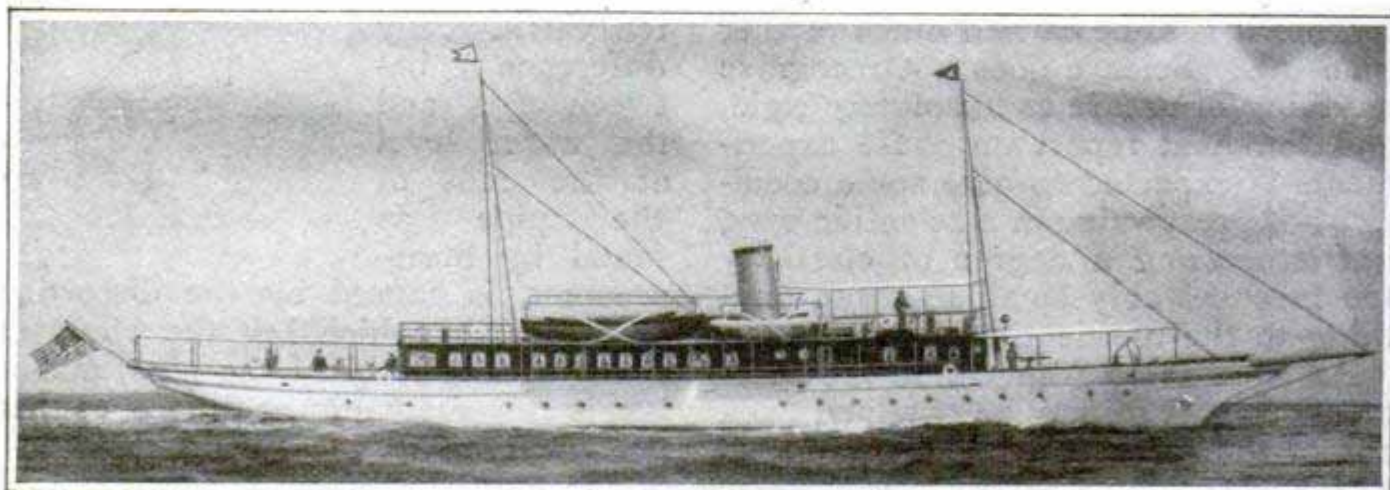
LARGEST GASOLINE-DRIVEN YACHT IN THE WORLD

What is said to be the largest gasoline-driven yacht in the world is the "Florence," now under construction in a Boston shipyard. This vessel is to be 154 ft. long, with a 20-ft. beam and a draft of 7 ft., and will be propelled by two 200-hp. gasoline engines. Two

smaller gasoline engines will be used to supply electric current for lighting the boat and operating the searchlight, as well as for hoisting the anchors, hoisting small boats into the davits, operating the air compressors, and for numerous minor purposes. In the tender boats, two gasoline 6-cyl. marine engines that are considered the smallest of their type in the world are being installed. The cylinders of these engines have a bore of $2\frac{1}{4}$ in. and a stroke of 3 in., and each engine is rated at $7\frac{1}{2}$ horsepower.

A SWIMMING POOL FILLED WITH PURE WATER

One of the largest artificial swimming pools ever constructed, provided with artificial waves, varying depths, a diving island, and a sandy beach, has just been completed at an amusement park, high on the New Jersey Palisades, near New York City. It is not only large, but it is sanitary, for it is filled with pure, filtered drinking water from the Hackensack Reservoir, filtered again before it enters the tank and changed every day, to prevent the possibility of contagion. The pool is large enough to hold 1,000 persons and has sanitary dressing rooms and bathhouses for 600 bathers. It is 500 ft. long and 150 ft. wide at its narrowest end. The bottom slopes down from the beach end until it is 12 ft. deep at the narrow end. Two platforms, 4 ft. wide, are pumped up and down at the narrow end to produce artificial waves.



The "Florence," a Yacht 154 Feet in Length, will be Propelled by Two 200-Horsepower Gasoline Engines



The Largest Swimming Pool in the World: It Has a Sandy Beach, Artificial Waves, and Pure, Clean Water

In the deep water there is an artificial island with a diving tower under a fountain. The pool is open day and night and artificial moonlight is supplied by innumerable electric lights.

MINIATURE MODELS MADE IN BIG SHOP

Near Cologne there is a famous German model shop in which exquisite miniatures of bridges, boats, steamers and models for demonstration and experimental purposes are made. So complete is this plant, that steamboat models with all external fittings in most perfect reproduction of great boats are made for schools and exhibition purposes. A model of a universal rolling mill for I-beams, with a capacity for beams up to 40 in. high, was recently made in this shop, and the little model was so perfect that machine-steel billets could be rolled into I-beams only $\frac{3}{4}$ in. high. Bridges, lifts and intricate machinery which cannot well be installed for exhibition purposes are shown in miniature, and this firm is kept busy, orders coming to it from all parts of the world.

NEW TYPE OF BICYCLE SEEN IN PARIS

A new and successful type of bicycle has been built by a French inventor which is declared to be as "easy as a rocking chair." The frame, instead of having the usual diamond shape, consists of a laterally braced truss, upon which a chair seat is mounted on springs, and a support is provided for the rider's back. The steering wheel operates like the one usually seen on an automobile, while the propulsion is

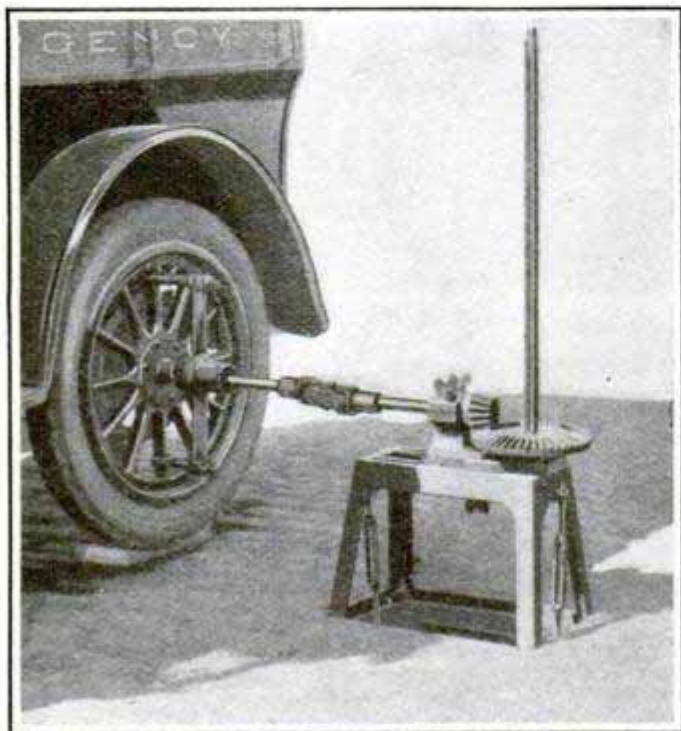


Novel French Bicycle

given by forward pushes on pedals, set well in front of the seat and connected by chain and gearing with the rear wheel.

AN EMERGENCY DEVICE FOR CLOSING GATE VALVES

When a water main bursts in city streets, the damage usually increases



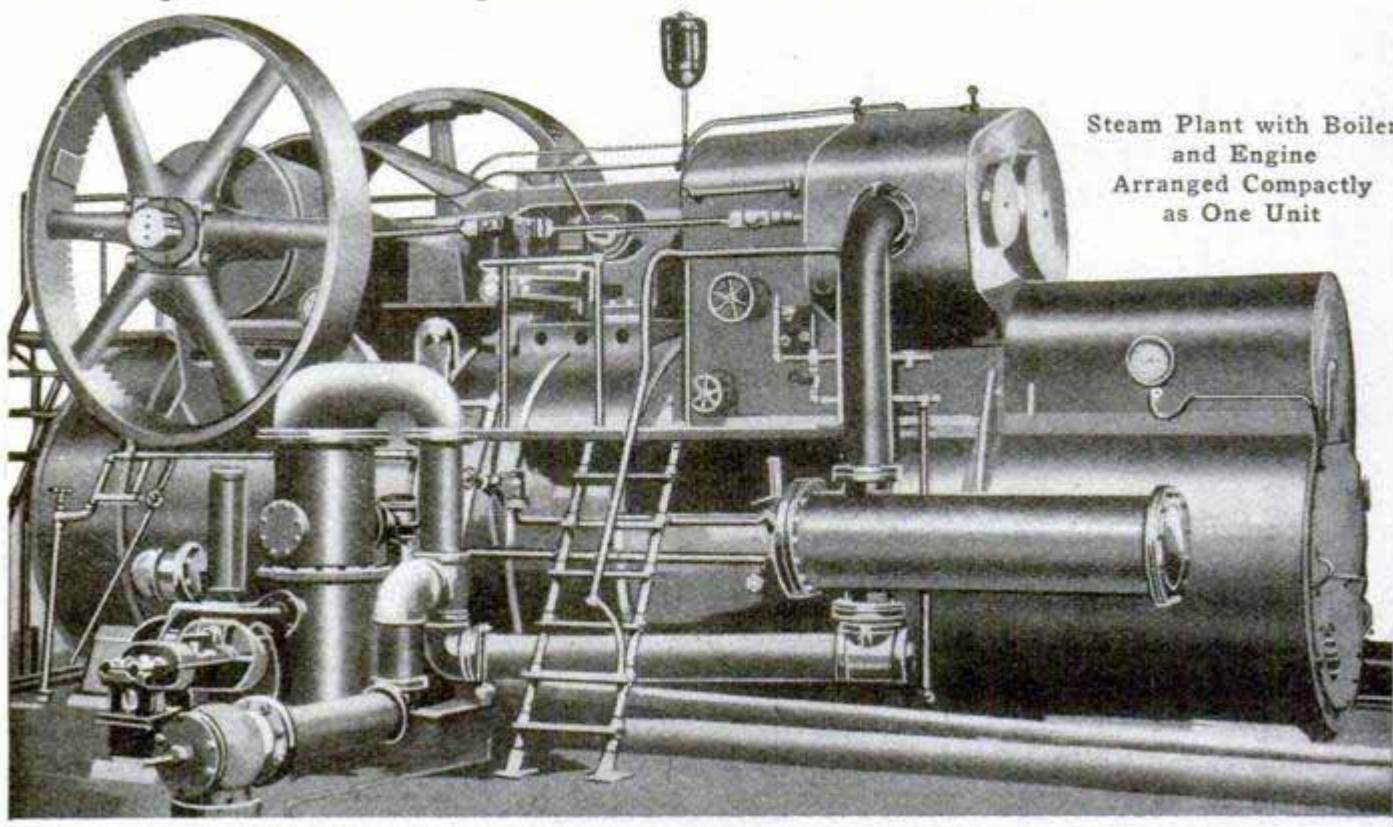
Motor Truck Used to Shut Off Broken Water Main

every minute until the water is shut off. The water department of Boston has hit upon a scheme for the more rapid closing of the gate valves, should accident occur. An emergency motor truck is provided with a specially de-

signed hub for the rear wheel, which can be connected quickly with a gear arrangement carried in the truck. This latter consists of a bevel gearing attached to a standard which fits inside the gate-box frame, and by means of which the stem of the gate valve is worked. An emergency call comes in, the truck hurries to the scene, and while one man is fitting the standard to the gate box and attaching the gears, another is jacking up the rear wheel. The moment connections are made, the motor is started, the rear wheel, revolving, turns the gears and closes the gate valve, shutting off the flow of water. The whole operation takes scarcely more time than it takes to tell it.

COMPLETE STEAM PLANT IN COMPACT FORM

A compact steam unit of a type that has been common in Europe for some years, under the general name of locomobile, and which comprises a complete power plant in exceedingly small space, has been placed on the American market. This unit, it is stated, uses only a trifle over a pound of coal per horsepower-hour as against 4 or 5 lb. in railroad locomotives and 5 or

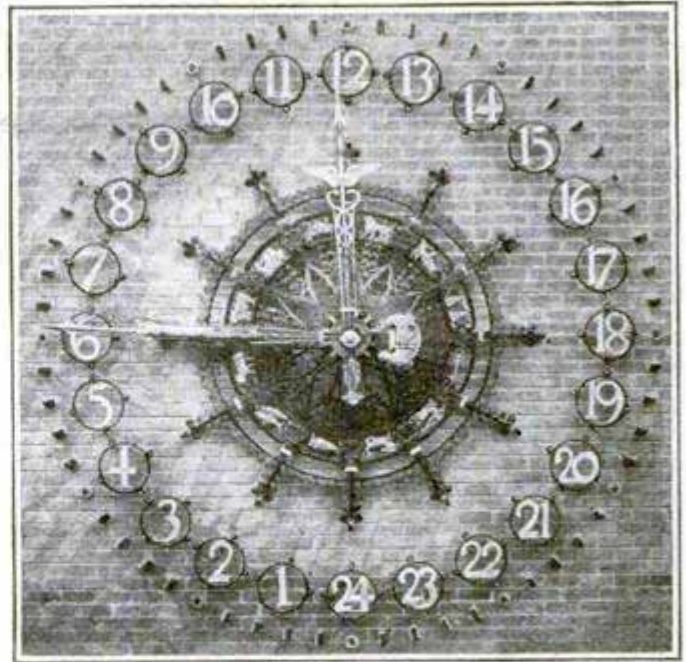


Steam Plant with Boiler and Engine Arranged Compactly as One Unit

6 lb. in the ordinary small steam plant. A high-class compound engine is mounted directly on the boiler so that the cylinders are in the smoke box, the steam passing from the superheater directly to the high-pressure cylinder and from this cylinder through the reheater to the low-pressure cylinder without outside piping. In passing through the superheater the direction of the steam is opposite to that of the hot gases. The normal rating of the stationary plant shown, which has only 9 sq. ft. of grate surface and 370 sq. ft. of heating surface, is over 200 horsepower.

NEW PARIS POST OFFICE HAS 24-HOUR CLOCK

There has just been mounted upon the building of the new post office, at the corner of Faubourg Poissonière and Rue Bergère, Paris, a 24-hour clock, architecturally in keeping with that fine edifice. The dial is very large, the figures outlined within circlets of steel, the minutes designated by iron inserts in the brickwork of the wall, and each five-minute interval consisting of a small floral ornament.



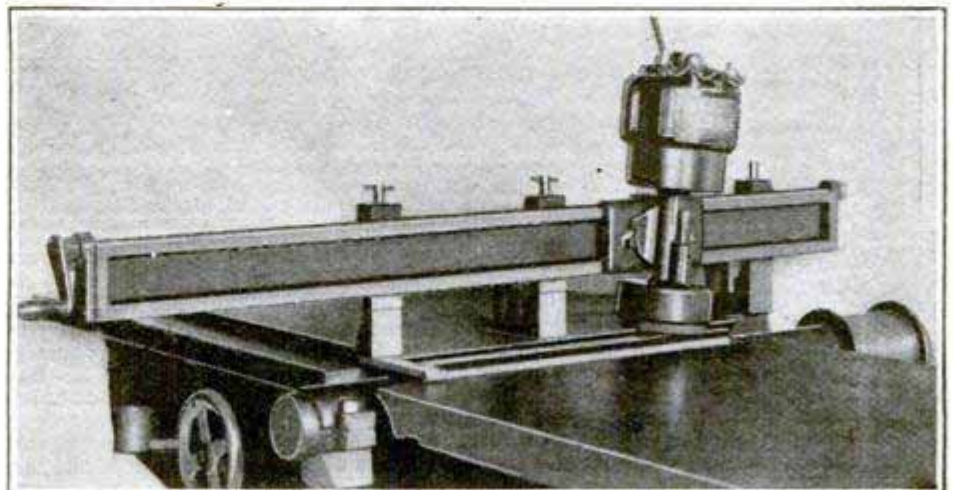
Beautiful Clock Recently Placed on the New Post-Office Building in Paris

The center of the dial is an intricate design in wrought iron, zodiacal figures in light color being superimposed upon the scrollwork. The hands of the clock are in themselves artistic, the hour hand bearing the caduceus of Mercury, and the minute hand ornamented with the Roman fasces, the inner ends of these hands bearing the monograms of the Post, Telegraph and Telephone Department and of the French Republic respectively.

KNIFE GRINDER USED IN WOODWORKING SHOPS

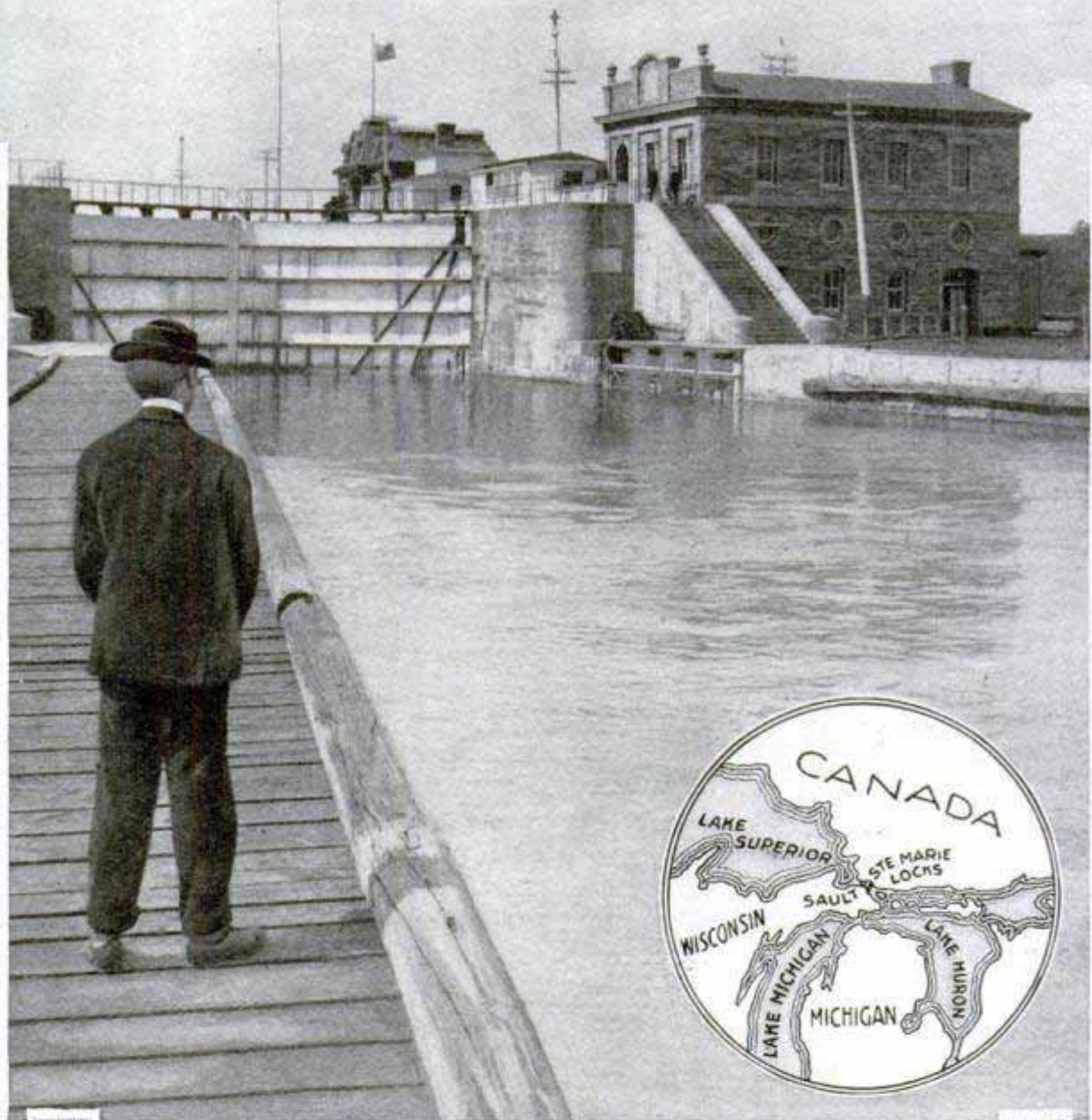
The knives of planers, jointers, and other woodworking machinery may, by the adoption of a device recently patented, be sharpened without being removed from the machine. The new grinder is motor-driven, the motor being mounted on the head and the current supplied from a lamp socket. With it the knives are sharpened on the machine, with uniform angle, or with a concave surface if desired. The grinder slides along a trans-

verse bar or bridge which is held perfectly rigid by intermediate supports, and is clamped firmly to the bed of the woodworking machine. A torsion spring within the grinding wheel regulates the pressure against the knives.



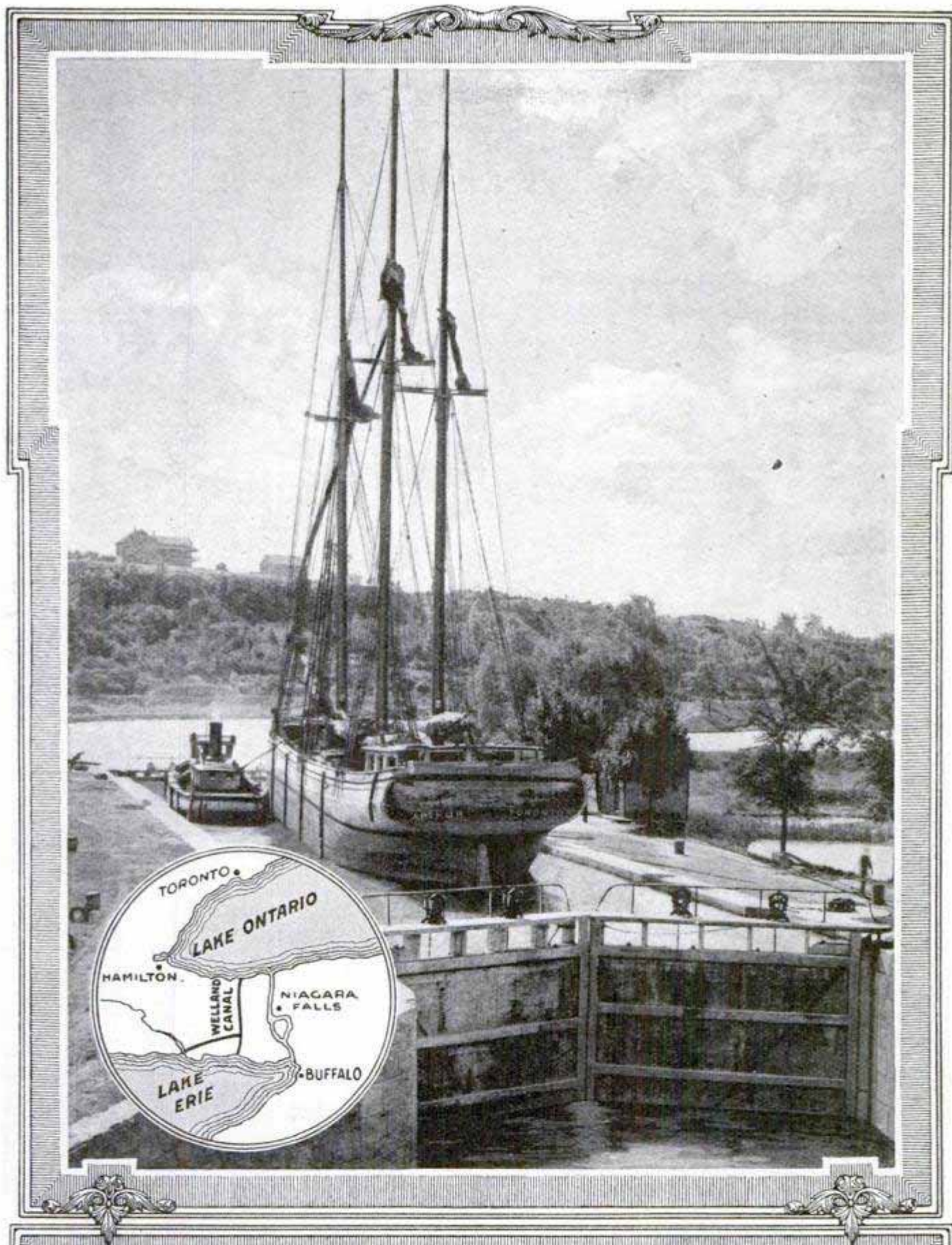
Novel Device for Grinding the Knives on a Planer without Removing Them from the Machine

ARTIFICIAL WATERWAYS IN MANY LANDS



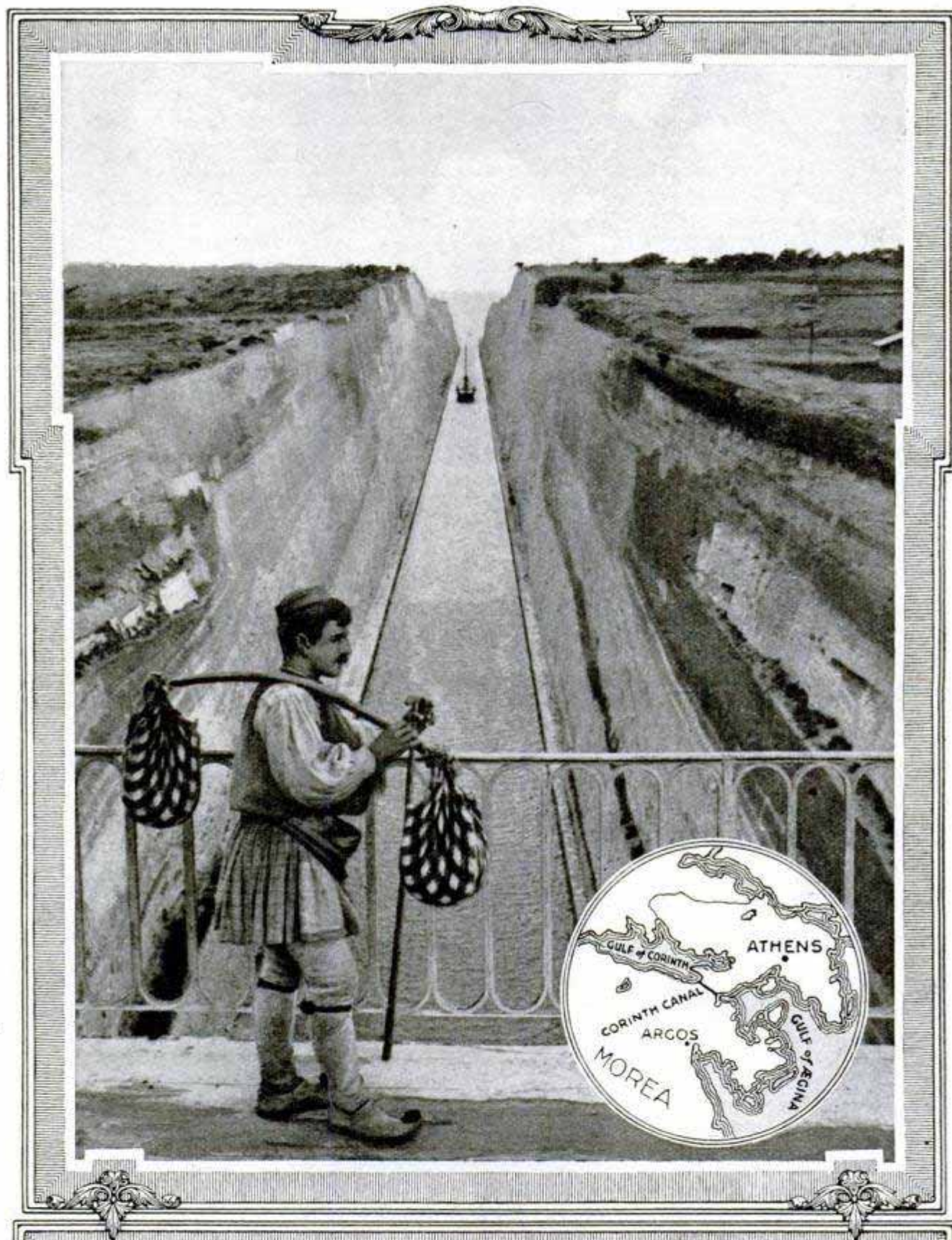
IN the volume of traffic passing through it annually, the Sault Ste. Marie Canal, which enables lake vessels to pass the rapids of the St. Mary's River, connecting Lake Superior and Lake Huron, exceeds every other artificial waterway in the world. Begun by the state of Michigan in 1837, it was not completed until after the Federal government, in 1852, gave the state 750,000 acres of land, the proceeds from the sale of which were applied to canal construction. The Federal government has since three times enlarged the canal and locks at the "Soo," as it is termed by lake men, to keep pace with the increased size of lake ships, so that the largest vessels may pass through.

ARTIFICIAL WATERWAYS IN MANY LANDS



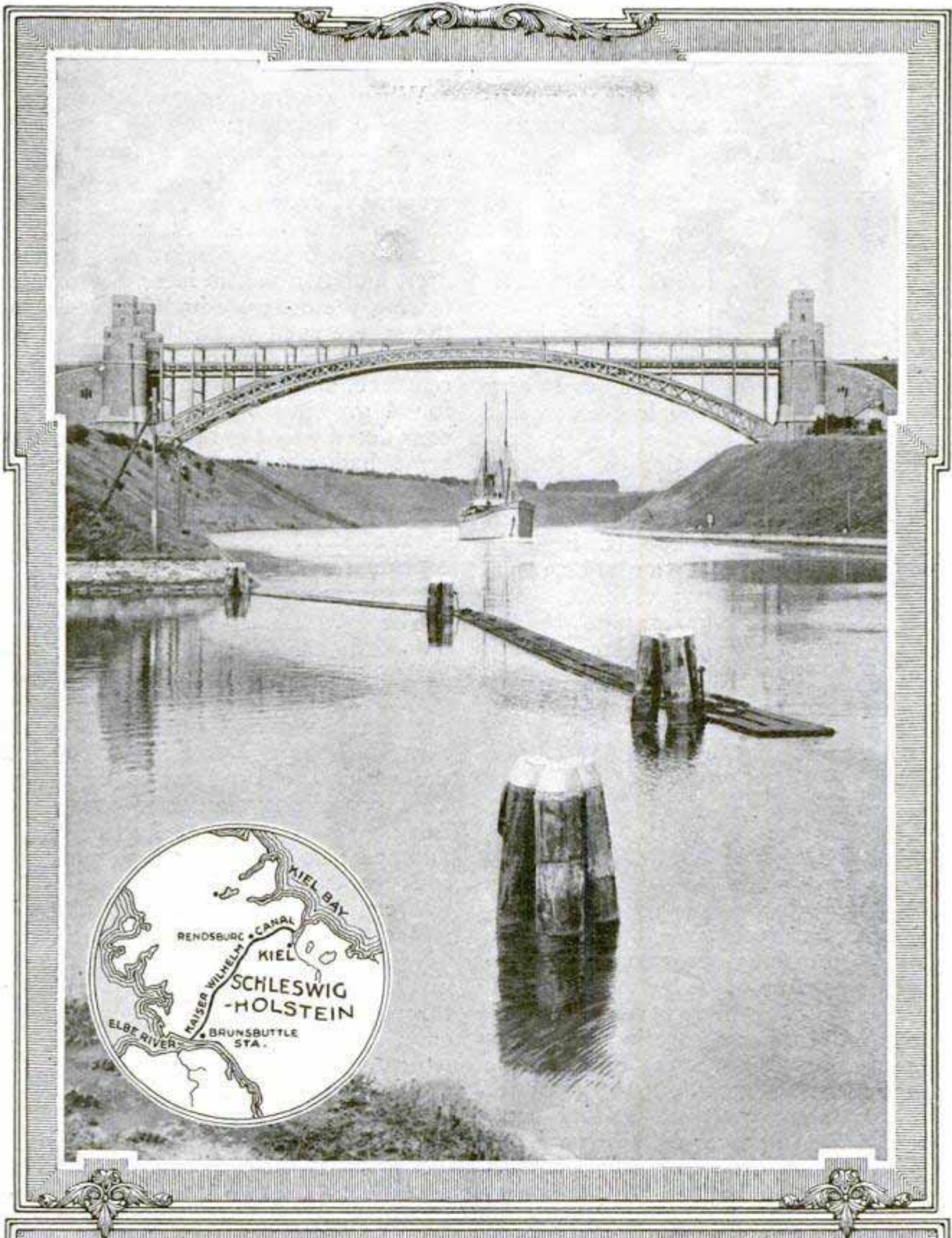
THE only route by which vessels may pass between Lake Erie and Lake Ontario is the Welland Canal, built by the Canadian government and opened in 1833. It is 26 $\frac{3}{4}$ miles long, running from Port Colborne on Lake Erie to Port Dalhousie, on Lake Ontario, with a drop of 323 ft., necessitating an almost continuous series of locks. Vessels of 14-ft. draft and up to 270 ft. long and 45 ft. beam can pass through these locks, but the work of shortening the canal and enlarging it so that large lake freighters and seagoing vessels may pass around Niagara Falls and enter the upper lakes is now under way.

ARTIFICIAL WATERWAYS IN MANY LANDS



MORE than two thousand years ago navigators of ships plying between the Adriatic Sea and Piraeus found it more convenient to drag their vessels overland across the Isthmus of Corinth than to sail them 202 miles around the southern peninsula of Greece. In A.D. 67 the Emperor Nero began cutting a canal through the isthmus, but the project was abandoned until 1881 when a French company began the construction of the present canal, which was finished by a Greek company in 1893. It is 4 miles long, 70 ft. wide, and 26 ft. deep. Its swift current, however, and its narrowness, make it impractical for large vessels, which seldom use it.

ARTIFICIAL WATERWAYS IN MANY LANDS



FROM the viewpoint of military strategy the Kaiser Wilhelm Canal, also often called the Kiel Canal, is the most important artificial waterway in Europe. Connecting the Baltic with the North Sea, it gives German warships quick and direct access to the Atlantic Ocean. Its commercial importance is also great, as it enables seagoing ships to avoid the stormy passage around the Jutland capes. Begun in 1887, it was finished in 1895, with a depth of 29 ft. 6 in., a bottom width of 72 ft. and surface width of 213 ft. In 1908 the work of doubling the bottom width and increasing the depth to 45 ft. was begun.

ORNAMENTAL CHIMNEY SEEN IN SALT LAKE CITY

What appears to be an ornate monument or the minaret of an oriental mosque is in reality a highly ornamental smoke-



stack on the property of the Mormon church in Salt Lake City. The lower part is of hewn stone, with columns and airy balconies, while the upper portion is of iron. The structure stands about 100 ft. high in parklike surroundings, and suggests to the traveler a very practical method of contributing to the city-beau-

tiful scheme of the particular city in which he makes his home.

AIR COMPRESSOR OF HUGE CAPACITY FOR MINE

There was recently completed by a German turbine factory an air compressor capable of delivering 3,531,400 cu. ft. of air per hour at a pressure of 140 to 170 lb. per square inch. This is one of three compressors of the same output to be supplied to a South African mining company, using compressed air as power on a large scale. The compressed air in a smaller plant near Johannesburg, already in operation, is sent through a pipe line over 18 miles long, for operating rock drills and other mining tools.

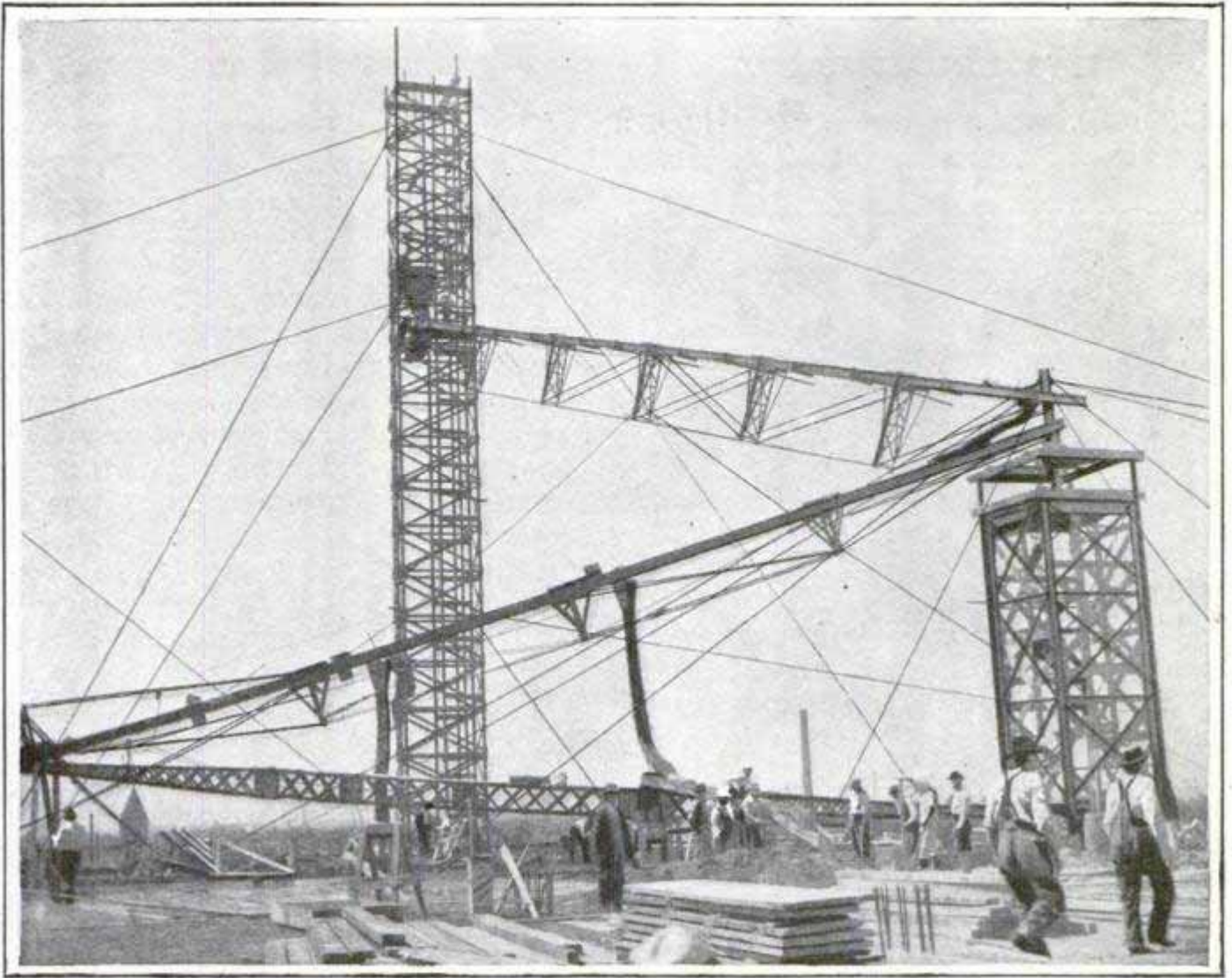
Many of the forest fires attributed to railroads are set by cigar and cigarette butts thrown from smoking-car windows.

GROWING WHEAT PROVED CONCRETE NEVER FROZE

When contractors constructing a concrete building last winter faced severe loss through the freezing of a freshly run concrete floor, they covered the floor with 4 in. of wheat straw, and pulled tarpaulins on it to keep out snow. On the floor below they started fires, and two weeks later, the owners fearing the concrete had frozen during the severe spell when the temperature fell to 10° below zero, the covering was removed, and green wheat beards were found growing 2 in. high. This was considered proof enough that the concrete had not been touched by the frost.

CONCRETE DISTRIBUTOR FOR BUILDING WORK

The laborer's shovel has been supplanted in the construction of concrete buildings by a system of conveyors for mixing and handling materials. From the time sand and cement leave the cars until the concrete is tamped into the molds, no handling is necessary. Cars containing sand and gravel are run up on an elevated trestle and dumped into bins over a moving-belt conveyor which takes the material up to very large bins directly above a motor-driven mixer. Another belt conveyor brings the cement, and all the materials are dumped into the mixer through gates in the bins. The mixer empties directly into a hopper elevator which carries the concrete to a bin near the top of a wooden tower, and from there a chute carries the concrete to a lower tower, centrally located, which has a 40-ft. boom mounted to swing around a complete circle. A second chute, from the top of this tower to the end of the boom, has a number of "rubberneck" flexible-steel spouts, controlled by traps and dams in the chute, which carry the concrete to any part of the building. Still another chute on wooden horses may be attached to the end of the boom. The system is flexible and grows with the



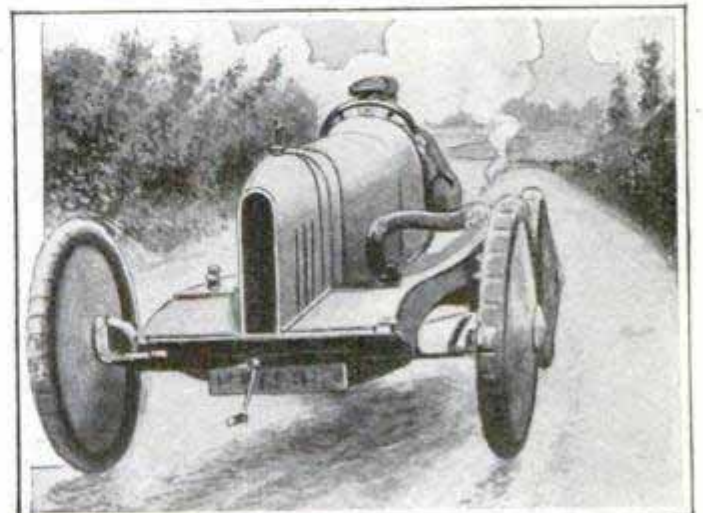
A Mechanical Concrete Distributor Which is Superseding the Shovel and Wheelbarrow in the Construction of Concrete Buildings

building. The apparatus shown in the picture is being used on a six-story building and delivers from 400 to 500 cu. yd. of concrete in an eight-hour day—its efficiency is twice that of usual methods. The taller tower, of wood, is 100 ft. high, and the hopper carries about 1 cu. yd. a minute. About 5 cu. yd. are on the way to the molds all the time.

CURIOUS ENGLISH RACING AUTOMOBILE

The solution of the problem of wind resistance in the construction of racing cars depends largely upon the personal equation. An Englishman, interested in seeing just how far he could go in restricting air friction, recently experimented with a model which presented very little surface to the wind. His radiator is extremely narrow, almost sharp, and combines with the engine

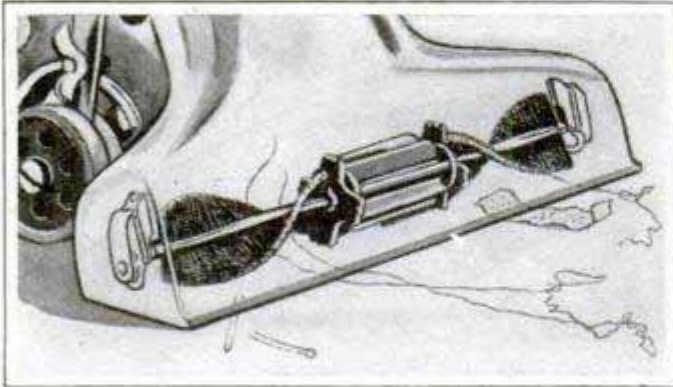
hood wedgewise, being only wide enough at the rear to shield his body from the impact of the rush of air. The wheels, which are solid, are of standard gauge, the narrow radiator jutting up from a flat platform on the chassis.



Courtesy of the Graphic
Wedge-wise Design on an English Entrant for the Tourist Trophy

VACUUM-CLEANER NOZZLE HAS BRUSH INSIDE

There has been recently patented a nozzle, for use with vacuum cleaners,



Brush Helps Vacuum Cleaner to Get Things Clean

which has a revolving brush so arranged just within it that, as the nozzle is swept back and forth over

the floor, the brush assists in raising the dust particles, lint, thread, and other removable dirt, and the action of the cleaner is more efficient.

BOXER IMPROVES METHODS BY WATCHING "MOVIES"

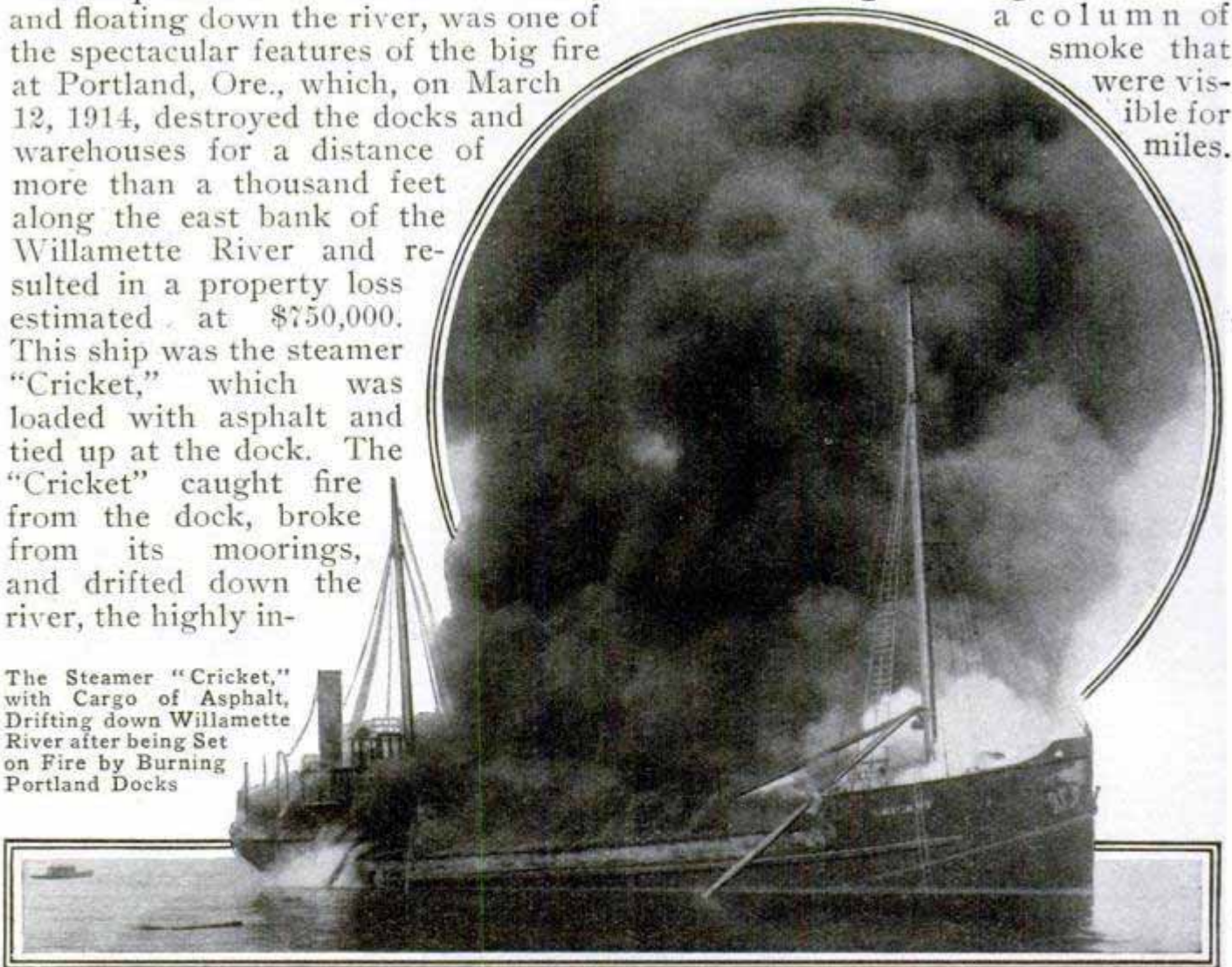
That he has acquired some of his most valuable training from watching moving-picture films that show championship fights is the assertion made by a French boxer. In studying the films no movement of the two adversaries is lost, although the films are sometimes worked so fast that it is difficult to catch all the details of the fight. By studying films depicting his own contests he began to notice his faults and to criticise himself, and this led to improvements in his methods.

BLAZING STEAMER ADRIFT ON WESTERN RIVER

A ship ablaze from stem to stern, and floating down the river, was one of the spectacular features of the big fire at Portland, Ore., which, on March 12, 1914, destroyed the docks and warehouses for a distance of more than a thousand feet along the east bank of the Willamette River and resulted in a property loss estimated at \$750,000. This ship was the steamer "Cricket," which was loaded with asphalt and tied up at the dock. The "Cricket" caught fire from the dock, broke from its moorings, and drifted down the river, the highly in-

flammable cargo causing a blaze and a column of smoke that were visible for miles.

The Steamer "Cricket," with Cargo of Asphalt, Drifting down Willamette River after being Set on Fire by Burning Portland Docks



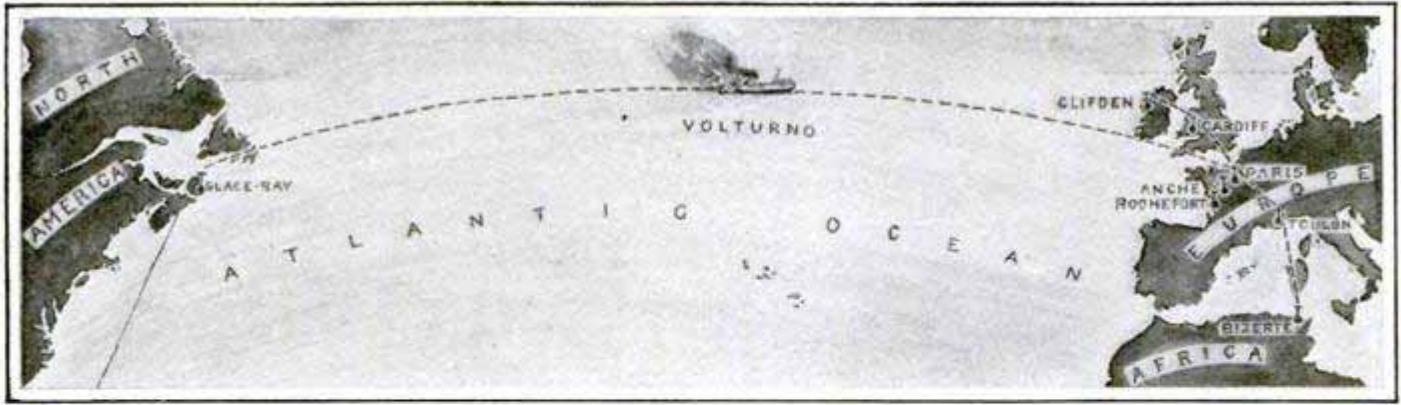


Diagram Showing "Volturno" in the Path of Wireless Waves

DANGER IN THE WIRELESS WAVE

That the catastrophe to the "Volturno" may have been due to an explosion caused by Hertzian waves is the contention of a French scientist. He demonstrates the possibility of such accidents by preparing a globe of glass filled with a mixture of oxygen and hydrogen in the proportion of 1 to 2. Through the stopper of this globe he forces two needles, whose points approach closely together. To the free ends of the needles he affixes insulated wires, which may be strung aloft or laid on the ground. Now when the waves from a wireless apparatus are caused to pass the field of these wires, a spark is produced across the needle points and an explosion is provoked within the globe. The principle involved is the well-known "electric resonator," which has been employed by the British Admiralty in blowing up old warships. Here, instead of an explosive mixture of gases, gunpowder was set off by the spark induced by the Hertzian waves. The "Volturno," so this scientist states, was in the direct track of the high-powered waves between the Eiffel Tower station in Paris and the great Marconi apparatus in Glace Bay. There is no need for a special apparatus, when two metallic points within the ship may catch the influence of the Hertzian waves, and produce a spark capable of igniting the gases arising from fuel or other oils. Such explosions may explain many otherwise unaccountable disasters, and must lead to a careful study both of the so-

called musical spark, which is not so apt to occasion these sparks, and of so insulating all metallic surfaces about oil tanks and powder magazines that no spark can be produced.

LADIES WEAR FOOT MUFFS DURING COLD SPELL

Even fashion has to bow to the rigors of zero weather, and as the vogue for sheerest stockings continued unabated, Parisian ladies fortified themselves by the adoption of foot muffs last winter. These muffs, so termed for the want of a better name, are made of fur, padded and silk-lined, extending from the ankle well up on the calf. They are easily adjusted and quickly removed upon entering the home.

The present American record for altitude flight is held by Theodore Maccauley, who reached an elevation of 12,139 ft. at San Diego, recently.



BLIND MAY NOW PLAY CARDS

A newly devised deck of playing cards makes it possible for those who



Playing Cards for the Blind Have Holes for Indexes

have lost their sight to play simple card games. At the top and bottom of these cards there are holes punched in groups corresponding to the Braille characters, or raised letters which the blind are generally taught to read. There is an obvious advantage in this system in that no one can "see" the cards of the opposing side. The invention of these cards has added greatly to the enjoyment of the blind in providing them with a means of amusement, of which they have far too few.

INSTRUMENT SHOWS BALANCE OF MACHINE

Determining accurately whether a revolving mass, such as a flywheel, is in perfect balance, is a difficult undertaking if done by any ordinary method



Device to Test Balance of Flywheels

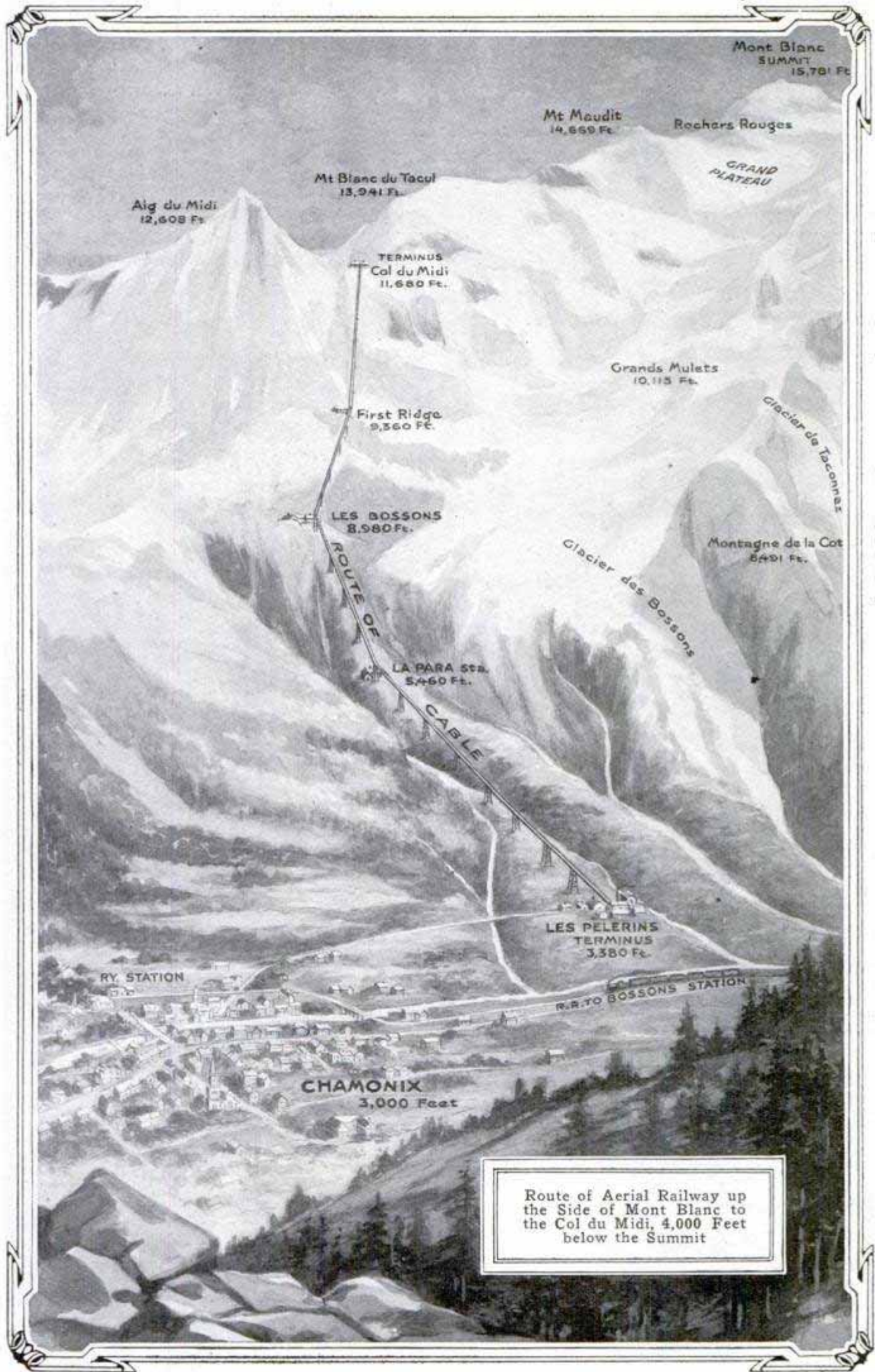
of sighting and measurement. A simple instrument that has just made its appearance on the market is designed

to do this easily and quickly and to show definitely which are the heavy and which are the light portions. This instrument consists of a perfectly balanced disk loosely supported on its axle so that its center is free to move in a circular or irregular path as the disk revolves. There is always enough play and elasticity even in the best bearings to permit a slight but appreciable oscillation of the center of the shaft, and it is this movement that the instrument detects and indicates. The instrument is applied to the end of the shaft, being placed against the exact center, and if the machine is out of balance the disk is thrown out from the center by the centrifugal force and moves in a small circular path. A pointer carried on the disk indicates the heavy portion of the revolving mass. The pointer can then be clamped and held in extended position until the machine is stopped and the heavy portion marked.

MONT BLANC NOW REACHED BY AERIAL RAILWAY

An aerial railway running to a point only 4,100 ft. below the summit of Mont Blanc, the Alpine peak famous as a goal for mountain climbers, has been completed and is to be opened to traffic during the summer of 1914. This railway is of the same general type as those employed in ascending the Kohlererberg and the Vigiljoch, both of which were described in the July, 1913, number of Popular Mechanics Magazine. Such installations are becoming common in the Alps, with the result that many peaks formerly inaccessible to any but hardy and experienced mountain climbers are now within easy reach of the ordinary tourist. The new cableway runs from Les Pelerins, at the foot of the mountain, up to the Col du Midi 11,680 ft. above sea level. Each car accommodates 20 passengers and the aerial trip will require 20 minutes.

⌈There are 8,000 islands under the possession of the United States.



Mont Blanc
SUMMIT
15,781 Ft.

Mt Maudit
14,660 Ft.

Rochers Rouges

Mt Blanc du Tacul
13,941 Ft.

GRAND
PLATEAU

Aig du Midi
12,608 Ft.

TERMINUS
Col du Midi
11,680 Ft.

Grands Mulets
10,115 Ft.

First Ridge
9,360 Ft.

Glacier de Tacconis

LES BOSSONS
8,980 Ft.

Glacier des Bossons

Montagne de la Cot
8,491 Ft.

LA PARA STA.
5,460 Ft.

ROUTE OF
CABLE

LES PELERINS
TERMINUS
3,380 Ft.

RY. STATION

R.R. TO BOSSONS STATION

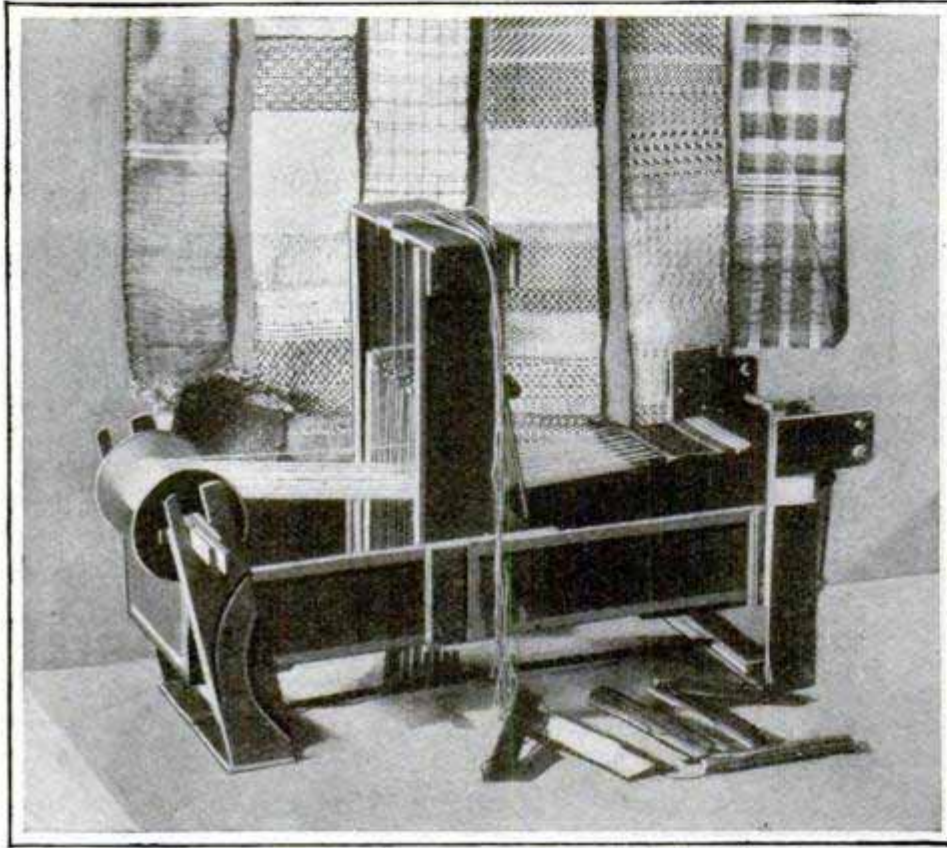
CHAMONIX
3,000 Feet

Route of Aerial Railway up
the Side of Mont Blanc to
the Col du Midi, 4,000 Feet
below the Summit

MINIATURE LOOM MADE OF CIGAR BOXES

A student at the Rhode Island School of Design made a small loom from cigar boxes, on which he wove intricate patterns as a part of the course in textile design. The machine

There are eight harnesses, which raise the threads at appropriate times, permitting the shuttles to be thrown across the warp yarn by hand. All the woodwork, with the exception of the harness frames and the bar holding the rubber bands which pull the harnesses down, is composed of cigar-box sides. Even the miniature shuttles are cut from the same material. So accurately are the patterns woven by this tiny loom that already many other students have made similar looms, the miniature machines being constructed in something like six hours and at an expense of but 50 cents or so. A piece of cloth, 10 ft. long, can be woven on these small looms, and as many patterns shown as may be de-



Small Loom, Made of Cigar Boxes, Used in Pattern Designing

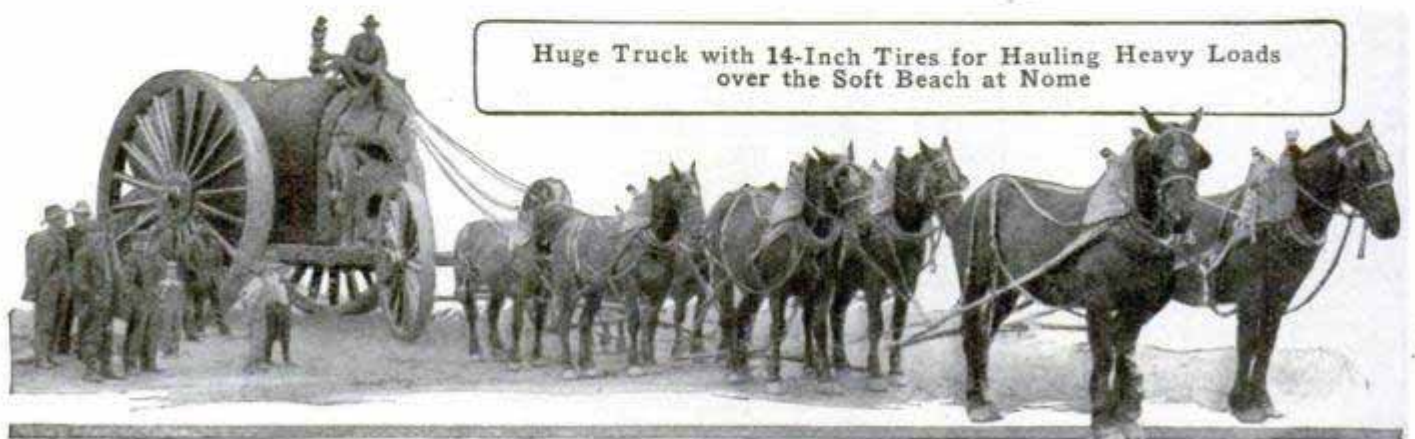
is about 18 in. long and 7 in. wide. It is equipped with everything that is necessary for the construction of cloth.

sired. The photograph shows a number of pieces of cloth woven on this machine.

WIDE TIRES ON BIG TRUCK USED ON NOME TUNDRA

The Nome district in Alaska has a surface of vegetation overlying frozen, or glacial, deposit and calls for trucks especially adapted to soft

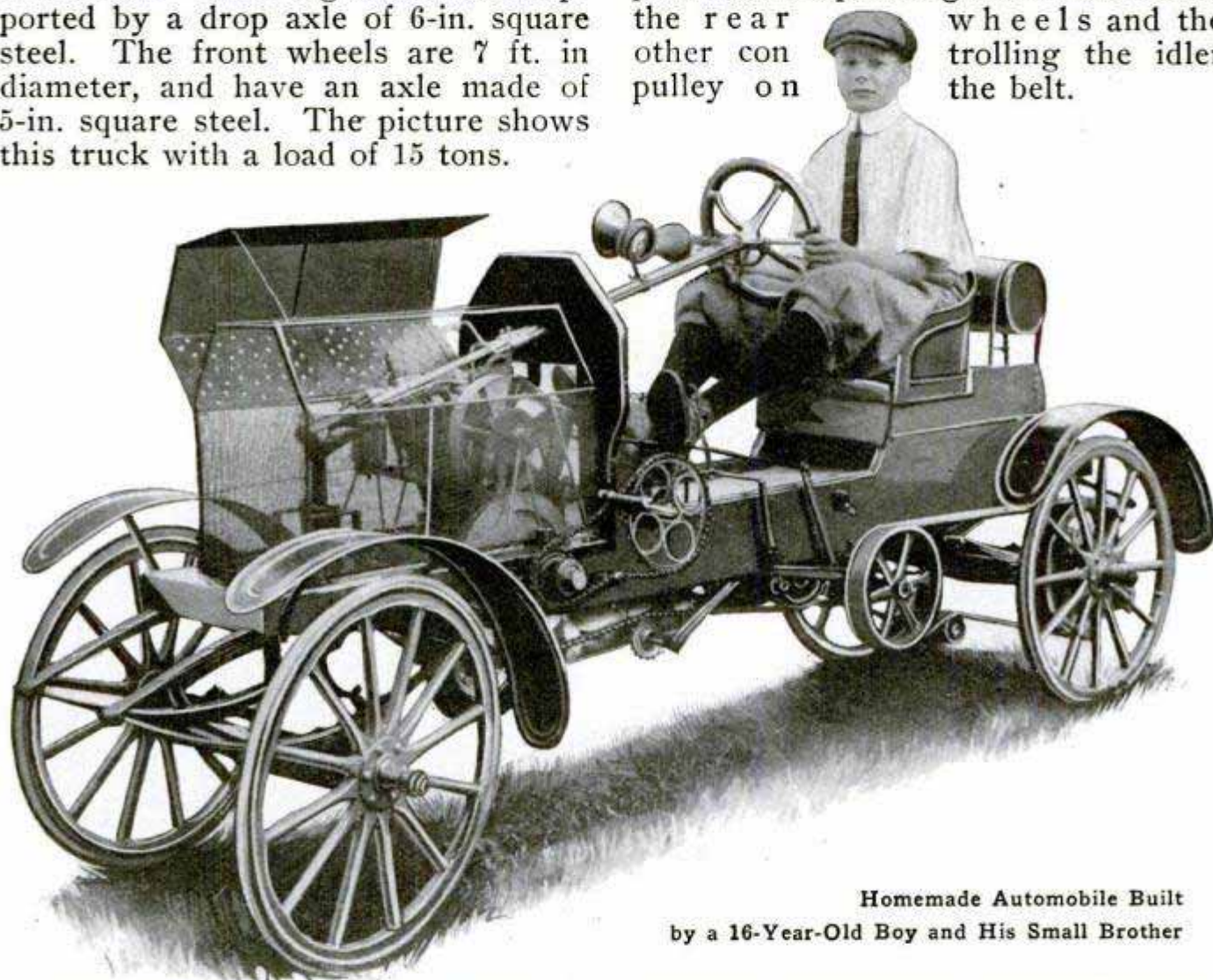
or springy ground. The beach line, known as the tundra, is the scene of active mining operations which require equipment of great weight.



Huge Truck with 14-Inch Tires for Hauling Heavy Loads over the Soft Beach at Nome

As operations are changing from point to point, caused by the pay streak varying, much hauling of outfits is the rule. To meet these requirements a monster truck has been built. The rear wheels have a diameter of $12\frac{1}{2}$ ft.; the tires are made from $\frac{3}{4}$ -in. iron, and are 14 in. wide. The spokes are 10 in. at the base, tapering to 7 in. at the rim. These big wheels are supported by a drop axle of 6-in. square steel. The front wheels are 7 ft. in diameter, and have an axle made of 5-in. square steel. The picture shows this truck with a load of 15 tons.

It is propelled by a 2-cyl., 5-hp. motor taken from a disabled motorcycle, supplied with fan, battery and coil ignition, and muffler. Transmission is by a countershaft and two belts to the rear wheels which take the place of differential gears. The car is run by a steering wheel with quadrants for spark and gas control and two foot-pedals, one operating drum brakes on the rear wheels and the other controlling the idler pulley on the belt.



Homemade Automobile Built
by a 16-Year-Old Boy and His Small Brother

TWO BOYS BUILD A REAL AUTOMOBILE

A first cousin of the commercial cyclecar is the homemade automobile designed and built by two Louisville, Ky., boys, 16 and 8 years old. It has the finished look shown in the accompanying picture, will run from 3 to 30 miles an hour, and cost one year's labor. The car's specifications are: weight, 250 lb., 84-in. wheel base, 33-in. tread, 30-in. artillery wood wheels with $\frac{7}{8}$ -in. solid rubber tires, four full-elliptic springs, capacity two passengers when the rumble seat is attached.

RESULTS OF FOOTBINDING IN CHINA

Of all strange customs, that of binding the feet of Chinese women must rank among the most curious. For centuries deformed feet have been the mark of high birth and social distinction among the people of the "Flowery Kingdom." Tradition says that once a beautiful princess, cursed with club-feet, so skillfully concealed the deformity that all her court sought to imitate her. A more pessimistic origin is that told by a cynical philosopher who traced the barbaric custom

to a desire to place a handicap upon women's habit of gadding about. Girls about the age of five have pieces of cloth wound tightly around their



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The Feet of a High-Caste Chinese Woman, Which have been Deformed through Binding

feet, beginning at the big toe and winding the strips upward over the ankle. The other toes are bent beneath the foot and the heel drawn in toward the sole until the two are almost in contact. Occasionally the bandages are removed and readjusted, the circulation being arrested only enough to check further growth. In reality the feet are not so small as they appear to be, for only the sharp part of the foot, the big toe, is placed in the shoe, while the heel is lifted up into the leg of the shoe, giving the appearance of a foot only 3 in. long, while actually it may measure 6 or 7 in. If the wrappings should be removed from the feet of a grown woman, the foot would grow with the influx of more blood, but it would never regain the semblance of a human foot.

ODD DISCOVERY PREVENTS CANAL-FLOOR EROSION

A German scientist who has made a study of the effect of propeller action on the floors of canals found that if a bottom plate were attached to the rudder no erosion occurred, even if the boat were kept stationary by means of cables while the propeller was revolved at normal speed. The bottom plate was made a little longer than the rudder, projecting at the rear, and was as wide as the rudder was high. This deflected the current induced by the propeller which normally was turned downward by the rudder and which was the cause of the erosion complained of by canal authorities.

PUBLIC TELEPHONE ON AN UNINHABITED ISLAND

There is a little island about a mile northeast of Guernsey, in the English Channel, upon whose highest cliff a small uninhabited lighthouse stands, the signals of which, operated from the adjacent coast, inform ships whether the weather is clear enough to enter in safety the narrow channel of the ports Saint-Pierre and San-Sampsons. This lighthouse contains a public telephone, by means of which shipmasters may communicate with the shore. The interior of the lighthouse is reached by means of a steel ladder from an exterior platform.

NEW LIFE-SAVING APPARATUS

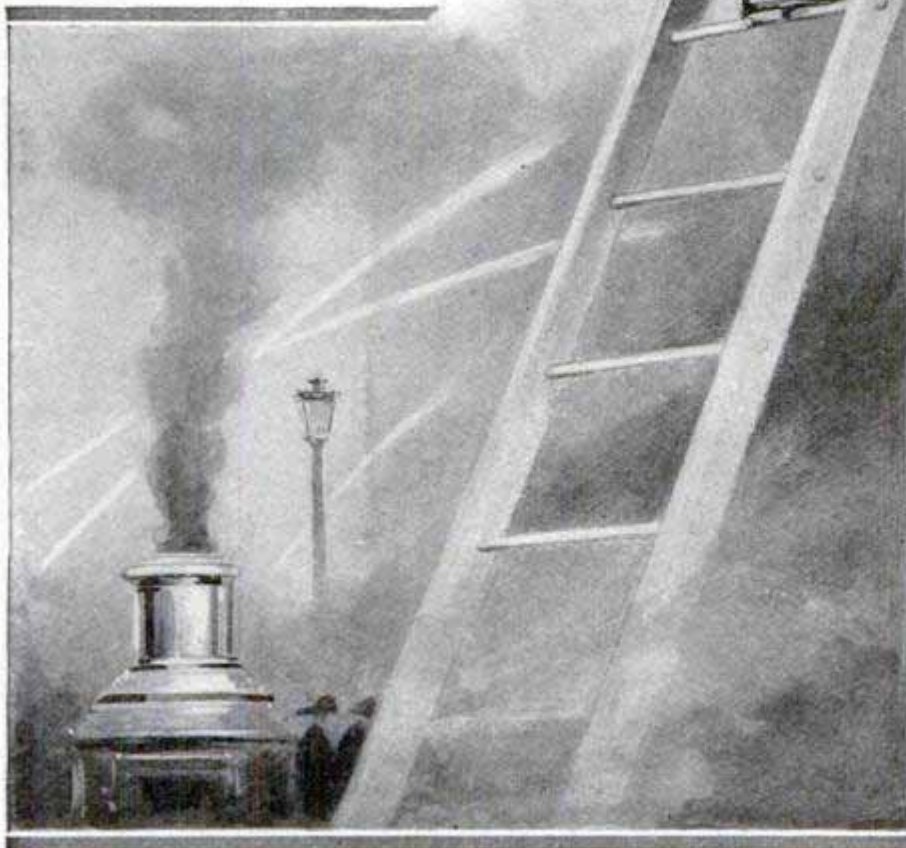
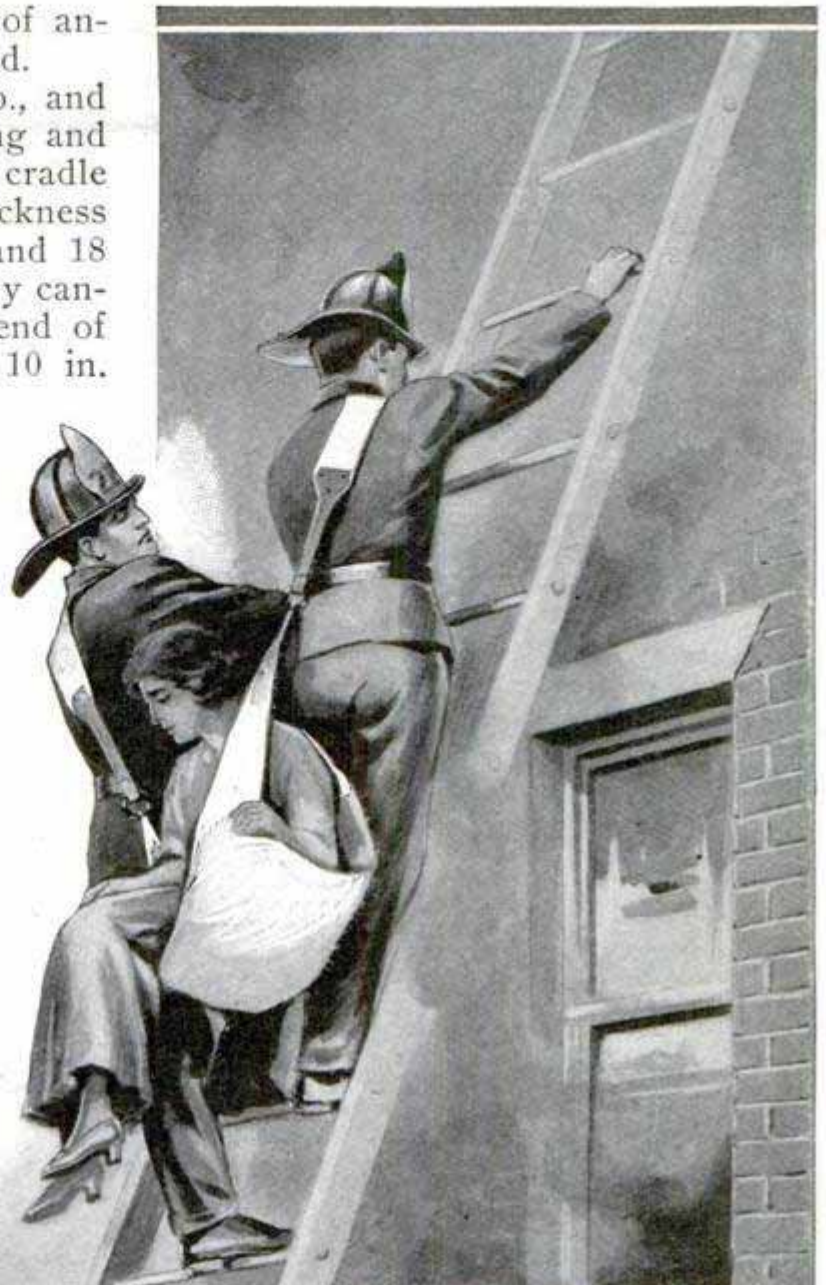
Invented by the wife of a retired admiral of the U. S. navy, a little cradle or litter is designed to enable injured or unconscious persons to be brought safely out of buildings where the only exit is a ladder. It was invented primarily for carrying sailors or soldiers from battlefield or fighting place to the hospital, but its adoption by fire companies is rapidly demonstrating its efficiency in the lines of peace. In making a rescue, one fire-

man descends one rung ahead of another, thus distributing the load.

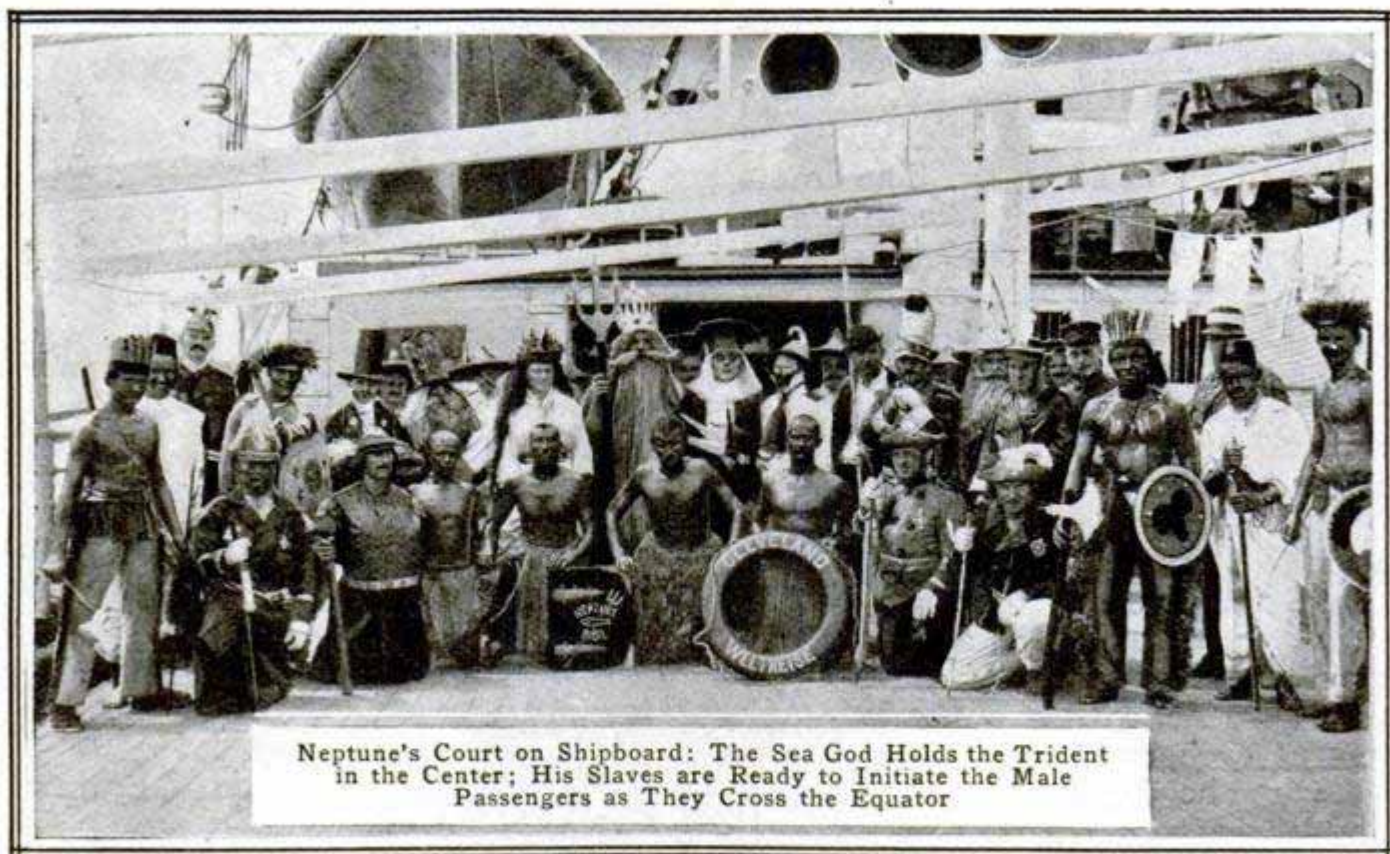
The cradle weighs but $4\frac{1}{2}$ lb., and makes a bundle only 18 in. long and less than 5 in. in diameter. The cradle proper consists of a double thickness of heavy canvas, $3\frac{1}{2}$ ft. long and 18 in. wide. To each end of a heavy canvas strip, attached across one end of the main sheet and projecting 10 in. at each side, is a patented catch, held firmly in place with a piece of stout leather riveted directly to the canvas strip. A harness of canvas and leather is provided for each of the two men who are to use the appliance. Shoulder straps of canvas, 4 in. wide, with two metal rings at each end, permit the cradle to be hooked to the shoulder harness.

Used as a litter, this device has proved much more flexible than the standard stretcher, which is of little use in descending or ascending stairs where sharp corners have to be turned. The new apparatus leaves the hands free.

Ladder
Rescue
from
Burning
Building



Cradle Rolled Up,
Ready for Use



Neptune's Court on Shipboard: The Sea God Holds the Trident in the Center; His Slaves are Ready to Initiate the Male Passengers as They Cross the Equator

NEW TELEGRAPH SOUNDERS NEED NO BATTERIES

A late patent has been granted on a diaphragm sounder by which telegrams may be clearly read from a relay without the use of batteries. The new sounder consists of a diaphragm contained within an air-tight chamber actuated by an extended arm in connection with the arma-



ture. The diaphragm intensifies the sound, transmitting the vibrations into a bell-shaped horn, and enabling the operator to take the message directly on the typewriter. A sound regulator is provided so that the sound may be modified, if attached to other instruments than the relay, and the sound may be varied by adjusting screws, so that no two instruments need sound alike.

Leaks from compressed-air pipes may be located by the use of oil of peppermint.

CELEBRATING THE CROSSING OF THE EQUATOR

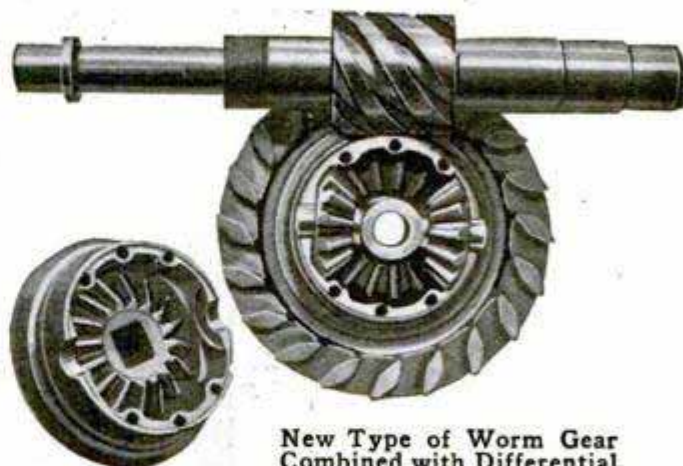
A pantomime of Neptune and his court during the celebration of the ancient sailor custom of initiating those who are crossing the equator for the first time is shown in this picture. The rites of cleansing newcomers from the northern hemisphere, which sailors still observe, are said to date back hundreds of years. On the night before the ship reaches the equator, a sailor dressed as Triton, Neptune's messenger, with his beard full of glistening fishes and his clothes dripping wet, is drawn up over the bow to announce Neptune's coming. Late the next afternoon, Neptune and his court, impersonated by the ship's crew, gather on a stage behind a huge canvas tank to cleanse the male passengers. Each candidate dressed in white linen kneels before Neptune and receives a soap bath over the head and a treatment with a wooden razor and wooden shears at the hands of Neptune's barber. A thorough ducking in the canvas water tank follows and a struggle through a big canvas pipe, with sticks prodding from the outside and a hose directed into the open end.

When all the male passengers have been initiated and the women are laughing, suddenly a shower of water comes from hoses that have been carried up into the rigging and every one on deck is used as a target until he or she can escape.

WORM GEAR WITH TEETH ON SIDE OF WHEEL

By placing the teeth of a worm gear on the side of the wheel instead of on the outer edge, a French inventor has produced a new type of driving gear for automobiles. Only the center tooth is fully meshed in the ordinary type of worm gear, while with the new gear the teeth are so shaped that each is in full mesh as long as it engages the worm, a feature that increases the power and adds to the life of the ap-

paratus. With the ordinary type the worm must be set either above or below the axle casing and the engine



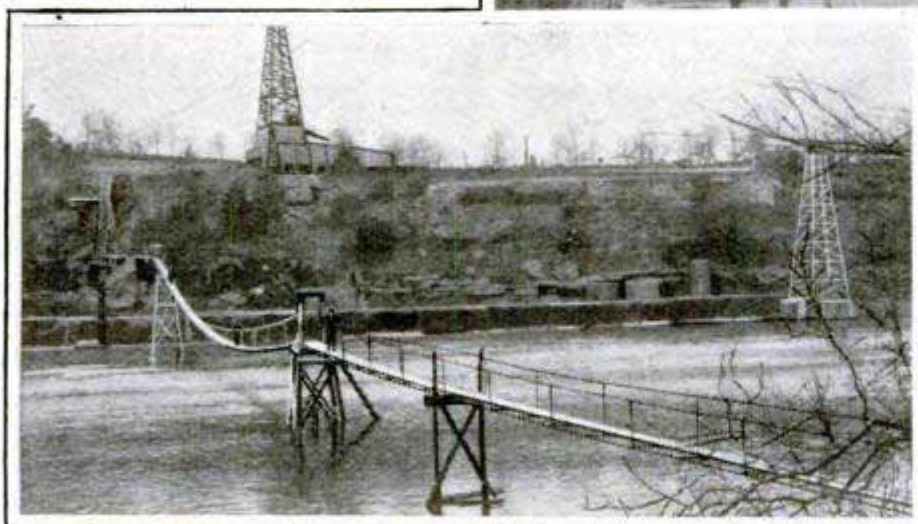
New Type of Worm Gear Combined with Differential

must therefore be set high or inclined in order to obtain a straight-line drive. This is overcome in the new gear, as the worm may be set as close to the axle as may be necessary.

OIL WELLS DRILLED IN THE BED OF A RIVER

An unusual condition exists in the Cushing oil fields, in Oklahoma, where the privilege of drilling oil wells in the bed of the Cimarron River was sold at public auction by the government recently. At the points shown in the photographs, the river is about 500 ft. wide, and can usually be forded. The usual derricks are

erected either at the water's edge or close at hand, and several wells of over 1,000-bbl. capacity have been



Drilling Oil Wells in the Bed of a River, and a Bridge Made of Wire Cables Formerly Used in Drilling Oil Wells

struck. The bridge shown is made of old wire cables which had been used in drilling oil wells. To walk across this swinging bridge gives one a sensation of strolling on the deck of a ship in a storm.

JAPANESE TALISMAN BRINGS GOOD LUCK

Travelers in Japan often see curious stone rings supported on a pillar, to which has been given the name

FOLDING BAG PROVES HANDY IN BIG STORES

A canvas bag with folding steel framework, which has just been patented, is found of convenience in de-



Convenient Carrier for Use in Big Stores may be Compactly Folded for Return

“Fortune’s Spectacles.” These curious devices are believed by some to have a talismanic virtue, in that if one crawls through the ring, he will be able to accomplish all he undertakes.



Curious Ring of Stone Believed to Bring Luck

The size of the rings is such that no great dexterity is required to perform the feat.

partment stores and shipping rooms where, heretofore, large baskets were used to hold packages. The bag is made in a variety of sizes, and when emptied, may be compactly folded and returned to the proper department in very small bulk. The objection to the baskets was chiefly that after they had served their purpose to transport merchandise, they took up considerable space, making their return as “empties” cumbersome. This has been overcome where the folding bag has been adopted.

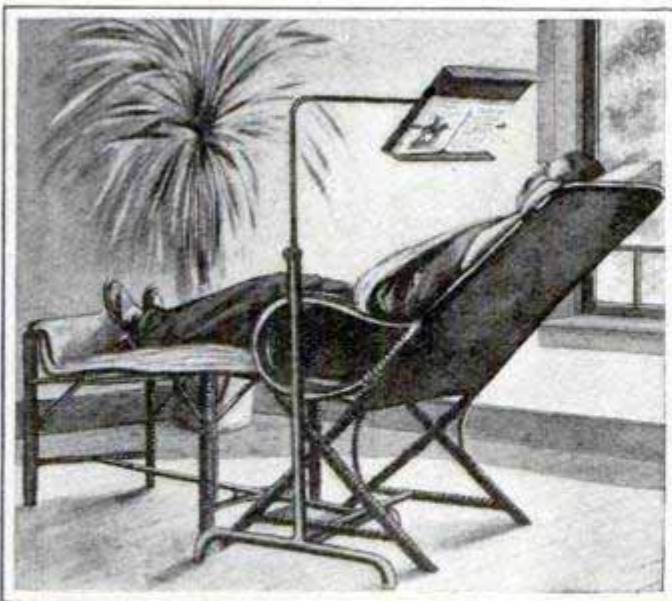
SHELTERS ARRANGED FOR GERMAN STUDENTS

To foster a love for the outdoors, and to give a wide knowledge of their fatherland, German educational authorities favor far more freedom in excursions among students than in this country. A system of shelters, called “Schüler Herbergen,” have been established, where students, bearing the proper card as credentials, may obtain lodging and breakfast without payment. During every vacation large numbers of students make foot excur-

sions through the more picturesque parts of the empire. The establishment of these shelters aids materially in making these tramps enjoyable. By the payment of two marks, about 50 cents, a student obtains a membership card, the presentation of which at one of the shelters entitles him to sleeping accommodations for one night and a good, substantial breakfast next morning. The cards are only issued to students over 16 years of age who are attending a high school or university, and are good for 20 lodgings.

NOVEL BOOK REST FOR INVALIDS

An ingenious arrangement for holding a book so that it may be easily read by a person reclining in an invalid's chair or upon a couch consists of two distinct parts, a metal stand which may be adjusted to various heights, and the book rest proper, mounted by a set of flanges on a metal tube. The book is inserted in the rest by placing a rod through the open space between the binding and the cover at the back, while the lower edge of the book rests upon a flat support. The pages are held in position by two holding rods, which may be

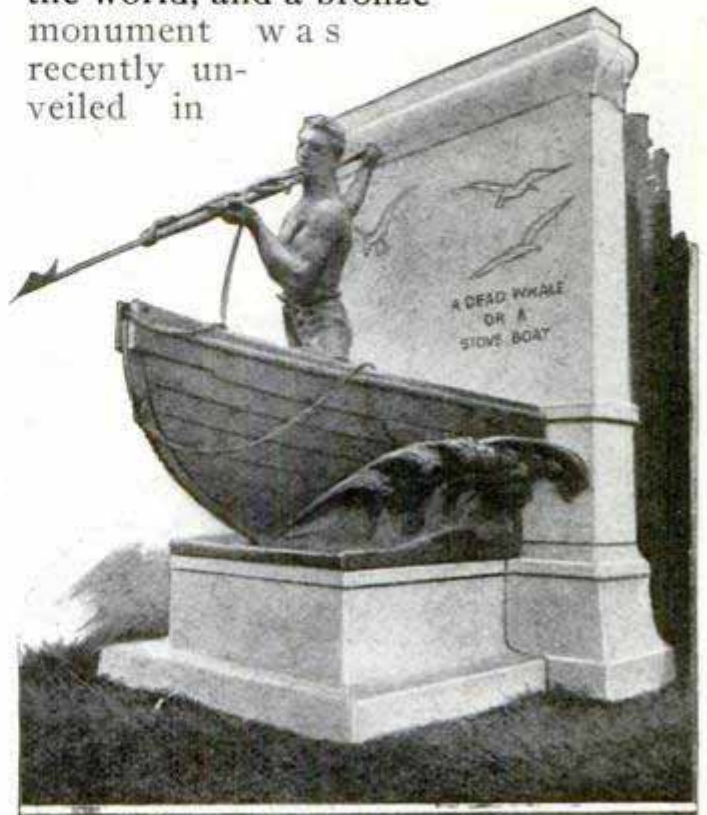


This Device Makes Reading Easy While Lying Down

readily shifted by the thumb and finger of one hand, so that reading is not interrupted by a tedious replacing of the book after turning the page.

MONUMENT COMMEMORATES THE OLD-TIME WHALER

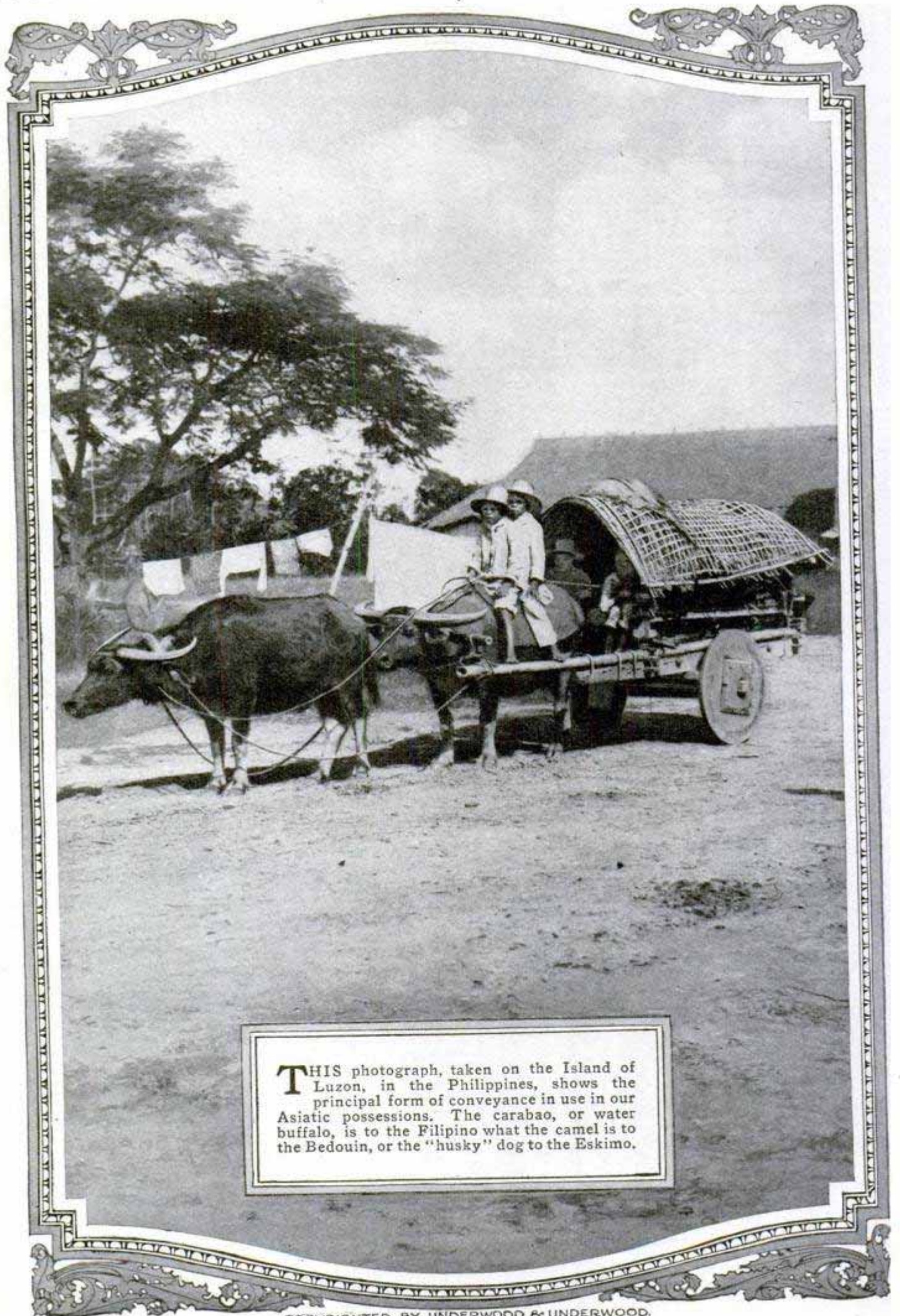
The whaling industry made the name of New Bedford known around the world, and a bronze monument was recently unveiled in



Whaler in Bronze Recently Unveiled in New Bedford

that Massachusetts city to commemorate the deeds and the men who, half a century ago, were known in every seaport on the globe. Upon a granite pedestal the prow of a whaleboat plows through the waves, while the whaler stands ready to throw the harpoon poised in his hands. The background is of granite, upon which is faintly traced a suggestion of sea and sky, with birds whirling overhead. Near the lower corner is a quotation from "Moby Dick," a famous tale of whaling: "A Dead Whale or a Stove Boat," the slogan of the men from New Bedford. Upon the other side is the inscription, "In honor of the whalemens whose skill, hardihood and daring brought fame and fortune to New Bedford, and made its name known in every seaport on the globe."

¶ In completing the floor of a quay wall at Balboa, a squad of five West Indian masons laid 96,000 bricks in 10 hours.



THIS photograph, taken on the Island of Luzon, in the Philippines, shows the principal form of conveyance in use in our Asiatic possessions. The carabao, or water buffalo, is to the Filipino what the camel is to the Bedouin, or the "husky" dog to the Eskimo.

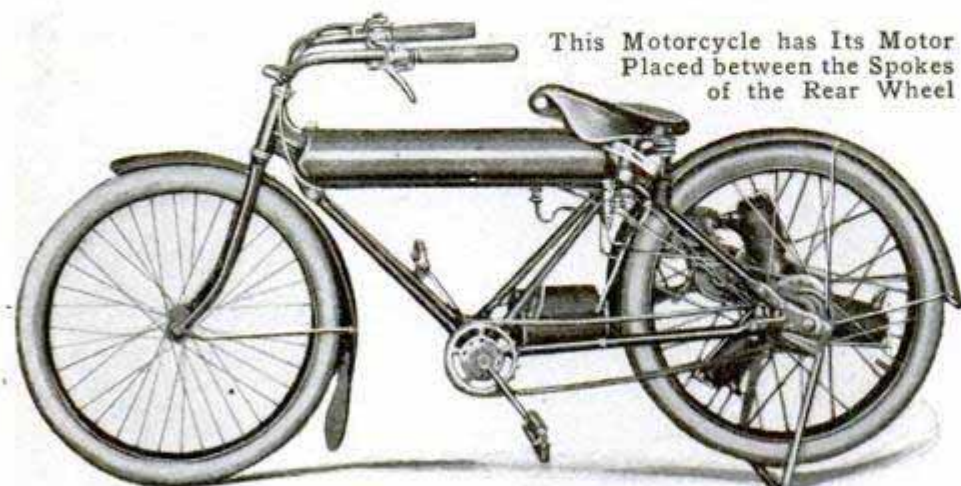


BAGDAD, the ancient city on the Tigris, around which so many of the curious tales of the "Arabian Nights" center, has yielded so far to the march of progress as to install a street railway. Horses provide the motive power for curious double-decked cars.

ROTARY-CYLINDER MOTOR ON A MOTORCYCLE

A motorcycle with a three-cylindered engine mounted within the rear wheel is a novelty developed by a New

York inventor. The adoption of this form of motor comes from its success in aeroplane practice, and the inventor



claims for it lightness and power without vibration transmitted to the seat. Being perfectly balanced and the intervals between the firing of the cylinders being equal, the motor runs smoothly, and the torque is constant. The engine can be throttled down and run slower than ordinary motorcycle engines. The cylinders constantly cut the air, whether the motorcycle is moving or not, thus cooling is certain, and the elimination of the chain

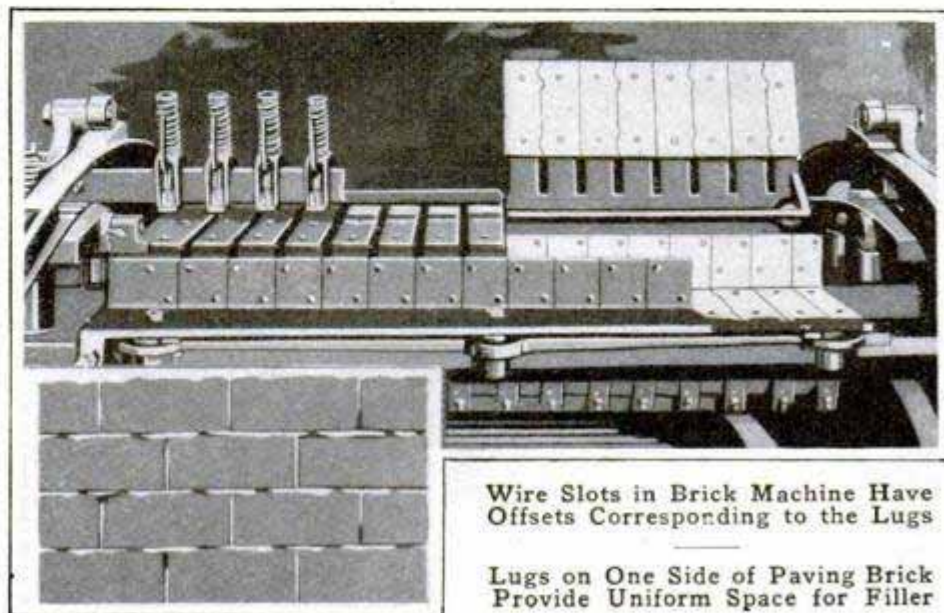
drive makes for quiet operation. An open frame for women riders is possible with this type of motor.

drive makes for quiet operation. An open frame for women riders is possible with this type of motor.

LATEST TYPE OF PAVING BRICK

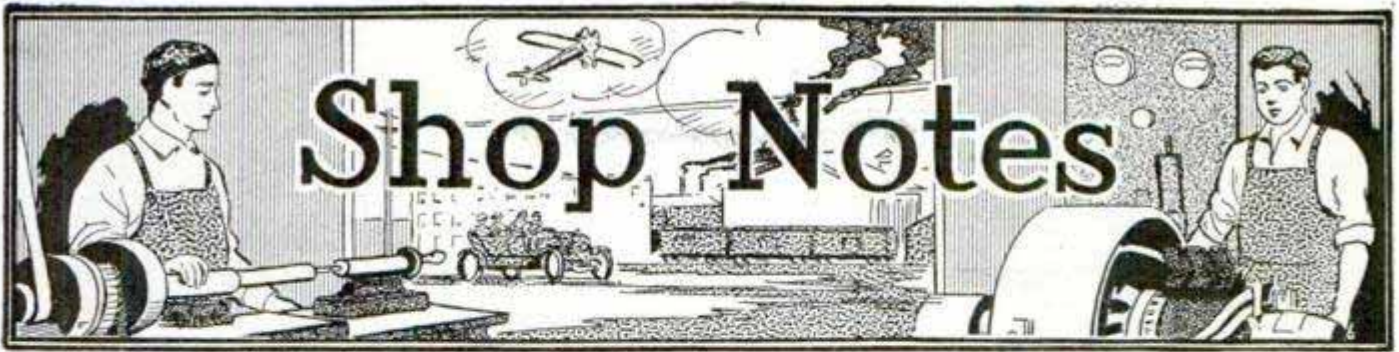
In the latest type of paving brick the process of repressing, formerly considered necessary for securing a good product, is eliminated, and the clay column is simply passed through the die and then cut into individual brick by means of wire. With the sharp edges secured in this way, the result is a smooth surface in the completed pavement, while with the repressing process the edges are necessarily more or less rounded. On one side of the brick lugs are placed for separating adjacent courses and for providing a uniform space for the filler. These lugs are wire-cut, a special automatic machine being used for this work. This is accomplished by passing the wire through a slot which is provided

with offsets corresponding to the lugs, as shown in the illustration. The cutting wires are mounted on a carriage which travels with the column of clay and returns automatically to its original position as soon as the cutting is finished. On steep grades it is desirable to have the downhill edge of each brick slightly beveled to give a better footing for horses, and this beveled edge is also made by means of the wire-cutting machine.



Wire Slots in Brick Machine Have Offsets Corresponding to the Lugs

Lugs on One Side of Paving Brick Provide Uniform Space for Filler



A Chute for Fish to Pass over a Dam

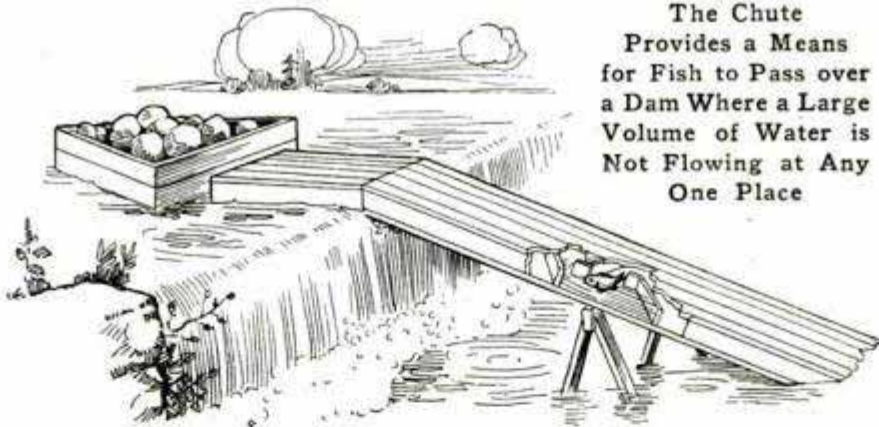
TO provide a means for fish to pass upstream over a dam, a long, gradually sloping box is made, inside of which a series of pockets, or obstructions, are fixed to hold a sufficient quantity of water to allow the fish to pass from one to the other until it finally gains the summit and can swim into the stream above.

The chute consists of timbers, 2 in. thick and 10 in. wide, nailed together in box fashion. The length of the pieces will depend on the height of the dam, which governs the length of the box, or chute. A good size is one made five planks in width and one plank high. The planks should be surfaced on three sides so that the edges will make a good joint; then they are placed together and fastened securely to battens across the under side. The sides should be nailed with one edge set on the upper surface of the outer bottom boards.

If the dam is so high that it demands a longer chute than the stock sizes of the plank, it is best to stagger the board ends so that no two boards, lying side by side, will have the end joint at the same location. This will make a solid and continuous box, save for the top, which is left partly open for cleaning out the pockets.

It will be seen by the diagram that a part of the chute runs horizontally, or on a level with the top of the dam. A careful joint should be made at the bend A, and it should be securely fastened with straps of iron overlapping the parts.

The bottom and sides are built up and placed in position on the dam. The crib at the head, which is built on the bottom boards of the horizontal part, is located about 6 or 8 in. ahead of the opening in the box and is triangular in shape. The crib is well weighted with stone to prevent the structure from being washed away.



The Chute Provides a Means for Fish to Pass over a Dam Where a Large Volume of Water is Not Flowing at Any One Place

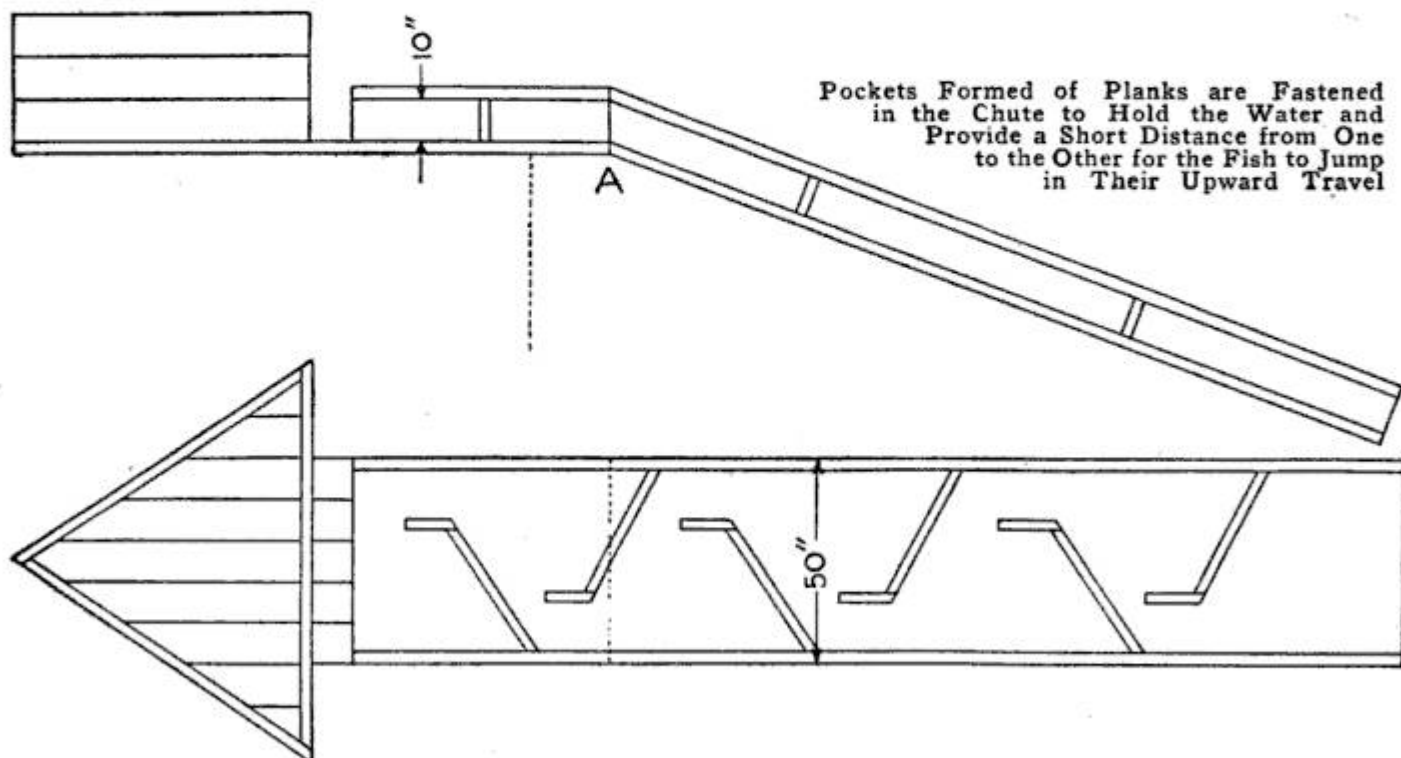
Within the box, which is now in a trough form, a series of staggered obstructions are placed so that the water spilling from one is caught in the one next below, and so on, until the bottom is reached. These are well nailed in place, whereupon the top planks are nailed on and nails driven through them into the pieces forming the pockets. These pieces are made of the same width planks, thus filling the space from top to bottom. As mentioned before, spaces are left between the top planks so that a stick or paddle can be used in cleaning out the pockets.

If it is necessary to build the chute

very long, a brace or support can be set under it at the center, to keep it from sagging under the weight. This

is approximately 100 lb.—to be exact, 100.2 lb.

Thus, if it is desired to know the re-



can be made up in the form of a trestle and should be well anchored to keep it in place.

A Reminder for the Wire Table

Although the following simple relations in connection with the Brown & Sharpe gauge wire table are not new, they will be of great service to anyone who has occasion to make frequent calculations involving certain data given in the wire table where no great degree of accuracy is required.

A wire which is three sizes larger than another wire has one-half the resistance, twice the weight for a given length, and twice the area.

A wire which is 10 sizes larger than another wire has one-tenth the resistance, 10 times the weight for a given length, and 10 times the area.

A No. 10 gauge wire is approximately 0.1 in. in diameter—to be exact, .1019 in., or 101.9 mils; it has an area of approximately 10,000 circular mils—to be exact, 10,380 circular mils; it has a resistance of 1 ohm per 1,000 ft., at 20° C., or 68° F., and it weighs approximately 32 lb. per 1,000 ft.—to be exact, 31.43 lb.

The weight of 1,000 ft. of No. 5 wire

distance and weight, say, of a No. 4 wire per 1,000 ft., it can be determined with sufficient accuracy for all practical purposes from the foregoing relations as follows: Since a wire three sizes larger than another has one-half the resistance, it follows that a No. 7 wire will have a resistance equal to one-half of a No. 10, and a No. 4 will have one-half the resistance of a No. 7, or one-fourth of a No. 10; hence the resistance of a No. 4 wire will be one-fourth ohm per 1,000 ft., and it will weigh four times 32, or 128 lb. per 1,000 ft.

The procedure in calculating the resistance of a wire that differs in number from a No. 10 by an amount that is not a multiple of three is a little different from the above. For example, if the resistance and weight of a No. 8 is desired to be known, proceed as follows: First find the resistance of a No. 20, which is ten times a No. 10, or 10 ohms per 1,000 ft.; then find the resistance of a No. 17, No. 14, No. 11 and a No. 8. The resistance of a No. 17 is one-half of a No. 20; of a No. 14, one-fourth of a No. 20; of a No. 11, one-eighth of a No. 20, and of a No. 8, one-sixteenth of a No. 20, or .62 ohm per 1,000 ft. The weight of a No. 8

would be 16 times that of a No. 20, but a No. 20 weighs one-tenth of a No. 10 or 3.2 lb. per 1,000 ft.; hence a No. 8 would weigh 16×3.2 or 51 lb.

If the area in circular mils is known, the approximate number of feet per ohm can be obtained by dropping one cipher.

The approximate weight for a given length may be found by dropping four ciphers from the area in circular mils, and then multiplying by the weight of a No. 10 wire.

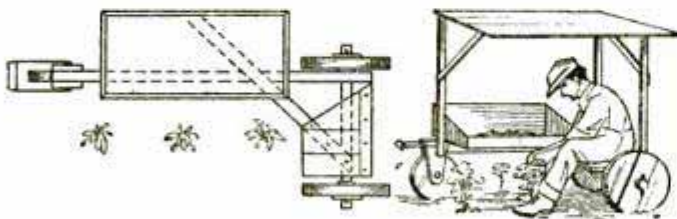
The values, as calculated above, are not exact and do not correspond with those given in a wire table, but they are sufficiently accurate for almost all ordinary purposes.

Protecting Polished Steel Surfaces

A coating that will protect hardware and machinists' tools from rusting may be made as follows: Mix well 4 oz. of demar varnish with $\frac{1}{2}$ gal. turpentine and dip the articles into it or apply it as a wash. A thin coat of this colorless varnish will not show on the polished surfaces of tools, but will protect the surfaces indefinitely, unless scratched.

A Gardener's Weeding Cart

With the use of the weeding cart shown it is not necessary for the gardener to get on his knees to pull weeds out of the growing plant rows. The plan shows its construction. It is also useful in picking green beans. For weeding I use wheels 12 in. in diameter, and for picking 18 in., on the rear axle. A canopy or umbrella can be

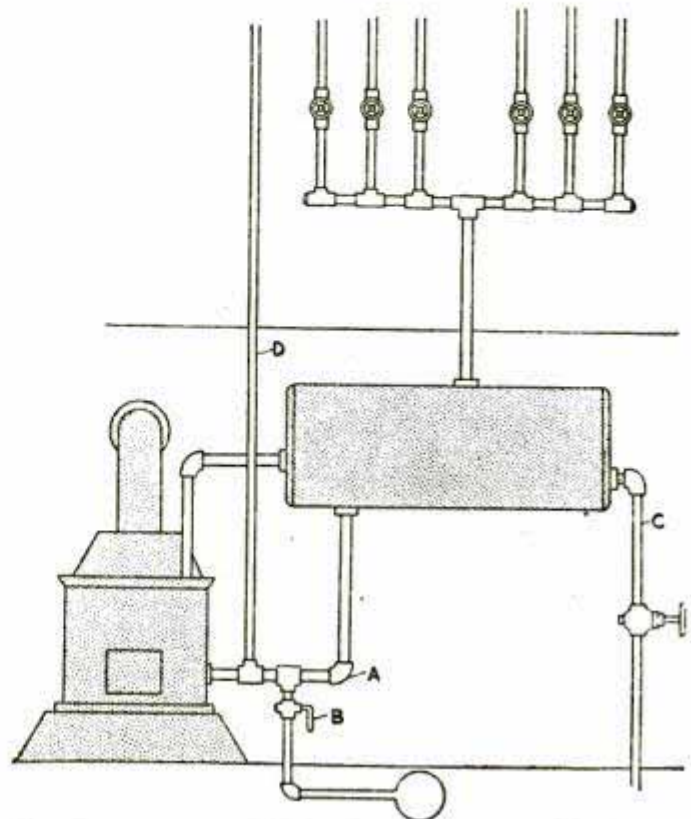


A Weeding and Picking Cart That will Greatly Assist the Gardener Having a Large Acreage

attached for use in the sunshine.—Contributed by A. S. Thomas, Amherstburg, Ont.

Installation of Water-Heating Plant

The general layout and pipe connections for a water-heating plant in large apartment buildings and hotels is il-



The Arrangement of Pipe Connections to a Hot-Water Boiler and the Heater for a Large Building

lustrated in the drawing. It is first necessary to locate the boiler and heater and make pipe connections between them with 2-in. pipe as shown.

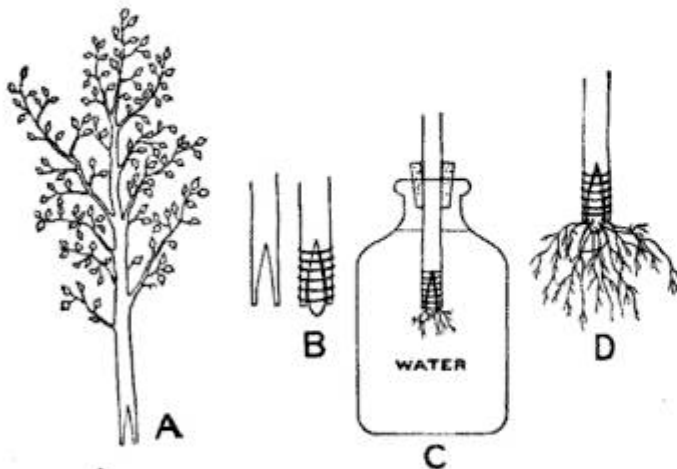
The sediment pipe A introduces the cold water to the heater and it should have a blow-off valve, B, with connections to the sewer. The boiler supply C feeds into the lower part, thus forcing the hot water to the top and into the system. The return pipe D affords free circulation and provides a means of drawing hot water at any tap.

Each of the pipes leading from the top of the boiler to the different departments has a valve so that it is not necessary to shut down the whole plant if repairs are to be made on one system.—Contributed by Geo. M. Crawley, Newark, N. J.

☞ An emergency screwdriver for use in tightening a screw in eyeglasses can be had by turning a steel pen end for end in its holder.

Starting Hardy Plants

A reliable way to obtain best results in starting plants of the laurel and oleander group is as follows: A branch, which through the evenness



The Oat Kernel Assists the Growing of Slips before Setting the Branch into the Earth

of its shoots promises to become a perfect plant, is selected from a plant that has proven to be healthy in growth and rich in flowers. The best size for a branch is 8 or 9 in., with a stem end about the size of an ordinary pencil. This end is cut with a sharp knife, as shown at A, and an oat grain is inserted, head upward, in the split, where it is secured by winding a bit of thread around the branch, as shown at B.

The end of the branch with the oat kernel is placed in a bottle of water, C, and adjusted to the center of the neck by means of cork wedges, as shown. This will prevent the branch from dropping to the bottom of the bottle. The branch should be as nearly vertical as possible to obtain a perfectly straight growth.

The bottle is kept in a warm place, and in a few days the oat grain will sprout and through its close connection with the stem will draw and feed water to the branch. In four or five weeks the roots started on the stem D are strong enough to permit the branch to be planted in very soft and loose earth in a pot. The pot should have a hole in the bottom and should be placed in a deep dish, which should be kept filled with water.

It is important to have plenty of

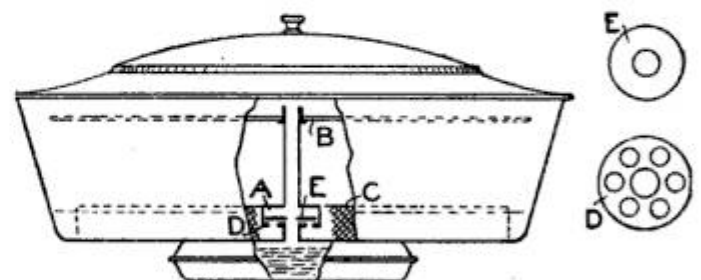
room for the plant to spread its roots, and when necessary it should be transplanted to a larger pot, but without disturbing the mass of earth that adheres to the roots.—Contributed by Pierre Wagner, Indianapolis, Ind.

Automatic Dish Washer

Solder together two small pie tins, as shown, and cut a $\frac{1}{2}$ -in. hole in the center of the one used for the top; also make a $\frac{1}{2}$ -in. hole in the center of the bottom of a large dish or bread pan. The $\frac{1}{2}$ -in. tube used in these holes should be supplied with a valve, A, and a removable sheet, B, which distributes the hot water through numerous small holes drilled in it. The tube is soldered in the holes of the pie tin and pan to make a water-tight joint.

The tray C is a piece of wire screen, with $\frac{1}{2}$ -in. square mesh, having the edges bent down. This tray keeps the dishes out of the water. The valve is a simple check valve, the seat D being made of a piece of thick brass with a center hole to fit on the tube where it is soldered, and six smaller holes drilled around the central one. The disk E is a thinner piece of brass with only one hole in the center. This disk works loosely in the space made for it. This space consists of a larger tube with a covering which is soldered to the upper tube.

The washer acts in the same manner as a percolator. The water is heated in the pie tins and the expansion forces it up through the pipe, where it falls over the dishes through the holes in



The Principle of the Percolator is Used in This Dish Washer to Throw Hot Water over the Dishes

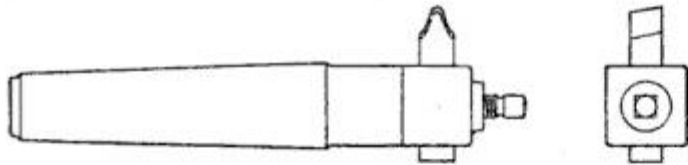
the sheet B, then returns to be heated again. After 10 or 15 minutes the pan is taken from the heat and the cover removed. No drying cloth is neces-

sary, as the heated pieces will evaporate what little moisture remains.—Contributed by H. W. Hahn, Chicago, Ill.

Fly-Cutter Holder for Milling Machines

The amount of work required for cutting one gear to replace a broken one does not warrant the outlay for a special circular milling cutter. For this reason the tool illustrated was devised for use in a milling machine to cut the teeth. The tool is simple and easy to make. A piece of carbon steel, $\frac{1}{2}$ in. square, was procured and one end shaped to fit the space between the teeth of the broken gear. In shaping the steel it was carefully ground to give clearance, then properly hardened. This steel was held in a taper shank with a setscrew in the end.

The gear blank was first roughed out with a stock cutter. If such a cut-



A Fly Cutter for Use in Shaping Teeth in a Special Gear Quickly

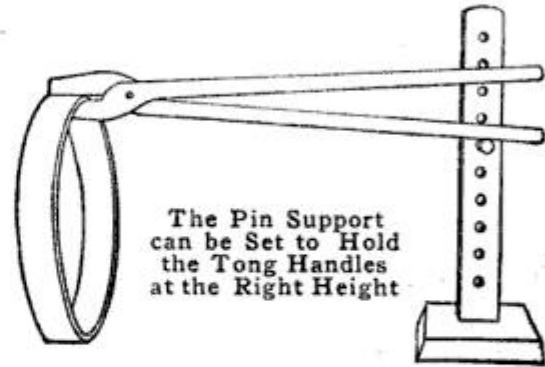
ter is not at hand, a slitting saw may be used. The holder and fly cutter were next placed in position and the work set to make the cut to the proper depth.

It is well to remember that a tool of this kind has only one cutting edge and will not remove the metal as fast as the circular cutter, therefore it necessitates a finer cut. However, with this tool it is possible to do this and similar work quickly.—Contributed by A. Dane, Pottstown, Pa.

Adjustable Stand to Hold Blacksmith's Tongs

In forging small hoops it is a great help to have a stand to support the handle of the tongs as they hold the work upright. A very handy stand for this purpose is constructed as shown in the sketch. It consists of a vertical

piece fastened to a base, the upright part having several holes drilled for receiving an adjusting pin. The pin



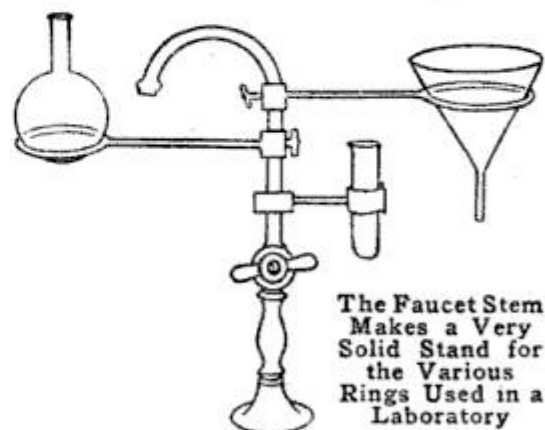
can be placed in a hole at the right height for the work.—Contributed by D. C. Goff, Knoxville, Tenn.

Protection for Chisel Edges

A means to protect the cutting edge of a chisel when not in use is to wrap a piece of medium-heavy paper around the chisel body to form a paper ferrule. The paper is cut into a strip, about $1\frac{1}{2}$ in. wide and 6 in. long. One side is glued and it is then wrapped around the chisel. The protector is slipped up on the body when it is in use, but when placed in a chest the ferrule is brought down over the edge.

Faucet Stem Used as a Ring Stand

The laboratory faucet makes an excellent ring stand. All the utensils necessary are kept on hand and near the water, which in many instances is one of the ingredients used in mixing chemicals. The rings are fastened to the faucet shank with clamps so that

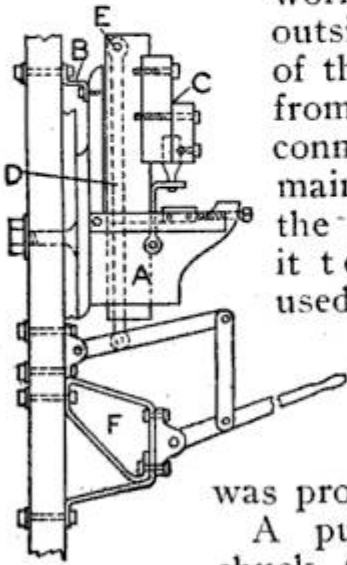


they can be easily attached or taken off, as desired.—Contributed by R. C. Kyle, McMinnville, Ore.

A Homemade Hand-Lever Punch

A broken and discarded vise provided the main working parts in the construction of a wall punch that is worked by hand. The outside and sliding jaw of the vise was broken from its slide at the connection. The remaining jaw A, with the bolt for fastening it to the bench, was used for the same purpose of fastening it to the wall or post, and an extra support, B, was provided for strength.

A punch holder or chuck, C, was attached to the slide in place of the broken jaw. Instead of using the screw, the threads were bored out of the stationary jaw part, and a rod, D, made to slip in the hole snugly. The rod was attached to the sliding part at E. A bracket, F, was made of stake iron, and a double lever arrangement attached to it as shown. With this device it is easy to punch a $\frac{3}{8}$ -in. hole through $\frac{1}{8}$ -in. stock.—Contributed by G. E. Koener, Springfield, Ill.

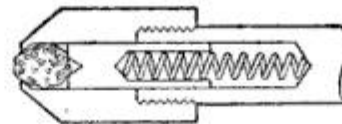


Green-Sand Cores for Molds

Having need of two cores, one $1\frac{1}{4}$ in. in diameter by 3 in. long, and the other 2 in. in diameter and 5 in. long, and no core box for these sizes being at hand, I hastily made substitute cores as follows: Two pieces of cold-rolled steel, having the right diameter, were procured, and heavy paper was wrapped around them, allowing the paper to extend over the end of the steel for a length equal to the length of the core. The paper was tied to the steel. Ordinary molding sand was rammed into the paper and ventilated, and retaining wires were run in lengthwise. These made good cores in place of the baked ones.—Contributed by Carl Snyder, Richmond, Ind.

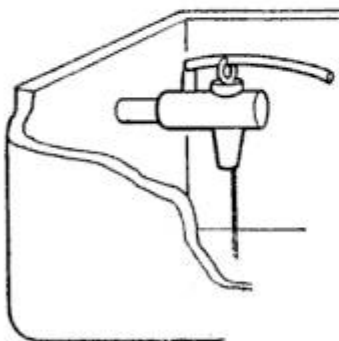
Emery-Wheel Diamond-Dresser Holder

The usual method of setting a diamond in the end of a steel rod for dressing emery wheels is greatly improved by the use of a holder as shown in the sketch. The parts are constructed similar to a draw chuck, except that a strong coiled spring keeps the diamond in the taper hole at the end. The spring absorbs the shock and the diamond is not so apt to be cracked. The size depends on the size and shape of the diamond used.



To Stop Dripping Noise in a Flush Box

The sound caused by the continual dripping of water in the flush box, due to the small leakage and imperfect seating of the valve, is very annoying and as a remedy I hit upon the following idea. A piece of wire was soldered to the mouth of the inlet valve, as shown, and it entirely eliminated the troublesome noise.—Contributed by Henry G. Manley, Brooklyn, N. Y.



Operating Typewriter-Carriage Shift with Foot Lever

A stenographer doing a great deal of typewriting made an attachment whereby the carriage shift was worked by the right foot. A piece of cord was tied to the thumb lever of the carriage, then run over a pulley and down to the floor where it was attached to a treadle. Pressure on the treadle draws the carriage to any desired position and at the same time turns the roller when a new line is to be written.—Contributed by Harold Goff, Salt Lake City, Utah.

To Clean a Water Column on a Steam Boiler

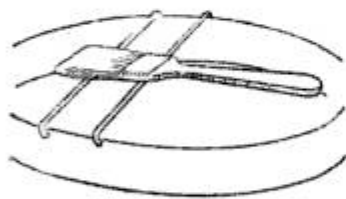
When connecting the water column to a steam boiler, instead of making the turns with elbows use ordinary crosses and close the two openings not used with plugs. In this way the pipes can be easily cleaned out when the boiler is cooled off to wash out. The plugs are taken out and a scraper run through the pipes. It is only necessary to use the crosses on the lower or water connections, as the steam connections are not so likely to become plugged with sediment. If gate valves are used, they leave a straight opening, and the pipes can be easily cleaned.—Contributed by P. W. Tooth, Leastalk, California.

Holding Gas in Pipe While Making Repairs

Desiring to make an extension of the shop gas pipe with as little disturbance as possible, I carefully unscrewed the cap at the pipe end and quickly plugged the pipe with warmed paraffin wax, thus sealing the pipe and preventing the escape of gas. The new pipe line was then connected and the wax plug melted away by heating the pipe at the joint.—Contributed by Dexter W. Allis, Boston, Mass.

Varnish-Brush Cleaner

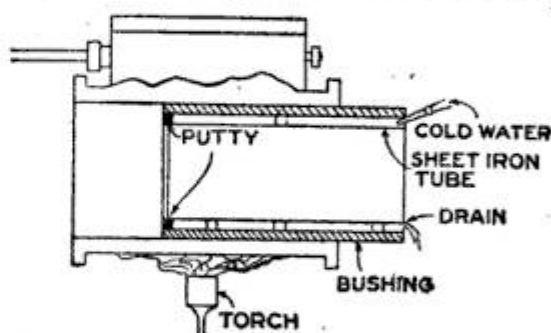
It is absolutely essential that the varnish brush be kept free from dust and grit. The device shown affords a clean method of wiping a varnish brush, and also provides a good support for it at intervals while some article is being varnished.



A clean pudding pan with a double wire, drawn taut across the top, is all that is necessary. The dirty varnish falling into the pan may be thinned with turpentine and added to old paint which is to be strained.

Method of Removing a Stuck Cylinder Bushing

The sticking of large cylinder bushings which are shrunk or forced into the cylinder is by no means an uncommon occurrence.



Heat Applied to the Outside and Cold Water Within Cause the Metals to Separate by Expansion

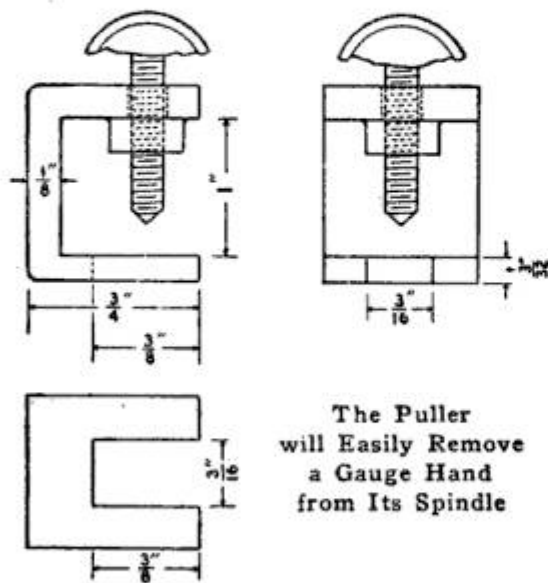
Irregularities in the shape of the cylinder or in the size of the bushing are causes which at times make this fault almost unavoidable. However, the task of getting them out is the greatest difficulty, and in many cases it is only accomplished by ruining a new bushing.

The sketch shows a method that has been used in removing stuck cylinder bushings of various sizes and kinds, without in any instance having failed to effect a removal or caused damage to the bushing or cylinder. A piece of metal, the length of the bushing, is rolled to a diameter of about 1 in. less than the inside diameter of the stuck bushing. Pieces of wood are fastened to its outer surface at several points, to keep the tube in place when it is shoved into the cylinder bushing. The opening between the metal shell and the bushing is puttied up at the ends except at two points, one at the upper side and one at the bottom. This forms a jacket through which cold water is run to keep the bushing cool. Heat is then applied to the outside of the cylinder body. The cylinder alone expands by this method, allowing the bushing to be readily pulled or forced out.

ⒸAn automobile can be driven a considerable distance by repeated fillings of the carburetor float chamber when a feed pipe breaks.

A Gauge-Hand Puller

Gauge-hand pullers are tools easily lost and somewhat expensive at best. The sketch illustrates one that can be



readily made very cheaply from a stove bolt and a small piece of sheet steel. The nut of the stove bolt is soldered to the inside of the U-strip, and its head is flattened out to form a small thumbscrew head.

Stove bolts are cheap and standard in size, and it is consequently possible to have any number of stem points ground for different-size hand stems. For the mechanic on this class of work who must supply his own tools, this homemade device is a money saver.

Preserving Oil Colors on a Palette

Occasionally I find time to start a sketch in oil, but other matters often interrupt the art work. Not wishing to



The Mixed Paints, Covered with Water, Keep Several Days and are Ready to Work Any Time

remix colors after having secured what I think is just right, I mix on a small piece of glass, and when stopping, the glass is placed in a shallow earthen dish and covered with water. In this way the colors keep workable for days. The glass can be secured to an ordinary wood palette with rubber bands. —Contributed by James M. Kane.

Remedying Loose Automobile Fenders

A number of automobiles, more especially the lower-priced ones, have fenders that will become loose and rattle after a little service. Some of the noise is due to loosened bolts and may be remedied by tightening up the nuts. Another cause for the rattling is that the rivet holes are worn large. This is usually found on the lower rear braces supporting the fenders over the rear wheels. The action of the chains and mud slinging is very apt to loosen the thin sheet metal from its fastening, and once started the hole enlarges rapidly. Sometimes a larger size of rivet will suffice. When the hole becomes too large for these repairs, a new fender will be required or the old one must be patched. The patching is usually unsightly. Frequently a large washer with a hole for a $\frac{1}{4}$ or $\frac{5}{16}$ -in. rivet can be used over the tear and, if riveted down tightly, it will last quite well. If the edge of the washer is well tapered, this repair will not be noticeable after the entire fender has been painted over.

Applying a Bright Finish to Screw Threads

In working tool steel, it is always difficult to produce a good finish in any other manner than grinding, and this cannot be applied to screw threads. Where a thread is used in tool making a good smooth finish is desirable, not only as a matter of appearance, but to maintain the accuracy and lengthen the life of the thread.

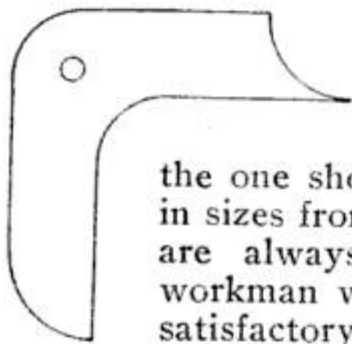
The best method to finish threads is to turn them to size, then procure a piece of soft wood and hold it against the threads, which forms a hand chaser. Dip it in oil, then in No. 0 or 00 emery, and chase over the threads. It will be impossible to remove over .001 in. of the material in this way, and a fine, ground finish is obtained quickly and in an inexpensive manner.—Contributed by J. B. Murphy, Plainfield, N. J.

Draining Dished Porch Steps

In passing a house having a wood porch with steps at the entrance, I noticed that each step had three grooves or channels cut in its upper surface. On closer inspection I discovered each step was slightly warped and sagged in the center. When it rained, the water remained in the sunken part and the owner cut the grooves from the outer edge deep enough to drain the water off quickly.—Contributed by Fred Schumacher, Brooklyn, N. Y.

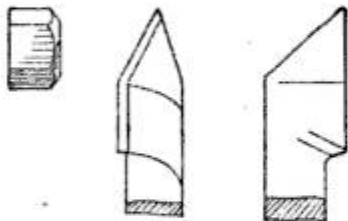
Radius Templates for Mechanics

Usually a drawing calls for a radius on shafts and the workman must make a radius template of paper. A better way is to provide a set of templates like the one shown in the sketch, in sizes from $\frac{1}{16}$ in. up. They are always ready and the workman will turn out more satisfactory and accurate work.—Contributed by John A. Kagerhuler, E. Dowingtown, Pa.



Combination Chamfering and Facing Lathe Tool

In facing a large number of nuts on a single mandrel considerable time is lost either in shifting the tool to chamfer the top face of the nut, or in placing the nuts again on the mandrel if the tool is kept stationary.



The sketch illustrates a tool by means of which the chamfering and facing of the nuts can be done without shifting the tool and with only a slight forward movement of the lathe carriage. In a shop where a great number of nuts are faced off for different purposes, this tool is certainly a time and money saver.

An Insulator Remover

The remover is made of a piece of spring steel, 10 in. long, $\frac{3}{4}$ in. wide and $\frac{1}{16}$ in. thick, bent as shown. The

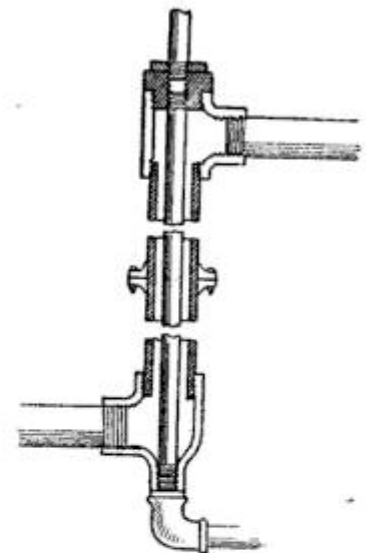


The Notched Ends of the Steel Cut and Remove the Insulation as the Wire is Drawn through Them

ends are filed sharp and a notch is cut in the center of each. The edges of these notches are filed sharp and the wire to be cleaned is placed between them. The jaws are then closed by pressure of the hand and the wire is drawn through, which removes the insulation.—Contributed by Patterson Merrill, Chicago, Ill.

Heating Range Boiler with Return Steam

In most boilers of the tubular or firebox type there are no provisions made for placing a coil in the firebox if a range boiler is to be heated and it necessitates the drilling of the boiler shell and placing a coil in the boiler. This is an expensive piece of work and requires skill, but just as good a job and one that will be entirely satisfactory is as follows:



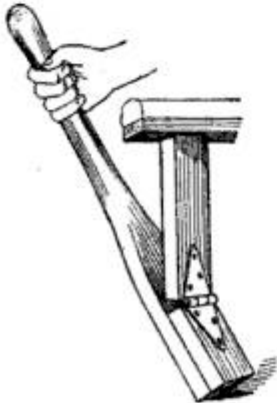
Disconnect the flange union on the steam return, remove the ells. at the top and bottom and replace them with tees and connect the return in the usual manner. Cut a piece of $\frac{3}{4}$ -in. galvanized pipe 2 in. longer than the vertical piece, including the tees, of the return pipe and cut long threads on each end. Place this within the

return pipe and use reducers in the tees, as shown. The protruding ends of the pipe provide a means to make connections to the range boiler. It may be necessary to use a thin locknut and a gasket on the pipe ends to prevent a leak.

This method is much better than placing a coil in the firebox, as it will continue to heat long after the fire has gone out or as long as steam surrounds the $\frac{3}{4}$ -in. pipe in the return steam pipe.—Contributed by John F. Vidler, Portland, Ore.

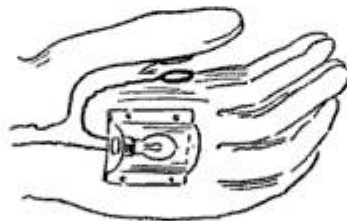
A Handy Jack

A useful and handy jack for many purposes can be made of a piece of 2 by 4-in. material about $4\frac{1}{2}$ ft. long, to which is attached a block with a hinged arm. The long piece has its upper end shaped into a handle. The hinged part should be just long enough to be easily placed under the object to be raised when the jack is in the position shown. It is obvious how the jack works.



Signal Lamp on Chauffeur's Glove

The signal used by the driver of an automobile to notify following drivers that a turn is to be made is to extend the arm with the hand up. This signal serves the purpose in daylight, but cannot be seen at night. The device shown in the illustration will permit the same signal at night. A small electric globe, inclosed in a transparent cover, is attached to the back of the glove. The connections are made to a pocket battery, and a small switch, or contact



points on the leather of the thumb and finger, control the light. By pressing these two points together the light is flashed as the hand is waved.—Contributed by C. H. Thomas, Norristown, Pennsylvania.

Removing Rusty Screws from Wood

In trying to remove a rusty screw which held two pieces of oak together, I was unable to do so with the ordinary screwdriver. Some soldering work being pressing, I turned to it, and after finishing the job, looked around for a place to lay the soldering iron. As the pieces with the rusty screw in them happened to be handy, I set the point of the soldering iron on the head of the screw and leaned the handle end against the wall. I did this simply to avoid burning anything with the iron. A short time afterward the iron was taken back to the stove. When I returned to the bench I thought I would have just one more try at the screw, and I discovered it came out quite easily. For a moment I was puzzled, but upon picking the screw up in my fingers I found it to be hot. Then I remembered having set the soldering iron on it. The next time I had a rusty screw to remove I applied heat to it, and the screw was easily taken out.—Contributed by W. S. Lockwood, Chicago.

Suction Pump for Draining Crank Cases

An ordinary bicycle pump with the plunger valve reversed on the rod makes an excellent suction pump for draining automobile-engine crank cases. The closed upper end of the pump cylinder is cut off so that the oil may be poured out quickly. After the first charge the plunger is pushed down as far as it will go, displacing the oil into the upper part. This action is repeated until the pump is half full each time, and it takes only a short time to drain any case.—Contributed by Albert J. Hynd, Lakewood, O.

Patterns for Cylinder Barrels

By JOSEPH A. SHELLY

There is no difficulty experienced in preparing the stock for turning small-cylinder barrels in halves when the stock is of sufficient thickness, but when the radius of the circle is in excess of the thickness of the lumber on hand, it becomes necessary to build up the halves. There are three ways of doing this, namely, by gluing up a solid block, stepping, and lagging.

In gluing up a solid block there are two methods in general use; one is to glue the pieces together parallel with the center line of separation, and the other, in strips. These are illustrated in Fig. 1. The strip method is generally considered the better of the two, as there is less liability of shrinking and warping.

The stepped form of construction is shown in Fig. 2. The filling-in pieces to close the ends are fitted in place and

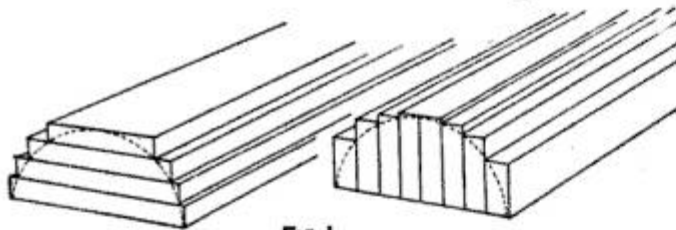


FIG. 1

Two Ways of Making a Solid Piece by Gluing Several Boards or Planks Together

glued after the steps have been put together, the grain of all the pieces running lengthwise.

The staved barrel, Fig. 3, is used for small cylinders with thick walls. It is built on heads long enough for turning prints, but there must be considerable difference in the diameter between the two, otherwise the staves at the joint would be too thin to stand much hard usage. The opposite condition exists in Fig. 4. In this case there must not be too much difference in the diameters or it would leave very little thickness at the joint where the part is turned down for the prints, except where very thick stock is used. To obviate this, reinforcing pieces are sometimes glued to the inside ends of the joint staves, as shown in Fig. 5, or the barrel is built as shown in Fig. 6.

The joint staves in this case are made much thicker than the others. An excellent form of construction for large

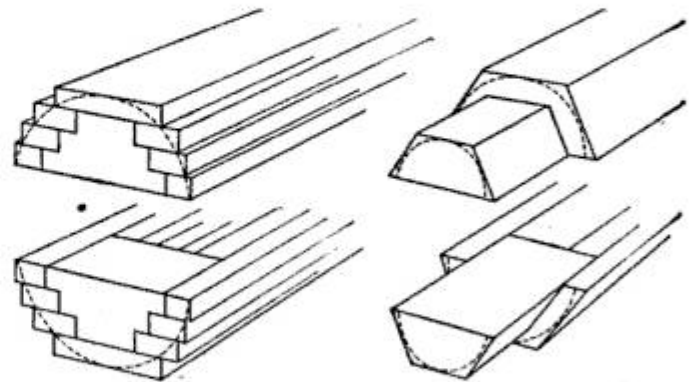


FIG. 2

FIG. 3

The Stepped and Staved Forms of Construction Save the Material in the Center

cylinders is shown in Fig. 7. The prints are built up of staves first and these form the foundation for the barrel staves.

The first step in preparing to build a cylinder is to lay out a semicircle representing the print and barrel, as shown in Fig. 8. To the barrel diameter should be added enough to turn the pattern, say, $\frac{3}{8}$ in. all around. The outer circle should then be spaced off to suit the number of staves to be used. From two of the points stepped off on the outer circle, lines are drawn to the center. These lines should be drawn through and somewhat beyond the circle. A line tangent to the outside circle and connecting the two

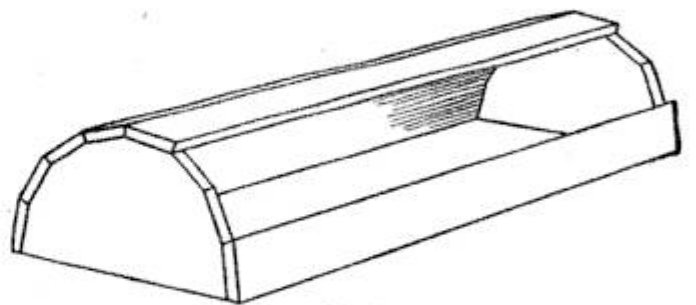


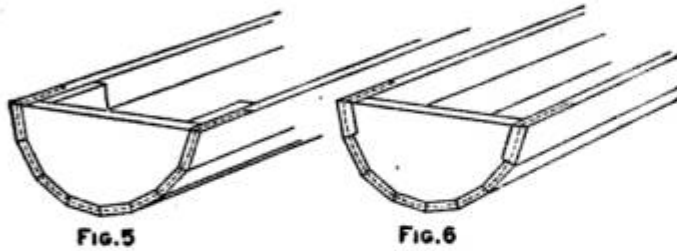
FIG. 4

A Larger-Size Barrel Where There is Not Much Difference in Diameters of Pattern and Print

radial lines is drawn to represent the outside of the stave. This line should intersect the radial lines at points equidistant from the center. The inside of the stave is drawn parallel with the

outside and the points where this inside line intersects the radial lines fix the diameter of the circle for laying out the heads.

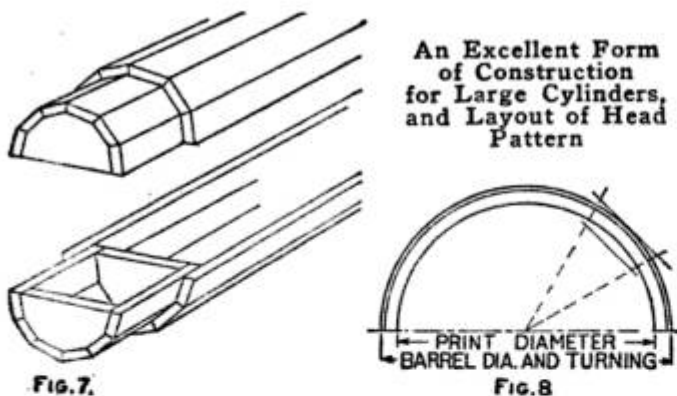
It is only necessary to lay out one



Where There is a Great Difference in Barrel and Print Diameters One of These Methods is Used

head for each diameter. Each one is planed up true on the surfaces and used as a template in marking the others. The staves should be made as close to size as possible on machine tools, the circular saw being used to cut them to the correct angle on the edges, but an allowance in width should be made for finishing them on the surface planer. With a good planer there should not be much necessity for fitting with a hand plane.

The molder always experiences more or less trouble in rapping and drawing patterns of this kind, unless some provision is made by the patternmaker for



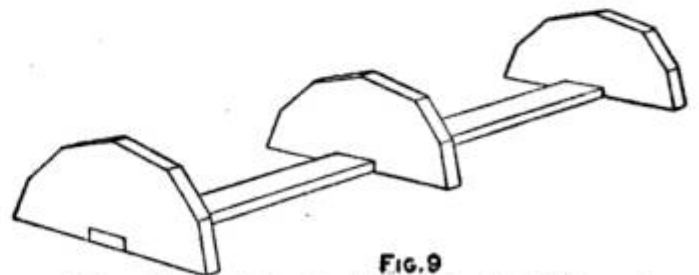
doing so, as shown in Fig. 9. The bar fitted into the heads and flush with the joint runs the full length of the pattern, adding strength and making it unnecessary to have a straight board on which to build the first half, also providing the means for rapping and lifting.

One half of the pattern, starting at the top and working to the joint at each side, should be built up, then the joint should be planed up and dowel pins attached. The second half is built

up in the same manner, starting at the joint on each side and working to the top, but the bar in the second half should not be fitted until the pattern is taken apart; then it can be done easily.

It is a good plan to glue corner blocks inside of all staved work, particularly at the joint staves, where the glue is not apt to hold well on the end wood of the heads.

Heads are sometimes built up of segments, or framed, but for the general run of work the head sawn from a

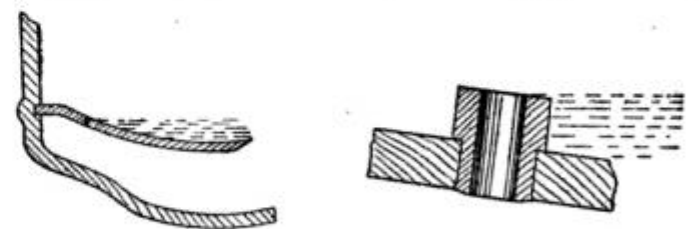


A Bar Mortised in the Heads for Rigidity and for Rapping the Pattern in the Mold

solid piece of plank answers the requirements and is easily and cheaply made.

Surplus Oil Used in a Splash System

Certain models of automobiles had engines equipped with a splash-feed oiling system working in the manner shown in the sketch. A stamped metal plate, set in the case, formed the bottom of the oil reservoir. In this the connecting rods dipped at each downward stroke. At the sides were holes through which the oil overflowed into the space beneath when the level became normal or higher. A pump below returned the oil. It was found in some parts of the country that there was not depth enough of oil



Raising the Oil Level in a Crank Case to Aid the Splash System on Hilly Roads

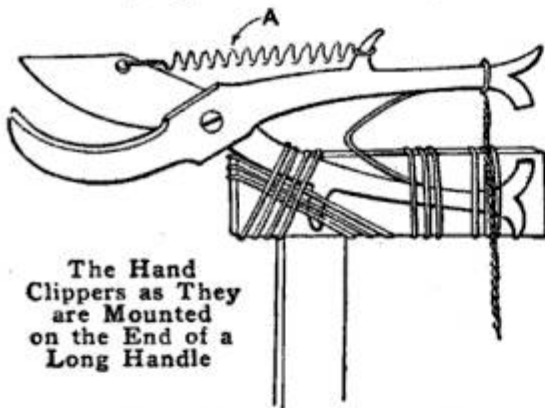
for the rough and severe usage which the cars received. To raise the oil level without procuring special

parts was the problem that presented itself.

The difficulty was overcome in the following manner: The overflow holes were punched out larger, then pieces of brass were drilled out and turned to a shoulder. These were riveted and soldered in the holes. They projected above the plate $\frac{1}{2}$ in., and consequently the oil had to rise that much higher before overflowing, so that the connecting rods picked up a greater quantity of oil at each dip; and their oiling was thus assured when the car was climbing a hill or passing over bumps.—Contributed by Donald A. Hampson, Middletown, New York.

Homemade Clipper for Pruning Trees

Having some high branches to prune and being without a clipper used for such work, a pair of ordinary hand clip-



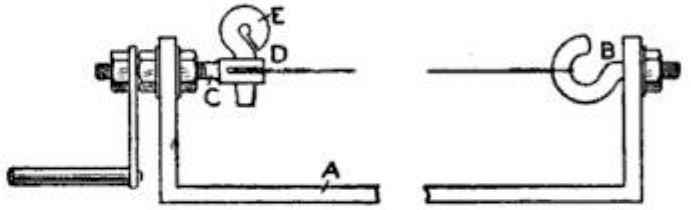
The Hand Clippers as They are Mounted on the End of a Long Handle

pers was rigged up on a wood arm that was mounted on a long handle. One handle of the clippers was lashed to the arm and a heavy cord attached to the other. An auxiliary spring, A, kept the lower jaw from sticking. The device worked well.—Contributed by James M. Kane, Doylestown, Pa.

Making Loops on Wire Ends

Having to make loops on both ends of a large number of wires and the use for the wires requiring them to be of equal length and to have uniform-size eyes, I found the device illustrated to give very good satisfaction. The material used was piano wire, which, on account of its stiffness, is difficult to handle.

A piece of flat iron, $\frac{3}{8}$ in. thick and 2 in. wide, was procured for the frame, as indicated by A. About 4 in. of each end was bent up at right

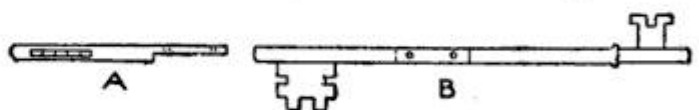


Making Loops of Uniform Size and of Equal Length on Very Stiff Piano Wire

angles, the length between the uprights being governed by the required distance between the loops on the wire, with allowance made for the swivel B and the head C. The head C was made from a piece of $\frac{1}{2}$ -in. rod, on one end of which a square blank nut was brazed, while the other was threaded for a sufficient length to allow for nuts and a handle, or crank. A slot was then sawed in the nut D along the axis of the body and at right angles to the hole in the nut. The pin E is tapered at the end for easy removal. When a loop has been formed, remove the pin E to release the wire, then place the loop on the swivel and proceed as before. A little practice will enable the operator to make uniform loops on very stiff wire.—Contributed by R. C. Price, Rapid City, S. D.

Two Keys in One

Having use for two keys several times a day, I cut them in two about the middle and filed the ends of each, as shown at A. The two keys were then placed together, as shown at B, and riveted and soldered. The keys were thus easily found in the pocket,

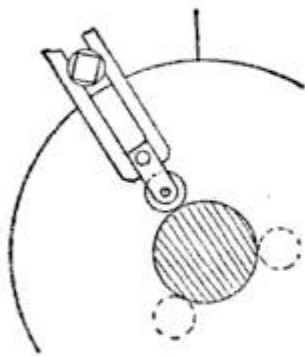


The Stems of Two Much-Used Door Keys Fastened Together for Convenience

and, in use, one was inserted in the lock while the other provided a means for turning it.—Contributed by J. J. Kolar, Maywood, Ill.

Roller Ends on Steady-Rest Jaws

The jaws of the ordinary steady rest, used on an engine lathe, will often score and sometimes cut grooves in the shaft which is being machined. A very easy way to overcome this trouble is to attach a roller to each jaw end. This may be done by bolting or riveting sides, made of $\frac{1}{4}$ -in. stock, to the jaws with projecting ends, between which a roller made of $\frac{3}{4}$ -in. cold-rolled steel is pivoted. These will roll on the shaft and prevent the scoring.—Contributed by L. A. Bocksberger, Fort Wayne, Ind.



Using Drills with Broken Shanks

Drills that have the small flattened end twisted off can be used successfully by making an extension socket as shown. These sockets can be made from shanks of drills that have been broken. The broken drill shank is then ground to fit into the notch of the socket. One of these extensions for each size of drill socket makes a handy addition to the drill cabinet.—Contributed by V. S. Denison, Sandusky, Ohio.



Ventilating a Cellar

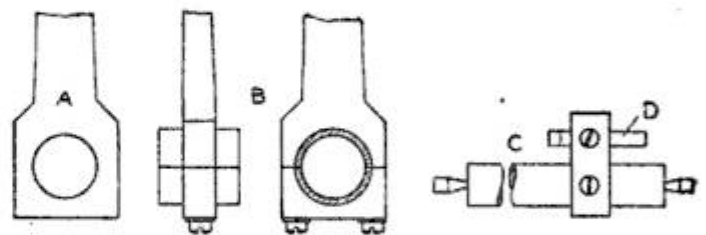
In ventilating a basement or a cellar, the air admitted should be a little cooler than the air within. Warm air holds moisture and the cold air striking it causes a condensation of the moisture. If a cellar is opened on a warm day, the warm air entering and striking the colder air causes the moisture to settle on the walls in the form of a dew, which will be often seen running down in a stream. This makes the place damp, and consequently the contents will become moldy.

In airing a place of this kind, open the doors and windows at night when the air outside will be at the same or nearly the same temperature as that inclosed, and no dampness will be formed. Be sure to close the openings before the temperature begins to change in the early morning. The dampness in a cellar may be taken up with a little fresh lime placed in an open box.

Machining Connecting-Rod Ends

Desiring to machine the large end of a small connecting rod, rather than file it into shape, I hit upon the following scheme of accomplishing the desired result on my lathe. The large end of the casting is represented by A in the sketch. It was desired to have it, when finished, as shown at B; that is, to have the split bearing in sleeve-like form.

The casting was split, drilled and tapped from the bottom and the hole was bored to size. The sleeve-like portions were roughed out with a hacksaw, leaving, in places, about $\frac{1}{8}$ in. of metal oversize. The next step was to procure a piece of cold-rolled steel rod, C, of the same diameter as the hole in the bearing, which was centered in both ends and fitted with a rectangular block of steel. This block was provided with a hole, at D, to receive a small tool; the latter being located just far enough from the mandrel to cut the sleeve to the finished thickness. The face and inside edges of the tool were



Shaping the Large End of a Connecting Rod into a Split Bearing with a Sleeve-like Form

ground to a cutting angle, the holding block being tapped and fitted with set-screws, to engage the mandrel and the tool. The connecting rod was supported in the tool post, and the mandrel

was run through the bearing while the work was fed against the cutter.

The cutting was rapid and perfectly smooth, and by using the take-up screws in the end, the bearing was made to run close to the mandrel, with just sufficient play to prevent chattering and yet to move freely.—Contributed by Harry F. Lowe, Washington, District of Columbia.

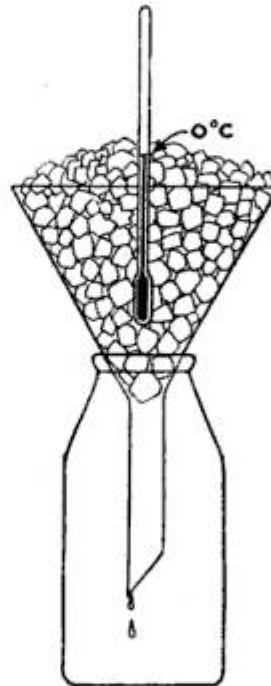
Testing the Accuracy of Thermometer Readings

To determine the accuracy of the calibration on thermometers, or to ascertain whether the register marks along the side of the tube coincide with the height of the mercury column at the various temperatures, proceed as follows: Find the freezing point, zero on a centigrade or plus 32° on a Fahrenheit thermometer. This may be accomplished by filling a funnel, 5 in. in diameter at the top, with cracked ice and setting it in a milk bottle, or other receptacle, to catch the dripping water, then placing the thermometer in the ice, as shown, and allowing it to remain there about 12 minutes. The mercury level will then be at the freezing point, or the zero mark on a centigrade thermometer, and 32° for the Fahrenheit.

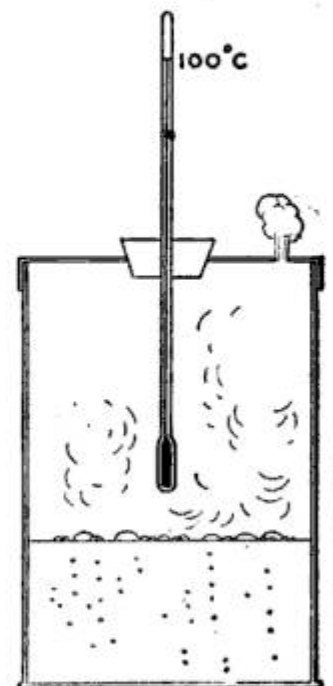
To find the boiling point, 100° C. or 212° F., procure a can which has a close-fitting cover and in the center of the latter make a hole to receive a cork of suitable size; then make a hole in the cork to fit the thermometer tube snugly. If the can cover fits so tightly that no steam will escape, make a small vent hole to release the excessive pressure and prevent a possible explosion. Fill the can about one-third full of water and place the cover and thermometer in position, making sure that the thermometer bulb does not touch the water. Set the can on a burner and when steam begins to escape, or in about 12 minutes, the mercury level will register 100° C. or 212° F., according to the thermometer being tested.

These two main points having been accurately marked, the remainder of

the calibrations, or intermediate degrees, are tested by accurately spacing them off with a pair of dividers, to the



Ice Test for Locating the Freezing Mark

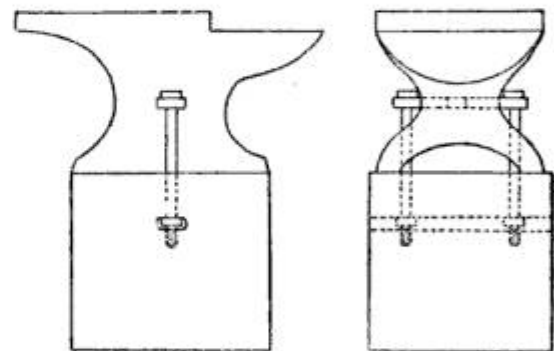


Locating the Boiling Point by Heat

necessary number of degrees between them, which should be 100 spaces on a centigrade and 180 on a Fahrenheit thermometer. All degrees above or below these points can be carried out by continuing with the same spacing.—Contributed by Russell E. Hollis, Chicago, Ill.

Fastening an Anvil to a Block

The anvil is drilled through the central part of its stand, and the shanks of eyes are fitted in the hole from each side. Nuts are mortised in the anvil block and bolts placed in the eyes and



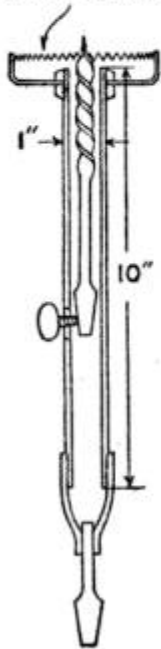
The Bolts, Passing through Eyes Attached to the Anvil, Hold It Securely to the Block

through the block to the nuts. If the anvil becomes loose a turn of the nuts will hold it rigidly.

Cutting Holes for Ceiling Plates

The cutting of a hole in the ceiling plaster for the 3 or 4-in. ceiling plate is quite a task where the old method is employed. To overcome this difficulty I

CEILING PLATE

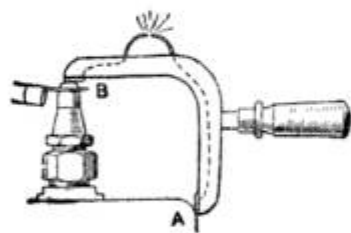


To overcome this difficulty I constructed a device for cutting these holes quickly. The ordinary ceiling plate was used as a cutter, the rim or edge being filed in saw-tooth fashion and then clamped on the end of a piece of 1-in. pipe, 10 in. long, by means of lock-nuts. A slot was cut in the side of the pipe at the point the square tapered end of a bit would reach while allowing the cutter end to project a trifle beyond the teeth

filed in the plate edge. A screw was used in this slot to clamp the bit in place. The other end of the pipe was fitted with a reducer so that the square tapered end of a bit could be attached, as shown. This part was cut from a discarded bit. It only requires a few turns to remove the plaster to receive a ceiling plate.—Contributed by E. Hansen, Chicago.

Spark-Plug Tester

A way to prevent getting a shock while testing out spark plugs is to provide an insulated handle to a device



carrying two wires that will be made terminals by the contact plates A and B touching the spark plug and the engine head.

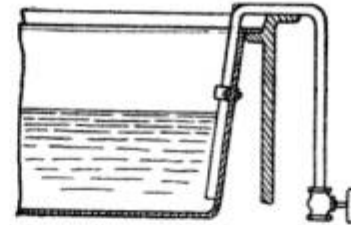
The two wires are brought up through the insulation and the ends bent in close to each other, or the same as the terminal wires of the spark plug. Such a device is very handy to keep in the tool box or bag of an automobile or motorcycle.

Exterminating Water Bugs in Drains

In shops where dirty water is poured into sinks, or in kitchens, especially those of restaurants and lunch rooms, water bugs breed within the pipes. A way to kill all of these and at the same time kill all sewer-gas odors is to pour into the sinks small quantities of a solution of potassium permanganate. The chemical is secured from any druggist at a small price. Just a few grains for each 1 oz. of water will be sufficient. This weak solution is harmless, but should be kept from the hands, as it is liable to stain the skin. The solution should remain in the pipes for a little time before water is run in the sink.—Contributed by Loren Ward, Des Moines, Iowa.

Outlet for a Range Boiler

The trouble and dirt caused by lifting the reservoir lining out of the kitchen range to empty it can be



avoided by attaching a siphon outlet as shown. The permanent attachment will also make it unnecessary to

raise the cover when water is taken out. The pipe is fastened to the reservoir with a clamp and a space for the pipe is cut out of the reservoir cover.—

Contributed by J. V. Loeffler, Evansville, Ind.

Irrigating with Drain Water from Kitchen Sink

Anyone living in the country or in a village can have the convenience of a drain from his kitchen by which all waste water may be carried out without the use of pails, and at the same time providing irrigation for the garden. The tank on our home place has a capacity of 3,000 gal. and supplies eight different faucets at convenient places on the grounds, and one in the kitchen. The drain from the kitchen

sink consists of a $\frac{3}{4}$ -in. pipe leading through the floor and into the earth to a depth of about 18 in., and from that end begins the irrigating device.

Old discarded tin fruit cans were procured, those of the 3-lb. size, and holes punched in the closed ends; the other ends, which had been cut out to remove the contents, were melted off. The cans were then placed end to end, as in laying drain tile. The water seeps through the holes in the cans and irrigates seven trees.—Contributed by Mrs. A. J. Cleveland, Slaton, Texas.

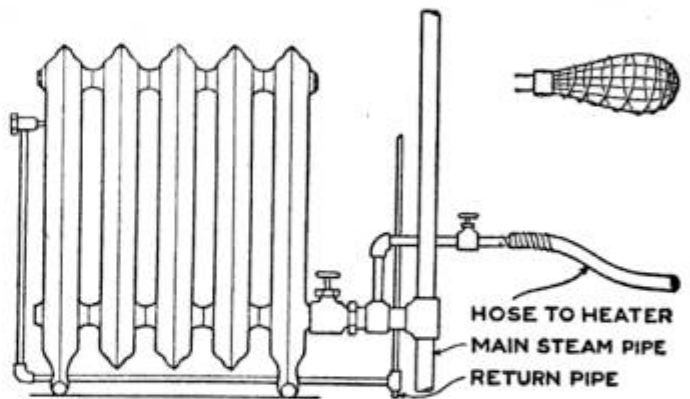
A Steam Water Heater

A great many apartment buildings at the present time have no hot-water supply although they are steam-heated, making it necessary to heat all water by gas or other fuel, which is quite an expense to the occupant, to say nothing of the inconvenience. The following device, which is in use in an apartment, has proven very satisfactory, and its original cost has been saved almost every month in the gas bill.

The pipe leading from the main steam pipe to the radiator was taken apart and a tee inserted, with a side opening for a $\frac{3}{4}$ -in. pipe. This tee was placed between the valve and the vertical pipe, so that steam could be obtained from the outlet with the radiator turned on or off. A $\frac{3}{4}$ -in. iron pipe was run from the side outlet in the tee to within about 1 ft. of one end of the bathtub. A valve was placed in this pipe near the radiator and a piece of rubber hose, about 6 ft. long, was attached to the end nearest the tub. A balloon-shaped device, similar to the one shown, about 7 in. long and 3 in. in diameter, was made from some galvanized-iron wire and attached to the end of the hose. A cloth was wrapped around the outside of this wire device, so as to prevent the steam making an undesirable noise when it escaped into the water. The bathtub is first filled with water to the desired level, then the end of the hose is placed in the tub and the steam turned on.

A tub half full of water may be heated in from five to ten minutes under ordinary steam pressure.

At first some trouble was experi-



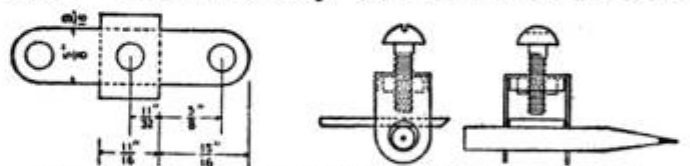
Connections for Attaching a Hose to the Radiator Steam Pipe for Heating Bath Water

enced in that the rubber hose broke near the end of the iron pipe, from repeated bending when its free end was put into and removed from the bathtub. This trouble was overcome by making a coil spring, with an inside diameter equal to the outside diameter of the hose and 6 or 7 in. long, and placing it outside the rubber hose where it was connected to the iron pipe, thus preventing an abrupt bend being made in the hose at this point.

A small box should be provided in which to place the end of the hose when not in use, so as to keep it clean.

Homemade Trammels

An ordinary rule may be used for the bar with the trammel-point connections shown in the illustration. They are made of sheet steel of a size to correspond with the dimensions given. The holes are $\frac{5}{8}$ in. in diameter. An ordinary $\frac{1}{4}$ -in. stove bolt is



The Bolt Clamps the Trammel to the Rule and Also Holds the Pencil in Place

used for the clamping device.—Contributed by J. A. Oesterle, Albany, New York.

☞ When using a glass for a hot beverage, set it in another glass and it can be taken in the bare hand.

Holding Conduit for Cutting

A very serviceable device for holding conduit or armored cable while cutting can be easily made by attach-



Two Pipe Straps Fastened to a Board over the Conduit Hold It Solidly While Cutting

ing two pipe straps of sufficient size over the part to be cut, as shown in the illustration, using a piece of wood for the base. The cut is made between the straps. The device is very handy, as it holds the cable solidly and can be carried anywhere work is to be done.—Contributed by R. G. Whipple, Chicago.

Spigot for Use in a Barrel Side

Occasionally the closeness of metal hoops on a barrel near the ends prevents the insertion of a spigot as near the bottom as desired; and the barrel must be tilted to remove the contents remaining below the spigot level. If the spigot shank projects some distance into the barrel the tilting will not remove all the contents. If, however, a fair-sized hole is drilled in the spigot shank at a point which will reach just inside the barrel, as shown, the operation of emptying the barrel will be greatly facilitated.



Hardening Hacksaw Blade to Cut Tool Steel

Ordinary hacksaw blades are not intended for very hard steel and if it is desired to cut such steel, the blade should be hardened. In hardening these blades they would warp out of shape when brought to a cherry red, but by experimenting I find if a blade is bound flat on an old file and both

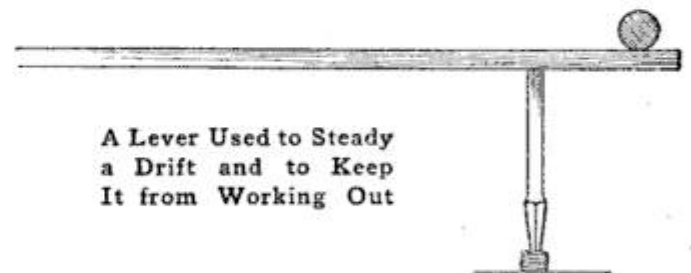
heated together, the blade will be kept flat and the file will retain the heat while preparing to dip it.

The temper of the blade end should be drawn to prevent breaking. For extremely hard temper, heat to a cherry red and give the blade a mercury bath, but do not inhale the fumes, as they are poisonous. Saws or drills hardened in mercury will readily cut glass if moistened in turpentine. In using a hard blade do not press too hard, and run it slowly.

All steel instruments when heated to a red heat lose a portion of their carbon, which loss means a softening of the surface on the instrument. This loss is especially noticed in fine instruments, the more delicate ones being utterly ruined. To protect them from this loss, they should be covered with a layer of potash or other medium. This may be accomplished by heating slightly and rubbing them with soap.—Contributed by Dr. W. H. Albright, Bellevue, Ohio.

Removing Stub End of a Broken Screw

Very often a screw is broken off in a piece of machinery. A common method of removing it is to drill a hole about $\frac{1}{8}$ in. smaller than the root diameter of the screw in the end, then drive in a square drift and twist it until the broken part comes out, using a wrench for greater leverage. This method is a good one and quickly accomplished, but it has one objection: the drift used must be tapered to start it and fill the



A Lever Used to Steady a Drift and to Keep It from Working Out

hole as it is driven. The taper is the cause of the trouble, as it makes the drift easily loosened in the hole, and, once loosened, it will slip up a little and cut out the hole instead of starting

the screw. A straight drift cannot be used for the reasons mentioned. The way to make the tapered one effective is to keep it in the hole and to avoid wriggling at the top, which loosens the drift. To keep the drift in the hole is simple enough by using a bar, a piece of board or a lever of any kind on top of the drift, and in almost every case the broken screw will come out. The sketch shows a piece of board fulcrumed on a shaft or any support and acting to keep the drift in place while it is turned.

An Oil-Hole Cleaner

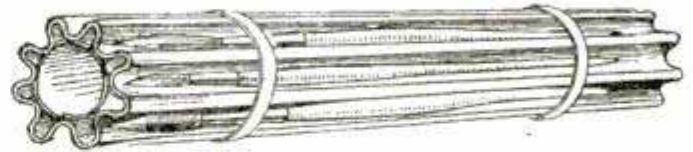
The cleaner consists of a light frame, made of galvanized iron, to form bearings for a $\frac{1}{4}$ -in. shaft, the whole being fastened to a light wood handle of any convenient length. The shaft has collars attached just outside of the frame, to prevent it from shifting endways when it is turning. A strong cord, A, is given two or more turns around the shaft. Then one end is passed through a screw-eye, B, on the handle and tied to the end of a coil spring, C, the other end of which is fastened to the handle. The other cord end passes through another screw-eye and runs the full length of the handle, being fastened to the handle. The spring used was taken from a discarded curtain roller.

The end of the shaft is split and the parts are turned outward. This will pick up waste and clean out any dirt or gummy oil. A pull on the cord will cause the shaft to revolve rapidly, and a backward motion is given by the spring when the cord is released.—Contributed by C. R. Van Keuren, Famoso, Cal.

☞ Inspect all belts frequently and keep them in a condition to avoid accidents.

A Brush Holder

A sheet of corrugated strawboard, rolled up with the corrugations on the outside and held with rubber bands,



The Corrugations in the Strawboard Keep the Brushes Straight and Absorb the Moisture

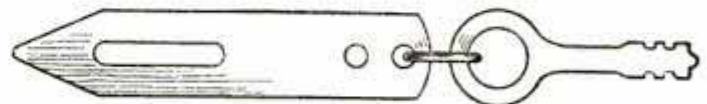
makes a good brush holder for water-color brushes. The ribs prevent the brushes from bending and becoming deformed. The porousness of the strawboard also assists in absorbing the moisture after the brushes are washed.

Protecting Shade Trees from Destructive Insects

To prevent ants and other insects from crawling up and gradually injuring valuable shade trees, encircle the tree about 1 ft. above the ground with sticky fly paper. Carpet tacks may be used to fasten the paper in place, and where the edges lap, the blank margin should be trimmed away so as to make the circle sticky all the way around. Where spaces or crevices occur beneath the paper—as will be the case with a very rough tree—they should be stuffed with cotton. If this remedy is tried out for a week, the insects will desert the tree.—Contributed by Chas. K. Theobald, Vicksburg, Miss.

A Garage-Key Holder

A small hasp is just the thing to attach to a garage or stable key if it is to be kept in the house. The hasp part is used, and the key is attached

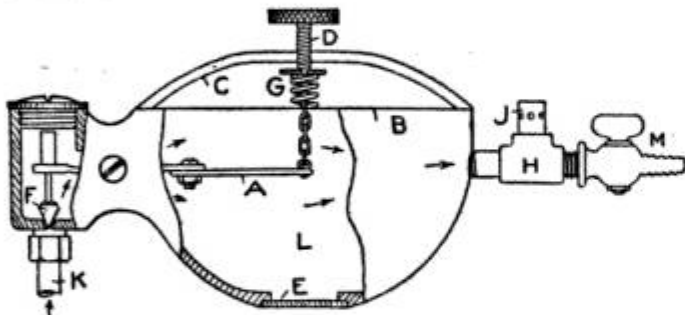


The Hasp Makes a Hanger for the Key and is Much Better Than a Stick of Wood

to it by using a split key ring.—Contributed by A. A. MacCready, E. Orange, N. J.

A Pressure Regulator for Acetylene Gas

The pressure regulator shown is for use in connection with tanks having a high pressure of oxygen or acetylene.



Pressure Regulator Constructed from a Discarded Carburetor for Delivering Gas to a Torch

It is constructed from a discarded carburetor. The float is removed and an arm, A, is attached in its place. A diaphragm, B, is soldered on top of the bowl to form a gas-tight joint. An arch, C, made of a flat piece of brass, is soldered at the edges, and a hole is drilled and tapped in the center, to receive a thumbscrew, D. A piece of brass is soldered over the hole E. A short piece of chain is fastened to the end of the arm A, and soldered to the center of the diaphragm B, allowing enough slack to let the valve F open $\frac{1}{4}$ in. The screw D compresses the spring G against the diaphragm B in making adjustment to obtain the desired pressure of gas to operate the torch. A $\frac{1}{8}$ -in. tee, H, is connected, as shown, and a safety valve, J, is turned into its side outlet.

In operation, the gas enters the pipe K, passing through the valve F into the chamber L and through the outlet M. When the set pressure is reached, the diaphragm B closes the valve F. When the torch is shut off, the valve will be entirely closed. If the regulator is well made, there will be only a slight variation in the pressure used in the torch, regardless of the amount of pressure in the main supply tank.—Contributed by F. Elmer Wurzbarger, Fairbury, Ill.

ⒸThe arrangement of a belt, rope and cable transmission should be such that it may be easily guarded.

To Prevent Hollow Porch Columns from Rotting

Hollow porch columns may be prevented from rotting at the bottom if two or three holes about $\frac{3}{4}$ in. in diameter are bored through the porch floor and the base of the column. This will allow the air to enter the inside of the column.

In building the column paint the inside with white lead and oil mixed thinly. The painting will prevent them from cracking open at the stave joints, as is often the case. If the column is finished, the painting can be done with a swab made of a piece of rag tied to the end of a stick long enough to reach halfway through the column.—Contributed by L. G. Burnand, Lyons, Iowa.

Clamping Screw for Calipers

The locking device on the ordinary dividers or calipers not being satisfactory, I made a substitute, as shown in the sketch, that can be set quickly and will hold without slipping. It consists of a knurled nut with a part of it threaded and slotted, similar to a draw-in chuck. A second knurled nut, with an internal tapering thread, closes the parts on the threads of the bolt, thus clamping it solidly.—Contributed by Chas. G. England, Washington, Pennsylvania.



Duster Made of Hemp Rope

Procure a piece of 1-in. hemp rope, about 18 in. long, and bend it in the center, then bind about 5 in. of the two parts together with a strong cord to make a handle. The remaining unbound part is loosened and combed out to form a brush. This makes a good duster for a shop bench.—Contributed by



Samuel D. Laurie, Hannibal, N. Y.



How to Make a Houseboat

By H. SIBLEY

THE houseboat shown is of the scow design, 6 ft. wide by 20 ft. long, with the cabin extending beyond the scow 1 ft. on each side. The scow tapers up at the forward end and is protected with a heavy sheet-iron plate so that the craft may be snubbed up on sandbars without danger of springing a leak, even though a submerged log be struck while running at full speed.

The power plant consists of a standard 4-hp. reversing gasoline engine which drives the paddles at their most efficient speed, 45 revolutions per minute through a 13-to-1 reduction. Cast-iron hubs, into which are inserted cold-rolled steel spokes, and wood paddles bolted to their ends constitute the propeller wheels. The cruising speed is about 4 miles an hour.

Two wide bunks, beneath which is locker space, provide sleeping accommodations for a crew of four. In the kitchen the motor and gearing are almost completely concealed under the work

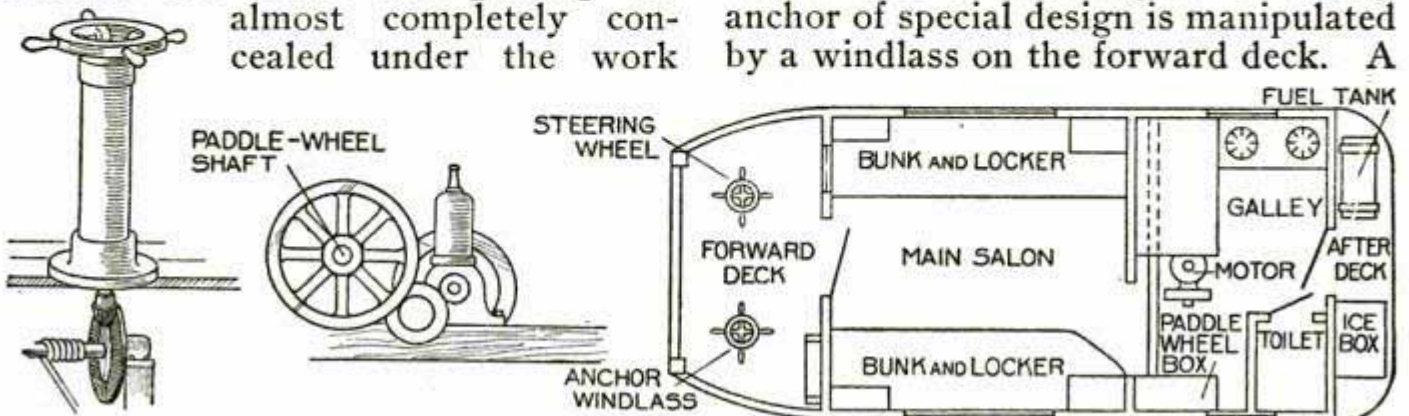
table. The cooking is done on a two-burner blue-flame kerosene stove, and the sink is provided with running water



The Hull of the Houseboat is Built on the Scow Type so That It can be Run in Shallow Water without Danger

suitable for washing dishes, etc. This water is drawn from a 30-gal. tank on the roof, which is filled by a centrifugal pump driven from the engine shaft. A modern toilet room is installed, and an ice chest on the after deck will hold supplies and ice for a week's cruise.

An acetylene-gas lighting system is installed and is used to light both cabins and a searchlight. A heavy anchor of special design is manipulated by a windlass on the forward deck. A

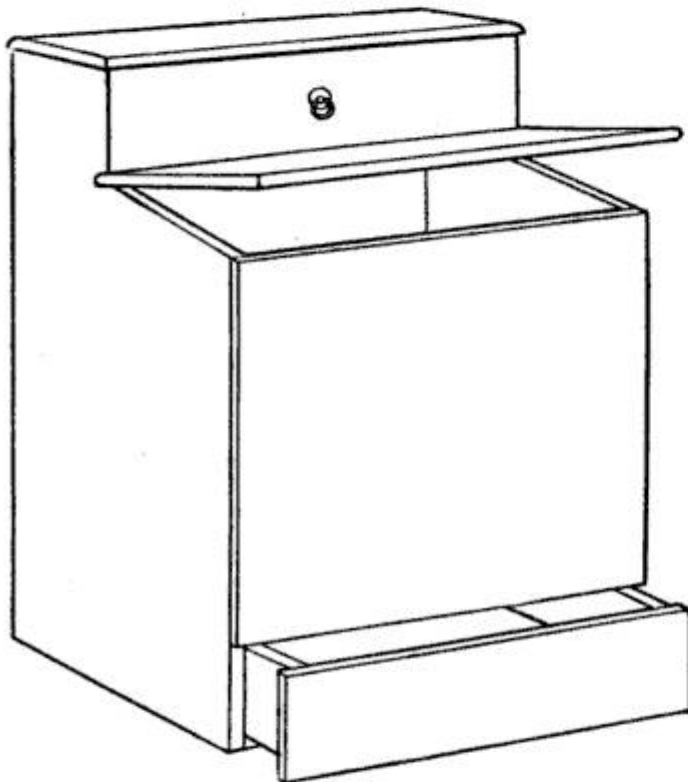


Detail of the Anchor Windlass and Engine Gearing; Also the Deck Plan, Showing the Location of the Parts and the Arrangement of the Cabins

similar device controls the rudder. Life rafts, complete with paddles, are placed on the roof, and in hot weather these are moved to one end and an awning erected to make a cool sleeping place.

Wood Box with a Refuse-Catching Drawer

The ordinary wood box may be greatly improved by adding a drawer at the top and one at the bottom, as



The Wood Receptacle Has a Drawer Bottom for Catching the Dirt, Which can be Easily Cleaned

shown in the sketch. The upper drawer is used for storing the flat-irons and stove-polishing materials, and the lower drawer is the bottom of the wood box. The dirt and pieces falling from the wood remain in the drawer, which can be removed and cleaned easily.—Contributed by William Jutila, Astoria, Ore.

Disappearing-Coin Trick

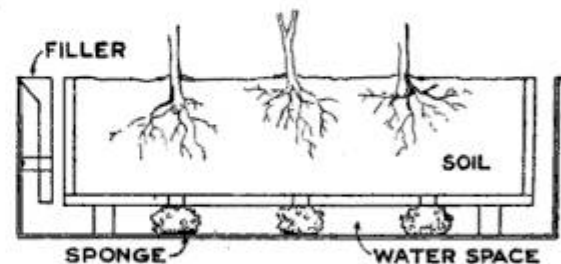
To make a quarter disappear from a glass of water after hearing it drop is a very puzzling trick. The articles necessary to perform this trick are a glass of water, a handkerchief, a quarter and a piece of clear glass the exact

size of a quarter. The glass can be cut and ground round on an emery wheel, and the edge polished.

To perform the trick advance with the piece of glass hidden between the second and third fingers of the left hand and holding the quarter in plain sight between the thumb and first finger of the same hand and the handkerchief in the right hand. Throw the handkerchief over the left hand and gather up the glass piece in the fold of the cloth, allowing the coin to drop into the palm of the left hand while covered. Remove the left hand and hold out the piece of glass with the handkerchief drawn tightly around it. Anyone can touch the cloth-covered glass, but it cannot be distinguished from the quarter. While this is being shown slip the quarter into a pocket. Spread the handkerchief over the glass of water and allow the glass disk to drop. A distinct click will be heard when it strikes the bottom. Raise the handkerchief and nothing will be seen, as the glass will not be visible in the water.—Contributed by Amon H. Carr, Gainesville, Tex.

Watering Window-Box Flowers

The window box for flowers can be conveniently watered in the following manner: Construct a metal box to receive the box holding the soil and bore enough holes in its bottom to admit water to the soil. The inside box should be supported about 2 in. above the bottom of the metal box. Sponges are placed in the bottom to coincide with the holes in the soil box. A fill-



The Soil is Kept Moist by the Water Feeding through the Sponges from the Under Side

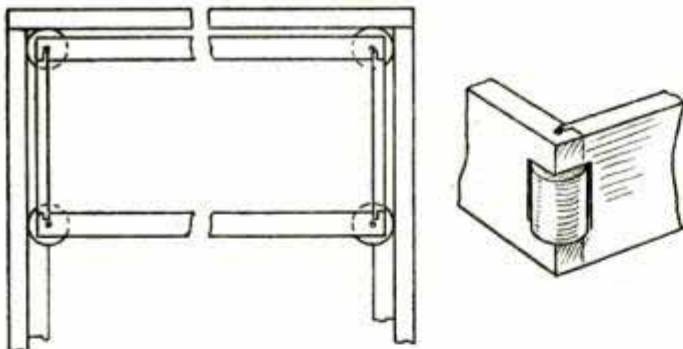
ing tube is made at the end. The water is poured into the metal box and the sponges admit only enough water for the plants at all times.

Substitute for Rivets in Couches

The rivets in a couch come loose and work out quite often, leaving it loose and wobbly. To make rivets fit properly by hammering them into place is almost impossible and to repair the couch with stove bolts makes an unsightly job. A very good repair and one that will make a couch rigid and strong again is by the use of ordinary brass binding posts from old dry-battery cells instead of rivets. These can be easily placed without tools.—Contributed by G. H. Clemmons, Storm Lake, Iowa.

A Nonbinding Tool-Chest Slide Tray

The slide trays of a tool chest, especially if they are wider than they are deep, are apt to bind. To remedy this trouble, I procured four ordinary thread spools and inserted them in



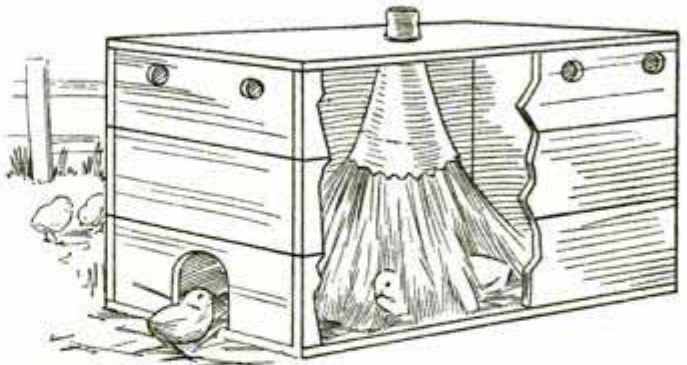
The Spool in Each Corner of the Tray Rolls against the Side of the Tool Chest

openings cut for them in the corners of the tray. Holes were bored through the corners for pins to hold the spools in place.—Contributed by J. V. Loeffler, Evansville, Indiana.

A Brooder

A very effective brooder can be made of an old feather duster hung in a box so that the tips of the feathers will come close to the bottom. The brooder consists of a wood box about 1 ft. high. The cover is removed and a hole cut in the center to receive the shank of the duster after cutting its handle off. This makes an excellent substitute for the feathers of the hen. Some finely cut hay, or sand, is placed

beneath so as to bring the level up sufficiently for the chicks to run among the feathers. For ventilation, bore some holes in the sides of the box near



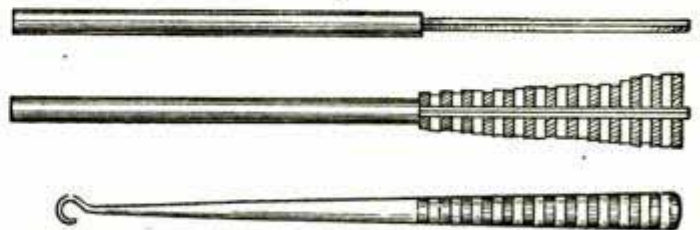
The Feathers of the Duster in the Center of the Box Take the Place of Those of a Hen

the top and cut a small opening for an entrance. For convenience in cleaning, the cover should be hinged.—Contributed by Wm. T. Miller, Roslindale, Mass.

How to Make a Fancy Buttonhook

Procure a piece of $\frac{1}{4}$ -in. round steel, about 5 in. long, and file one end of it square for about one-third of the length, so that the diagonal of the square part is less than the diameter of the rod. Cut about 8 washers each, of brass and iron, from material, $\frac{1}{8}$ -in. thick. Make the hole in the washers square to fit the square on the rod. The washers can be cut out roughly on the outside, but they must be larger than the diameter of the rod. Place the brass and iron washers alternately on the rod, beginning with a brass and finishing with an iron washer, which latter is held in place by riveting the end of the rod on it.

The washers are then filed round, and the remaining end of the rod is

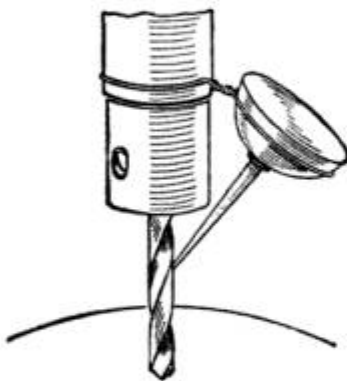


The Different Colors of the Metals When Polished and Buffed Give the Hook a Neat Appearance

tapered. The pointed end is bent into a hook. The whole length is then polished and buffed.—Contributed by H. W. Hankin, Trail, Can.

Oiler for a Hand-Drill Press

On stationary hand-power drill presses, where both hands are required to turn the crank and hold the work,

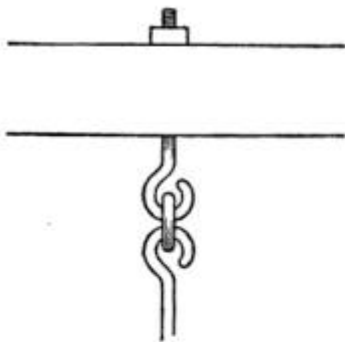


some means must be provided for applying lubricant to the drill, or the machine would have to be stopped from time to time to apply the oil. A very handy arrangement, for pouring the oil on automatically, is to make a support of wire to hold an oil-can, as shown. This will provide a slow and constant dropping of oil on the bit.—Contributed by Bert Verne, San Diego, Cal.

some means must be provided for applying lubricant to the drill, or the machine would have to be stopped from time to time to apply the oil. A very handy arrangement, for

Bearing for Playground Swings

To have the playground swing work easily and without friction make the



hangers as shown in the sketch. The ring in the hooks produces a slight rolling action and gives the swing a free motion. — Contributed by Edwin

J. Bachman, Jr., Fullerton, Pa.

Die in a Bottle

The die is made of cork and the spots painted white. A small round bottle is procured, the die is placed



cork is then sealed in the bottle. If

there is an air bubble, the cork die will not work well.

If the bottle is held bottom up, the cork die will spin around and float up against the bottom of the bottle where the number of spots can be seen. It is impossible to manipulate the die to turn up any desired spots, this being left entirely to chance. A number of bottles can be prepared so that any of the dice games can be played.—Contributed by Henry J. Marion, Pontiac, Michigan.

Small Hook for Hanging a Picture

After an unsuccessful attempt to hang a small picture with a common pin, I devised the following method:

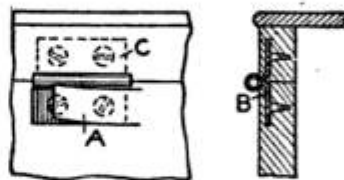


After bending about $\frac{3}{8}$ in. of the point on an ordinary pin to an angle of about 45 deg. and bending up the other end in the opposite direction to form a hook, I drove the

point on a downward slant into the wall. It went in easily and did not mar the plaster. When making a test I found that the hook would readily support a weight of several pounds.—Contributed by C. P. Smith, E. Radford, Va.

Covering Hinge Wings

In making fancy boxes where ordinary hinges are used, a much neater job can be done if as much of the



hinge as possible is covered. This can be done by carefully raising a sliver with a sharp chisel as at A. The wings

are bent at an angle, as shown at B, and are then set in place, as shown at C. The sliver is carefully glued back in place over the hinge wing, and the surface is leveled with sandpaper.

Ⓒ A bit of rubber insulation stripped from an electric wire makes an excellent holder for a scarfpin.

Electrical Heating Apparatus for the Home

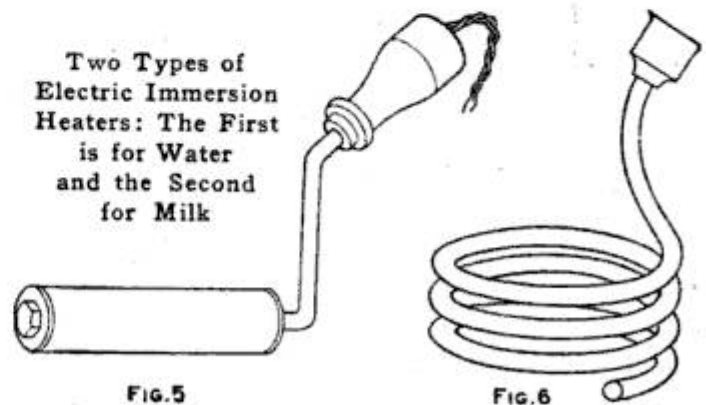
By ARTHUR MOORE

Part IV—An Immersion-Coil Water Heater

When heat is applied to the outside of a container to raise the temperature of the liquid within, a large portion of the heat is wasted. An electrical immersion heater, on the other hand, is economical for the reason that all heat radiated is transmitted directly to the fluid. The immersion coil consists of some kind of electrically heated element, which may take various forms, as conditions demand, so that it can be placed in the water or liquid to be heated.

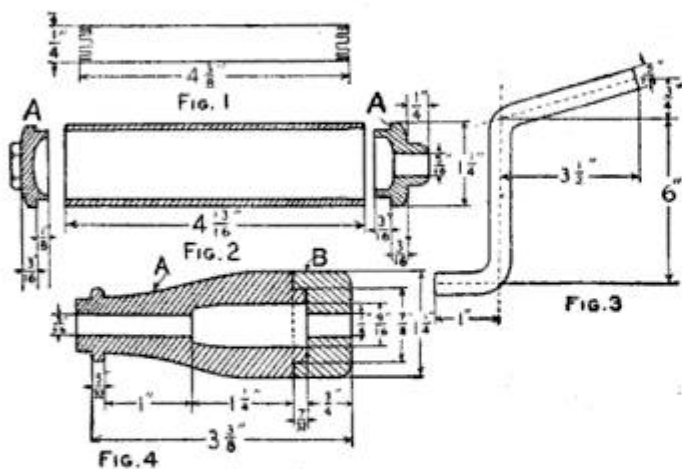
To make such a heater, proceed as follows: Make a hollow metal core, as shown in Fig. 1, and cut a number of notches in both ends so as to provide a better circulation of the air about the heating element. Apply several layers of thin mica around the tube and fasten them with several turns of twine or fine wire, until the first winding of the heating element is in place. Procure 55 ft. of No. 18 gauge nichrome wire for the heating element. If the heater is to be used on an alternating-current circuit, it is wound noninductively, which may be done as follows: Take the length of

ceed the diameter of the wire. After the first layer is in place, it is covered with several layers of thin mica and then a second layer of wire wound on it. This process is continued until all the wire is used, when the ends are



securely fastened. Several layers of mica are then placed outside of the last layer and held in place with a number of turns of small wire. The winding should not come nearer the ends of the tube forming the core than $\frac{1}{4}$ in., but the edges of the mica that separate the various layers must extend to the end of the tube, and numerous small notches are cut in the edges of the mica to provide a better circulation of heat within the completed element.

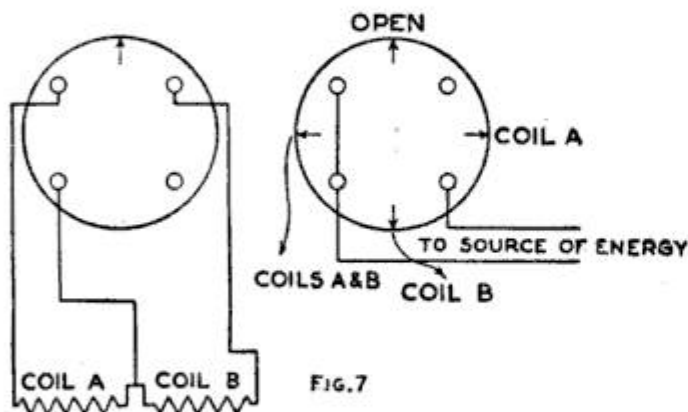
The containing case for the heating element is shown in Fig. 2. It consists of a thin copper tube. Two plugs are made from pieces of brass, one like that shown at the left, which is brazed into the end of the tube, and the other similar to that at the right, which should be threaded so that it may be screwed into the opposite end of the copper tube, which is also threaded. The portion of the plugs marked A is made hexagonal in shape. Next, obtain a piece of copper or brass tubing, with an outside diameter of $\frac{5}{16}$ in. and about 11 in. long. Bend this tube into the form shown in Fig. 3, and braze the lower or left end into the opening of the threaded plug. A



Detail of the Parts for the Construction of an Immersion Water Heater

wire and double it and then start to wind the coil with the closed end. The wires are placed side by side and the distance between them should not ex-

handle is made from some hard wood, such as maple, similar to the one shown in Fig. 4. This handle consists of two parts, A and B. The part B is fastened to the part A by means of



Wiring Diagram for Use When a Heater is Made for More than One Degree of Heat

two long wood screws running parallel with the axis of the handle. The part A is fitted with a small ferrule placed on the left end and then fastened to the upper or right end of the piece of tubing shown in Fig. 3.

The device is now ready to be assembled as follows: Place a thin washer of asbestos in the bottom of the case and then put the heating element in place with the ends of the winding toward the open end. Two leading-in wires, about No. 14 gauge, of asbestos-insulated copper and at least 18 in. long, are connected to the heating element before it is placed in the case, by securely twisting together the bare joints of the leading-in wires, at one end, each with the exposed portion of one terminal, then completely covering the connection with asbestos thread, wound in both directions. Sufficient asbestos washers are

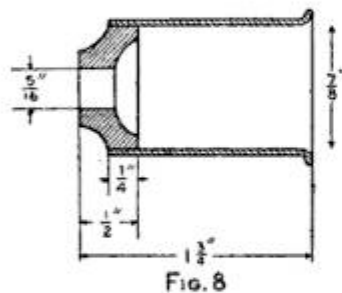


FIG. 8

now placed on top of the heating element so that when the plug is screwed into the case the element will be held firmly; the free ends of the leading-in wires are shoved through the plug and the copper tube, extending several inches beyond its upper end. The joint between the case and plug should

be made water-tight, and it can be screwed up very tight by means of wrenches placed on the hexagonal portion of the two plugs.

Obtain a piece of heavy lamp cord, at least 8 ft. long. Put one end through the opening in the part of the handle marked B, Fig. 4, and tie a knot in it very near the end. The ends of the leading-in wires are soldered to the ends of the conductors of the lamp cord and the joints thoroughly insulated with tape. These joints are then shoved down into the large opening in the handle, and the part B is fastened in place. An ordinary attachment plug is fastened to the free end of the lamp cord and the coil is complete, as shown in Fig. 5.

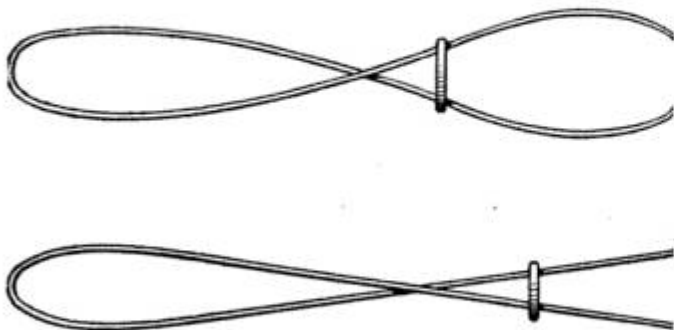
This immersion coil is the most common form, but there are other forms that are exceedingly useful and have advantages not possessed by this one. In some cases it is desirable to have the heat more uniformly distributed throughout the substance to be heated, as in heating milk, and in such cases a coil similar in form to that shown in Fig. 6 is more satisfactory. The containing case for such a coil can be made from a piece of soft copper tubing, while the heating element may be made by winding the resistance wire around a core of asbestos and then covering the bare wire outside with a number of layers of asbestos thread wrapped in alternate directions. The heating element should only fill so much of the tube as will always be submerged in the liquid to be heated. Asbestos-insulated copper wires are used to connect the heating element with the terminals of the coil. The heating element may be drawn into the tube before the tube is bent into the desired form, and the lower end of the tube is then closed. Care should be exercised in bending the tube to prevent its kinking. A piece of soft-pine wood may be used to bend it around. The terminal connection described for the large coil will serve well also for this heater.

Often, in using immersion coils, it is desirable to have them so arranged

that it is possible to obtain more than one degree of heat. In such cases the winding of the heating element and the terminal connections become more complicated. The following suggestions may, however, be sufficient for anyone to construct such a coil. For example, if wire of half the cross section were used in either of the coils and two of these wires were placed in parallel, the same results would be obtained as with the larger wire. If only one of these circuits be connected, the heat generated would be immediately reduced to one-half its previous value, and if the two circuits were connected in series, the heat generated would be reduced to one-fourth of its maximum value. Such an arrangement of connections is shown diagrammatically in Fig. 7. The connector for making such connections can be constructed similar to that used for the heating pad described in a previous part. The stationary portion of this connector may be mounted in a metal cup, similar to that shown in Fig. 8, which may be fastened to the end of the copper or brass tube.

Homemade Calipers

A good pair of calipers can be easily and quickly made by anyone in the following manner: Procure a piece of spring wire, about 15 in. long, and bend it as shown in the sketch, allowing the ends to point inward or outward as the style demands. A loop of heavy wire is fastened around the center so that it

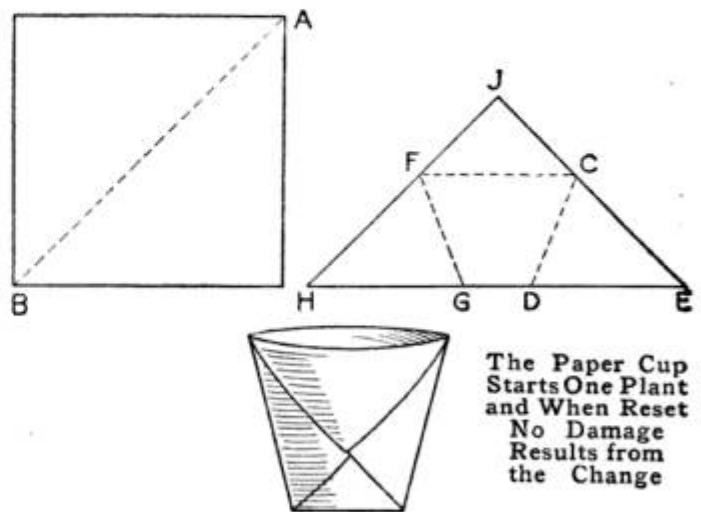


The Spring Wire is Bent So That the Points Turn In or Out as Desired

can be slid back and forth along the wire. This serves the purpose of an adjuster. — Contributed by Stanley Radcliffe, Laurel, Md.

Starting Garden Plants

In starting small plants to get them hardy and ready to plant in the early spring provide separate receptacles of paper, then the plant can be set out



The Paper Cup Starts One Plant and When Reset No Damage Results from the Change

without trouble and it will grow as if it had never been moved. Procure some heavy paper and make the cups as shown in the sketch.

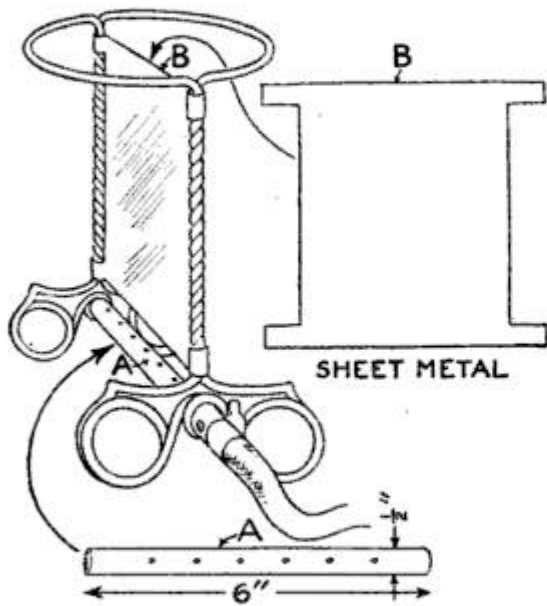
The paper is cut into squares, the size depending on the plant, and each square is folded on the dotted line AB. This forms a triangle of a double thickness. The next fold is made on the line CD, bringing the point E over to F. Then the paper is folded over on the line FG, bringing the point H over to C. This will leave a double-pointed end at J. The parts of this point are separated and folded down on the sides which form the cup as shown.

These cups are filled with earth and set into earth placed in a box. The seeds are planted within the cups. When it comes time for transplanting, the cup with the plant is lifted out and set in the garden without damage to the plant roots. The paper soon rots away and gives no trouble to the growing plant.

Gas Stove for the Dining Table

The stove is made of one piece of No. 6 gauge brass wire and a 6-in. length of $\frac{1}{2}$ -in. gas pipe, A. Drill six $\frac{1}{16}$ -in. holes in the side of the pipe, spacing them evenly. Turn a cap on one end of the pipe and fit a hose cock

on the other. Start with the ends of the wire and make one turn around the pipe, then make loops at both sides,



The Stove Takes the Place of an Electric Stove Where There is Only a Gas Supply

to serve as feet, and shoulders, on which to set the bread in making toast. From this point, where the wires come together, twist them for a length of 6 in. They are then spread and formed into a circle about 4 in. in diameter. The other side, or upright, is made in the same manner as making the first part.

A piece of sheet metal, B, is cut to fit the space between the wires, allowing projections at the upper and lower outside edges for bending around the upright twisted wires. The entire stove can be nickelplated if desired. It can be used in the same manner as an electric stove and for the same purposes where a home is supplied only with gas.—Contributed by E. L. Douthett, Kansas City, Mo.

Castings without Patterns

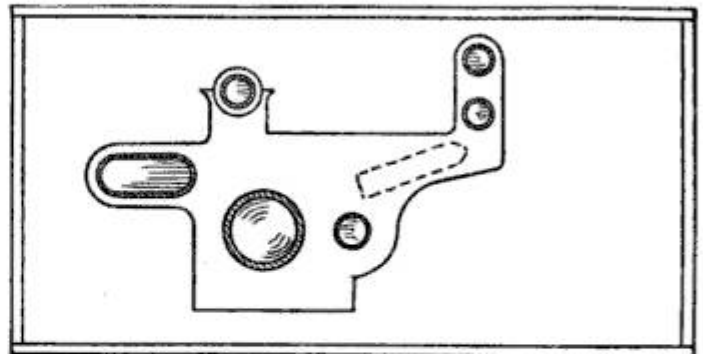
The sketch shows a method of making small castings that I have used for several years and the castings so produced are strong and very durable, almost equal to the ordinary casting. The idea may be of considerable value to inventors and home mechanics.

The mold is of plaster of Paris, held in a wood frame or box, and all that is

required in the way of a pattern is a plain block or anything that will produce an impression of the general outline of the casting, as shown in the sketch. After the impression is made, the mold should be dusted thoroughly with black lead. The journal bearings are then located, holes drilled in the hardened plaster and wood pins set, as shown. These pins must be of hard wood and of a diameter to suit the finished size of the bore. Brass tubing of a suitable size is cut off to the length required and placed on the wood pins. These pieces of tubing will be the brass bushings in the finished castings. Babbitt metal is melted and poured into the mold. Before pouring the metal it is well to be sure that the plaster is thoroughly dry.

The mold is as shown, and the upper side of the metal is at all times exposed to the air. This makes it necessary to have all core prints on the under side, as this side will be the one in view when the casting is finished, and the upper side, as the casting lies in the mold, will be the inside or unexposed side. In case of curved work, reinforcing strips of sheet brass should be placed in the mold and imbedded in the casting, as shown in the sketch by the dotted lines.

A little practice will enable anyone to produce very neat cored castings,



A Mold Made in Plaster without a Special Pattern and Run with a Soft Metal

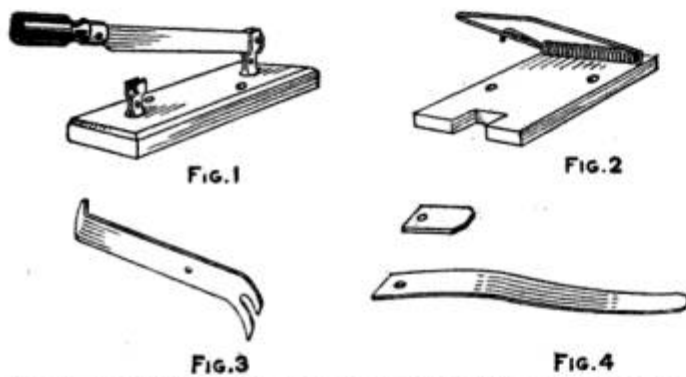
and when the brass bushings are fitted to size and faced off, and the casting painted, a piece will be produced that

will compare in finish and general usefulness with anything of the nature that could be bought. Do not treat the brass tubes with soldering flux unless necessary, for they should be removable so that they can be replaced when worn.—Contributed by J. B. Murphy, Plainfield, N. J.

A Developing-Paper Printer

Having a rush order for a large quantity of post cards, I was compelled to adopt some way of making the prints quickly. As I was in a place where a printer could not be secured for several weeks, I set about making one, with good results, as shown in the illustrations.

I first secured an ordinary soap box and took it apart, being careful to keep

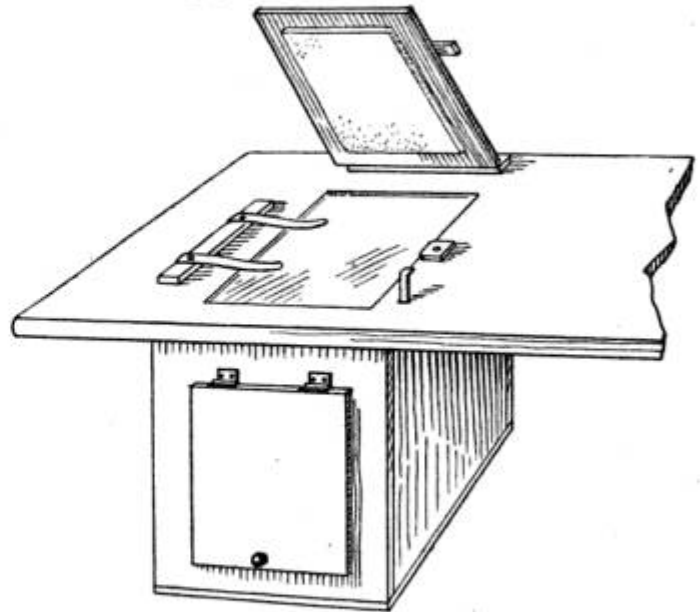


Parts for Making the Switch So That It will Operate Automatically as the Cover is Moved

the boards whole, then rebuilt it to make a box with ends measuring 12 in. square, and 14 in. in length. In one end I cut a large hole to admit a 60-watt tungsten globe, then, taking another board, I fitted a knob and hinges to it and used it for a door. The other end of the box was centered and a hole bored large enough to admit an ordinary socket. Another hole was bored, 4 in. to the right, for another socket. A much heavier material was used for the lid than for the box, being at least $\frac{7}{8}$ in. thick. A piece of double-strength, clear glass, 8 by 10 in. in size, was procured and set in a hole cut in the cover so that its upper surface would be flush.

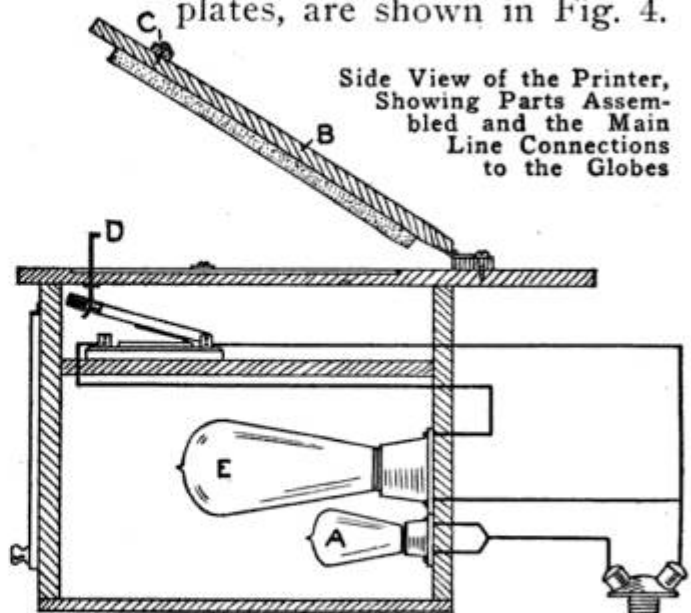
An ordinary single-pole switch was secured, as shown in Fig. 1, also a small mousetrap, as shown in Fig. 2. The front part of the trap was sawed

off so that only the spring was utilized. The base of the trap was then cut out to fit snugly on the base of the switch,



The Printer may be Set in the Table Top or Used Separately, as Desired

into which two corresponding holes were bored for the screws. The next thing was to secure several clips, which were cut from sheet brass, to operate the switch, and a lever to control the switch, as shown in Fig. 3. The lever is 1 in. wide and 4 in. long, having a slot at the bottom, to slip easily over the lever handle in the switch, and a hole, drilled 1 in. above the slot, to admit a nail to keep the spring from throwing it out of position. The clips for holding the films, or plates, are shown in Fig. 4.



Side View of the Printer, Showing Parts Assembled and the Main Line Connections to the Globes

After securing a double socket, of which there are many types, a few yards of lamp cord, a piece of felt, 6 by 8 in. in size, and two ordinary lamp

A Weeding Tool

A handy weeding tool may be made of an old case knife—one of the kind having a wood handle is the best. Remove the handle sides and heat the blade about 1 in. from the end, then bend it at right angles as shown at A. Ream out the rivet holes in the handle large enough to allow screws, about 1 in. in size, to enter. Procure an old broom handle and saw a slot in one

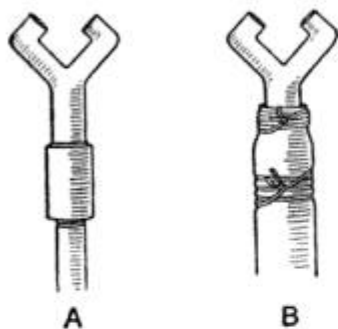


A Case-Knife Blade Bent and Fastened in a Broom Handle Makes an Excellent Weeding Tool

end deep enough to receive the knife shank, and fasten it with screws, as shown at B. This makes an excellent tool for removing weeds from beds of young radish, lettuce and other plants, as it is possible to get close to the plant stem without injuring it.—Contributed by L. G. Burnand, Lyons, Iowa.

Spray Nozzle Made of Acetylene Burner

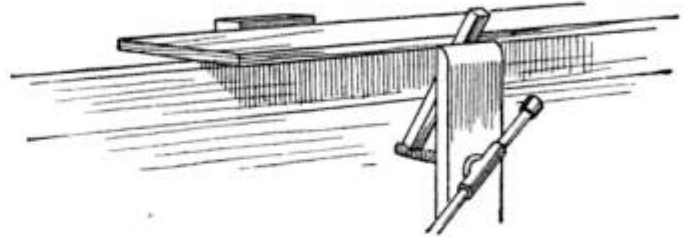
An acetylene burner makes a first-class spray nozzle, even though the lava tips are broken off level with the metal. The burner may be secured on a short piece of pipe, as at A, and this inserted in a hose, or it may be pushed into a hose and wound with wire, as shown at B.



Clamping a Wide Board on a Bench

Having occasion to cut a groove on the surface of a board too wide for the vise, I rigged up the arrangement shown to hold it. The board was laid on the bench with the edge slightly projecting, then I nailed a block firmly to the bench, close to the edge of the

board, and placed a stick in the vise as shown. When the vise screw was

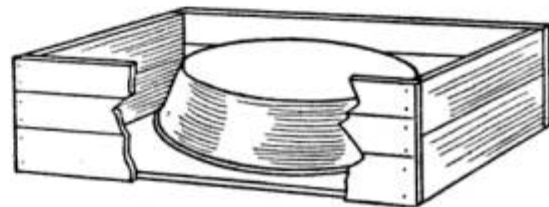


A Block on the Bench and a Stick in the Vise Served as Jaws of a Wide Opening

turned up, the board was gripped solidly.—Contributed by S. H. Bosuston, Victoria, B. C.

Feeding Pan for Poultry

An excellent water or feeding pan for small chicks can be made of concrete. Take an old pan and place it in an inverted position in a shallow

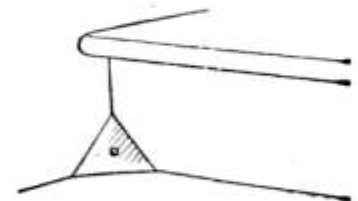


An Ordinary Pan Placed in a Shallow Box Makes the Form for a Concrete Vessel

box, as shown in the sketch, then mix the concrete and pour it over the pan. When the cement sets, turn it over and a pan will be had that small chicks can climb out of, should they get into it.

Metal Floor Corners

The hardest part of a room or stairway to clean is the corners, and these always collect a good quantity of dirt. Instead of removing the dirt each time, a better plan is to fix the corner as shown in the illustration. A triangular piece of brass or copper, 2 in. on each side, is fastened into the corner with one nail through the center. These metal pieces are especially desirable in public buildings.—Contributed by Abner B. Shaw, N. Dartmouth, Mass.



INTERESTING NEW PATENTS

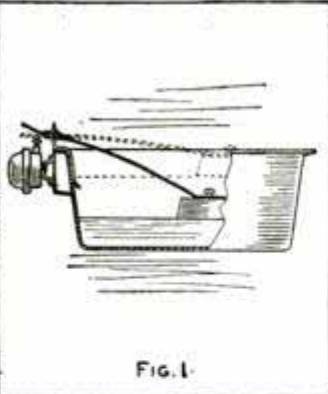


FIG. 1



FIG. 3



FIG. 5

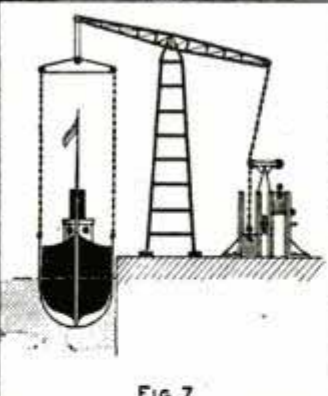


FIG. 7



FIG. 9

DRIP-PAN ALARM FOR ICE BOX (Fig. 1)—This device, which is easily attached to the side of any ordinary pan, has an alarm bell which is set ringing whenever the drip pan under the ice box or refrigerator needs emptying. It is provided with an arm, to one end of which a float is loosely attached. When the float is raised to the top of the pan by the water, the opposite end of the arm is pressed against a spring button and the depression of the button starts the bell ringing.

COMBINED MATCH HOLDER AND GAS-VALVE TURNER (Fig. 2)—This implement is designed for convenience in lighting gas jets that are placed too high to be within easy reach. The wire loop at the angle is shaped in such a way as to make a fork for turning the valve, while the outer end is twisted to form a socket for holding the lighted match.

BULLET THAT FLASHES WHEN IT STRIKES (Fig. 3)—The nose of the bullet has a cavity with an opening through the point. When the bullet strikes, this composition is fired by the impact and produces a momentary illumination. It is designed particularly for use in target shooting.

TELEPHONE APPARATUS FOR AIRMEN (Fig. 4)—On account of the noise of the engines, communication between pilot and passenger in an aeroplane is difficult without the use of a telephone. This apparatus keeps both the transmitter and receiver in position for use at all times. A shield that concentrates the sound is fitted over the mouth and nose of the wearer. This is provided with a breathing vent in which is a sound-muffling device.

A NOVEL GARDENING IMPLEMENT (Fig. 5; British patent to a Frenchman)—This device, which carries a small plow or other cultivating implement, is designed to be dragged over the ground, the operator walking backward as he uses it. A chain attached to the frame is provided with a snap hook by which it is fastened to the operator's belt.

VAPOR CABINET FOR BATHTUB (Fig. 6)—The main feature of this apparatus is a canopy that can be fitted closely over a bathtub and used in taking a vapor bath. The canopy is supported by a steel rack which is attached to the edges of the tub and which also carries a seat and foot rest for the convenience of the bather. The apparatus is made with the idea of being quickly and easily set up and taken down.

TIDE-POWER MACHINE (Fig. 7)—This apparatus is an attempt to utilize the rise and fall of the tides for obtaining and storing power. At one end of the walking beam is a float that rises and falls with the tide, while at the other end is a mechanism by which weights are lifted by the movement of the walking beam. The weight, which may be water, is stored in a receptacle at the high level and may be used intermittently as desired.

LICENSE-TAG CARRIER FOR AUTOMOBILE (Fig. 8)—By means of the ball-and-socket joint the plate on which the tag is carried may be swung to any position required and secured in that position with the setscrews, as shown. The tag is fastened to the plate by setscrews and is easily attached or removed.

EGG-CLEANING MACHINE (Fig. 9)—The machine is provided with a rotating shaft on the end of which is a cup-shaped cavity lined with heavy bristles, the shaft being inclined to the horizontal so that the end will be partly submerged in the water-filled basin. The eggs are cleaned by being held against the bristles while the machine is turned.

FRUIT PICKER (Fig. 10)—This device consists of a wire basket carried at the end of a pole, with a stripping hook so placed that as the fruit is stripped from the tree it will fall into the basket. The basket is pivoted at the ends and is free to swing in a level position. The hook is rigidly fixed to the end of the pole.



FIG 2



FIG. 4



FIG. 6



FIG. 8

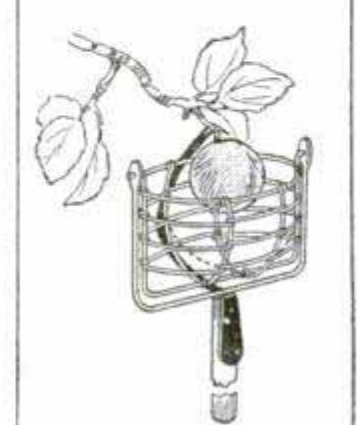


FIG. 10

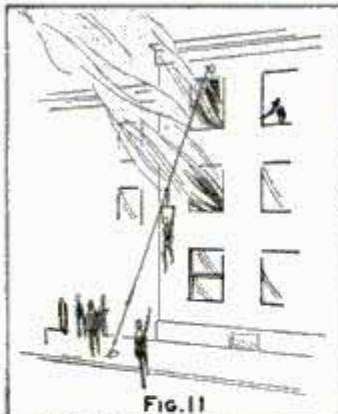


FIG. 11



FIG. 13



FIG. 15

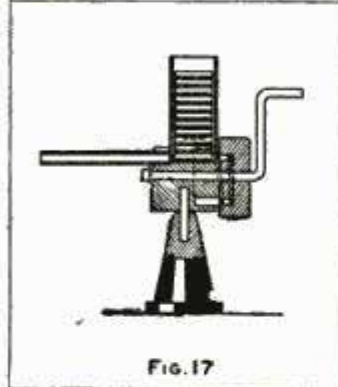


FIG. 17

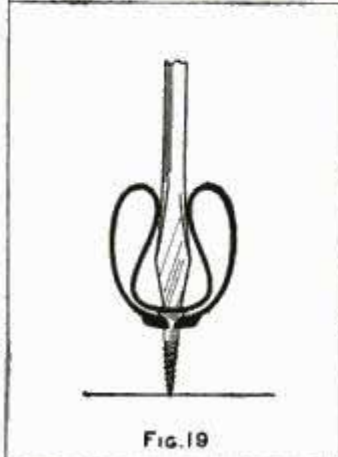


FIG. 19

A NOVEL FIRE ESCAPE (Fig. 11)—One end of the rope is attached to a point near the top of the building and the other is anchored to the ground at a point some distance from the wall, so that a person in escaping slides down and away from the building. In using, a special hand grip is snapped around the rope, and the descent is limited to a safe speed by friction. In grasping the grip, the hands are placed through wrist sheaves which hold the wrists firmly in case the escaping person is unable to hold to the grip.

CYLINDRICAL TRUNK (Fig. 12)—The interior of this novel trunk is divided by a partition running crosswise with reference to the curved side. On one side of the partition is a space closed by a door, while on the other side is a drawer. The door is locked from the outside and the drawer is locked by a bolt which can only be reached when the door is open.

EMERGENCY BRAKE FOR SHIP (Fig. 13)—A series of vertical plates are pivoted to the side of the forward part of the ship below the water line, so that when extended they engage the water and act as an emergency brake. When not in use they are held flat against the side of the ship, the forward part of each plate overlapping the pivot of the plate ahead. When released the plates swing outward under the impact of the water.

BED CANOPY (Fig. 14)—This novel apparatus is apparently designed for holding the bed clothes away from contact with the occupant of the bed. It consists of a frame made up of wire loops and is easily attached to the side of the bed. The end of the frame is made to telescope.

A GUN THAT CAN BE PROJECTED THROUGH BREASTWORK (Fig. 15)—The purpose of this device is evidently to enable a soldier to stick his rifle through an embankment and fire at the enemy without exposing his own head. A sighting tube is attached along the top of the gun barrel, and the front and rear sights project through openings into this tube. In using, the muzzle of the gun and the front of the tube are closed with plugs that are rigidly connected together, and the barrel is thrust through the embankment. The plugs are then forced out by a rod pushed through the sighting tube.

COMBINED CHAIR AND STEPLADDER (Fig. 16)—The back of the chair consists of two sections connected by hinges and held in place by pins that fit into openings in the edge of the chair seat. When it is to be converted into a stepladder the back is lifted out and turned with the hinge upward, and pins carried on the end slats are inserted in the openings in the chair seat, the slats then becoming the rungs of the ladder. The end slats are capable of being rotated so that the pins fit securely into the openings.

TOY MAGAZINE GUN (Fig. 17)—In this toy the projectiles are fed into the barrel from the magazine automatically and are thrown from the gun by the action of a helical spring. The gun is operated by a continuous turning of the crank, which alternately winds up and releases the spring.

SELF-SKIMMING MILK PAN (Fig. 18)—The inlet to the spout is at the bottom of the pan, and the milk may be drawn off, leaving the cream in the pan. The outer end of the spout is provided with a screw cap for closing.

SCREW HOLDER (Fig. 19)—This device is made of a single piece of flat metal, is shaped to grip the sides of the screwdriver, and is provided with a slotted opening through which the driving edge projects. The screw is held by two jaws as shown, which are easily sprung apart after the screw is driven.

SELF-HEATING DINNER PAIL (Fig. 20)—A lamp fixed in the base has its burner projecting into a cross flue placed immediately below the main portion of the pail. The gases escape through openings into vertical flues on the outside of the pail.

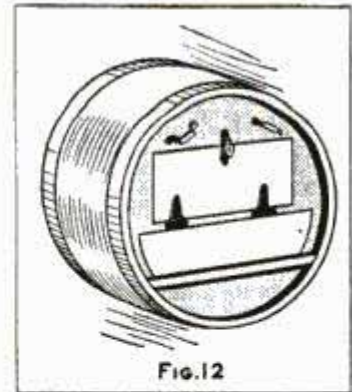


FIG. 12

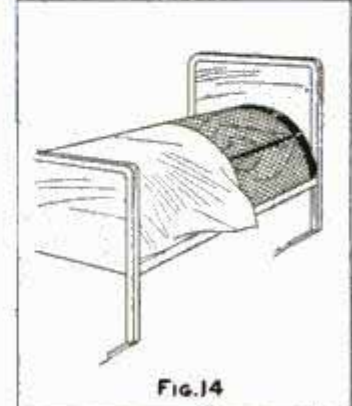


FIG. 14



FIG. 16



FIG. 18

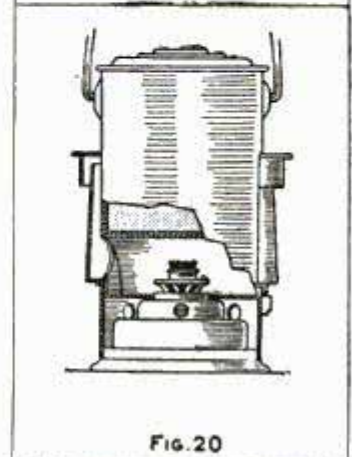
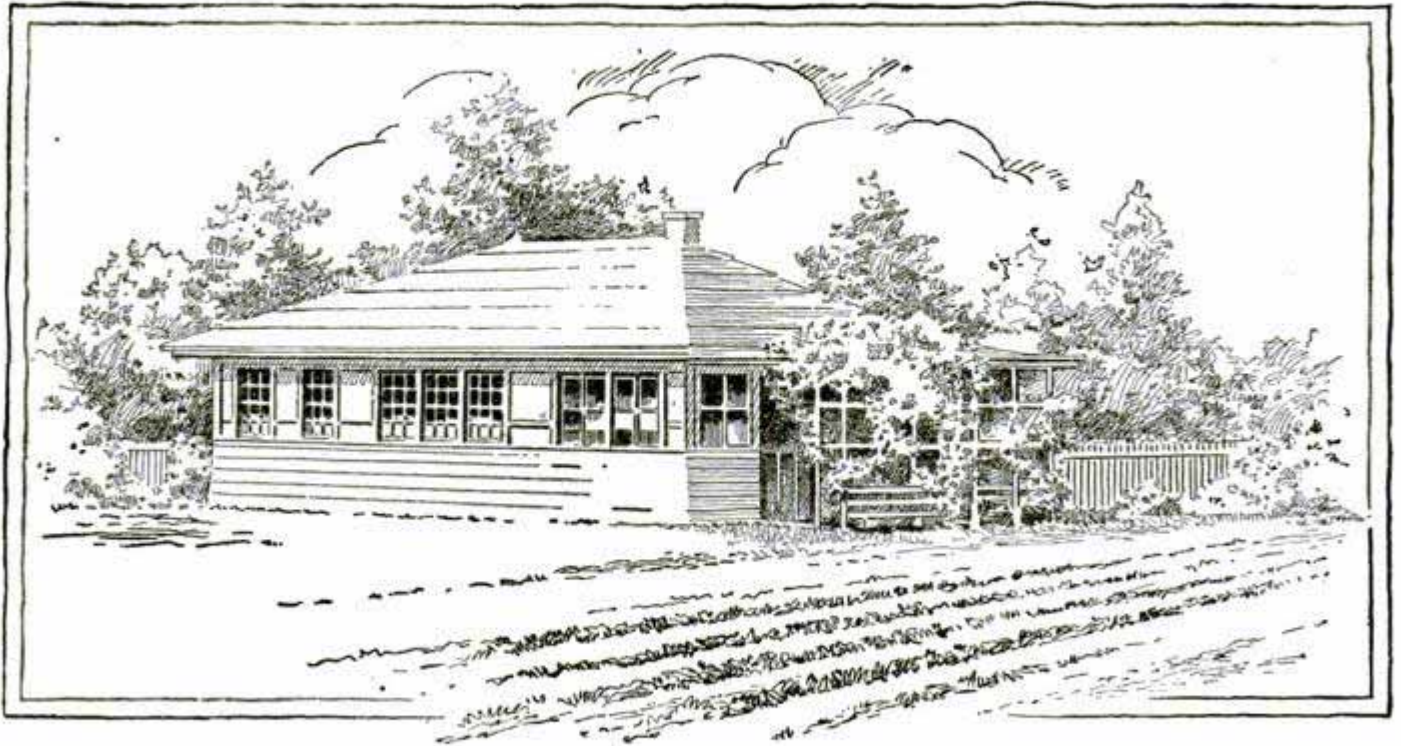


FIG. 20

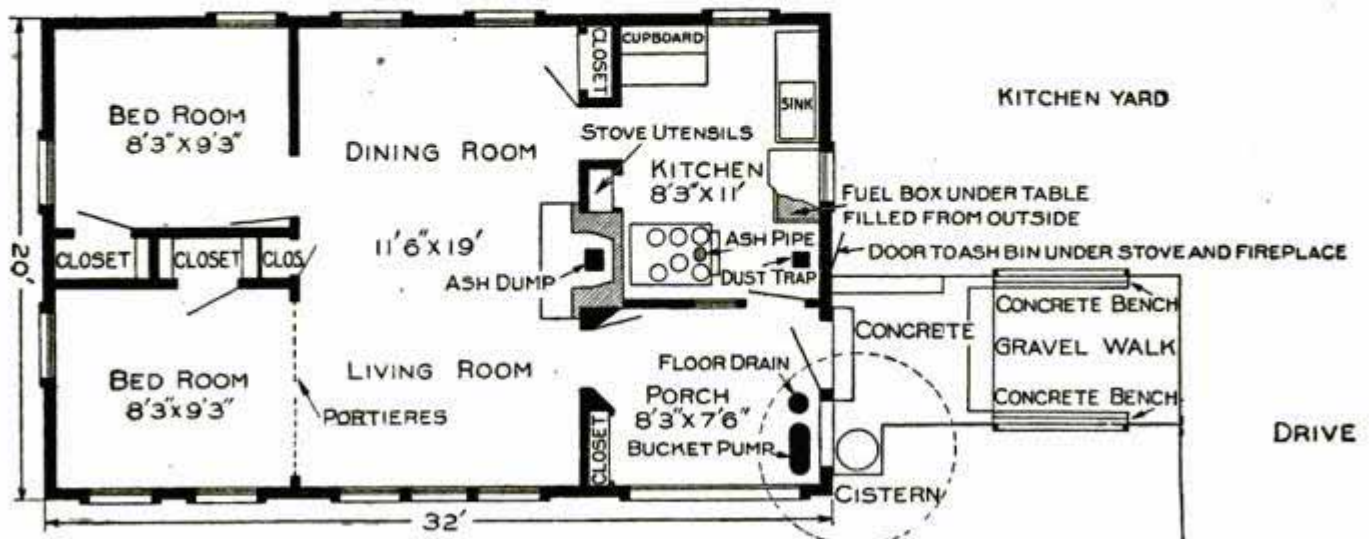
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The house is of frame construction and is a simple, four-cornered structure without any projections except the cornice, which overhangs and protects the walls and window openings. In order to save space, only one outside door is provided, this being the entrance to the screened front porch. The kitchen and the living room are adjacent to the porch so that this entrance serves both as front and back door. The two bedrooms are at the rear of the house. The front of the house overlooks the driveway and the farm buildings beyond, while a simple and inexpensive pergola separates the front yard from the back yard. A number of labor-saving conveniences are included in the design. Through a short pipe close to the stove, ashes are dropped into an ash bin, placed under the concrete floor and large enough to hold a year's accumulation of ashes. The kitchen-table top is supported on a fuel box which is filled from the outside and provides space for fuel to last several days, while sweepings may be dropped directly into the ash bin through a trapdoor placed in the floor.



Floor Plan and Arrangement of Grounds



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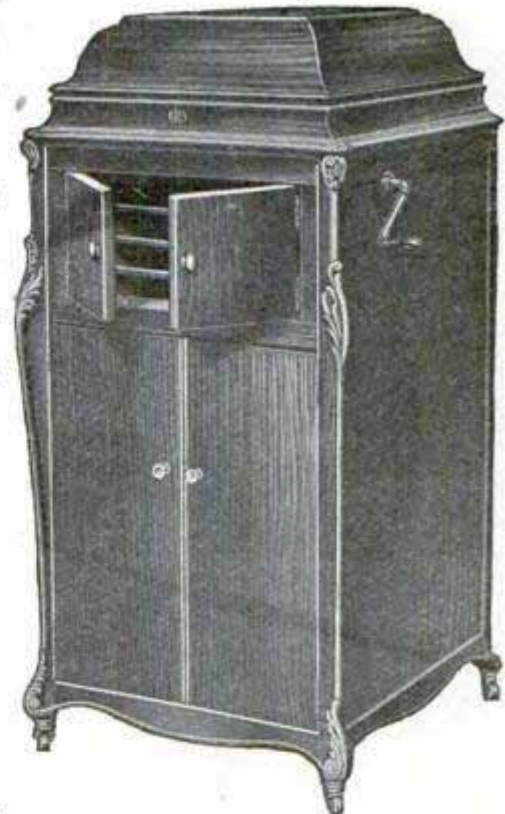
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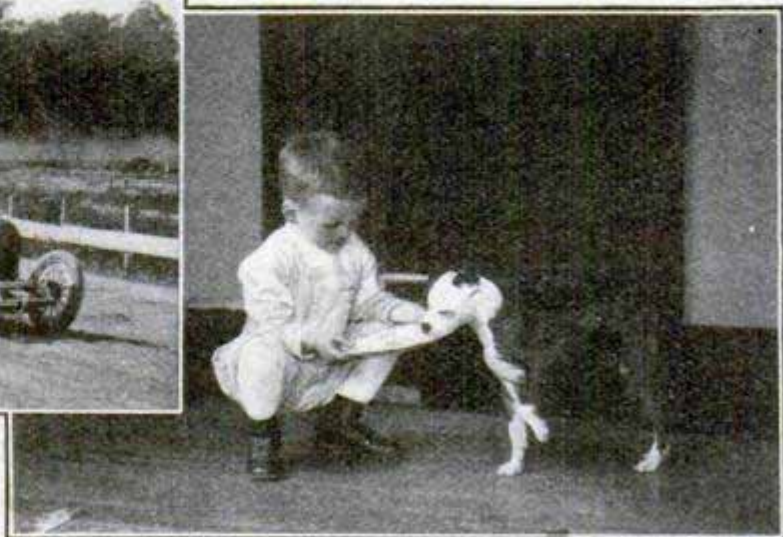


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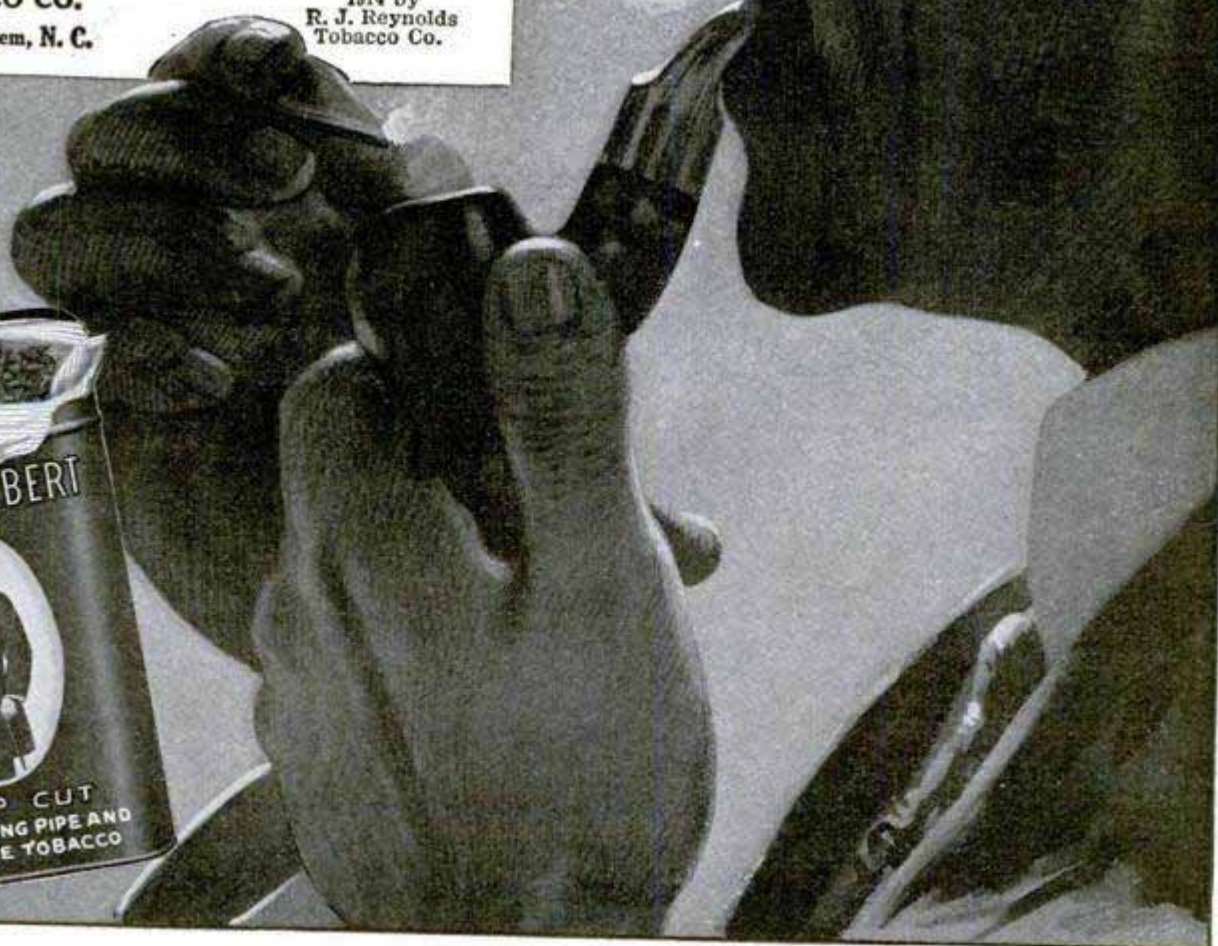
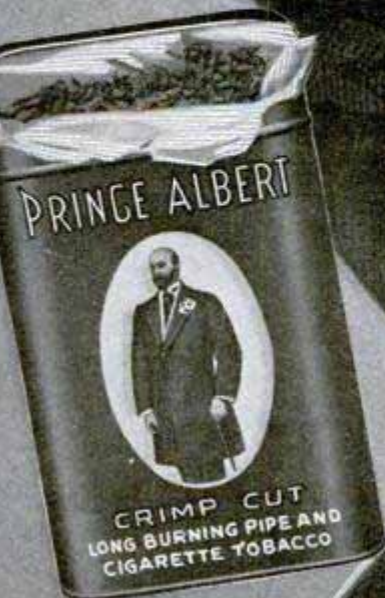
Say, you chum up to a jimmy pipe. And some P. A. that you'll call by its first name before you're an hour older. And you'll find yourself on the road to contentment. It's bully fine to be jimmy pipe joy'us!

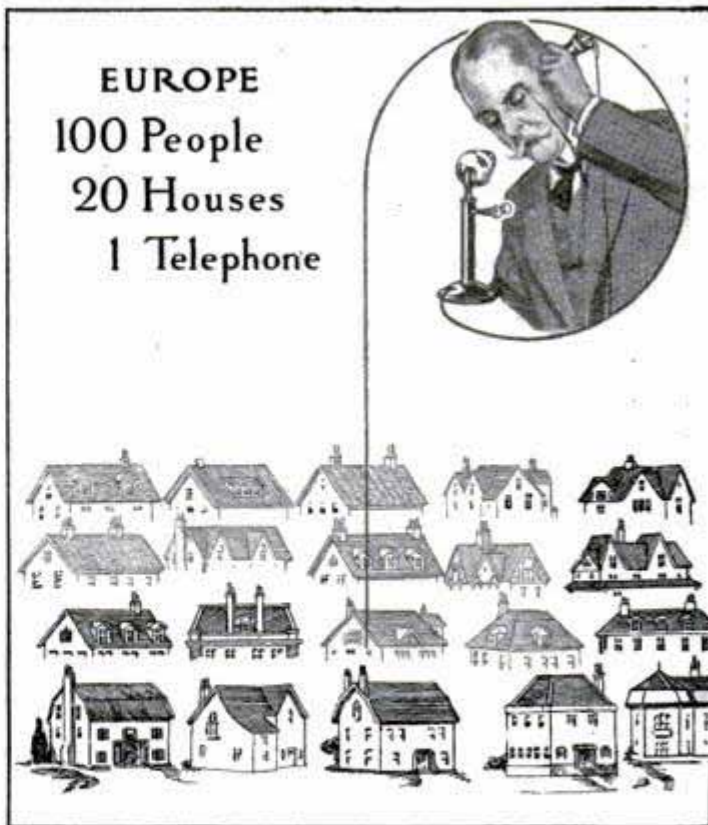
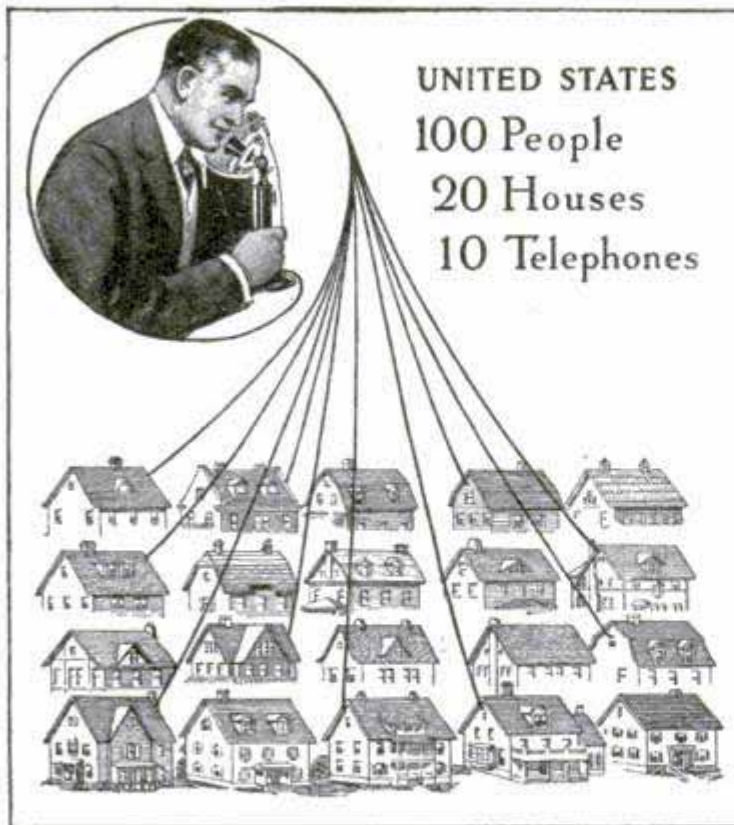
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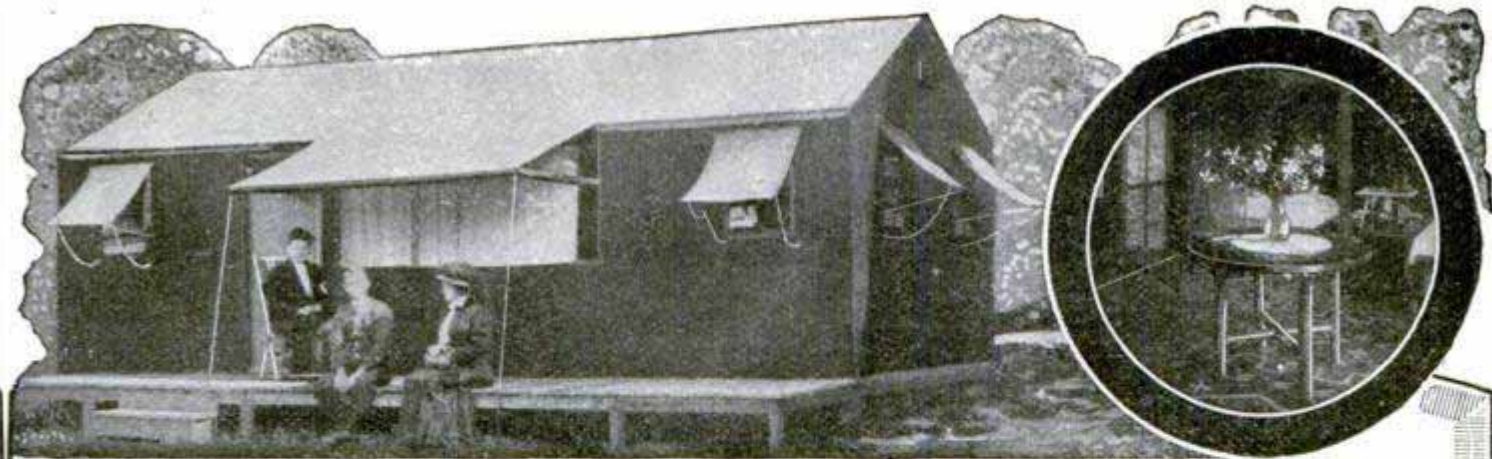
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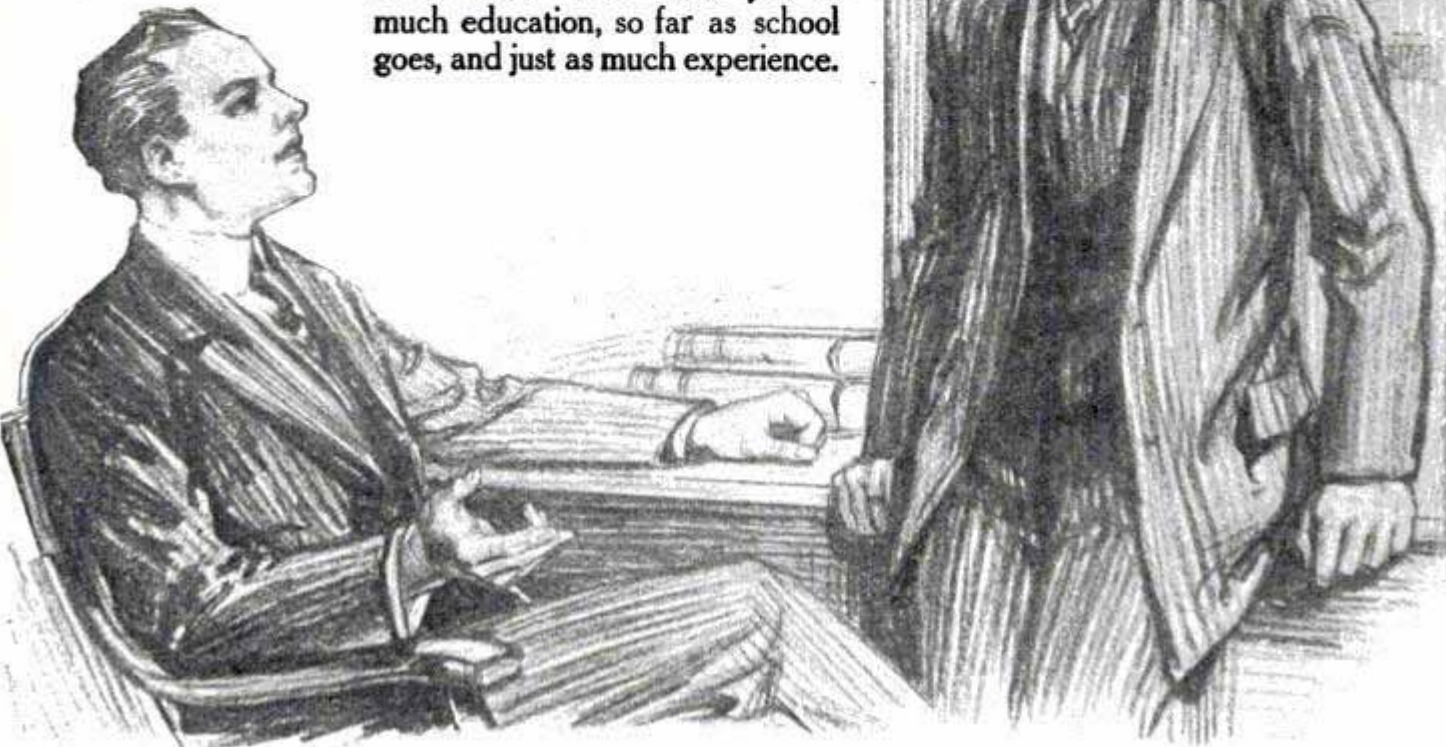
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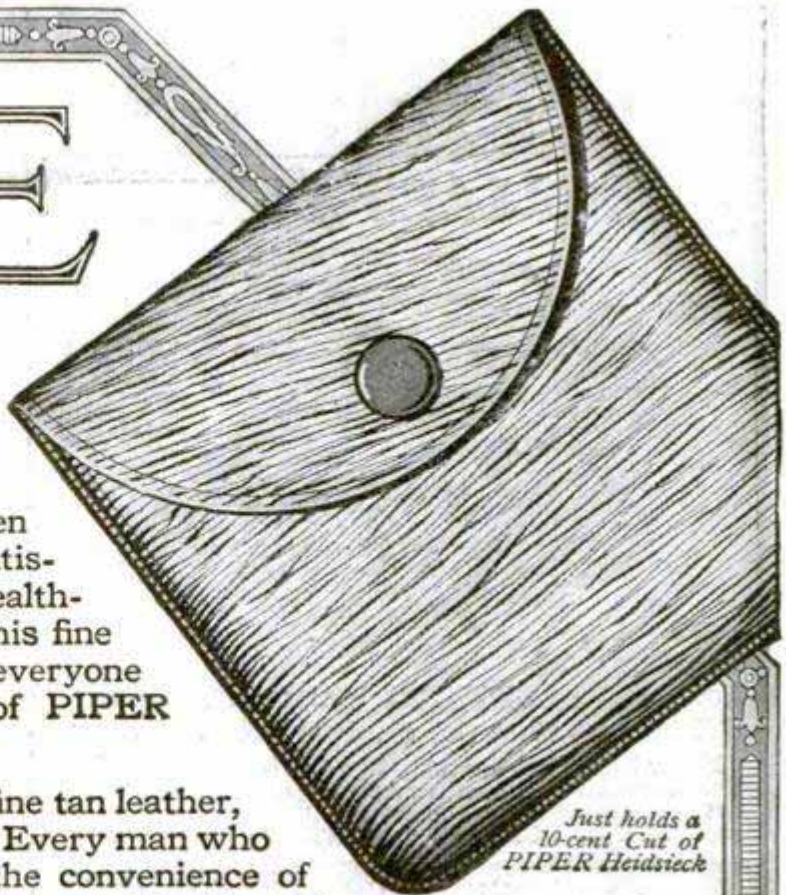


FREE

A Genuine Leather Tobacco Pouch

In order to acquaint more men with the supreme enjoyment and satisfaction afforded by the wholesome, healthful "PIPER" habit, we will give this fine leather Tobacco Pouch, *Free*, to everyone sending 10 cents for a 10c cut of PIPER Heidsieck Chewing Tobacco.

The pouch is strongly made of fine tan leather, with a flap and patent snap clasp. Every man who loves a good chew will appreciate the convenience of this handsome, handy leather pouch to carry his tobacco in.



*Just holds a
10-cent Cut of
PIPER Heidsieck*

PIPER Heidsieck

CHEWING TOBACCO—Champagne Flavor

PIPER Heidsieck is the *highest type* of chewing tobacco in the world. Every leaf of ripe, golden brown tobacco used in "PIPER" is carefully selected from Nature's choicest crops, clean, sweet and mellow.

*Sold everywhere,
in 5-cent foil-
wrapped Pocket
Plugs and
larger cuts.*

The wonderful flavor of "PIPER" is different from that of all other tobaccos made—a rich, wine-like, delightful taste which never fails to make a friend. "PIPER" is famous the world over for this delicious "Champagne Flavor."

FREE

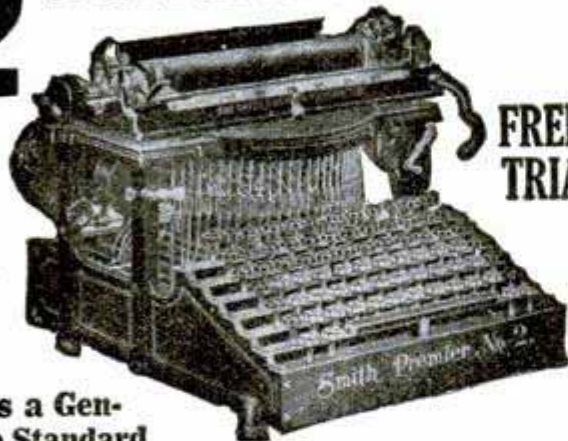
Send 10 cents and we will send a full-sized 10-cent cut of "PIPER" and a handsome leather pouch **FREE**, anywhere in the U. S. Also a little folder telling about PIPER Heidsieck. The tobacco, the pouch and mailing expenses cost us 20 cents, and we are glad to spend the money to get you to try "PIPER." We know that once you have started, you will become a permanent friend of this wonderfully wholesome, healthful and satisfying tobacco. In writing please give name of your tobacco dealer.

THE AMERICAN TOBACCO COMPANY
Room 1168, 111 Fifth Avenue New York City



TYPEWRITER SENSATION!

2 DOLLARS A MONTH



FREE TRIAL

Buy a Genuine Standard No. 2 SMITH-PREMIER Typewriter and at \$71.20 less than the original price.

Never before has anything like this been attempted. Dealers get \$3.00 a month rent for this make of machine, not nearly as perfect as the one we will send you, and you pay only **TWO DOLLARS A MONTH AND OWN IT.**

A Guaranteed Typewriter \$28.80

Perfect machines only, complete outfit, nothing extra to buy, no strings of any kind to this offer. Just think of buying such a typewriter for \$8.80 down and \$2.00 a month. Cash price \$27.40. Thousands of people have paid \$100.00 cash for Smith-Premiers. It's standard, by many considered the best typewriter ever built. A key for each character, so each character is always the same, a type brush for cleaning the type built into the machine; the tilting carriage throws all previous writing in plain sight of the operator. Comes to you with two color ribbon, complete operating instructions, tools, waterproof cover, practice paper, everything, ready. It runs beautifully. Writes as perfect and clean cut a letter as quickly and easily as any machine bought for \$100.00. It's wonderfully simple, a child can operate it with half an hour's practice and rapidly attain speed. It's strongly built and will give you years and years of honest service and complete satisfaction.

Send the Coupon and We Will Ship You this Smith-Premier Typewriter

When the typewriter arrives, deposit with the express agent \$8.80 and take the typewriter three days and try it. If you find it to be the best typewriter you ever saw, satisfactory in every respect, keep it and send us \$2.00 each month, until our special price of \$28.80 is paid. If you don't want to keep it, return it to the express agent, and he will give you back your \$8.80, and return the typewriter to us. We will pay the return express charges.

You won't want to send this machine back after you have seen it and tried it. You can't imagine the perfection of these machines till you see one, and the price is \$71.20 less than the catalogue price, and it is guaranteed just as if you paid \$100.

Only 200 orders will be filled on this offer. Act today to be sure

This coupon states the terms. Fill it out, send it now, today. You can't lose, and it's the greatest economical typewriter opportunity you will ever have.

COUPON
HARRY A. SMITH, Robbins Bldg., CHICAGO

Ship me a No. 2 Smith-Premier, f.o.b. Chicago, as described in this advertisement. I will pay you the \$20.00 balance of the special \$28.80 purchase price, at the rate of \$2.00 per month. The title to remain in you until fully paid for. It is understood that I have three 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.

Name

Address

Pop. Mech. June

Please Mention Popular Mechanics

Defeats Rust and Tarnish

A few drops of 3-in-One on a flannel cloth works wonders on escutcheons, door knobs and locks, electric push buttons, andirons and black iron ornaments of every kind. Use

3-IN-ONE OIL

on nicked and brass faucets. Also on guns, revolvers, musical instruments, everything metal. 3-in-One is the foe of tarnish—the absolute preventive of rust everywhere. Keeps all metal surfaces bright, indoors or out.

Sold in hardware, drug, grocery, housefurnishing and general stores: 1 oz., 10c; 3 oz., 25c; 8 oz. (1/2 pt.), 50c. Also in Handy Oil Cans, 3 1/2 oz., 25c. If your dealer does not have these cans, we will send one by parcel post, full of 3-in-One, for 30c. A Library Slip with every bottle.

FREE: Write for free sample and 3-in-One Dictionary.

THREE-IN-ONE OIL CO.

42C.N.W. Broadway, New York

The new open system of handling sheep is simpler, quieter herding during the day, and bedding the sheep where night overtakes them. Contrast this with the old

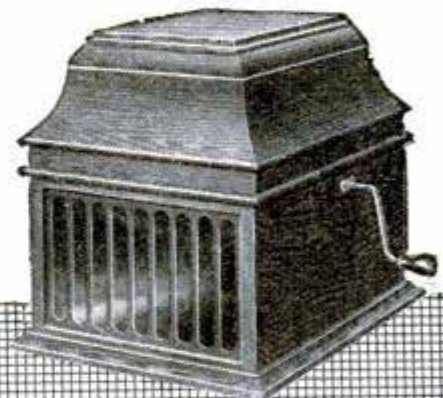
Guaranteed Used Pianos

A large number of fine instruments at exceptional bargain prices, many like new, exchanged for Kimball Player Pianos, thoroughly overhauled and guaranteed to be in splendid condition in every way.

Examples:	Schaefer Upright	\$140	Hallet & Davis	\$190	
Briggs Upright	90	Hinz Upright	145	Kimball Upright	220
Colby Upright	110	Fisher Upright	165	Steinway Upright	275
Emerson Upright	110	Whitney Upright	185	Kimball Upright	275
Decker Bros. Upr't	135	Chickering Upright	175	Knabe Upright	175

We ship anywhere to reliable people on easy payment terms. Write Today For Complete List, Prices, and Terms and Beautiful Illustrated Musical Herald FREE, and catalogue New Kimball Pianos.

W. W. KIMBALL COMPANY, 129A Kimball Hall, Chicago, Ill.



NEW Edison Phonograph and Records Now Shipped FREE

Try it in your own home. Entertain your family and your friends. Send it back at our expense if you don't want to keep it. Terms as low as \$2.00 a MONTH for a genuine Edison Phonograph at ROCK-BOTTOM prices and without even interest on monthly payments. Send today for new Edison book—it's free.

Our Edison Catalog Free Send a postal or a letter once, for our new Edison catalog and particulars of this liberal trial offer. No obligation whatever. Do not delay an instant. **WRITE TODAY SURE.**

F. K. Babson, Edison Phonograph Distr., 119X Edison Block, Chicago, Ill.



THE PLEASANT BITS OF LIFE

A bit of fine weather . . . a bit of a stroll in the Champs Elysees . . . a bit of love-making, of leisure, of lightheartedness. Above all, a bit of a cigarette, hand-rolled, in the paper Riz La Croix.

These are but bits of life and laughter . . . but, *ma foi*, what a pleasant life it is! Life in a spangle of sunshine . . . *quelle vie, mes enfants!*

RIZ LA CROIX.

(Pronounced: REE-LAH-KROY)

FAMOUS CIGARETTE PAPERS

are to be seen everywhere in the sunshine moments of happy days. They are the light little, tight little wrappers in which the epicure of life rolls his golden grains of joy, through which he puffs his aromatic cloudlets of content.

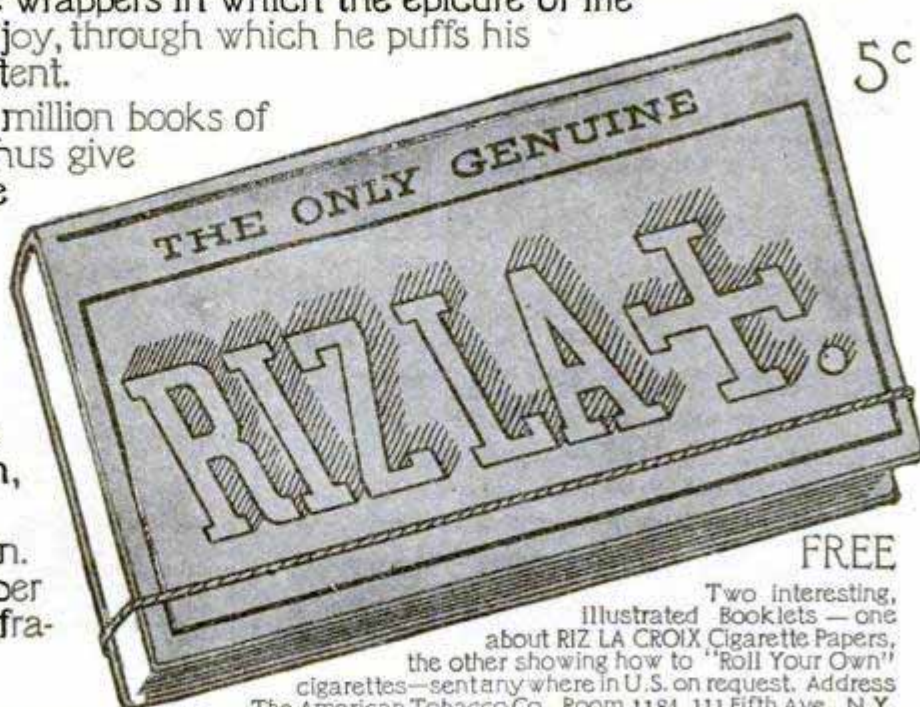
One hundred and fifty million books of such papers every year thus give up their earthly existence to aid men's dreams of paradise.

Riz La Croix bring pleasure, because:

They are strong.

They are adhesive. Made from flax-born linen, the edges adhere.

They are light and thin. When they burn, no paper odor mingles with the fragrance of your tobacco.



FREE
Two interesting, illustrated Booklets — one about RIZ LA CROIX Cigarette Papers, the other showing how to "Roll Your Own" cigarettes — sent anywhere in U.S. on request. Address The American Tobacco Co., Room 1184, 111 Fifth Ave., N.Y.



BRUNSWICK
Convertible
Dining and Billiard Table

Billiards *and* Furniture Both in One Fits Any Cosy Home

Why not have BILLIARDS when you buy your next Dining Table, Library Table or Davenport? Here is an inexhaustible supply of fun, recreation and home entertainment for the whole family and your guests. These ingenious BRUNSWICK *Convertible* Billiard and Pocket-Billiard Tables can be quickly turned into any of the Furniture named. Yet they cost you scarcely more than just plain Furniture of corresponding high-grade construction, and require no extra room. They have fast, accurate Monarch Cushions, genuine Vermont Slate Bed—all the scientific playing qualities of their larger brothers. Concealed cue rack and accessory drawer hold entire playing outfit. As Furniture they are beautiful specimens of de luxe cabinet work.

Soon Paid at 20c a Day

Brunswick Tables give you *real* Billiards and Pocket-Billiards—not a childish make-shift. They are priced from \$75 upward. Made also in larger sizes than described. The BABY GRAND at \$90 is built of stunning San Domingo Mahogany with inlaid design—now being adopted in hundreds of homes, church houses, clubs, Y. M. C. A.'s, etc., every month. Thousands have been bought on our special yearly terms as low as 20c a day. Make your whole family pay as they play and the Table is soon paid for.

Playing Outfit FREE

Balls, Cues, Markers, Rack, Chalk, Billiard Cloth, Brush, Bridge, Book on "How to Play," etc., now included with each table and no extra cost to you. Let us send you full particulars by return mail.

CUT OUT AND MAIL FOR FREE BOOK

or write us if you prefer (273)

The Brunswick-Balke-Collender Co.

Dept. ZR, 623-633 S. Wabash Ave., Chicago

Please send me free color-illustrated book—

"Billiards—The Home Magnet"

picturing and describing all Brunswick Home Tables, together with factory prices, terms and easy-purchase plan.

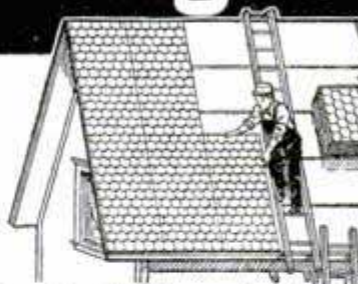
Name

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STEEL Shingles

Cheapest To Use

Get Edwards Direct-
from - Factory Offer!



At even less cost than the best wood-shingle you can now own a genuine Edwards Steel Shingle Roof that'll *outlast the house*.

Easier to put on than wood, too. Wood shingle go on one at a time. Edwards Steel Shingles are laid in big clusters—100 at a time. No extras. No special tools, no skilled workmen. No painting needed. Yet they never wear out.

Rot, Fire and Rust Proof

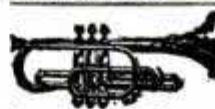
Don't confuse Edwards with ordinary galvanized roofing that cracks and rusts. Each sheet of Edwards separately dipped in molten zinc by "Tightcote" Process. Rust never gets a foothold. Can't burn, rot or blister. \$10,000 guarantee against lightning. Outlast **FOUR** ordinary roofs.

1,000,000 Sq. Ft. Priced for Quick Selling

Get Prices! This is best time to lay your roof. We are making an unusually low figure right now. Send for Book No. 650 and prices. Please give size of roof if possible.

The Edwards Manufacturing Company
600-650 Lock Street [153] CINCINNATI, OH

plan of herding sheep closely, by the use of dogs, and returning them each night to a fixed bed ground. The old plan, of course, rendered certain areas absolute



10 Cents a Day

Pays for this Cornet An astounding offer! Only 10c a day buys this superb Triple Silver Plated Lyric Cornet. **FREE TRIAL** before you decide to buy. Write for our big offer.

WURLITZER
82 years of instrument making

Free Band Catalog Write for our brand new 250 page Band Catalog

Carrying Case Free with this superb triple silver-plated Lyric Cornet.

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. Gov't. Write now to **THE WURLITZER CO., Dept. 119X, 4th St., Cincinnati, Ohio** S. Wabash Ave., Chicago

Delivered TO YOU FREE on Approval and 30 Days Trial



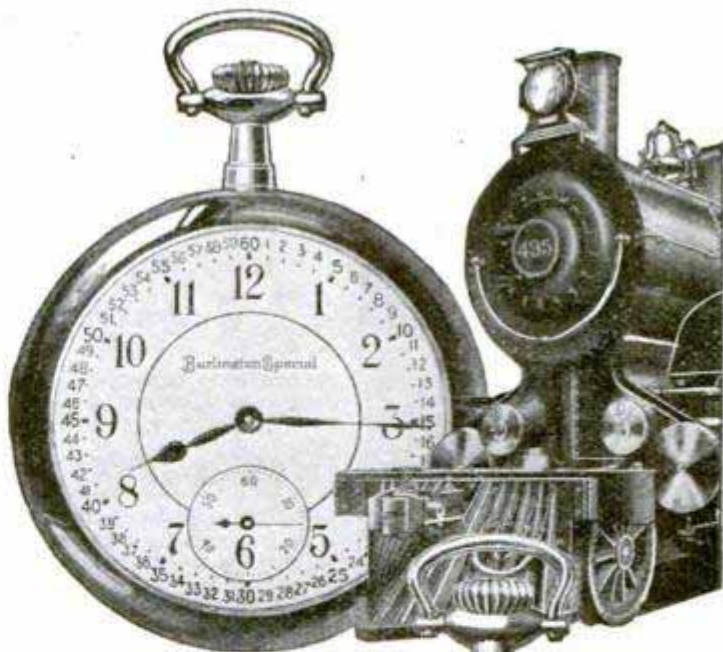
SEND NO MONEY but write today for our big 1914 catalog of "Ranger" Bicycles, Tires and Sundries at prices so low they will astonish you. Also particulars of our great new offer to deliver you a Ranger Bicycle on one month free trial without a cent expense to you. It's absolutely guaranteed you can make money taking orders for bicycles, tires, lamps, sundries, etc. from our big handsome catalog. It's free contains "combination offers" for re-fitting your old bicycle like at very low cost. Also much useful bicycle information. Send for **LOW FACTORY PRICES** direct to you. No one else can offer values and such terms. You cannot afford to buy a bicycle, tires or sundries without first learning what we offer you. Write now.

Mead Cycle Co., Dept. W108, Chicago,

New

Ideas in Watches

The masterpiece of watch manufacture—the **Burlington**—19 jewels, adjusted to the second—adjusted to positions—adjusted to temperature—adjusted to isochronism. Your choice of the newest cases: **Inlay Enamel Monograms, Block and Ribbon Monograms, Diamond Set, Lodge, French Art, Dragon Designs.** Open face or hunting case, ladies' or gentlemen's 12 and 16 sizes. See coupon.



Special Offer!

The Superb Burlington Watch 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. Read the coupon below.

New Book on Watches! Send the Coupon

Learn the inside facts about watch prices and the many superior points of the Burlington. Write for book while this offer lasts.

Burlington Watch Co.
Dept. 119X
19th Street and Marshall Blvd.
Chicago, Illinois



WATCH
Book Coupon
Burlington Watch Co.
Dept. 119X

19th St. & Marshall Blvd. Chicago

Please send (without obligations and prepaid), your free book on watches, with full explanation of your cash or \$2.50 a month offer on the Burlington Watch.

Name.....

Address.....



Would You Accept This 30-Day Offer?

Standard of the World. Endorsed by Government and Railway Officials. Harris-Goar's enlarged Easy Credit Plan now enables you to own one of these superb Elgin Watches without missing the money. Write for Free Catalog.

17-Jewel Elgin

Now, during this Special Sale, is the time to buy this elegant 17-JEWEL Elgin. Thoroughly factory tested, fitted in a beautiful Gold Strata Case, Factory stamped and

No Money Down

Guaranteed 25 years, hand engraved, plain polished or with your own monogram, and our startling offer is to send you this celebrated 1914 Model free of charge for your approval.

Because we want to prove to you that the great volume of our business actually enables us to do better by you than any other Watch or Diamond House in the World, and that on this particular watch, we save you nearly half for it sells regularly at \$20 to \$22, while our

Special Price is ONLY \$12⁷⁵-

25-Year Gold Case

17 Ruby Jewels



3 Fine BOOKS FREE

MR. HARRIS wants to send you his three latest Books FREE—one the story of "The Diamond," its discovery, where and how mined, cut and marketed, the other, "Facts vs. Bunc," or all about the Watch Business, both at home and abroad, also our Big Free Watch and Diamond Book.

We don't want you to send us one cent—not a penny. Merely give us your full name and address that we may send you this superb 17-Jewel Elgin on approval, and if after you receive it and want to keep it, then pay us the sum of

Only \$2.00 a Month

But if after you have worn it 30 days FREE and don't want to keep it, send it back at our expense. You assume no risk whatever. You do not buy or pay a cent until we have placed the watch right in your own hands for your decision. We want no security, no interest, no red tape—just common honesty among men. Write for our BIG FREE WATCH AND DIAMOND BOOK today. Do it now!

HARRIS-GOAR CO., Dept. 1287, KANSAS CITY, MO.

The House That Sells More Elgin Watches Than Any Other Firm in the World.

A BOOK THAT EVERY SHOOTER SHOULD OWN

50c "A New Chapter in an Old Story"—an intensely dramatic recital of man's development of his means of defense and offense from the stone age to the present day. A temptingly readable volume. Price 50c prepaid. Address Remington Arms-Union Metallic Cartridge Co., 299 Broadway, NEW YORK 50c

bare, and the going from and returning to the be grounds trampled a great deal of forage. It is est

Shirley President Suspenders

Light, cool, easy shoulder-comfort

50¢

"Satisfaction or money back"
Be sure "SHIRLEY PRESIDENT" is on buckles
The C. A. Edgarton Mfg. Co., Shirley, Mass.



01 RAINPROOFED Silk — COOL and LIGHT

This is to be a Silk-Hat Summer. THE MALLARD is the master-offering. Designed by us on the new oval telescope block; made up in richest silks. Stand the weather: stays on the head in a wind. Silk-lined; leather sweat band 4 in. crown, 2 3/8 in. brim. Ventilating eyelets. Colors: Black and White Check; Dark Gray Striped; Light Gray Striped; Dark Brown Striped. Price: \$2 Prepaid. Money back if you don't like it. Order Now—just state size and color and enclose \$2. Write for "1914 Spring and Summer Style Book"—FREE

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WE TEACH YOU FREE

Our extensive national advertising yields thousands of inquiries from farmers, orchardists, etc., who need blasters to clear land, blast ditches, holes for tree planting, tight subsoils, etc. More than twenty million pounds of agricultural dynamite used in 1913. We refer all inquirers to nearest blaster, supply free advertising matter and help you get the business. We want to start in this independent business, reliable men who have \$200 capital for tools, magazine, and running expenses. Write for free booklet No. 248-B.



Agricultural Division, Du Pont Powder Company, Wilmington, Del.

MY NEW PLAN OF SELLING

Any honest man, no matter where he lives in the U. S., can have a WITTE engine suitable to his needs, on any easy, reasonable terms.

Sizes are 2, 4, 6, 8, 12, 16, and 22 H-P. Styles — Stationary, Skidded, Portable, and Special Sawrigs. I ship on

60 Days Free Trial
AND GIVE A
5-Year Guaranty

with every engine. I have manufacturing advantages (among them, Natural Gas from my own well, that gives me free power, heat, and light), that make my cost of production less than in any plant I know of.

I share my advantages with every customer, in lower prices for strictly highest-standard engines.

I can and do give a more definite and binding guaranty than any I have seen from any other manufacturer.

No man can say he can't afford an engine, until he has read my new book and considered my selling plan.

Ed. H. Witte

I take special pride in the fact that much over half of my orders come from and through my old user-customers. (I have no agents). I have had no trouble to keep in the lead in engine-quality. I had only to be honest, to hold the respect and good-will of my customers. But I needed an extra-well equipped factory, to lead in low prices. Now, after many years' struggling, I am able to make engine prices **lower** than anyone has ever done, for dependable engines. I have "revised prices downward," while WITTE quality still leads.

Get My Complete New Offer— All Sent FREE with My New Book!

I don't consider any sale closed until the engine has made good—sold itself under actual test in the user's hands. Under my New Plan, you are sure of knowing what any engine ought to do, besides knowing what my engine can do, before you finally decide to buy. You know, when you get a "WITTE," that its 5-year guarantee will be good in the fifth year, as well as in the first year, and that the engine will give life-time service.

MOST UNDERSTANDABLE ENGINE BOOK FREE.

Let me show you by my Great New Book, how to judge an engine; how to pick out the engine that is best for your work; in short to lay bare to you the secrets of the engine business, by which double prices are charged and collected for lowest grade engines. If you don't say it is worth dollars, I'll pay postage to get it back. Write me now for your FREE BOOK.

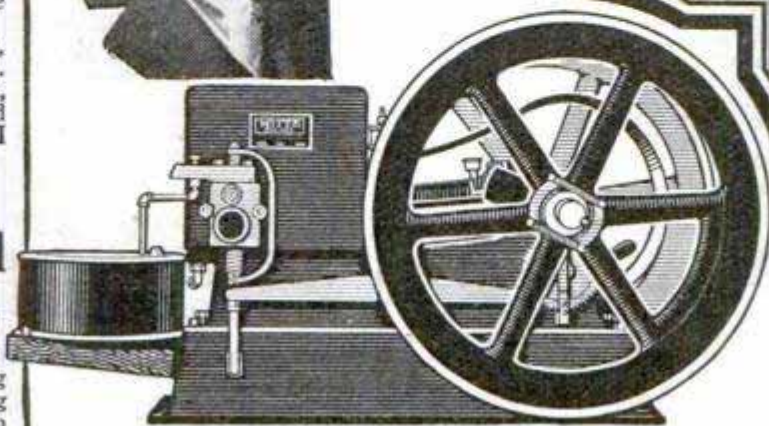
ED. H. WITTE,
Witte Iron Works Co.,
1746 Oakland Ave., Kansas City, Mo.
Pronounced "Wit-tee" to rhyme with "City"

NAME.....

ADDRESS.....

Engine Prices D-O-W-N- Another Notch!

Why pay two prices for any good engine, or take chances on a poor or unknown engine, when the WITTE costs so little?



2 H-P.	\$ 34.95
4 H-P.	69.75
6 H-P.	99.35
8 H-P.	139.65
12 H-P.	219.90
16 H-P.	298.80
22 H-P.	399.65

WITTE ENGINES Kerosene, Gasoline, Gas.

Sold only Direct from my Factory Doors to the User's Hands!

Get your engine from an engine specialist. All my life I have done nothing but make engines. **The success of my customers and nothing else, makes my success.**

My factory is the only one, that started in the engine business 27 years ago, which has come through successfully under the same management with which it started.

Only WITTE engine-quality has made that possible. I challenge anyone to show stronger proof of reliable engine-quality.

The test of time on a business, is the most severe that can be applied. Time tests, not only engine-quality, but it also tests the manner in which a concern lives up to its contracts and promises.

FREE BOOK COUPON

ED. H. WITTE,
Witte Iron Works Co.
1746 Oakland Ave., Kansas City, Mo.

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.

SEND
THE FREE
BOOK COUPON
TO-DAY.

Your Dealer Cannot Sell the Equal of This Table for Less than \$45



Our Factory Price
\$2250
Half What Your Dealer Demands

A superb example of cabinet workmanship—made of solid Quartered Oak—30 in. high—top, 54 in.—extended, 90 in.

Furnish Your Home for HALF Your Dealer Asks!

And have every piece specially finished to match the finish of the room in which you wish to place that furniture. We can help you do that because we are manufacturers—not a mail-order house or jobber or wholesaler. We MAKE all

BROOKS
"Master-Built" Furniture

and sell Direct. We save you every cent of the dealer's and jobber's profits. of the packing costs, $\frac{1}{2}$ of freight costs and $\frac{1}{2}$ the factory floor space usually required. All our furniture is

Then, our Sectional Method (of which we are the originators) saves $\frac{1}{2}$

Shipped in Easily, Quickly-Assembled Sections! Anyone Can Put It Together

Ours is the largest plant of its kind in the world. That of itself enables us to produce furniture at less cost—and sell it to you at lesser prices.

Write for Our Book of 100 Bargains in House, Office and Club furniture. It is Free.
Brooks Mfg. Co., 2706 Rust Avenue, Saginaw, Mich.

KEROSENE AND GASOLINE LIGHTING SYSTEMS

WIZARD LIGHT Burns Kerosene and Gasoline

Lamps constructed to burn kerosene are an achievement surpassing all other known methods of artificial lighting, while the cost of operating is very small and about 1-9c per hour.

Our gasoline lamps are the most perfect and up-to-date, while certain styles can be lit with an ordinary match, like city gas. For complete illustrated catalog and agency, address **THE NAGEL-CHASE MFG. CO., 148 E. Erie St., Chicago**

BUY YOUR FURNACE \$10 DOWN \$10 A MONTH



This No. 1 Jahant Down-Draft Furnace (weight over 1000 lbs.) as it stands \$48.00 cash, delivered east of Omaha and north of Ohio River.

Our monthly payment plan of selling direct saves you the dealer's profits and excessive charges for installation. The

Jahant Furnace

with the patented "Down Draft System" is best for residences, schools, hotels, churches, etc. Saves $\frac{1}{3}$ to $\frac{1}{2}$ in fuel bills. Install the Jahant yourself. We send complete outfit, freight prepaid with special plans, detailed instructions and all necessary tools for installation. Satisfaction guaranteed or money refunded. Thos. L. Flaherty, Hamilton, N. Y., writes: "Best Furnace made. Had no trouble to install it. Had it up and fire started in 12 hours."

Write for Free, illustrated book
THE JAHANT HEATING CO.
20 Main Street AKRON, OHIO

Save $\frac{1}{3}$ to $\frac{1}{2}$ on Fuel Bills



Easiest Ironing with a Saving of Money

IN the past eight years, thousands of homes have installed the Simplex Ironer because it does the ironing better, quicker, easier and with far less expense than any other method. It will iron a large table cloth in 3 minutes that would require 20 minutes to do by hand.

SIMPLEX IRONER
"THE BEST IRONER"

produces a uniform beautiful finish with no wear on the goods ironed. Two to four cents' expense will do an average ironing with no tired feeling or back ache. It soon saves its cost in labor, time, health and satisfaction.

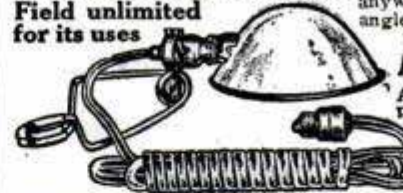
Write for name of our Local Dealer,
30 Day FREE TRIAL Offer and Catalog.

American Ironing Machine Co.
562, 168 No. Michigan Ave., CHICAGO, ILL.

mated that an increase of 10 to 25 per cent has been added to the carrying capacity of the ranges and the 5 lb. weight has been added per lamb, because they have not been harassed by herding or forced to travel long distances to and from bed grounds.

The Comfy Light of the Hour

The Comfy gives you light where you need it, when you want it, can be attached anywhere in less than a second at any angle required to give best illumination for its uses



AGENTS WANTED Everywhere

Agents are making \$50.00 to \$100.00 per week and not killing themselves doing it. Write for full particulars at once. Territory is being taken up.

THE "COMFY" LIGHT COMPANY
607 Marquette Bldg., Chicago.



EVERYTHING in Guaranteed Plumbing and Heating Supplies

at wholesale. Our \$200,000 establishment behind our Guarantee
Send for complete CATALOG 61.

J. HARDIN CO., 30 years at 4533-35-37-39-41-43 Cottage Grove Ave., CHICAGO

Triumph Light

WE ALL WANT BETTER LIGHT. HERE IT IS

This new 100 to 700 candle power light turns up and down like gas. One-third cost of electricity, gas or kerosene. For home, church or store. Anyone can operate. Perfection guaranteed or money back. Write for catalog (P.O.P.), Dept. 1. Agents Wanted.
BRILLIANT GAS LAMP COMPANY
1009 C. So. Wabash Ave., Chicago, Illinois



\$50 COMPLETE

exactly the same motor
that formerly sold at \$70



up to April 1st sold for \$70. It was designed and built to sell at \$70 and is a *superior* \$70 motor.

April 1st saw a radical change in our sales plan. This \$70 motor is being sold direct to you for \$50.

Why?

Because we are specializing on Speedaways, manufacturing them in enormous quantities (capacity of our plants 22,500 Speedaways a year).

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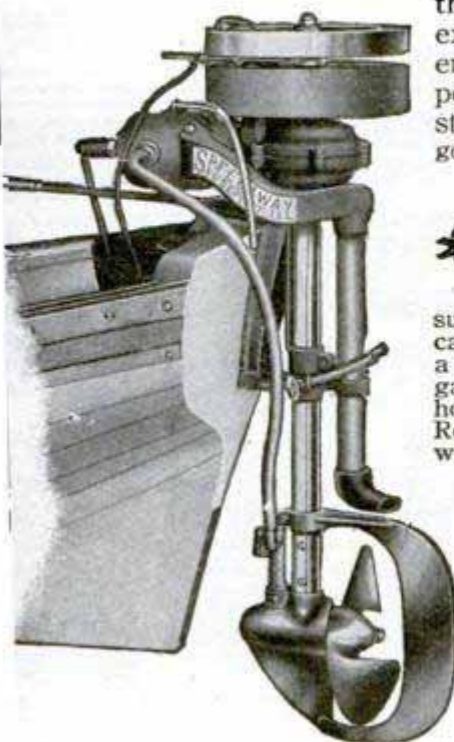
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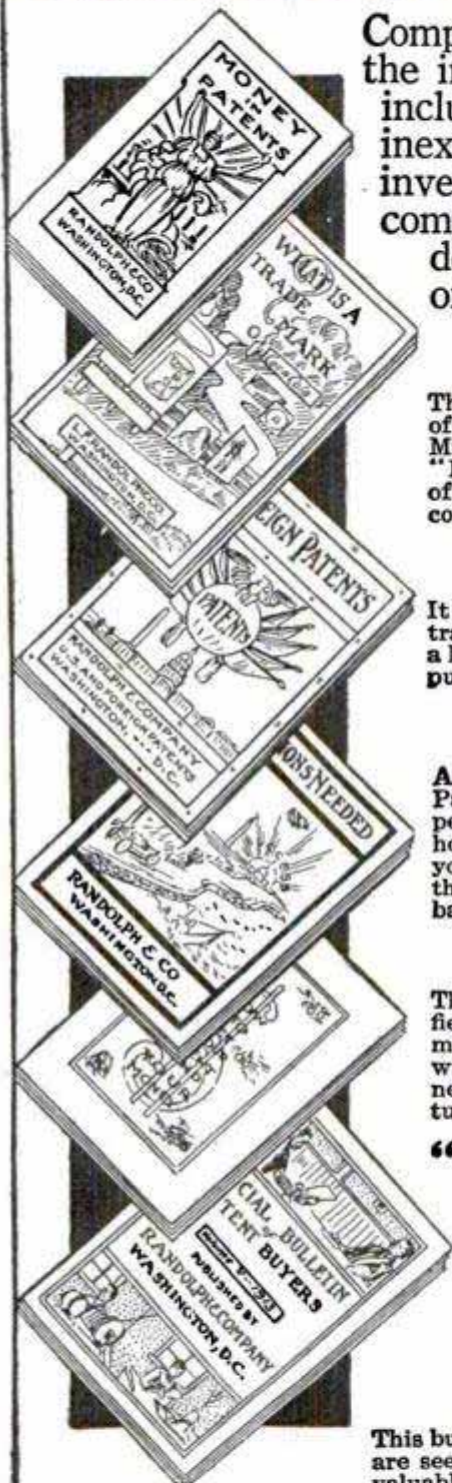
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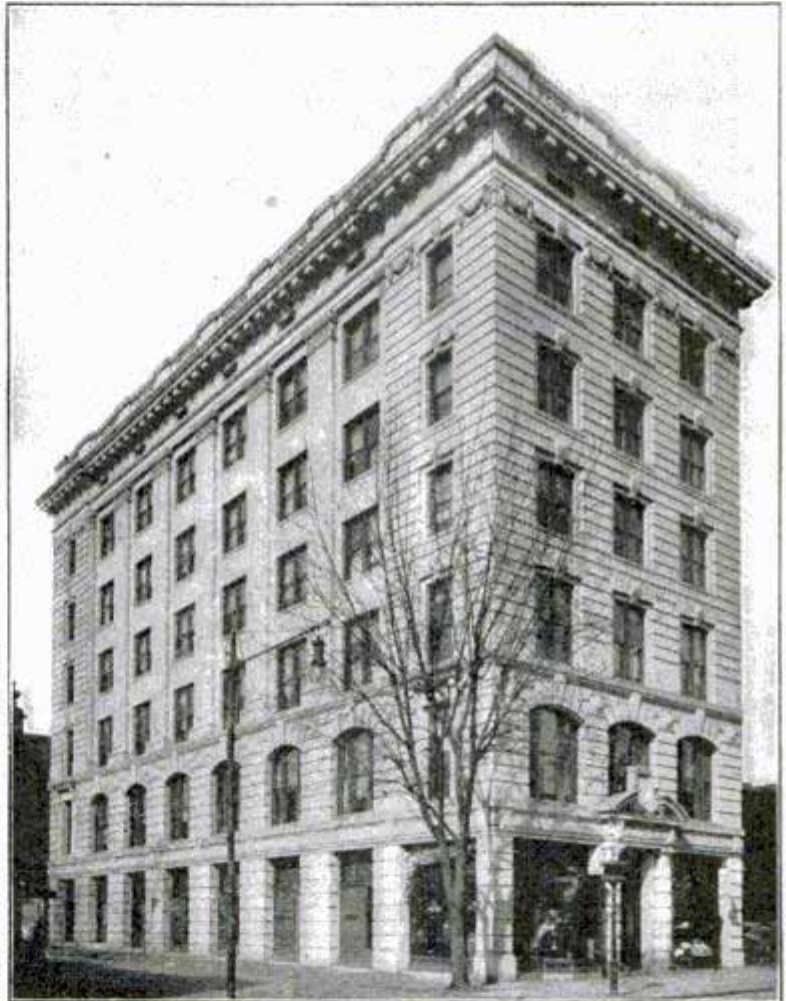
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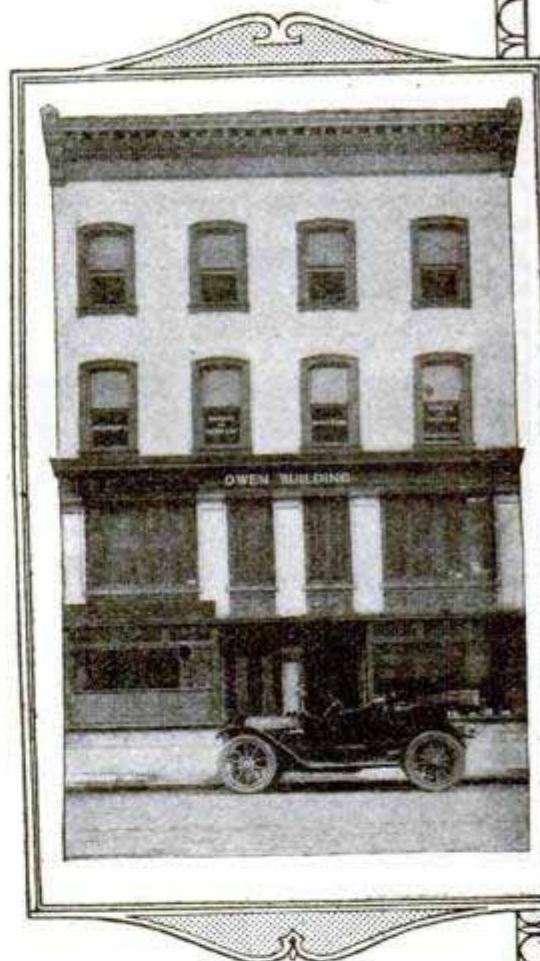
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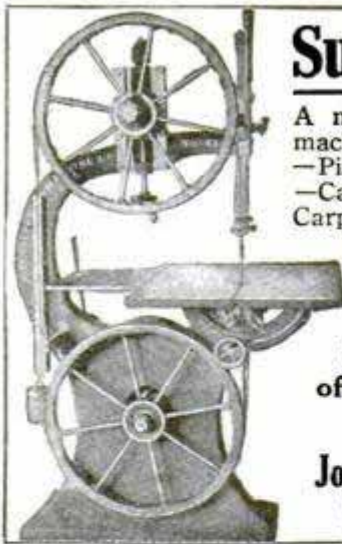
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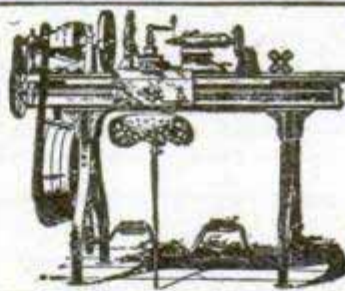
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The Harris is standard in size and shape—is equipped with Universal keyboard, two sets of shift keys, shift lock, release key, tabulator, back spacer, marginal release, 11-inch carriage, writes a line 9 inches long.

Hundreds of Harris Visible Typewriters have replaced other standard makes throughout our plants.

At \$39.80 we believe it is the greatest typewriter value in America.

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Write today, requesting Typewriter Catalog No. 80P92, which describes every detail and quotes liberal time payment terms.

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We will gladly send you a Harris for 30-day trial and return your money if you are not satisfied with your purchase.



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Your Choice, 3000 Typewriters
Underwoods, \$30; Oliviers, \$25; L. C. Smiths, \$15; Remingtons, \$12; Royals, \$24; and other makes as low as \$10. Every one perfect and guaranteed two years. Expert repairing. Free trial.

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Don't pay rent, don't buy a "blind" out-of-date typewriter when you can own this genuine Oliver Visible for only 13¢ a day. We save you \$41.50. No agents. Sent on Free Trial. Write for book, facts and low price. Typewriters Distributing Syndicate 166-546 N. Michigan Blvd. Chicago



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"See it sparkle! I'm just tickled to death with it!" And George is tickled too, because he has saved enough in buying her one of our

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At Low Prices—Easy Terms

to buy a rug or chair or table for that future home. We are importers and sell Diamonds direct, saving you jobber's and retailer's profits. **Certified Guarantee with every Diamond** guaranteeing weight and quality. We will send any

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Diamond or Watch in our Magnificent 25th Anniversary Art Catalog for your examination **without obligation or ad-**

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Why use ordinary pens with the never ending dip — when One Dip Pens make every penholder virtually a fountain pen?
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We mean a Daus' Improved Tip Top Duplicator, with "Dausco" Oiled Parchment Back negative roll, that ideal assistant, always ready to quickly make 100 copies from pen-written and 50 copies from type-written original. Complete duplicator, cap size (prints 8 3/4 x 13 in.), costs **\$5** but we don't want your money until **\$5** you are satisfied, so if interested just write us to send it on 10 DAYS' TRIAL WITHOUT DEPOSIT. That's fair enough, isn't it? Then send today.
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a pleasure, if you have a smooth, easy-writing
"VULCAN" INK PENCIL \$1
Red or Black, 4 1/4 or 5 1/2 in. Postpaid
FREE Supply of ink with retail orders.
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Golden Gem \$10 PORTABLE Adding Machine
It checks mental calculations. Handsome Morocco case free. **Buy Thru Your Stationer.** Write for 10 day trial offer. E. Ganeher, A. A. M. Co., 115 W. Broadway, New York City.
Multiplies - Subtracts
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There are Two Kinds of
Sharpening Stones
Those That Really Cut and Those
That Merely Rub

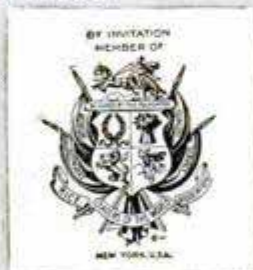


Carborundum Sharpening Stones

Really cut—they cut the edge on the tool quick, keen, smooth—they do the work in half the time and last almost as long as the tool itself.

They Hold Their Shape

When tools need grinding put them on a Carborundum Niagara Grinder—a great little machine fitted with a Carborundum wheel.



From your hardware dealer or direct.

**The Carborundum
Company**
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Please Mention Popular Mechanics

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Star Expansion Bolts and Screw Anchors are the only means of making permanent, enduring fastenings to hard substances.

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Expansion Bolts will not work loose. Their shields expand and hold them fast under all conditions.

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If your dealer does not carry these bolts and anchors write for samples. You can adjust them yourself, easily. They're well worth a postal.

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other firm is building a 200-ft. tugboat for the river Rhône, in southern France. In both cases the vessels, after erection at the works, must be disassembled and shipped in a knock-down condition to the place of launching, there to be reassembled.

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Are the standard of excellence in files, and have been for over 100 years. We send post paid as an introducer 48 files especially adapted for tool makers and machinists on receipt of **\$5.00**. This is a chance to get a set of files you'll appreciate and we'll get future orders.

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"Ohio" Edge Tools

are made from specially selected tool steel, by careful and skillful workmen. They are tempered by the most improved process and are sold with a money back guarantee.

Insist on "Ohio" Tools when buying Planes, Chisels, Drawing Knives, Auger Bits, Screw Drivers, etc.

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This excellent "Garage Set" with capacity for 78 most prominent Nuts and Screw sizes in U. S., A.L.A.M. and S.A.E., etc., standard openings provides for maximum service conditions. (Read table)

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Number	For U. S. Standard				For A. L. A. M. Std. Nuts & Cap Screws.	For S. A. E. Std. Nuts & Cap Screws.	For Set Screws
	For Nuts Diam. Bolts		For Cap Screws Diam. Sew.				
	Small Head	Large Head	Small Head	Large Head			
721	1/8		1/8	3/16	1/4		1/8 & 3/8
23	3/16	1/4		5/16			1/8 & 1/4
725A			1/4	3/8	1/4 & 3/8		1/8 & 1/4
27	5/16	3/8					1/8 & 3/8
729			7/16	1/2	1/8 & 1/2		5/8 & 3/4
731B		1/2	9/16	5/8	1/8		3/8 & 7/8
32	7/16	9/16					
33C			3/4	1	5/8 & 1 1/8		1 & 1 1/4
737		3/4	7/8		3/4 & 1 1/8		
38	5/8	7/8			1 & 1 1/8		

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(Moral - Don't fool, insist on owning a "RED DEVIL" Tool)



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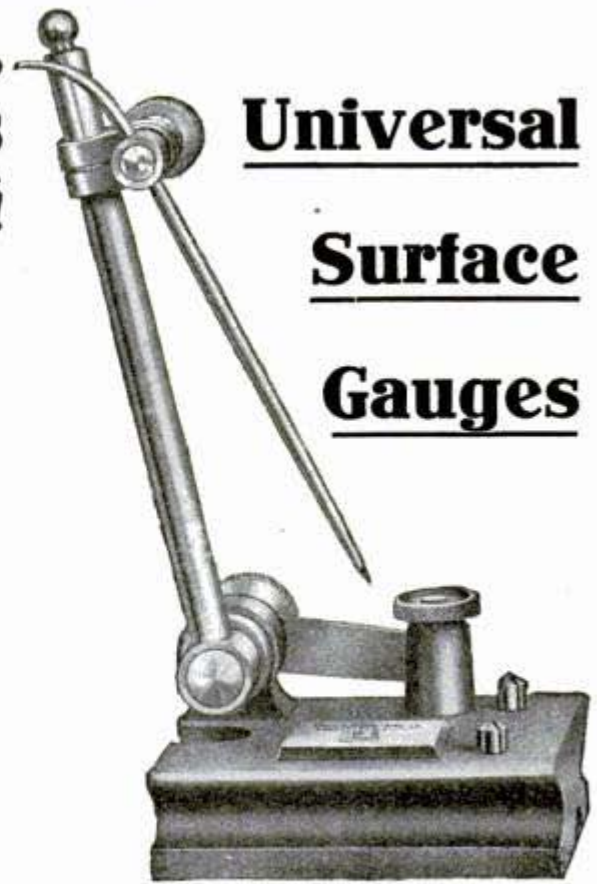
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Tool Makers, Pattern Makers, Planer Hands and All Mechanics Who Have to Lay Out and Set Up Jobs!

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A very useful machine for any place where metal is worked.

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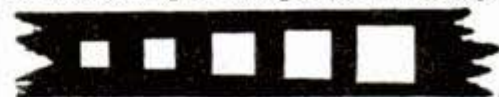


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The biological survey and the forest service have been cooperating in the extermination of ground squirrels in national forests in California. The annual loss of range feed and grain crops from ground squirrels is enormous.

SQUARE HOLE DRILL

A new, simple and practical tool, just perfected



**FOR WOOD
METAL
MARBLE**

Fits chuck in any brace, drill press, or lathe and by circular motion drills a square hole at one operation. Made of high grade steel, fully guaranteed. Sizes 1/8 in. to 1/2 inch in sixteenths. When ordering state size and kind (whether for wood, metal or marble.)

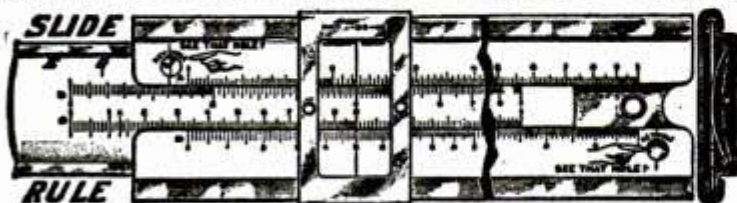
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Man, Cost Estimator, Manufacturer, Contractor, Salesman, Manual Training Teacher, Time-Keeper, Bookkeeper, Lumber, Land, Marine, and other merchants too numerous to mention.

This Simple Instrument multiplies, divides, adds, subtracts, solves proportion, extracts the square and cube roots, changes fractions to decimals and vice versa, calculates interest, discount, percentage, mensuration of superficies, the rule of three, etc., and performs almost any other kind of calculation almost instantly. For Engineers, Draftsmen, Master Mechanics—all technical men—it is indispensable. For Electricians it is a complete wire table. The operation with the use of the key and keyhole is very simple, and the answer is given direct for such problems as, Horse Power of Engines, Pumps, Belts, etc., size of duct for ventilating, radiation and grate and steam main, change gear and pulley problems, area, circumference and diameter of circles, etc. My new 1914 rule is made two sizes, coat and vest pocket, 10x1 1/4x1/4" and 5x1 1/4x1/4". 10" has Sine, Log and Tangent scales on the face of rule always in plain sight. No wood in their construction, scales white celluloid, printed from engine divided plates in two colors, washable, and secured by an improved locking device in non-corrodible Monel Metal framing.

Price 10" Rule, Add, Subtract, Multiply and Divide, \$3.00; 10" Rule (non-Add and Subt.) \$2.50; leather case, 5" extra; 5" Rule (non-Add and Subt.), leather case, \$2.50. 10" Dummy Rule bristol board scales, \$1.00. Postage prepaid. If ordered now the book, *The Slide Rule Simplified*, goes free with each rule. If interested in forming clubs, write for large list of tools GIVEN FREE.

For years the Slide Rule was considered so complicated an instrument that it was used only by Technical men, and there are people today who still have this opinion. The Richardsons Direct Reading Slide Rule has put an end to the mystery surrounding this machine, and my 52 p. book, *The Slide Rule Simplified*, shows the actual setting of the rule by 90 full size engravings, for problems which confront men in a vocation. It is written so that you can understand it, and make the use of the Slide Rule possible for everyone. The examples selected are those which frequently come up for solution by the Banker, Broker, Auditor, Inventory and Insurance

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"YANKEE" TOOLS

Make Better Mechanics

The ONE Bench Drill with Automatic Friction and Ratchet Feed

This is the newest "Yankee."
It is more convenient, entails less labor, gives more speed, has a larger capacity than any other bench drill—and it saves drills.
The Automatic Friction-and-Ratchet Feed, with its knock-off lever adjustment, makes the "Yankee" Bench Drill absolutely accident-proof. Screw threads cannot be jammed or stripped, nor gear teeth broken. Feeding pressure is uniform and controlled independently of operator.
It is strong and rigid. Careful machining and finish of every detail, ensures speed and accuracy in working, and reduces friction to a minimum.

This **LEVER** controls the Feed. In horizontal position, the Ratchet-feed operates continuously and uniformly, until thrown off by contact of lever with knock-off, at extreme down or up position. Friction-feed moves the drill quickly to or from the work.

Speed Shifter. On No. 1005. This pin moved to proper notch, controls speed fast or slow, or locks drill for removing or inserting of drilling tools in chuck. Change for slow or fast can be made with drill in work.

Three-Jaw Chuck. Tool-steel, hardened. Holds round shank drills absolutely centered.

This nut holds table bracket in position. Table is adjustable to different heights and angles.

Knock-off throws the lever, when set for Ratchet Feed, changing feeding from ratchet to friction.

Lower Knock-off for throwing lever on downward movement. Prevents jamming.

Slow Speed. These inside gears drive—one revolution of spindle to one revolution of handle.

Fast Speed. These outer gears drive—3½ revolutions of spindle to one revolution of handle.

Made in two sizes—
No. 1003 for drills up to ¼ inch,—one speed.
No. 1005 holds round shank drills up to ½ inch diameter—2 speeds—quickly changed by moving shifter pin.



"YANKEE" Vise No. 990

Designed for holding small work on "Yankee" Bench Drills, and can be used on its sides as well as base. Swivel, steel jaw to hold taper work. Opens to 3 inches without swivel jaw;—2½ inches with it.

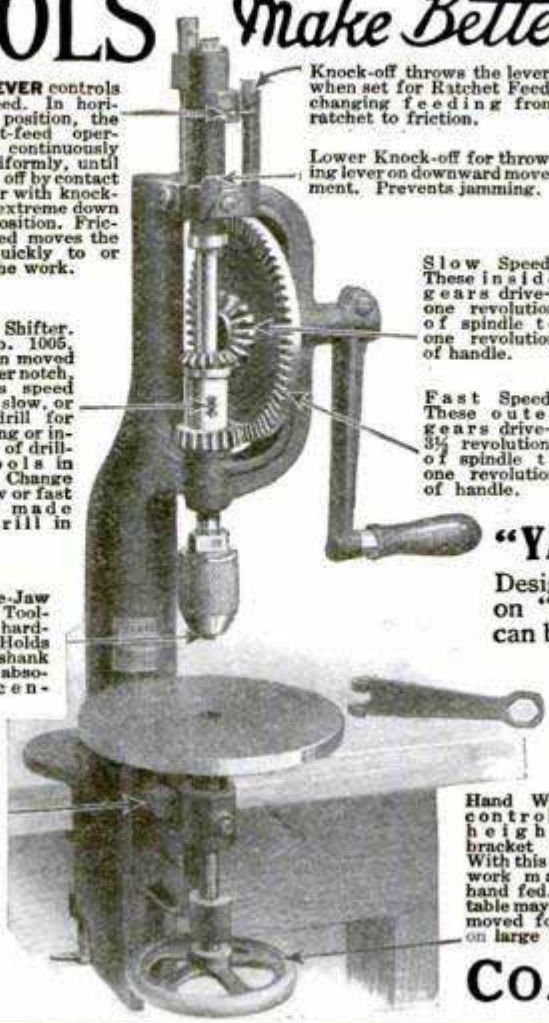
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Hand Wheel—controlling height of bracket table. With this wheel work may be hand fed. The table may be removed for use on large work.

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sews leather, canvas, shoes—anything, heavy or light. Complete repair shop in itself. Saves many trips to town. Mends harness, saddles, wagon covers, blankets, buggy tops, belts, etc. Can't get out of order. Original and only awl with diamond point full grooved needle to protect the thread. **BIG MONEY FOR AGENTS.**
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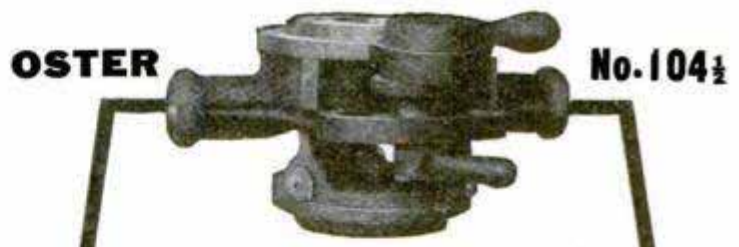
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A lifting jack, wire stretcher, wire mender, post and stump puller, etc. Get big circular. Write quick!
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er, held his peace." And well he might, says the riter, for Rebekah's act of kindness to the stranger as, in view of the camel's capacity—and there were n of them in the train—a mighty big job.



Tool Cases for Toolmakers and Machinists. Keep your tools orderly arranged in a Gerstner Portable Tool Case. There's a place for every tool in one of the felt lined drawers. Every up-to-date mechanic needs one and you'll find our Cases the best built, neatest and most practical on the market. We guarantee to please or refund all money.

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"I believe it to be the best medium-priced Cornet ever produced and that it is fully equal to the majority of high-priced instruments of other makes."—Jules Levy, Jr.

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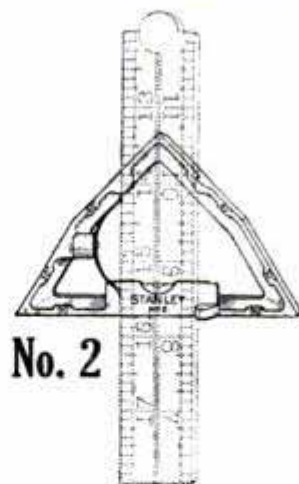
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LYON & HEALY, 37-42 E. Adams Street, CHICAGO



Stanley Tools

3-ANGLE RULE TOOL

No. 2

A light, handy little pocket tool for Carpenters, Mechanics and Householders. It can

be easily and quickly attached to any two foot rule that is one inch in width by simply slipping the rule between the spring and the boss as shown in the cut. In this combination it may be used as a Plumb, a Level, a Square, a T-Square, a Mitre Square, a 30-Degree Square, a Depth Gauge or a Marking Gauge.

Nickel Plated Weight 3 Ounces

PRICE 50c EACH

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 One Man's Work
 \$28.⁵⁰ With This**

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A portable post card gallery. Takes, finishes and delivers photo post cards and buttons in a minute's time—makes five different styles of pictures in 3 sizes. *No plates, films or dark-room*. One minute pictures sell like wildfire. Everybody buys. Picnics, fairs, carnivals, busy corners, small towns and large cities—*Big Money Everywhere*.

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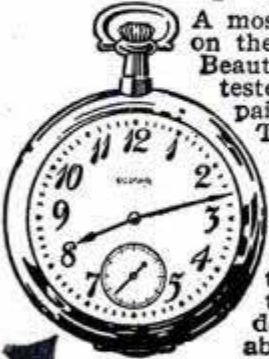
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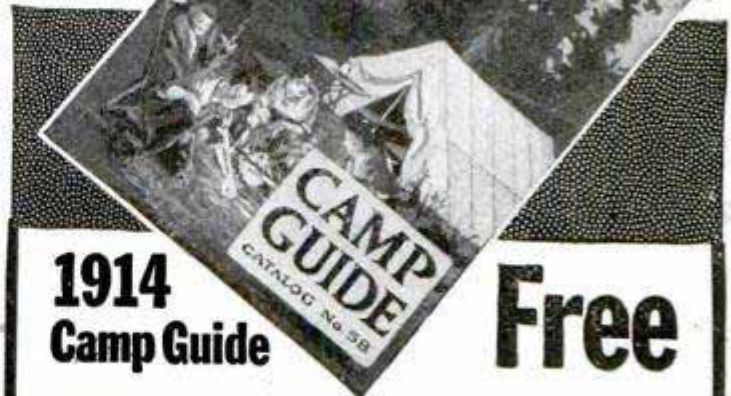
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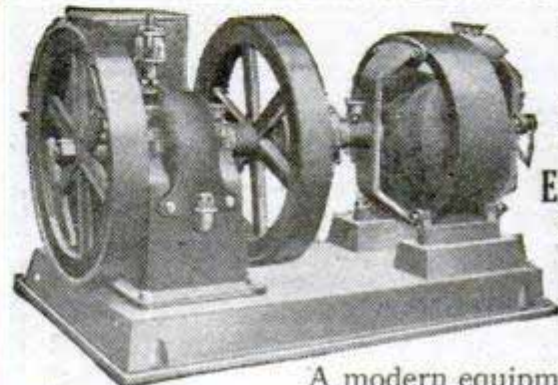
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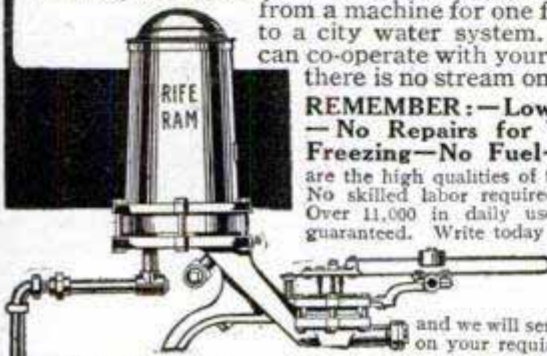


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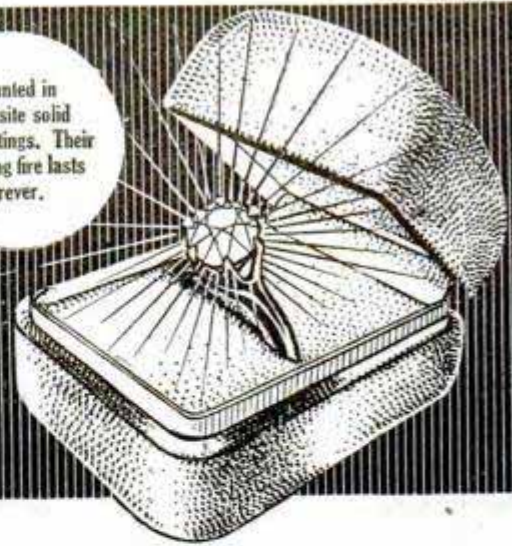
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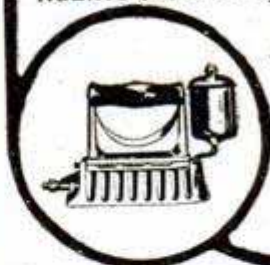
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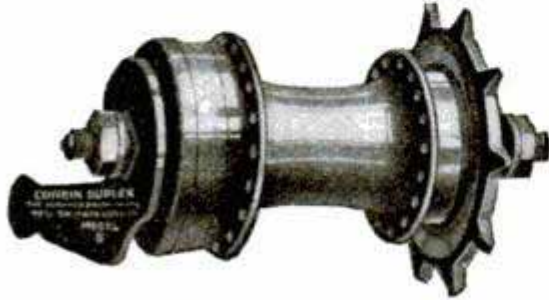
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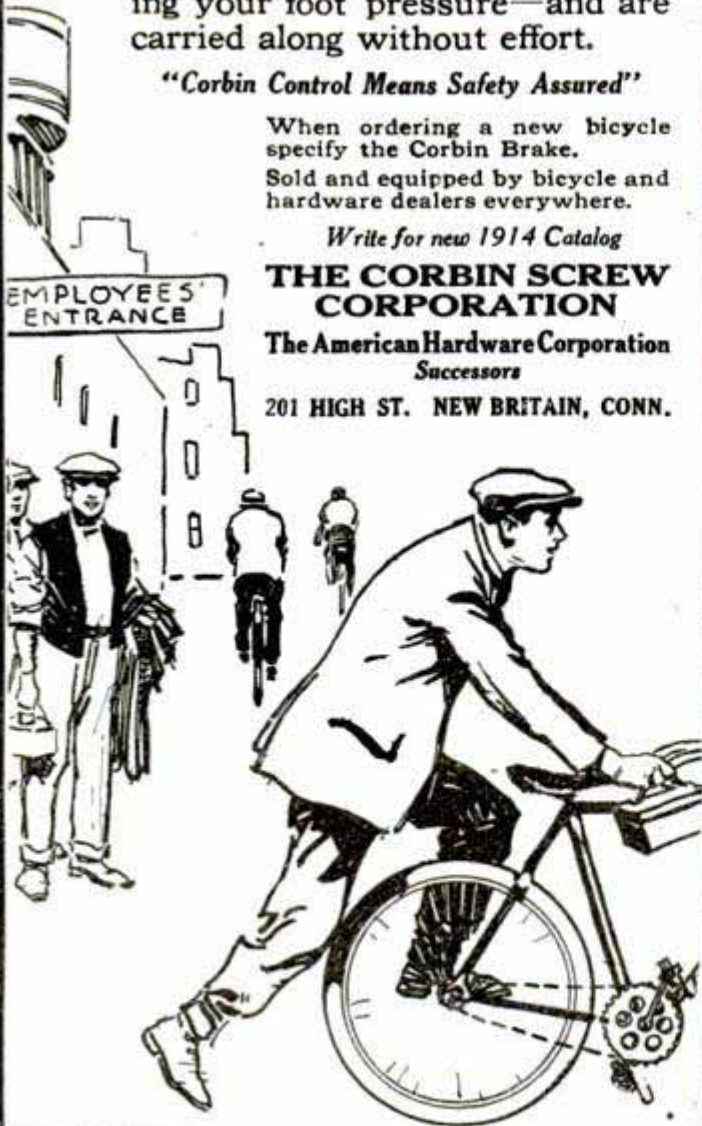
When ordering a new bicycle specify the Corbin Brake. Sold and equipped by bicycle and hardware dealers everywhere.

Write for new 1914 Catalog

THE CORBIN SCREW CORPORATION

The American Hardware Corporation
Successors

201 HIGH ST. NEW BRITAIN, CONN.



Please Mention Popular Mechanics



One Motorcycle Tire

Holds Every World's Record
Dominates in Sales
And Equips $\frac{3}{4}$ of All the
New Machines

It is built by Goodyear—built just the same as Goodyear automobile tires, which have won top place in Motor-dom. Consider that—one maker holds the leading place both in motor car and Motorcycle tires, despite tremendous rivalry. In three years Goodyears have gained topmost place in Tiredom. And the only reason lies in super-service proved by millions of these tires.

Why Take a Risky Chance?

Rival makers, of course, must say, "Our tires are as good as Goodyears." But look at the evidence.

How is it that Goodyears won all the world's records in speed and durability tests?

How is it that Goodyears, in the test of time, came to outsell all others?

Why is it that three-fourths of all the 1914 motorcycles come out with Goodyear equipment?

And look at automobiles. Those tires must also stand fearful strain and grind. And most users meter their mileage. Goodyears in that field have outrivaled all others. Now they have won in both fields by giving most of what you desire in a motorcycle tire.

GOOD YEAR
AKRON, OHIO
Motorcycle Tires

Then why take chances? No tire, in any way, offers more than Goodyears. You pay no more for Goodyears than for other standard makes. No good tire costs you less. And the verdict of users—the final verdict as shown by sales—is that Goodyears are best.

Made with a double-thick anti-skid tread. Made by a patent method to prevent tread separation. Made to hold forever the place they hold today.

There is a Goodyear dealer in your town. Ask us for his address—also for our book which pictures and describes the making of Goodyear tires.

The Goodyear Tire & Rubber Co., Akron, O.

Toronto, Canada London, England Mexico City, Mexico

Branches and Agencies in 103 Principal Cities
Dealers Everywhere

Write Us on Anything You Want in Rubber (1535)

NEVERLEAK

**Prevents
Tire Troubles**



Make your tires leak proof — cut out those expensive repairs, those hold-ups from flat tires. Inject into each tire a tube of NEVERLEAK Tire Fluid—the one reliable, time-tested preparation, used for eighteen years by thousands and thousands of riders.

Reduces Expense

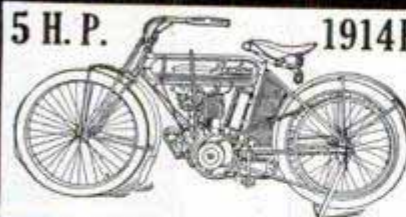
NEVERLEAK saves you money. It heals punctures instantly while you are riding, doing away with costly plugs. It preserves the rubber, adding years of life to your tires. A 4-ounce tube protects a tire until it finally wears out. Easily injected by means of handy tubes, 25c each. Sold everywhere by dealers and repair men.

**Buffalo
Specialty Company
Buffalo, N. Y.**



\$40 Motorcycle

We have the largest line of new and used Motorcycles in the country at the lowest prices. We also have a thoroughly equipped repair department and are in position to furnish repairs for any machine. Send us your machine to be overhauled. We pay cash for second hand motorcycles. *Send for Catalog.*
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5 H. P. 1914 Peerless Motorcycle

With Free Engine Idler and Bosch Magneto, together with the best there is in motorcycle construction—Power, Silence, Endurance, and those Wearing Qualities so essential for low cost of maintenance.
5 MILES FOR ONE CENT
Agents Wanted—Liberal Discounts

PEERLESS MOTORCYCLE CO., 179 Huntington Ave., BOSTON, MASS.

Don't Throw Away Your Worn Tires

For over three years French and German motorists have been getting from 10,000 to 15,000 miles out of their tires by "half-soling" them with Steel Studded Treads.

In eight months 20,000 American motorists have followed their example and are **saving \$50. to \$200. a year** in tire expense.

We ship on approval without a cent deposit, **prepay the express** and allow you to be the judge.

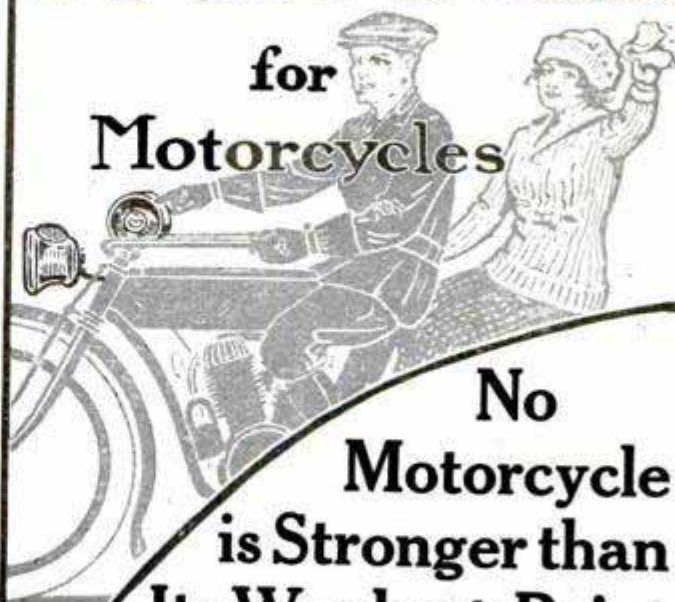
Durable Treads double the life of your tires and are sold under a **signed guarantee for 5000 miles without puncture.** Applied in your own garage in thirty minutes.

Special Discount offered to motorists in new territory on first shipment direct from factory. A postal will get full information and sample within a week. **State size of tires.**

on't wait—write today. Address nearest factory office.
THE COLORADO TIRE & LEATHER CO.

Prest-O-Lite

for
Motorcycles



**No
Motorcycle
is Stronger than
Its Weakest Point**

You wouldn't buy a machine whose engine would be useless the first time the motorcycle tipped over.

At night, light is as important as power. Any motorcycle lighting system depending upon a toy storage battery or delicate complicated apparatus may be destroyed by a knock or jolt which you wouldn't notice otherwise.

Prest-O-Lite is absolutely reliable

Safe, simple and sturdy, it has proved its worth in constant service for thousands of experienced riders.

The most convenient system, and the most economical. The operating expense is no greater than that of a carbide generator, and only one-third to one-fifth that of electric light.

30-DAY FREE TRIAL You can prove all our claims for Prest-O-Lite by our 30-day trial plan. Before buying any other system, insist upon the same kind of a test.

Insist Upon It!

Any dealer who offers you a combination of equipment, including any other lighting system, will give you Prest-O-Lite instead, if you insist. And if you know the facts, you will insist. Tear off on the dotted line, write your name and address below and mail it for complete information about motorcycle lighting.

**Prest-O-Lite
is ideal for
stereopticons**

The Prest-O-Lite Co., Inc.

265 Speedway

Indianapolis, Ind.

(Contributor to Lincoln Highway)

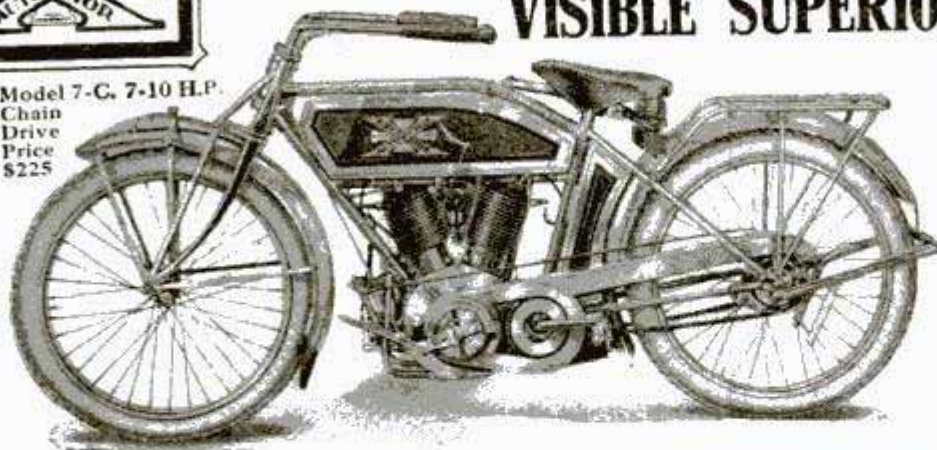
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VISIBLE SUPERIORITY



Model 7-C, 7-10 H.P.
Chain
Drive
Price
\$225



EVERY manufacturer claims the superiority of his product, but the wise buyer must be shown.

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AUTO-CYCLE**

is not only fully proven in public tests of **SPEED, POWER and ENDURANCE**, but the Rigid Straight Line Frame, Complete Grip Control, Double Brake Application, Drop-Forged Foot Rests, Tubular Luggage Carrier, Powerful Two Speed with Single Lever, Single Movement Control, are all features of visible superiority that are of real practical value to the rider.

The nearest dealer or our catalog will give you the details of
THE MOTORCYCLE THAT ALWAYS MAKES GOOD

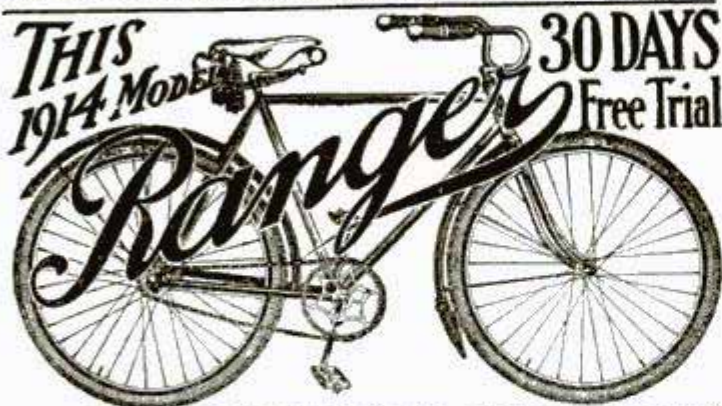
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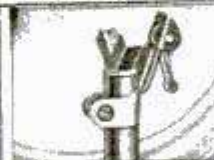
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MOTORCYCLE TIRES**

Sold in 1913 than in 1912?

"Limited" Motorcycles

Something different in motorcycle construction that will appeal to you. Write for catalogue and dealers' proposition.

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Only instantaneous spreader on market. For lubricating Wagon, Auto, or any spring. Real Opportunity for Hustlers. Immense field. Popular Prices. Millions will be sold. All our Specialties carry Money-Back Guarantee. Write Now to
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Send for Booklet! Boys!



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Send 20c today for Booklet, telling how to build this automobile. Complete instructions and descriptions of parts and sizes, illustrated with diagrams, blue print, cuts made from photographs, and price list of parts.

Have your Boy build his own Car. The experience and knowledge he gains is more advantageous than any learning obtained from books. Building the Lad's Car is a valuable experience and gives great delight to all boys.

We make a great specialty of our 5 h. p. engine and all the parts necessary, and any boy can assemble the complete car.

SPECIAL INDUCEMENT to first boy in your town

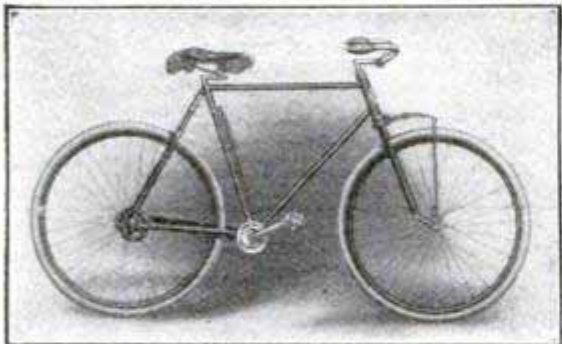
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Experiments in the use of aspen for shingles show that the shingles do not check in seasoning, and that they turn water satisfactorily, but that they are too easily broken in handling.



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1914 Model

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Remarkable new improvements make the 1914 "Arrow" a positive wonder for speed, comfort and easy riding. Makes bicycle riding like coasting all the way. The smartest looking bicycle ever built. Latest Eagle easy motorcycle saddle—new Departure coaster brake—special motorcycle pedals—motorcycle handlebars with long rubber grips—imported anti-friction chain—reinforced frame—beautiful finish. All sizes for boys, men, and women. Don't fail to learn about this great new motorcycle model.

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Write today for the low direct offer we are making on the splendid Arrow Bicycle. Get our free catalogs. For only a very, very small amount down we will ship direct to you the elegant Arrow, built to last a life time. Pay for it while you ride—a little each month. Enjoy the pleasure of the bicycle while paying.

Write Today! Right now, and we will send you the announcement of this remarkable new motorcycle type "Arrow," with full details of machine and astonishing bed rock direct offer. Send a postal now with your name and address. **TODAY SURE.**

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at a small cost, by using our attachable outfit. Fits any Bicycle. Easily attached. No special tools required.

Mr. Collins of Kentucky writes:

"Motor Attachment received O. K. and I cannot say too much for the SHAW 2 1/2 h.p. motor. If I could not get another, \$100.00 would not take it off of my frame. It is the attraction of the road. Last Sunday I rode it about 20 miles with no trouble at all. Also, pulled a hill 1 mile long on trip with all ease."

FREE BOOK Write today for bargain list and free booklet, fully describing the SHAW Bicycle Motor Attachment. Motorcycles all makes, new and second-hand, \$35.00 up.

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ADD TO YOUR INCOME With little effort you can make \$5 to \$10 a day

The "AMERICAN" is the only machine on the market (barring none) that sharpens, hones, and strops razors, sharpens all kinds safety razor blades, scissors, clippers, pocket knives, surgical instruments, etc. No previous experience required. REMEMBER THE "AMERICAN" Key-Cutter is a little wonder. Cuts Square, Angular or Round slots.

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"AMERICAN" Sharpener



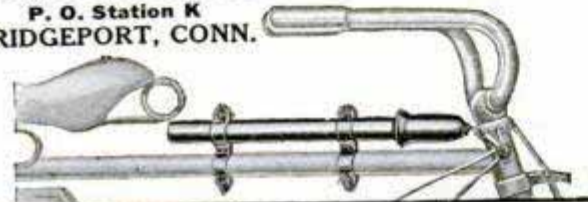


The most popular lamp on the market
 Riders who want to see all of the road at night, use the "SEARCH-LIGHT"—it is a handsome, dependable lamp, burns gas, and makes its own gas. Won't jar out.

"Bridgeport" bicycle pumps are best. Get one of these pumps and a "Search-Light."

Ask your dealer. Write for new illustrated catalog.

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\$210⁰⁰

The only direct chain drive with the same smoothness and flexibility of a belt.

They all say: "It can't be done"—But still we make them—"Flanders" better machines for less money.

Two Models—Single **\$165.00** Twin, Direct Drive **\$210.00**

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have the reputation of giving maximum service and satisfaction at low cost. Then why pay more? The 1914 models are truly wonderful values, and are bound to please both the customer and the dealer. A catalog will explain fully the many new and exclusive features—not freaks—but real meritable, long-life-giving, classy and advanced motorcycle construction features, exclusive on Flanders 1914 models.

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We have a very interesting Introductory proposition for those in sections where we are not represented. Write today.

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ADDRESS.....

R. F. D. No.....

Town.....

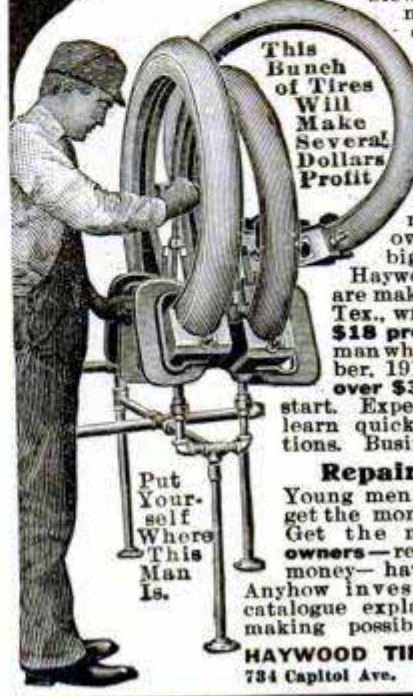
STATE.....

DEALERS:
 You want a high-grade motorcycle that can be sold for less and still show you big profits, don't you? Then why allow some one to beat you to it?
Write us today for our new proposition.

Please Mention Popular Mechanics

\$250⁰⁰ A MONTH REPAIRING TIRES

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Jewel Detachable Electric Rowboat Motor
 Attaches to any rowboat or canoe, runs on 2 six-volt batteries. No odor, noise, or dangerous gasoline.

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 Look inside your battery through the patented open window. See condition of plates and height of acid. Jewel Special 6-60, \$9. 6-80, \$12. 6-100, \$15. 6-100 Starting Battery, \$18.
 Write for Catalog. Business Est. 1880

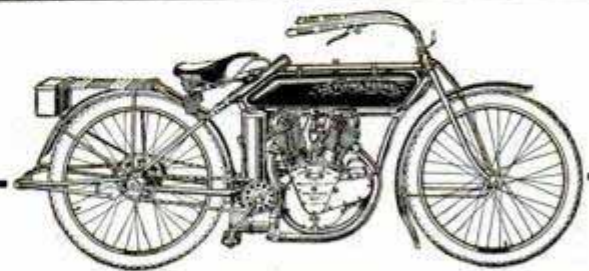
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CHASES MOSQUITOES



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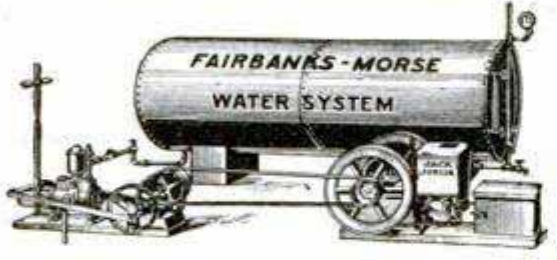


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THE MIAMI CYCLE & MFG. CO.
 280 Hanover Street Middletown, Ohio

WATER When You Want It Where You Want It
 "Equal to City Service"

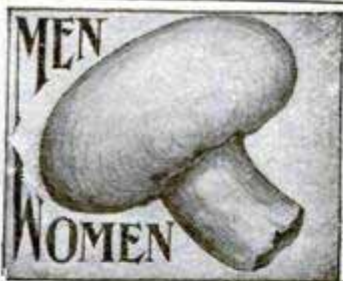
Real water system Economy is only possible where a private plant exactly fits your requirements.



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are made of standard parts, but the pump, tank, engine or electric motor are selected and combined to fit exactly the conditions found. The outfit you buy is especially arranged for your service — yet sold at a price possible only where each part is perfectly standardized. There are innumerable combinations, to fit every depth of well, every service requirement, and every size and style of house.

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Dazzling Pure Blue White Gem - Not an imitation.

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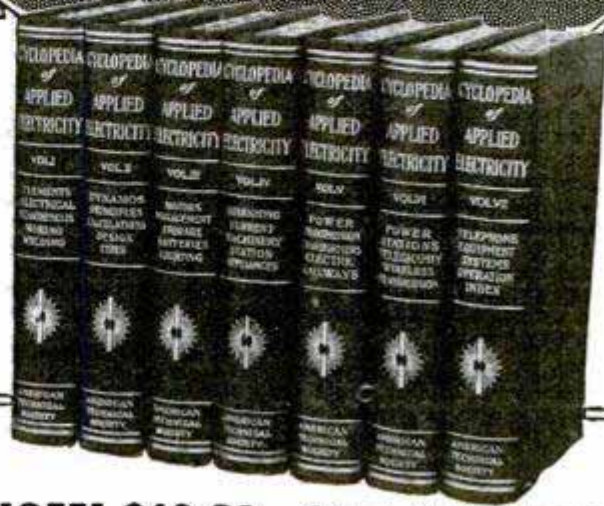
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guaranteed forever. Set in solid 14k gold mtgs. Ladies' Tiff, style Ring with 1/2 Kt. Gem \$8.50. Gents' Heavy Belcher Ring with 1 Kt. Gem \$16—sent C.O.D. for examination, 10% disc. for cash. State ring size. Our booklet on genuine native gems, Mex. Fire Opals and The Story of the wonderful "Maztec Gem" is free to you—write today.

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I Insist that
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And you can't get *THIS DESIGN* except in
The "TEMPLE" ENGINE

I don't have to tell you that **VIBRATION** and **FRIC-TION** cause **tremendous wear and tear on an engine** — besides wasting power, fuel and money. You know that.

But let me say **this**: that the "TEMPLE" Engine Design is the **only one** that really masters these ruinous forces. It does this by placing the Cylinder and Piston in a **vertical position**, with the **head right down** on the low, flat base (an exclusive "TEMPLE" feature).

The shock and strain of explosions are, therefore, fully 80 per cent **less** than in engines having their Cylinder-Head or Explosion Chamber **up in the air**, above a **high, wobbling base**.

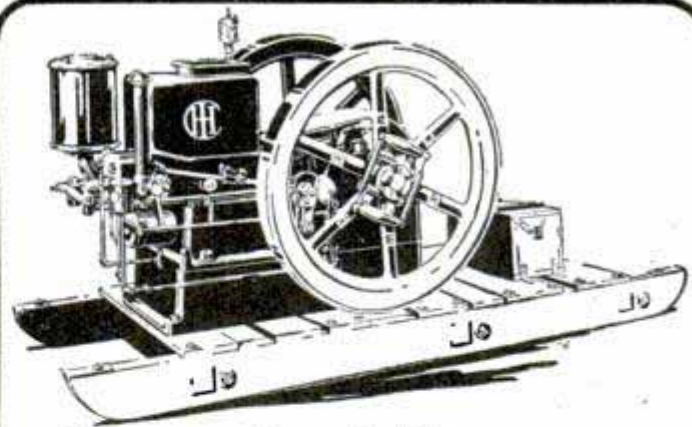
The "TEMPLE" **vertical piston action** — combined with especially designed **gravity lubrication system** (by which lubrication is supplied **exactly** when, where, and in quantity required) — almost entirely eliminates **friction**, and makes possible the **economical, trouble-free** delivery of a **STEADY STREAM OF MAXIMUM POWER**.

These special "Correct Design" features (joined with others made possible by them) make the "TEMPLE" run **more quietly and smoothly** — deliver **more and steadier power** — use **1-3 to 1-2 less fuel** — weigh **1-3 to 1-2 less** — have **2-3 less bulk** — occupy **1-3 to 1-2 less space** — more portable — wear **less and last longer** — than other engine types.

You simply **CAN'T GET "TEMPLE" RESULTS** in the vibrating, elevated cylinder designs. If you need **economical POWER** — to run a Thresher, Grist-Mill, Sawing Outfit, Shredder, Husker, Sprayer, Pump or any other **INDOOR or OUTDOOR** machinery requiring 2 H.P. to 50 H.P. — **write to me at once**. I'll tell you **some other things**, you never knew before, about **correct engine DESIGN** — something that may be worth **hundreds of dollars** to you in engine **SERVICE**.

Renneth Kennedy
 Ken Engine Expert
 (Formerly with U.S. Eng. Wks.)

TEMPLE MFG. CO.
 2100 S. 54th Ave., Cicero, Ill.



International Harvester Engines Stand All Tests

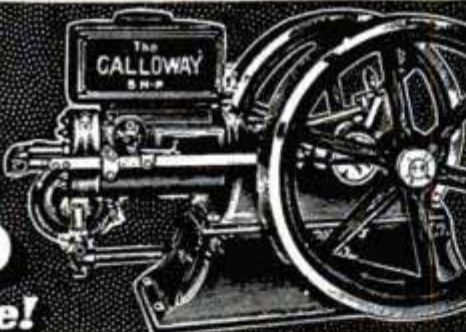
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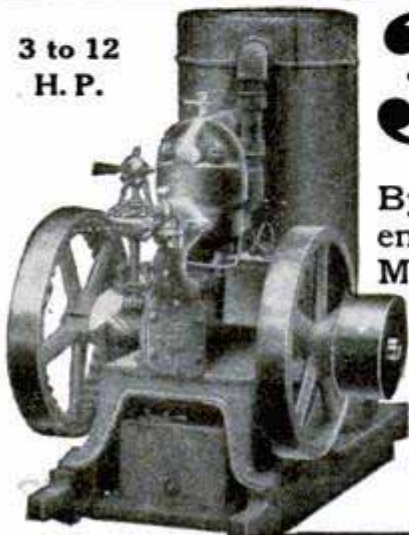
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4 cycle, 4 H. P. Weight 190 lbs. A wonder helper, famous for its great power in light weight. Convenient to handle—fits in anywhere—adapted to all duties. **The Original Binder Engine.** Also double cylinder specialty engines for all power work, 6 H.P. to 20 H.P. Throttle governor, Schebler carburetor. Catalog free.

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Runs this 6 H. P. Engine for a 10 hour day on KEROSENE

By means of the patent throttle you can run it as a 4 H. P. engine for 23 cents a day, or as a 2 H. P. for 12 cents a day. Many other strong points; force-feed lubrication; uniform speed; sight-feed fuel supply; automobile muffler; no cranking; runs either way; uses any fuel oil satisfactorily. And it's **Guaranteed for 10 Years**. Write for catalogue and 30 days' free trial.

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velocity of the wind at Point Hope is said to be rarely less than 20 miles an hour, but an auxiliary gasoline motor is to be installed. The mission at Point Hope contains about 400 inhabitants.

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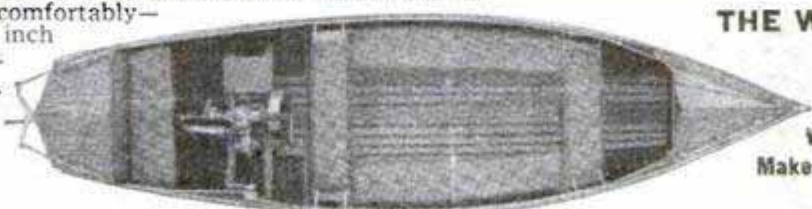


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Not only is this sturdy little motor a boon to father on his hunting or fishing trips—it also holds a thousand joys and pleasures for mother and the children. On hot, sultry summer days, when father is at work, they can safely venture out with their row-boat-launch and enjoy the cool, refreshing breezes from o'er the water. When father gets home at night—warm and tired—there's nothing so refreshing, so invigorating, so productive of a good night's rest as a spin with a

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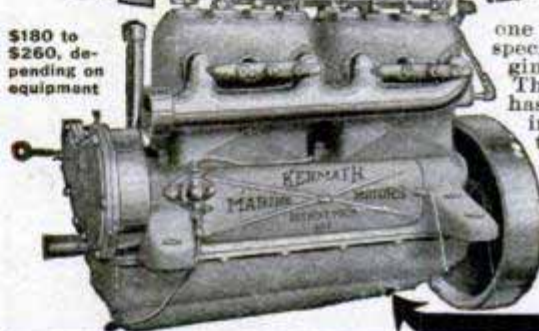


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KERMATH

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4
Cylinder

\$180 to \$260, depending on equipment



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2 H.P.
\$38

American Engine Co.,
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The Evinrude Magneto is built within the fly-wheel and in that manner is protected from all injury. It has no brushes, bearings or commutators to wear out and is not affected by rain, waves or even complete submersion. It saves carrying 15 or 20 pounds of batteries.

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We can now supply special Maxim Silencers for 1913 and 1914 "Evinrudes". The Silencer eliminates practically all noises. No similar motor can use the Maxim Silencer as it is an exclusive "Evinrude" feature.

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The tiller is controlled by a shock-absorbing, Compensating Device which allows the tiller free range in either direction and permits steering without the exertion or strength which is necessary with a rudder.

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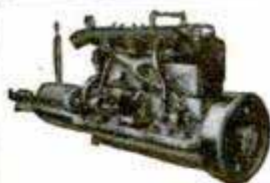
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6 H. P.	1 " "	84.00
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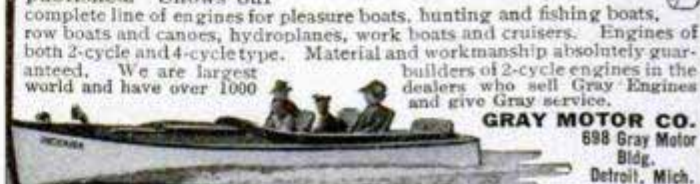
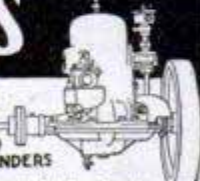
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A 5 1/2" x 6" Four-Cylinder Complete Marine Power Plant

In this design has been incorporated a number of distinctive features which will appeal to every motor boat enthusiast.

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The Seal of Safety at Sea

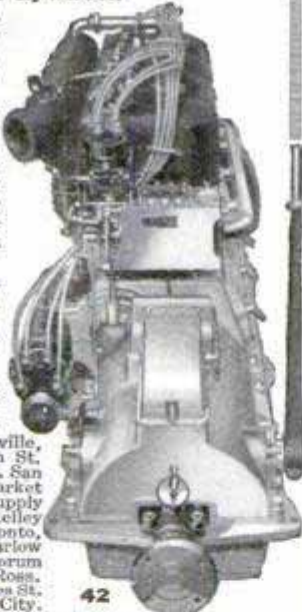
In this motor, the reverse gear has been completely enclosed in a substantial aluminum case. The control has been centralized. The lubricator is in a particularly convenient position for inspection.

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17 different models, including 1, 2, 4 and 6-cylinder types, semi-speed, medium duty and extra heavy duty. Write for catalogue. You will be interested in the new kerosene and distillate motors and the new electric self-starters.

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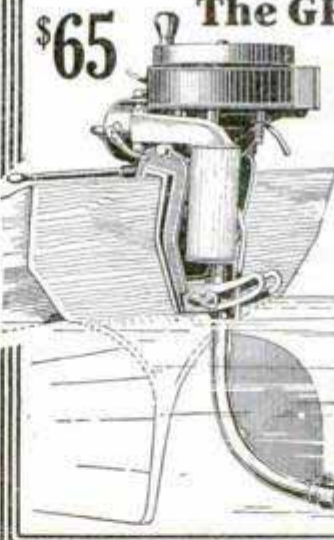
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THE Row Boat Engine THAT IS Mechanically Better

At Last! The right idea in portable motor construction. A brand new principle—no gears used.

The Gray Gearless not only makes a motor boat of any row boat, but it makes a **better motor boat**—a dependable motor boat—does anything that any portable motor will do and **does it better**. Attaches with two thumb screws—runs all day on a few cents' worth of gasoline. Clean—simple—sure—safe. Has **more power, less weight, fewer parts, longer life**, steers easier and gives your boat greater speed. Our literature gives you the **inside** facts about portable motors—and a pictorial demonstration of Gray Gearless superiority.

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is the **right engine** to carry with you on that vacation, hunting, or fishing trip, because it can be absolutely depended upon.

Engine shipped complete, ready to run in either fresh or salt water. Packed in a permanent, easy carrying case. Built by the largest marine engine builders in the world and backed up by a guarantee that assures lasting satisfaction.

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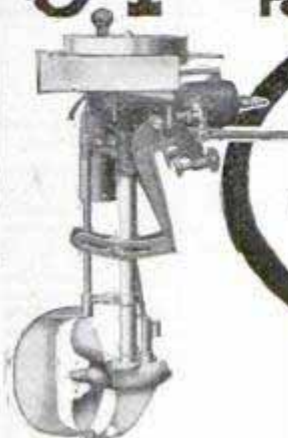
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A brand new member of the famous L. A. family. The fruit of 8 years' marine motor experience and sold direct from factory on **30 Days' Free Trial** for sale at a popular price. The popular outboard style of motor is now, for the first time, offered for sale at a popular price. You can enjoy all the pleasures of motor-boating this summer—such a summer as you never had before. The L. A. is light as the lightest, strong as the strongest, with many exclusive refinements. It drives a rowboat 8 miles an hour, or slow enough to troll. Instantly attachable—instantly removable.

Order today, sending \$54.75, and motor will be sent, freight paid. Try it 30 days. Send it back at our expense if unsatisfactory. Fully guaranteed. Send for L. A. catalog and post yourself on this popular motor at a popular price.

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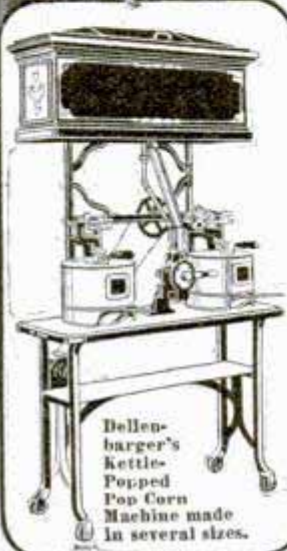
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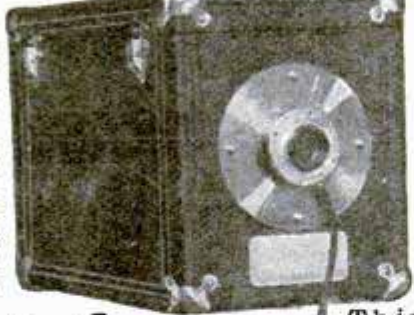
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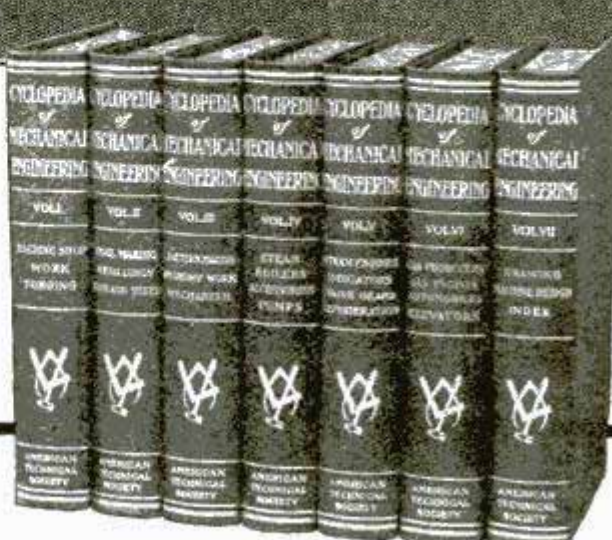
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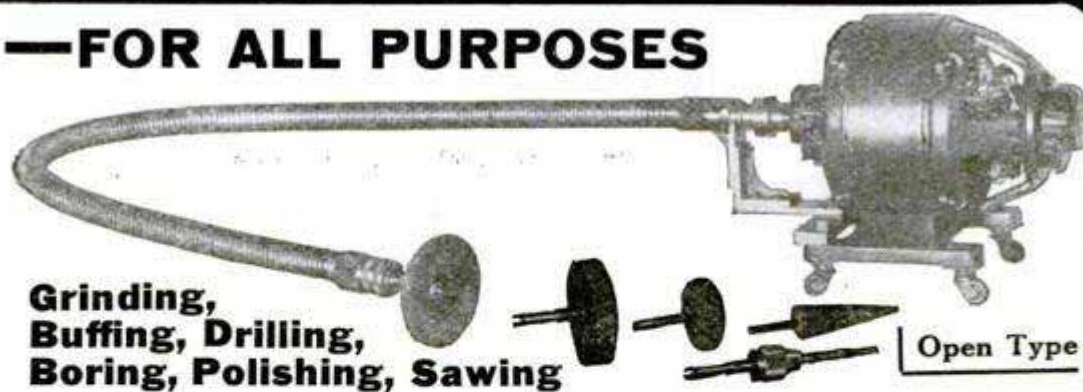
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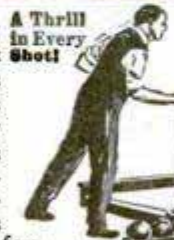
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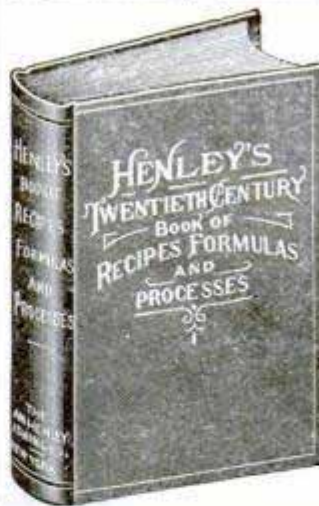
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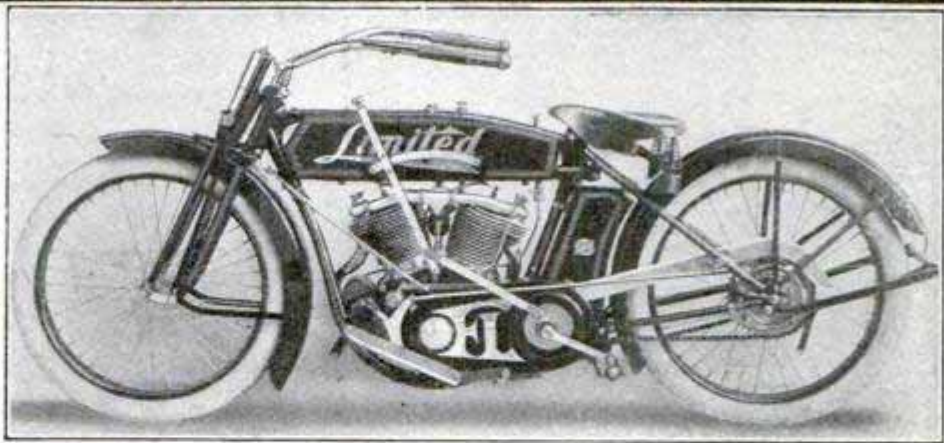
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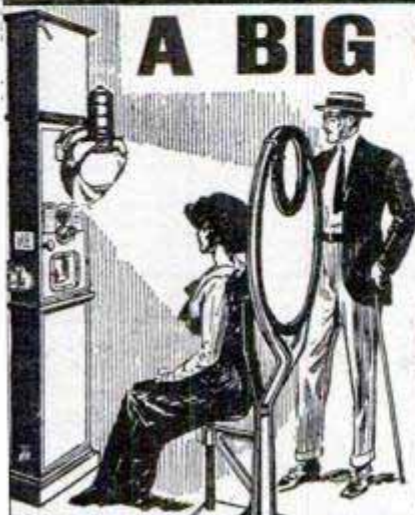
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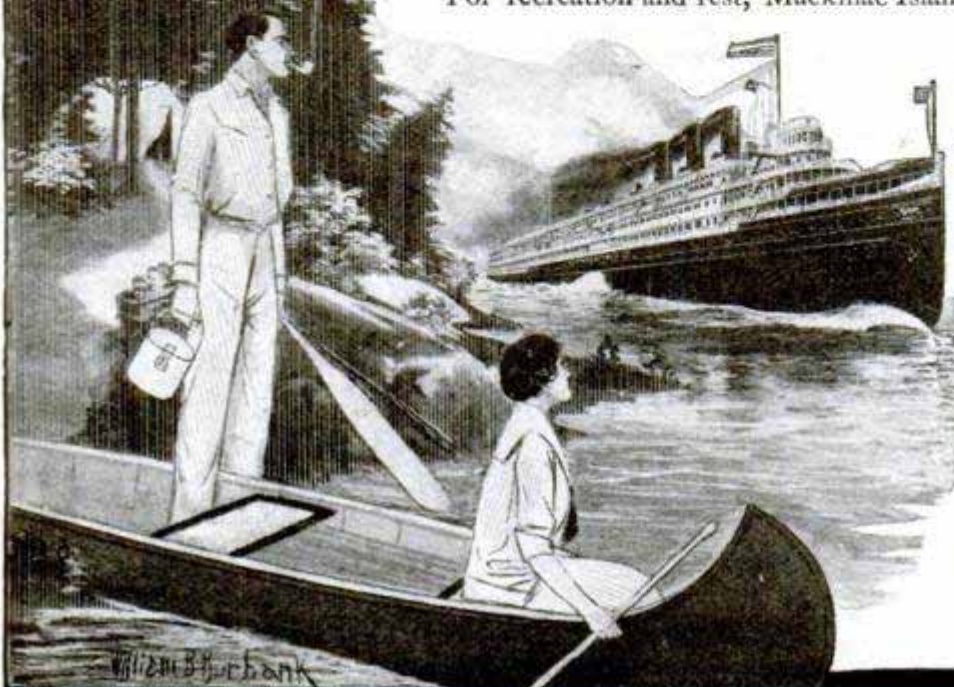
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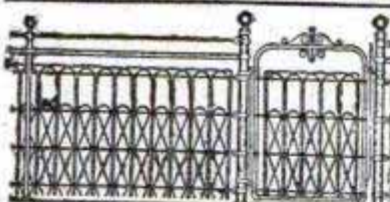
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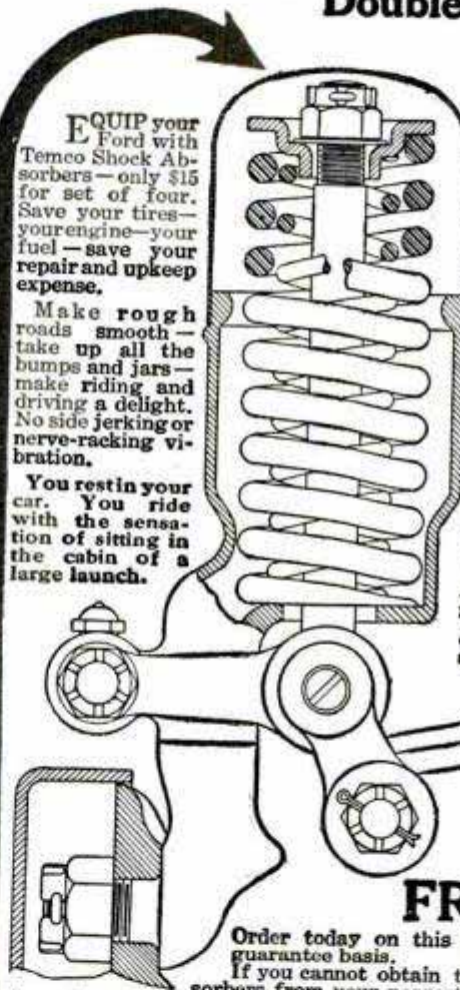
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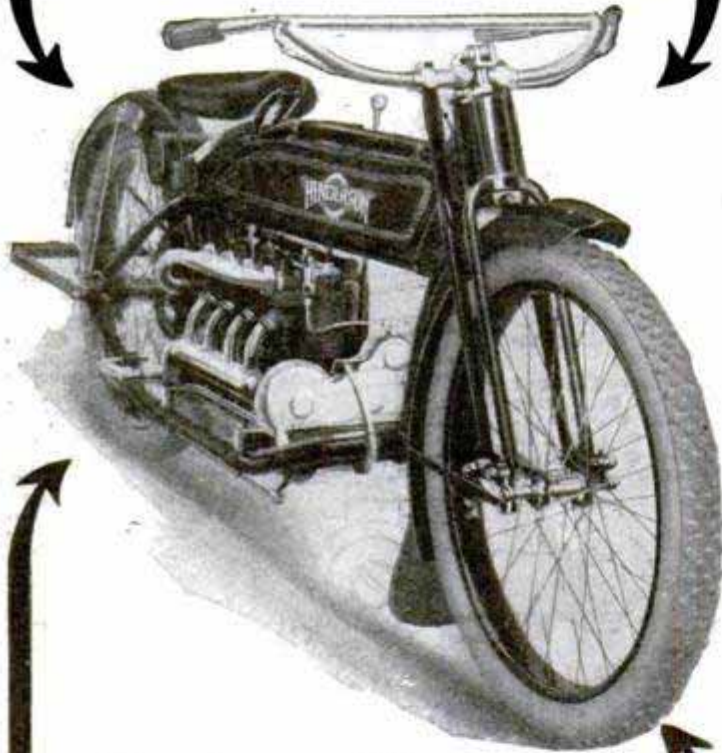
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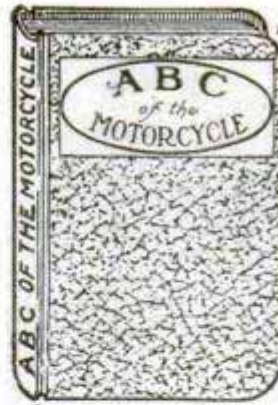


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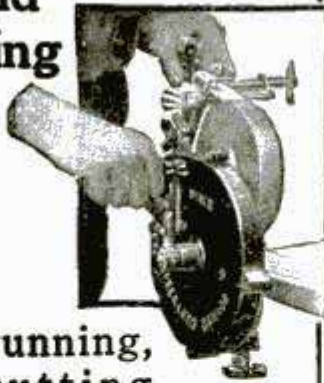
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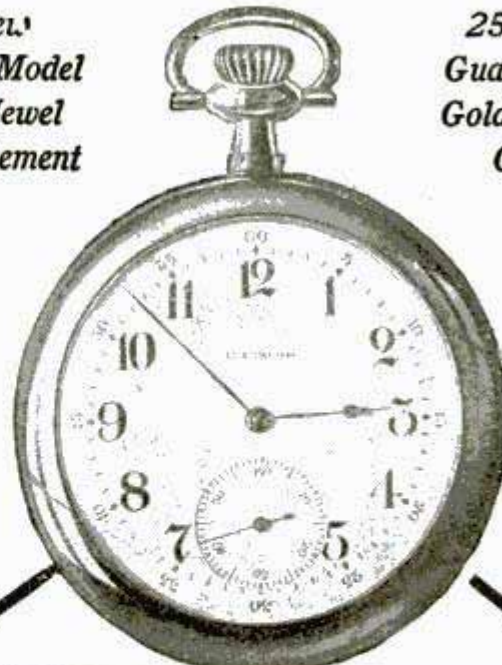
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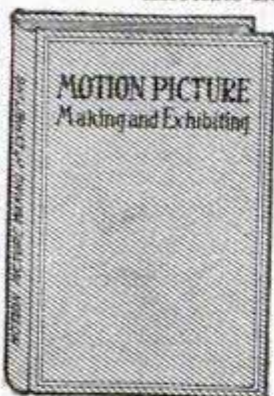
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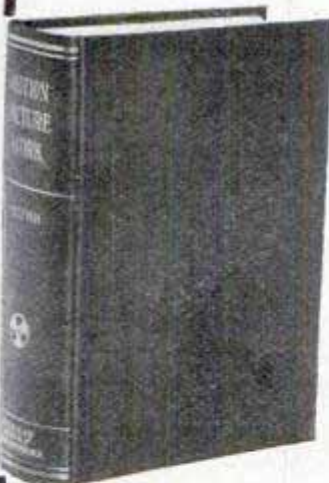
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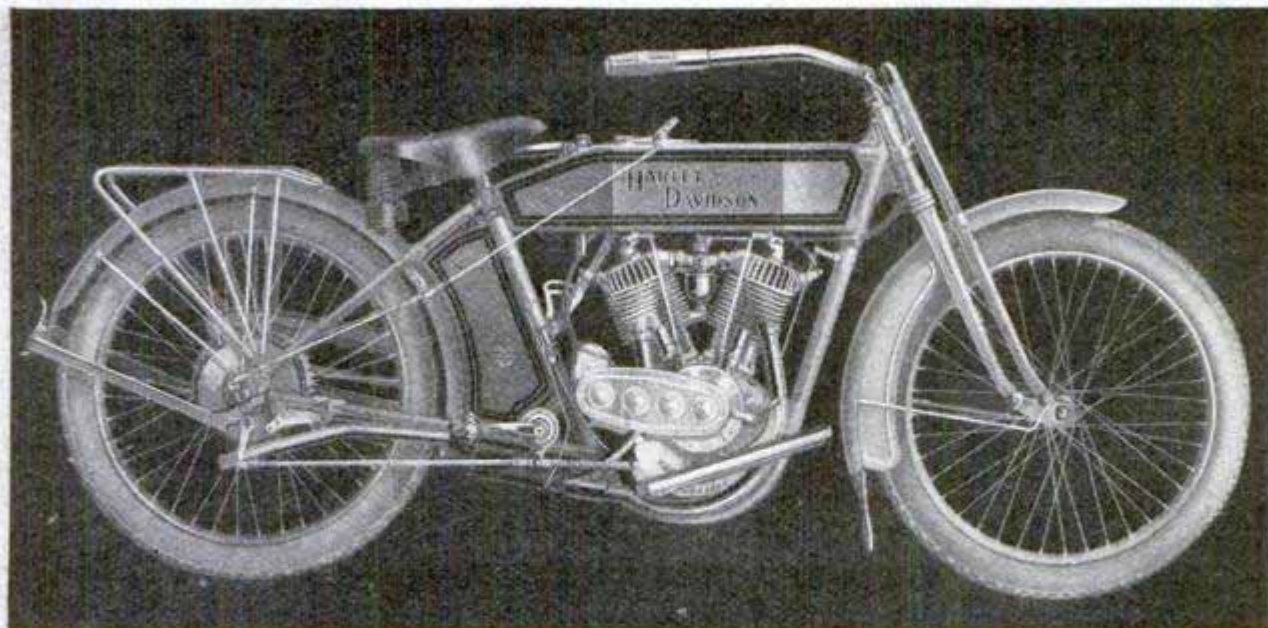
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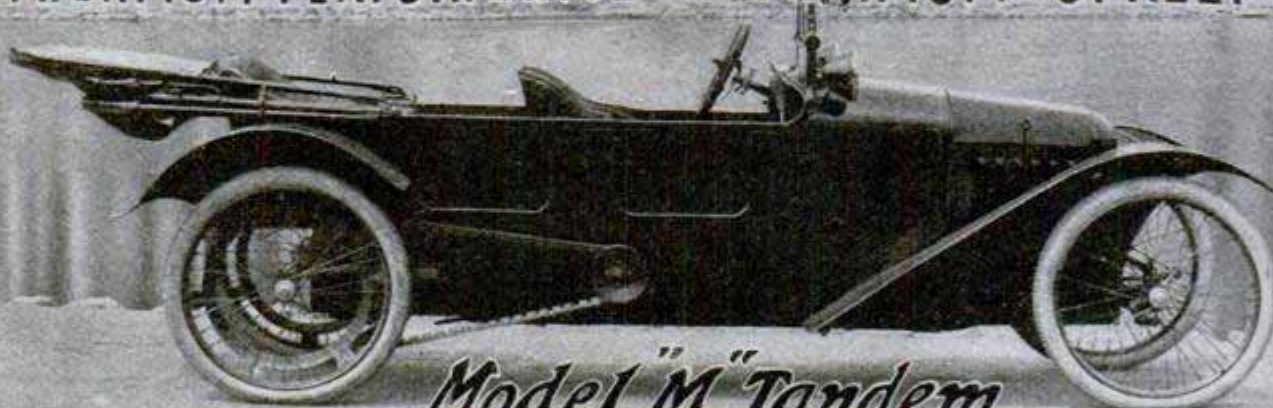
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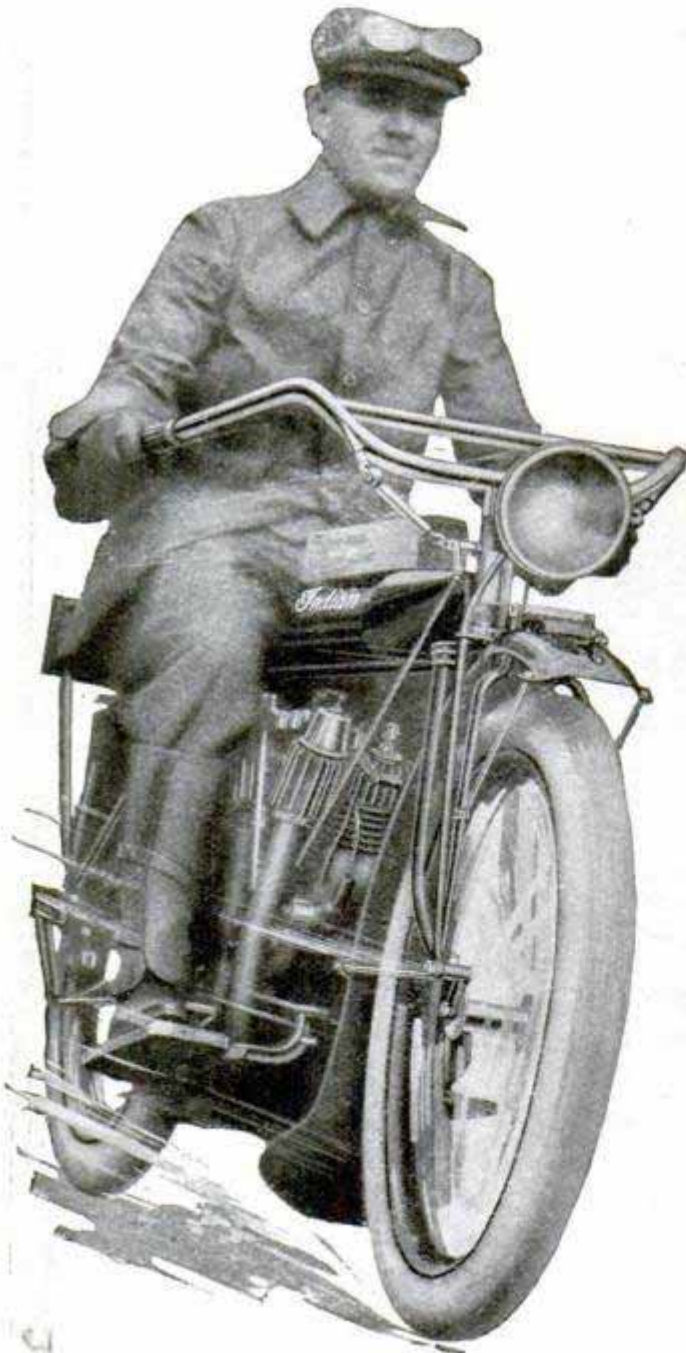
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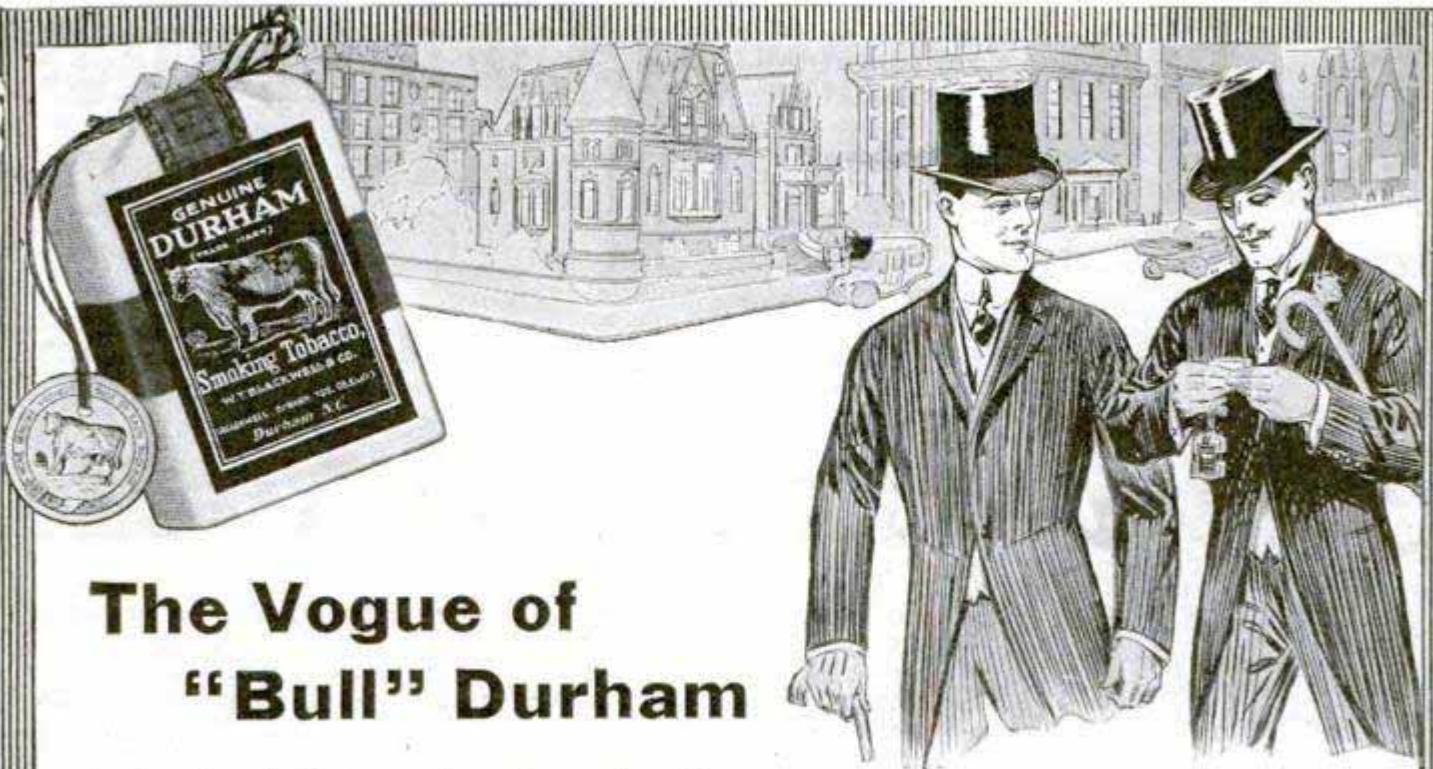
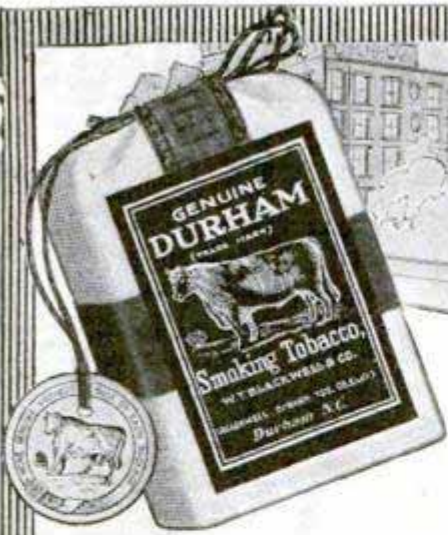
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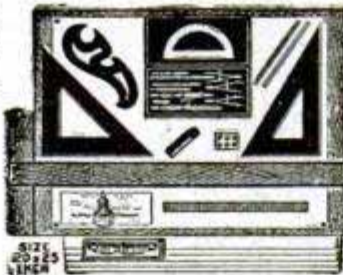
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