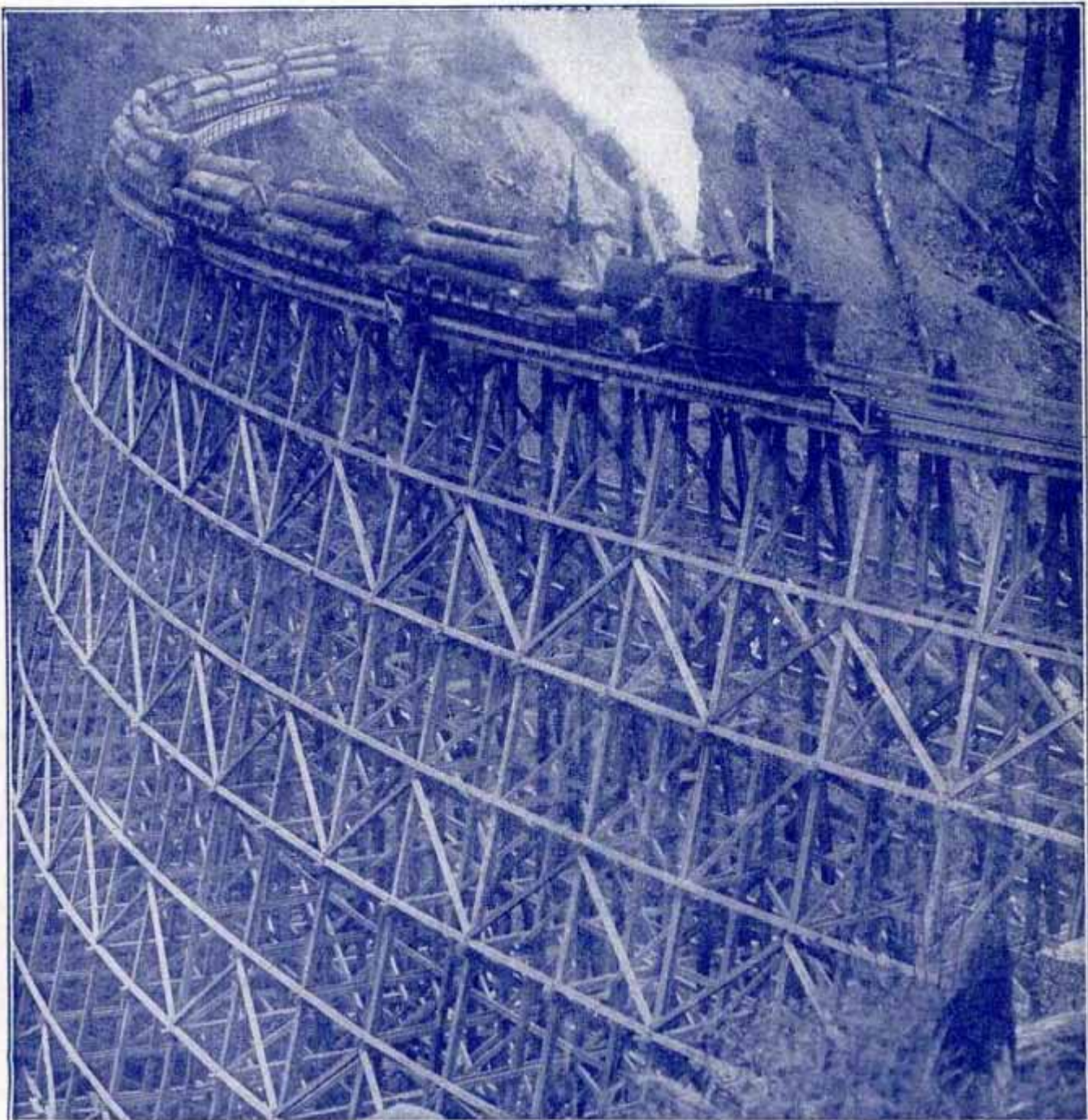


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CONTENTS FOR MAY, 1909

Germany Prepares to Fight Airships.....	393	Gets Doctor's Aid by Wireless.....	428
Iceboats Towed by Automobiles.....	394	Training Men for Rescue Work in Mine Disasters	429
House with Tree-Roof as Well as Roof-Tree	394	America's First Railroad Track Built 100 Years Ago	430
Sand Modeling on California Beach.....	395	Vaccinating New York's Municipal Lodgers	430
A Baby Carriage That Is Not a Perambulator	395	Types of Army Observation Devices.....	431
Steam Propelled Ice Auto.....	397	An Ingenious Teapot	432
Russian Motor-Sleigh	397	Nature Provides Largest Fountain in the Country	432
The Healing Power of Radium	398	Baseboards Unnecessary with Cement Floors	432
Lineman's Protective Shield for High-Tension Circuits	399	Electric Rammer for Big Guns.....	433
Hot-Air Shoe Drier.....	399	The Color of Warships.....	433
A Temporary Residence Section of Messina	400	Scotch Pipe-Line Built by Germany.....	434
A Pyramid of Oil Barrels.....	400	The Dehorning of Cattle.....	434
Train Dispatching by Telephone.....	401	Great Gun on Liffle Ship.....	435
Hat Deposit Box for Every Theatre Goer..	404	Curious Locomotive	436
New Idea for Mailing Tubes.....	404	Endless Chain Cross-Cut Saw.....	436
Logging Trestle in Washington.....	405	Twenty-Foot Hands for Tower Clocks.....	436
Human Body Encased in Solid Concrete....	406	Ship Intact After Seven Years' Buffeting...	437
Snakes Captured in Tangled Ball.....	406	Grinding Corozo Nuts for Valuable Oils....	437
Athletes Breathing Oxygen.....	406	Combination Baggage Car and Snow Plow..	438
Time-Signaling Attachment for Marine Whistles	407	First Type of U. S. Submarine.....	438
Effect of a Sleet Storm in Ohio.....	408	Whale Towed Up on Beach by Street Car...	439
Night-Signaling Auto Device.....	408	The Future of Aerial Navigation.....	439
England to Have Automobile Militia.....	409	Spraying Water for Turbine Plant.....	440
Beastie Bangles	409	Home-Made Mission Candlestick.....	441
Concrete Lamp Posts for Washington.....	410	Gasoline Passenger Car	441
An Italian Torpedo Boat Destroyer.....	410	Searchlights in Naval Warfare.....	441
Light Alcohol Fuel Locomotive.....	410	Electric Apparatus Produces Oxygen and Hydrogen for Brazing.....	443
Horse Made of Cavalry Equipment.....	411	Electricity Used to Capture Head Hunters..	444
A Fish that Is Nearly All Mouth.....	411	River-Bed Prospecting in California.....	445
Felling Big Trees in Oregon.....	412	Ancient Tree Destroyer	445
Surgical Gloves Put on by Machinery.....	413	Electric Ships for Atlantic Travel.....	445
Ingenious Mirror Scheme for Apartments..	414	Mechanical Section of Navy Electrical School	446
New Lake Steamer Has Many Novel Features	414	Church Built from Its Clay Excavation....	446
Kings and Aviators.....	415	To Christen Airships.....	446
Hung by Feet from High Flag Pole.....	416	The Basket Willow Industry.....	447
Electric Yacht Has Special Charging Boat..	416	Flexible Wire Mat.....	449
Iron Anvil Converted into Copper.....	416	German Dirigibles Equipped with Guns....	449
England's Greatest Battleship.....	417	How to Make and Finish a Magazine Stand	450
A Taxi-Vehicle of the Eleventh Century....	417	Oil Wells Rise from the Ocean.....	452
House Wrecked by Train Wreck.....	418	Instrument Makes Record of Automobile's Speed	452
Hop Picker Proves a Failure.....	418	Camel Corps of Indian Soldiers.....	453
Magazine for the Blind by the Blind.....	418	Holland Reproduces Hudson's Ship.....	453
Shackleton Almost Reaches South Pole....	419	Inexpensive Ice-Manufacturing Apparatus..	454
Zeppelin's Greatest Flight	420	Life Preserver Inflated with Liquid Gas... 454	
First Non-Magnetic Ship Ever Constructed	421	Maxim's Noiseless Firearm Invention.....	455
Train Wrecked by Cow.....	422	Sultan of Turkey to Have Cut Glass Stair-case	455
Historic Old Drum Head.....	422	Acetylene Lamps for Mines.....	455
Great Concrete Tank Built in Mexico.....	423	Aerial Fleets of the Powers.....	456
Hats from Paris.....	423	Moving a House with Traction Power....	456
Cutting a Ship Channel Through Rock River Bottom	424	A Thread-Measuring Reel.....	456
Wireless Room of U. S. S. "Gresham".....	426	German Aerial Torpedo.....	457
Quelling a Fire in Budapest Theatre.....	426	The Concrete Boat Bridge of Italy.....	457
Two Giant Fish Caught with Light Tackle	427	New Folding Umbrella.....	457
Soldiers to Administer Their Own Anaesthetic	427	Destroying Fog by Means of Electrical Discharges	457
Fixtures for High Candlepower Electric Lamps	428	Electricity* in the Navy.....	458
		Great Concrete Bridge for Cleveland.....	458

(Continued on Page 6.)

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The Motor Mail Coach Service of Montenegro	458
Wheel Attachment for Transporting Canoes	459
Landing a Camel from a Ship.....	459
Burning Coal and Oil Together.....	459
A Portable Church	460
Running 12 Miles an Hour in a Small Room	460
Editorial by H. H. Windsor.....	461
Cutting the U. S. Navy's Clothes.....	463
Moving Pictures as Court Evidence.....	463
A Desk Telephone Booth.....	464
Oiling Set for Automobiles.....	464
Lumps of Sugar Served in Packets.....	464
Folding Pocket Lantern	491
Protection for Concrete Curb Corners.....	491
Collapsible Tubular Fire Escape.....	491
New Type of Core Oven.....	491
Folding Hat Rack and Kneeling Stool.....	491
An Electric Current Bath Tub.....	491
Lumber Measuring Device.....	491
Corn-Cutter Attachment for Shoe.....	491
Automatic Window-Closing Device.....	491
A Patent Tent Peg.....	491
The Object Lesson of the Great Rush.....	492

SHOP NOTES.

Moving a Large Smokestack on Rollers....	465
Preventing Reel from Cracking Garden Hose	465
How to Tie an Upholsterer's Slip Knot....	465
Home-Made Wrenches.....	466
Protecting the Place of Wear on an Axe Handle	466
Tar Paper Used for Packing Rings.....	466
Holding Small Screws for Filing.....	466
Anchor for a Fence Post.....	466
Depth Gauge for Drilling in a Lathe.....	467
Moving a Bridge on Cables.....	467
How to Frost Window Panes.....	468
Concrete Ranch or Farm Entrance.....	468
Putting in a New Tailshaft at Sea.....	468
A Circular Saw Jointing Tool.....	469
Repairing a Galvanized Drain Pipe.....	469
How to Make Round Leather Belts.....	469
How to Turn Concaves on a Lathe.....	469
Spark Plug Tester.....	470
How to Draw Curves of Large Radii.....	470
Indicator for Water Barrels.....	471

Pumping Water with an Automobile.....	471
How to Bleach Sponges.....	471
Another Way to True a Grindstone.....	472
Steady Rest for Cutting-Off Tools.....	472
A Boiler-Maker's Holding-On Hook.....	472
Safe Moorings for Motorboats.....	473
Hardening of Steam Hose.....	475
Iron Rake Teeth Kept from Digging a Lawn	475
Preventing Stoppage in a Shavings Conduit	476
Boring Tool for Irregular Work.....	476
Expanding Mandrel for Small Work.....	476
How to Remove Broken Cap Screws.....	477
Roller Coaster for Handling Lumber.....	477
Home-Made Blower Head.....	477
Repainting Worn Dipper Teeth on a Steam Shovel	478
How to Make a Light Forging Hammer....	478
How to Plate on Wood.....	479
Enlarging the Capacity of a Mill Truck....	479
High Voltage Fuse Tongs.....	479
Repairing a Broken Vise.....	480
How to Make a Three-Wire Splice.....	480
Refrigerator Built of Concrete Blocks.....	480
Home-Made Weeders.....	481
A New Use for Old Cots.....	481
Bridging a Fence for an Automobile.....	481
An Unusual Telephone Buzzing.....	482
How to Make Black Wax.....	482
Handy Sack Filler.....	482
Design of a Growing Maze.....	482

AMATEUR MECHANICS

How to Make a Static Machine.....	483
A Concrete Swimming Pool.....	484
Old-Time Magic—Part III.....	485
A Chinese Outdoor Game.....	485
Home-Made Photograph of a Lightning Flash	485
How to Make Copper Trays.....	486
Photograph of a Clown Face.....	487
Finger Mathematics.....	487
Optical Illusions.....	489
Steam Engines Made from Gas Pipe and Fittings	490

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VII—Energy in Electric Circuit.	XIX—Alternating Current.
VIII—Calculation of Size of Wire for Magnetizing Coils.	XX—Automobiles.
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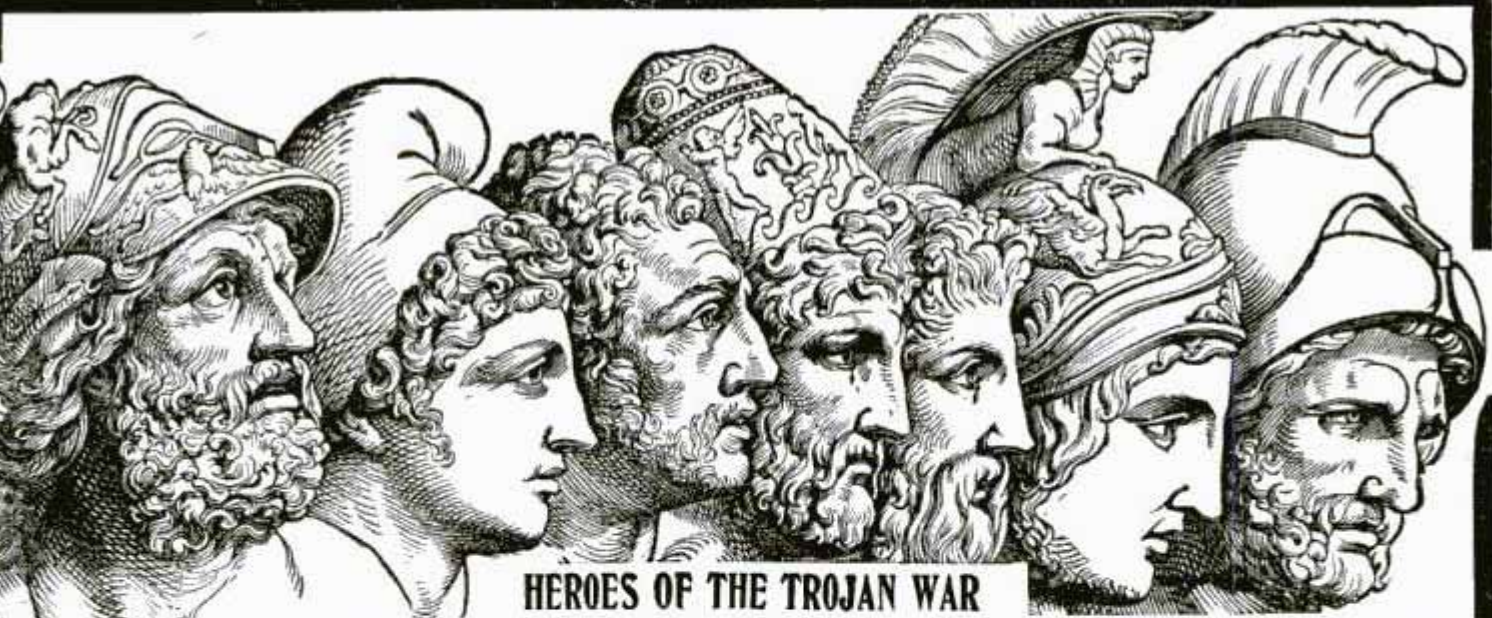
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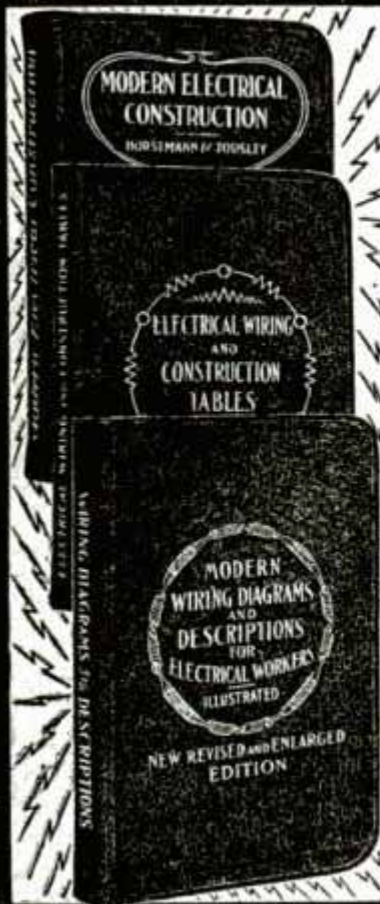
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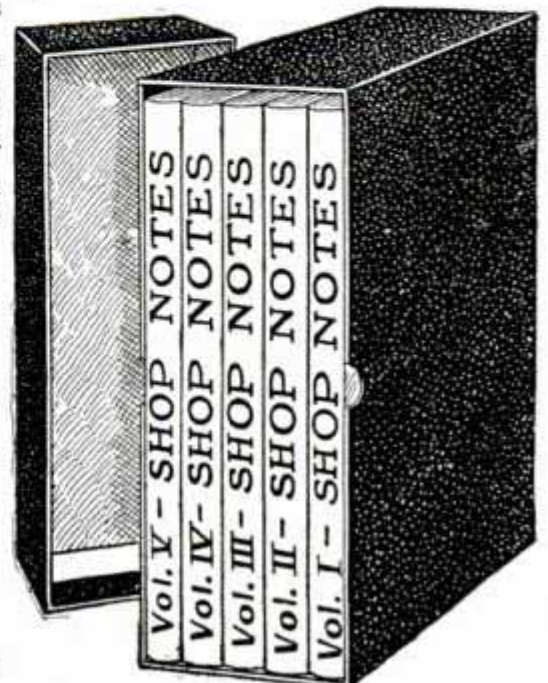
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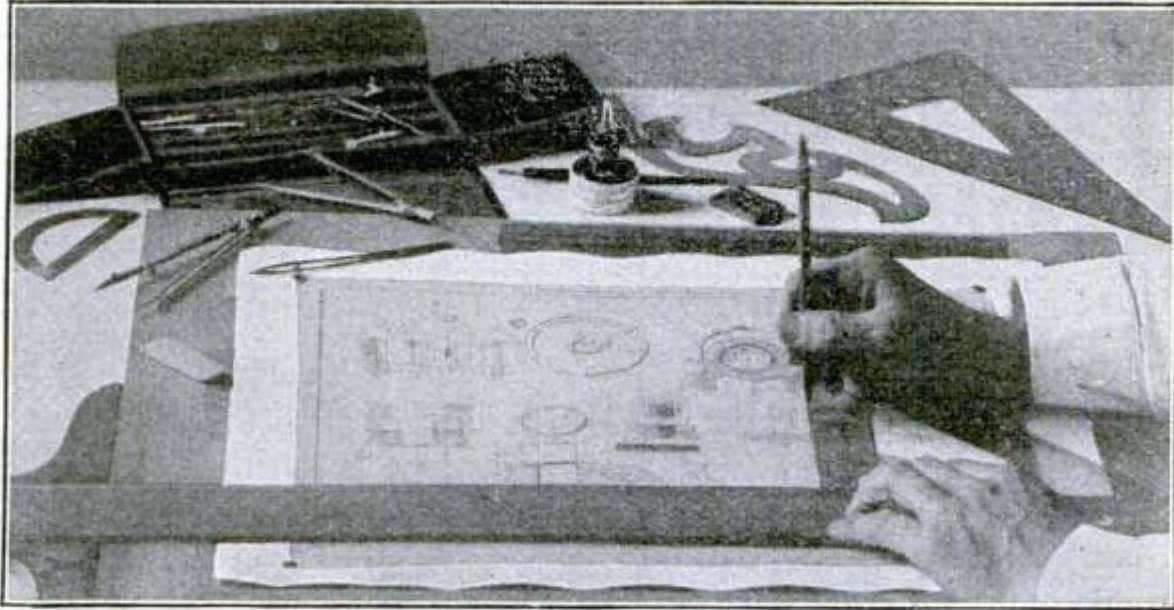
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500 per cent profit manufacturing and resilvering mirrors at home; send 10c for full printed instructions. Economy Chemical Co., Box M805, Ludington, Mich.

BIG MONEY—Start a dyeing, cleaning and pressing establishment, unlimited field, enormous profits; no capital needed. We teach you the secrets by mail. Particulars free. Ben-Vonde Co., Original School of Dyeing and Renovating, Dept. C, Staunton, Va.

PARTNERS FOR A NEVADA GOLD MINE! Legitimate mining is a business, not a gamble! We want the privilege of convincing you that our company is doing a legitimate mining business, developing a mine in one of the richest Mining Districts of this Golden State. We own a splendid property, well equipped with machinery—all paid for. 2,000 feet of underground workings in which a large tonnage of gold-ore is now in sight. We need to put up a milling plant to treat our ore, and for that purpose are offering some Treasury stock at 25 cents on the dollar. The company is managed by reputable business men; we want you to know who these people are, and why they have confidence in this proposition. We want you as a partner on a fair, square and equal basis with the rest to join us in this meritorious enterprise, which promises great riches for all. This is no fake or wild-catting; our mine and our people will stand the closest investigation. Send for our illustrated booklet, "The Absolute Truth About a Nevada Gold Mine." Correspondence solicited. O. M. Pudor, Secretary, Olinghouse, Nevada.

"MAKE RICE CRISP"—New confection; sells like wild-fire; enormous profit; machines, \$10 to \$20; big sample box "Rice Crisp" and literature, 10c. Shaw Mfg. Co., 900 Laguna St., San Francisco.

WILL SELL large line of Mechanics' Window Attractions. Something entirely new. European novelties; splendid opportunity to go in exclusive business, renting attractions to merchants; small capital; easily conducted anywhere. Attraction Co., 46 Great Jones St., New York.

I made \$50,000 in five years in the mail order business. Began with \$5. Any one can start a mail order business at home. Send for free booklet. Tells how. Heacock, Box 793, Lockport, N. Y.

BIG MONEY, any locality, operating or selling our Combined "Crystalets" Penny or Nickel Vending Machines. New idea. Lawful. Fine side line. Exclusive territory granted. Crystal Vending Co., P. Moneypeny Bldg., Columbus, O.

\$5,000 A YEAR can be made by using any of my 3 money-making formulas; sent upon receipt of \$1. Bernard Witsky, 442 Third Ave., New York City.

RARE OPPORTUNITY—2,140 acres placer, 25 miles from Nome; gravel averages, \$3 gold per cubic yard. Limited number of stocks for sale. Write me for particulars. A. Gillette, 712 17th St., Oakland, Cal.

\$3,000 TO \$10,000 YEARLY easily made in real estate business. No capital required. We teach the business by mail, appoint you special representative, assist you to success. Valuable book free. The Cross Co., 2634 Reaper Block, Chicago. See our other advertisements in this magazine.

FOR SALE—The Monroe Hotel, Monroe City, Mo. Three-story brick, eighty by ninety, four store-rooms on grade floor. Second and third floors a two dollar hotel. Two railroads—Burlington and Wabash; a new town in fine country. Income for past 5 years of this building one hundred and twenty-five dollars per month. Address owner, H. C. Sheetz, Palmyra, Mo.

WANTED—Good man to buy interest and take management of Bed Spring Factory; fine opportunity. Box 151, Independence, Ia.

make, teach or learn. Plan in detail 25 cents. J. M., ca The Press Co., Box 224, Elmira, N. Y.

LEARN CHAIR-CANING AT HOME. Octagonal typ family, profitable employment for every member of the family. Large demand for this work in every community. We teach you by mail. Send 2c stamp for further information. The R. B. Strong Instruction Bureau, Desk 1 Homer, Mich.

EARN MORE MONEY! "The Booster Magazine" put you "next" to a 600 per cent profit mail order business and an automatic press proposition actually paying you \$65 weekly. Other big features galore. In a class by yourself. Get out into the sunshine. Quit "grinding"! "Booster" starts you. Two months' trial, 10 cents. Z. M. Budick, 351 Dearborn St., Chicago.

LEARN to make raised letter signs! I paid \$5 for instructions. Had them printed, and will send copy, giving full instructions for 10c. Victor Hermann, 4319 Michigan Ave., Chicago.

MY BOOK, "Building a Business," tells how mail order agency business can be started with capital of \$50 to \$100 and make several thousand dollars annually. It's free. Robert Hicks, St. Louis, Mo.

IF you intend to go into business, send for my free prospectus and start right. Franklin Norway, Cleveland O. Lock Box 123.

LADY of means to back young inventor and writer for half interest, references, proofs. Sloan, 255 Pacific St. Brooklyn, N. Y.

SEATTLE AND ALASKA INFORMATION—For reliable information concerning business opportunities, investment or other legitimate matters in Seattle, Wash., or Alaska send \$1 to Palmer & Bean, 211 Mehlhorn Bldg., investment bankers, Seattle. References.

IF YOU WANT to buy, sell or exchange anything, anywhere, write The Traders' Exchange, Box 224, Troy, O.

FREE TO LEGITIMATE INVESTORS—How to make money in legitimate mining, with investment of few hundred dollars in proven mining propositions. Address A. R. Perry, Empire, Colo.

WE START YOU in a permanent business with us and furnish everything. Full course of instructions free. We are manufacturers and have a new plan in the mail order line. Large profits. Small capital. You pay us in three months and make big profit. References given. Sworn statements. Pease Mfg. Co., 1011 Pease Bldg., Buffalo, N. Y.

NOTICE—MANUFACTURERS. We want live novelties to introduce in Old Mexico. Nothing but general agencies considered, as our agents cover republic. Give full particulars. Stoner & Ball, Salvatierra, Gto, Mexico.

INCORPORATE FREE, pay expenses; we take stock for services. Listed Securities Co., Elmira, N. Y.

AGENTS—\$300 every month selling our wonderful 7-piece Kitchen Set. Send for sworn statement of \$12 daily profit outfit free. Thomas Mfg. Co., 305 Home Bldg., Dayton Ohio.

DON'T SLAVE FOR OTHERS. Reap the benefits for yourself. Fortunes made operating automatic penny weighing machines. Our scale speaks your weight. Write for Talking Scale circular. The United Vending Machine Co. 629 Caxton Bldg., Cleveland, O.

MY NEW STORE necessity is better than a telephone. Sells better than cash registers or scales ever sold. Sell for \$50 to \$1,000. Your ability alone limits your possibilities. Salesmen, Territory Managers and Local Agents wanted. Ref. First National Bank, Chicago, M. L. Piere, 183-189 Lake St., Chicago.

START MAIL-ORDER BUSINESS—Sell goods by mail cash orders, big profits conducted by anyone, anywhere we supply everything. Our plan positively successful satisfaction guaranteed. Write for free booklet and sample catalogue. Central Supply Co., Kansas City, Mo.

AGENTS make \$103.50 per month selling wonderful self-sharpening scissors and cutlery. V. C. Giebner sold 2 pairs in 3 hours, made \$13; you can do it. We show how. Free outfit. Thomas Mfg. Co., 49 Home Bldg., Dayton Ohio.

"DOLLARS & SENSE" FREE! Col. Hunter's great book free with Advertisers' Magazine one year at 50 cents. Indispensable to business men who advertise. Best "A School" in existence. Three months' trial subscription, 1 cent. Advertisers' Magazine, 747 Commerce Bldg., Kansas City, Mo.

AGENTS WANTED

TAKE LIFE EASY. Use a Receiver-Holder on the telephone. Works automatically. Releases the left arm. Good territory to men with a little capital. Acme Co., Box 688 Spokane, Wash.

WIDOW HANDKERCHIEFS. The joke of the season. 'Nuf said.' 25c. postpaid. Ewin's, Decatur, Ill.

TART a mail order business at home. 25c orders, 23c dit. Instructions, 10c. Mutual Exchange, 71½ N. High, Columbus, O.

ISK 1 CENT—Make \$2,200! Korstad did it in 2 weeks. Hundreds making phenomenal earnings the "Allen Way." A man, \$2,300 in 60 days—Langley, \$115 first day—Reese 60 people, sold 55; result, \$320. We start you—experience don't matter—credit given. Strange apparatus. As every home bathroom for \$5. Energizes water. Causes almost automatically. New, exciting business. Ask 1 cent—a postal—for proof. Allen Mfg. Co., 207 Adams, Toledo, O.

AGENTS—Manufacture your own Chemical Polishing Cloth, or Absorbent Dust Cloth. Either process, \$10. Large L. Cook, Milford, Mass.

NOTHING like them, or even similar, ever before sold by agents or otherwise. Two absolutely new, unique household necessities (one for kitchen), retailing for 75 cents and two dollars. Both innovations that captivate housekeepers; one, also, strongly appeals to men. Partial tests proved sale nearly every house. We are inventors, manufacturers and sole distributors. Supplies can be obtained from no other source. Large profits for agents, either sex. Don't forget these articles are new, distinctly our own, and possess rare selling qualities. Write today. Boyle & Co., Box 356, Centerville, Mo.

MONROE'S BURGLAR ALARMS keep 'em out. Univer- demand. Agents coin money. Sample, 50c; dozen, \$3. Sent for sale. Monroe, 1726 Broadway, Denver, Colo.

UR SIMPLEX peanut venders (penny in the slot) sold from 200 to 1,000 per cent profit. Write for circular prices. The Simplex Co., 214 McGill Bldg., Washington, D. C.

WE want an agent in every town or county to sell "Laddin," the wonderful kerosene mantle gas lamp; burns grade kerosene, producing light superior to gas or electricity. Agents readily clear \$35-\$50 per week. Salesman's complete outfit, \$4. Exclusive territory. Mantle Lamp Company, Dept. 28, 72-80 N. May St., Chicago.

TO see it is to buy it. We want agents for our up-to-date faucet filter; needed in every kitchen; easy to carry. Agents; sample, 25c; particulars free. Gem Mfg. Supply Co., Dept. 31, La Jolla, Cal.

21,500 made in 3 years by one of our agents; another, \$500 since Sept. 5th; another wins presidency of \$2,500, corporation; all making \$50 weekly and up, easily; fascinating, glorious, permanent business. No investment, experience, canvassing required. Oxygenator Co., Dept. 39, Buffalo, N. Y.

WE have an absolutely new advertising scheme by which an agent can net \$50 to \$100 in his own town for two or three days' work. Every merchant is glad to get in on it. Particulars for stamp. Ellis Furn. Co., Kokomo, Ind.

JUST OUT—Low-priced, 3-lb. mop; turn crank to wring; wash hands; women all buy; 150 per cent profit; catalog free. Exclusive territory. U. S. Mop Co., 588 Main St., Buffalo, N. Y.

1.50 for Carborundum non-heating grinder, sent prepaid. Best paying agency line on market. Everybody buys. D. C. Bros. Co., Milwaukee.

AGENTS may make a good continuous income selling line of imports; experience unnecessary; send 10c for samples and full instructions how to start work; also our complete credit plan to agents; exclusive territory; be the first in your section to start; we have agents making from \$10 to \$25 weekly. Brown Novelty House, Dept. C, Lamontville, N. J.

JUST OUT. Our wonderful whip-top is a dandy. It will amuse for hours. Great amusement for old and young. Sent by mail for 15c. We are sole agents for them. Our 168-page catalogue free with order. Crown Jewelry & Novelty Co., Watertown, N. Y.

METALLIC SIGN LETTERS for store and office windows. Easily applied. Many kinds. Catalogue free. P. Johnston & Co., Quincy, Ill.

AGENTS—Here's a winner: Magic needle threader; leads needles in the dark. Sample, 10c, with illustrated catalogue. Keim Mercantile Co., Box 142, Malden, Mo.

AGENTS, MEN AND WOMEN. We manufacture hosiery; placed free when hole appears. Easy sales. Large profits. Sole or part time. First reply obtains sole agency, your money. Triplewear Mills, Dept. D, 724 Girard, Phila.

3 FOR DIRT. Cleans everything. An article everybody needs. Send 10c for a can. Agents wanted everywhere. Bliss Chemical Co., St. Louis, Mo.

PERFECTION MILK BOTTLE OPENER and cover, 15 cents. Freeman & Richards, Box 866, Buffalo, N. Y.

AGENTS wanted for the most rapid selling household article on earth. Every woman buys on sight. Goods sell themselves. Write today. A. H. Cook, 13½ Arnold St., Buffalo, N. Y.

PERFUME vending machine. Sure winner. Penny play and assures good steady income on small investment. The DeGraff Co., Minneapolis, Minn.

LIGHTS—Stores, offices, residences, grounds lighted with greatest and cheapest light known. Agents wanted. Knight, Box 42, Montgomery, Ala.

WANTED—General agents to handle irrigated lands in small tracts and on easy payments. None but competent and energetic men need apply. Write at once. Truck Growers' Colonization Co., Washer Bldg., San Antonio, Tex.

SOAP CLUB LADIES—Write for our club plan and catalogue showing handsome premiums for a few hours' work. Address Factory to Family Agency, Urner's Arcade Bldg., Baltimore, Md.

SEND A DIME—coin or stamps—for a sample of "Just-Pull," the greatest electric light attachment on the market. A child can operate it. Easy money. No labor attached to the selling. Takes one minute to show it; can't get out of order; sells on sight for 25c. 100% profit. 2,000 sold to consumers at Chicago Electrical Show. Send ten cents for sample and full descriptive matter by return mail. Premier Novelty Company, Dept. A, 42 River St., Chicago.

AGENTS—14 tools in 1, made of tempered steel. Most useful tool ever invented. Lightning seller. Big profits. Nothing like it. Sample and terms, 10c. Advertising agents write. Novelty Mfg. Co., Dept. P, 620 N. Third St., St. Louis, Mo.

AGENTS, TEACHERS, STUDENTS—Here's your opportunity for coming vacation time. Five dollars daily easily made selling new household articles that reach every home. No capital required. Dexter Supply Co., 1110 Caxton Bldg., Chicago.

AGENTS—NEW AUTOMATIC CURRY COMB and other self-sellers. Big demand. First applicants control unlimited sales. Large profits. Write for proof and trial offer. Clean Comb Co., Dept. P, Racine, Wis.

AGENTS COIN MONEY selling our 25c Perfection Cherry Seeder. Send 10c for sample and agent's prices. Act quick; season short. Reed Novelty Co., Box 500, Springfield, Ohio.

AGENTS—Men's and Women's Handkerchiefs from the factory to the consumer, through you. For 75 cents we send you prepaid nine sample handkerchiefs of Pure Linen and Fine Lawn (wholesale prices) and full working particulars. Money returned if plan don't suit. Republic Mfg. Co., 202 Greene St., New York. Reference, Dun's or Bradstreet's.

STOP! Liberal credit extended; also big commission to agents handling our Fancy Goods, Linens, Embroidered Patterns, etc. Schwartz Importing Co., 500 Jacobs Bldg., St. Louis, Mo.

OUR AGENTS make big money handling our household specialty. Very fast seller. Southeastern Specialty Co., 33, Mattapoisett, Mass.

NON-ALCOHOLIC Food Flavors (Extracts). Endorsed by U. S. Government as "Best Made." Agents wanted. Shipman, Lewis Block, Buffalo, N. Y.

PERFUME—Gloss in starch. Gives clothes lasting perfume of Azure Violets and makes them white as snow. Agents wanted. Samples, 4 cents. Shipman, Lewis Block, Buffalo, N. Y.

AGENTS, \$50 WEEKLY—We manufacture the best needle case in the country; a wonderful seller; 500 easily carried; 200 to 600 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" envelope does the work; we prove that our general agents can make over \$100 weekly; particulars free; 25c sample for 10c; satisfaction guaranteed or 10c refunded. Paty Needle Co., 102 Union Sq., Somerville, Mass.

AGENTS MAKE \$125 to \$140 month. Send 25c for sample and circular. Echo Manufacturing Co., 330 First St., Butler, Pa.

WANTED AGENTS—\$10 per day selling our water strainers. Every water faucet needs one. Send 25 cents in stamps for sample. Address J. Harding & Co., South Bend, Ind.

A NEW INVENTION—The best yet. Self-Heating Flat Iron beats them all. When housewives see one operated they buy. Only two movements necessary to operate them; no pumping; no tank in the way. Big money can be made. Call or write for territory. Manufactured by M. L. Schlueter, No. 34 S. Canal St., Chicago, Ill.

LEGITIMATE substitute for slot machine, price \$1, nets dealer \$4.55 cash and sells \$7.25 trade; no cash paid out. A big trade stimulator. Write for particulars. Agents wanted quick. United States Novelty Co., Duluth, Minn.

UNUSUAL OPPORTUNITY for agents on a 25c article; particulars and small sample free. Bayro Company, 447 Bagg St., Detroit, Mich.

HERE'S A WINNER. Pair self-sharpening shears (quality guaranteed) and patent egg separator for 35 cents prepaid. Order today. Agents wanted. Ideal Supply Co., Dept. 6, Akron, Ohio.

AGENTS, DON'T FOOL YOUR TIME ON DEAD ONES. Anyone earning less than \$50 weekly, wake up. One Texas agent made 100 sales in 1½ days; profit \$30. Another in West Virginia 61 sales in 9 hours; profit, \$18.30. Another writes "he gets 9 orders from 10 homes." Davis agents will do even better than ever with our new spring proposition, giving a \$1.25 premium free with each 50c sale. "Get next" quick. No middleman's profit. Each day's delay means \$10 lost. Write now. Davis Soap Works, 80 Union Park Ct., Chicago.

YOU CAN EARN \$200 per month operating and selling the "Wonder Photo Cannon." Everybody wants to wear a photo button. They sell for 10c each; cost 2c. No experience necessary. Complete outfit, \$30. The Chicago Ferrotyping Co., Room 114, Ferrotyping Bldg., Chicago, Ill.

AGENTS—Coin money with "new scheme" for selling post cards. Big money. No experience or talking necessary. Write for big proposition. Gala Supply Co., Gala, Va.

BE INDEPENDENT. Nearly all profit. Enclose ten cents for four samples and particulars. Isaac Jones, 619 E. Cheery, Nevada, Mo.

WANTED AGENTS for most rapid selling household specialty on earth. Profits enormous. Write today. Carter Sales Company, 111 Broadway, New York.

AGENTS, STOP PEDDLING. When tired of ringing doorbells and dodging the dog send for our free prospectus and start a business of your own. Something unusually "alive" for you. Details for stamp. Pierce Supply Company, Fremont, Neb.

AGENTS, LOOK! Women and Men. We have just added four new big sellers. Rockford, Ill., agent worked 3 days, then ordered 100 doz. Write for particulars and \$2 free offer. Fair Mfg. Co., Box 147, Racine, Wis.

\$3,000 yearly positively made introducing and appointing sub-agents for patented Fire Tube. Grand opportunity for live men. D. & D. Chemical Co., Dept. 74, San Francisco, Cal.

WANTED—Agents, machinists, toolmakers, draftsmen, attention! New and revised edition Saunders' "Hand Book of Practical Mechanics" now ready. Machinist says, "Can't get along without it." Best in the land. Shop kinks, secrets from notebooks, rules, formulas, most complete reference tables, tough problems figured by simple arithmetic. Valuable information condensed in pocket size. Price, postpaid, \$1.00, cloth; \$1.25, leather with flap. Agents make big profits. Send for list of books. E. H. Saunders, 216 Purchase St., Boston, Mass.

AGENTS—\$75 monthly. Combination Rolling Pin. Nine articles combined. Lightning seller. Sample free. Forshew Mfg. Co., Box 248, Dayton, O.

THE LIGHTNING MULTIPLIER POST CARD will solve problems in multiplication quick as a flash, with absolute accuracy. Indispensable to every person who uses figures. Cannot get out of order. Send for one, and you will wonder how you ever got along without it. Agents wanted. Sample, 10 cents in stamps. The Simplicity Co., Chicago.

IF THERE WERE NO TELEPHONES in your territory now, and you had the exclusive right of selling them there, your proposition would not be as good as one I have to offer you now, if you are the man or men. References First National Bank, Chicago. M. L. Pitner, 183-189 Lake St., Chicago.

AGENTS make big money selling our new sign letters for office windows, store fronts and glass signs. Anyone can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 77 N. Clark St., Chicago.

MEDALLIONS SELL AT SIGHT. 300% to 500% profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 366 W. Randolph St., Chicago.

WANTED—Capable agents to handle new, high grade, up-to-date articles; lightning sellers in all homes, offices, stores, shops, \$3 to \$10 dally guaranteed. Promotion assured. Thomas Mfg. Co., 1301 Home Bldg., Dayton, Ohio.

EXCEPTIONAL OPPORTUNITY for energetic solicitors with grit and selling power. Article absolutely new and guaranteed. Tremendous seller. Everybody buys if shown. 60c to \$2 profit each sale. Virgin field awaits hustlers everywhere. Write today. Sanitax Co., 2309 Wabash Ave., Chicago.

NEW ART—Fascinating, rapid money maker. You can decorate china, burnt wood, pillow tops, anything, plain or colored from photographs. No talent required. Send stamp for information. D. L. Vallance Co., Elkhart, Ind.

WALL CLOTHES DRYER, Grand Seller. Particulars Free. Adjustable Clothes Dryer Co., Leipsic, Ohio.

JUST PATENTED, Young's Button Hole Gauge Knife. Nothing like it. Every woman wants one. One agent sold 107 at 25c each in one day, made \$13.37. Fifteen other useful rapid sellers. A. M. Young & Co., 10 Young's Bldg., Chicago.

AGENTS are coming money selling our great combination tool, the Washington Hatchet. Ten tools in one. Sells a sight to farmers, housekeepers, storekeepers, etc. We can show you how to make from \$3 to \$10 a day; experience unnecessary. Write today for our agents' offer. E. Thomas Mfg. Co., 120 Barney Block, Dayton, O.

AGENTS. \$100 monthly easily made handling one of more of our 350 fast sellers. Scheff Co., 640 Wells St. Chicago.

WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stained glass. Easily applied. Something new for agents. Big money maker. Sells a sight. Samples of this paper with catalogue in colors sent on receipt of 10c. S. H. Parrish & Co., Lakeside Bldg. Chicago.

AGENTS: Our Dashboard Line Holder will make you rich. Just shipped Texas agent 10 gross, being 3rd order in 30 days. Sample, 30c, silver, prepaid. Wholesale Supply Co., Dept. 15, Valdosta, Ga.

STIKPATCH MENDS STOCKINGS quicker and better than darning, wears longer, will wash. 20 patches, 10¢ postpaid. Agents write for terms. Excellent profit. Sell on sight. The Stikpatch Co., Box 3294, Dept. C, Boston, Mass.

AGENTS—Sell Patented Radiumite Self-Honing Strop. Just being put out as an agency proposition. Strop covered by 16 patents. A \$2.00 razor given free with every strop sold. Strop retails for \$1.50. Millions being sold and agents coining money. Throw away old, worn out propositions for something new and salable. F. J. Kin made 33 sales one Saturday afternoon in two hours. Outfit free. Thomas Mfg. Co., 904 Home Bldg., Dayton, Ohio.

GET BUSY. Ventilating burglar locks. Windows locked with 6 inch opening. 15c each; 4 for 50c. Agents wanted Cannon Mfg. Co., 1522 Kenmore Ave., Chicago, Ill.

AGENTS—MAKE \$10 per day metallizing flowers, leaves, insects, etc., at home. Shape and beauty, as in life. Big sellers. Original formula, 25c. Etna Novelty Co., Box 134, Seattle, Wash.

PORTRAIT AGENTS—Will make you first-class enlarge portraits with frame, glass and back, complete, F. O. B. Chicago, thirty-seven cents. Hot sellers at \$1.98. Chicago Copy Company, 425 Milwaukee Ave., Chicago, Ill.

DOLLARS in horse sense and new patented, unbreakable Harness Klingsnap. Agents make over 200 per cent of retail and 50 per cent on wholesale orders. Sales made in one minute. Sample pair by mail, ten cents. Pease Mfg. Co., Dept. G, Cincinnati, Ohio.

THE YALE DOLLAR ADDING MACHINE is a big seller for agents and M. O. men. Made of steel, nicked. Over 2,000 in U. S. postoffices. No competition, new model just out. If you want a business proposition, no fake, write for agent terms. Yale Mfg. Co., Sales Dept., Newark, N. J.

AGENTS WANTED everywhere, to sell our newly patented pencil holders for telephones. Enormous quantities being sold. Exclusive territory given. Liberal terms. Sample, 10 cents. The Wm. W. Bythiner Mfg. Co., 30 Race St., Philadelphia, Pa.

AGENTS—Portraits, 35 cents; frames, 15 cents; sheet pictures, 1 cent; stereoscopes, 25 cents; views, 1 cent. 30 days' credit. Samples and catalog free. Consolidated Portrait Co., 172 W. Adams St., Chicago.

MALE HELP WANTED

A SPECIAL SALESMAN in every county; \$150 to \$400 per month; high commission; exclusive territory for Sautary Carpet Renovator, which cleans and sweeps at the same time; easier and faster than a broom; no dust; cleaner and cheaper than a carpet sweeper; disinfects, purifies, cleans and sweeps in half the time of any method now in use; state what you have sold; samples loaned to salesman; sending reference from good merchant. Sales Manager 122 Sycamore St., Milwaukee, Wis.

WANTED RAILWAY MAIL CLERKS. Examination everywhere May 15. Over 2,000 appointments. Salary \$800 to \$1,600. Short hours. Annual vacation. No layoff. Common education sufficient. Country residents eligible. Candidates prepared free. Write immediately for schedule Franklin's Institute, Dept. E 22, Rochester, N. Y.

SALESMAN—CARRY SHINEQUICK SILVER polish a side line; 40% commission. Shinequick Mfg. Co., Detroit, Mich.

WANTED SKILLED MECHANICS—We have calls dall for skilled mechanics. If ambitious and seeking to better your condition, write us. Many new industries in the west offering good positions in the skilled and mechanical line. National Reference & Investment Co., 574 Brandeis Bldg., Omaha, Neb.

the making of glass and who can make tests of and for glass making purposes. Have large sand deposit for transportation and large city. If sand will make good little grade glass can show an excellent opportunity to right man. Address F. C. S., care Apartado 1656, Mexico City, Mexico.

WANTED—Railway Mail Clerks. Salary, \$800 first year. Examinations everywhere May 15. Preparation free. Franklin Institute, Dept. E 22, Rochester, N. Y.

BOYS AND GIRLS earn money selling our "Play Coin." Liberal commission. Sample box, 30c and 40c postpaid. Greenwood Supply Co., P. 393, Yonkers, N. Y.

MEN TO CONTRACT and paint roofs, skylights and chimneys. Paint guaranteed to stop all leaks. Easily applied. Very profitable. The Taylor Paint Co., Mansfield, Ohio.

WANTED—Railway Mail Clerks. Salary, \$800 to \$1,600. Examinations everywhere May 15. Common education sufficient. Country residents eligible. Candidates prepared free. Write immediately for schedule. Franklin Institute, Dept. E 22, Rochester, N. Y.

MEN, get out of the rut. Write for particulars. New Remedies. L. Eastwood, Mgr., 8 Fenner St., Pawtucket, R. I.

AUTOMOBILE SUPPLY SALESMEN—Our specialties sell. We teach the business thoroughly. Profits enormous. J. Coyne, 595 Albany Ave., Chicago.

WANTED—Railway Mail Clerks, Custom House Clerks. Salary, \$800 to \$1,400, payable twice each month. Examinations will be held everywhere on May 15 by the United States Civil Service Commission. Over 2,000 appointments will be made from these examinations. Common education sufficient. Political influence not necessary. Country and city residents stand equal chances. Short hours and annual vacation with full salary are absolutely certain. Government employees are never "laid off" because of poor grades. We prepare candidates free. Write immediately for free catalogue and schedule of examinations. Franklin Institute, Dept. E 22, Rochester, N. Y.

WANTED—A good, live man in every city and county to act as salesman to handle our standard electric lamps. Address at once Manager of Sales, 414 Buhl Block, Detroit, Mich.

PICTURE Agents, Look! Bromides, 25c; albumens, 30c; low tops, 35c; crayons, 40c; pastels, 60c; new sheet pictures, new small-sized portraits and frames. Write today. Franklin Art Association, Dept. 76, Chicago.

WANTED—Railway Mail Clerks, Custom House Clerks. Examinations everywhere May 15. Yearly salary, \$800 to \$1,600. Short hours. Annual vacation. No layoffs. Salary absolutely certain twice each month. Over 2,000 appointments to be made during 1909. Country residents eligible. Political influence not necessary. Common education sufficient. Candidates prepared free. Write immediately for schedule. Franklin Institute, Dept. E 22, Rochester, N. Y.

OFFICE MANAGER for your home city; \$500 required; liberal salary and commission. Lock Drawer 551, Port Townsend, Wash.

SALESMEN WANTED to handle our line of specialties. Liberal commissions paid. If you are able to furnish addresses we would be pleased to hear from you. Hagstrom Bros. Mfg. Co., Lindsborg, Kan.

BIG MONEY FOR BIG PEOPLE—We want real, hustling, high-class managers and salesmen to sell in quantities the best and only combined Burglar Alarm, Lock and Latch; found to be indispensable to every house, flat, store and territory in the country; liberal permanent contracts in rich territory; competition eliminated; results immediately; the field untouched; possibilities unlimited. Troetzel Burglar Alarm-Lock Co., Dept. F, 311 West 59th St., New York.

GOOD PAYING SITUATION open, men and women, cash weekly, copying and checking our advertising material at home for your locality; spare time; no canvassing; send stamp. Pandora Mfg. Co., Dept. C, London, Ont.

WANTED—Responsible men and strong boys at Los Angeles. Fair pay while mastering trade of plumbing, bricklaying or electricity in months instead of years. No expense for instruction. Write quick. United Trade School Contracting Co., Los Angeles, Cal.

WANTED—Railway Mail Clerks. Salary, \$800 to \$1,600. Examinations everywhere May 15. Common education sufficient. Candidates prepared free. Write immediately. Franklin Institute, Dept. E 22, Rochester, N. Y.

SALESMEN—We want a man in every town and village to look after new and renewal subscriptions to Practical Engineer, the popular power plant monthly. Read exclusively by the Superintendents, Engineers and Master Mechanics of steam and electric power plants. Subscription price, \$1 a year. You can devote all or part of your time to the work and make big money. See display ad. on page one of this issue, then write for our liberal offer to agents. Technical Publishing Company, 357 Dearborn St., Chicago, Ill.

a first class line of perfumes, extracts and toilet requisites. We advertise extensively and our agents earn big commissions. We give credit. Write today. Dept. P. M., box 200, Rochester, N. Y.

AGENTS WANTED for our new 25c Darning Machine; just out. Weaves new heel or toe in sock in a few minutes. One agent sold 288 in one day. Send 15c for sample or \$1.25 for doz. Hutton Co., Walnut St., Desk 2, Philadelphia, Pa.

WANTED

MOTORS, 2 hp. down, D. C. and A. C., 60-cycle. 405 St. Clair, N. E., Cleveland, O.

ANYONE in position to manufacture folding umbrellas or supply parts for same, address H. P. Petersen, 312 S. State St., Waupaca, Wis.

HAVE you a motorcycle, printing press, camera, kodak, auto, engine or moving picture machine. Write, giving lowest cash price, description or photo. G., 418 S. Fifth St., Louisville, Ky. Make a list of what you have to sell.

JOB WANTED by young man of first-class mechanical ability driving and caring for gasoline automobile. Temperate habits. References. State full particulars and terms. Box 29, Montrose, Kan.

WANTED TO BUY—Second-hand engine lathe and tools, gasoline engine 2 to 4 hp., and other machinery suitable for motorcycle, bicycle and automobile shop. Hultz & Co., Toluca, Ill.

OPEN launch, good condition; describe boat, engine and where located; must be cheap. Apply Boating, Box 339, New Orleans, La.

CAPITAL WANTED—Must have some funds to protect with foreign patents and to complete a new speed boat using air for buoyancy. Can show full-sized model boat. The right party can secure a good thing. B. Settergrau, care John Gubbins, 84 La Salle St., Chicago.

WANTED—Picture Shows, Passion Plays, Kinetoscope, \$24. Lists, stamp. Fred L. Smith, Amsterdam, New York.

WANTED A PRESS—To print steel and wood signs with paint, or wish to hear from parties that can make same. S. G. Pearl Co., Saginaw, Mich.

WANTED—Paid up course I. C. S. Complete Gas Engine operating or text books for same. A. E. Keyser, Chattanooga, Tenn.

WANTED—To purchase a small manufacturing plant in part or full. Frank L. Higgins, Shelby, Ohio.

WANTED—SECOND-HAND lathe, hollow spindle, 18 in. 8 ft. Also single-cylinder Cadillac engine or parts. Must be cheap. Fred B. Burton, Janesville, Wis.

WANTED—To buy your patent or will manufacture and sell on a royalty. Send copy of patent and lowest cash price. We are in the market for good things only. The Alliance Specialty Mfg. Co., Alliance, Ohio.

YOU to list your machinery, motorcycles, automobiles, machine shops—in fact, everything of value—with me to sell. My terms are reasonable and results unexcelled. M. C. Suttle, McLeansboro, Ill.

WANT TO BUY or Exchange—Mound builders' or Indian stone relics. Erich Zager, Clarence, Iowa.

WANTED—National Tube Co.'s Book of Standards, second-hand Kent, Supplee, Trautwine, also Eastman Kodak No. 3-A. J. Bendel, Arizona Commercial Copper Co., Globe, Ariz.

WANTED—TO BUY, wire wound auto boilers, any condition if one end is good. J. L. Lucas, Bridgeport, Conn.

FOR SALE

FLUTE—Key D; 13 keys; cost \$16; with case, \$8.50. R. L. Andrews, Onawa, Iowa.

BLUEPRINTS for 2-cylinder, 2-cycle, 10-hp. marine gasoline engine, \$1; 3/8-hp. 110-volt, single phase, 60-cycle induction motor, 25c. Plans complete in all details. Pacific Coast Electric Co., Portland, Ore.

FOR SALE—One 2-hp. motorcycle engine, complete, \$20. Two long distance telephones, \$10. Air compressor, \$10. Geo. Heltsch, 15 School St., Pontiac, Mich.

FOR SALE—Complete sets of castings 4-cylinder, 35-hp. gasoline engines, crankshaft included, \$50. Blueprints for 25 cents. Robert Perrine, 4066A Olive St., St. Louis, Mo.

FOR SALE—Set I. C. S. Civil Engineering Books. C. S. Bryan, Conyers, Ga.

BUILD YOUR BOAT or automobile engine. Blueprints, 50c. All kinds of drawings made; price reasonable. Lentz Blueprint Co., 108 W. 7th St., Covington, Ky.

FOR SALE—A 1-hp. gasoline engine, four-cylinder, four-cycle, complete with "Ball's" reversing gear for boat; worth \$300 if new; positively in A1 condition; must be sold for \$80. Also 1½-hp. stationary air-cooled, four-cycle; in good condition; cheap. And have others. Gas Engine Co., Box 363, Norwich, Conn.

FOR SALE—1-hp. gasoline engine; 1-hp. steam engine, boiler, fittings; also dynamo. T. Bowman, 5213 Carpenter St., Chicago.

GRAPHITE RESISTANCE UNITS, 50 ohms up, 15 cents. L. Miller, 382 Brooklyn, Detroit, Mich.

TALKING MACHINES, \$2 to \$75; records, 10c; bicycles, sewing machines, typewriters. Knight's, 219 12th St., St. Louis, Mo.

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FOR SALE—4x5 camera and complete outfit. Fred J. Kappler, 1146 22d St., Moline, Ill.

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IDEAL lawn mower grinding machine. Geo. Trine, Paulding, O.

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FOR SALE—A 1-hp. gasoline engine, four-cylinder, four-cycle, complete with "Ball's" reversing gear for boat; worth \$300 if new; positively in A1 condition; must be sold for \$80. Also 1½-hp. stationary air-cooled, four-cycle; in good condition; cheap. And have others. Gas Engine Co., Box 363, Norwich, Conn.

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FOR SALE—A story reprinted from Popular Mechanics entitled "The Troubles of the Trouble Hunter," by C. H. Carter. Consists of amusing solutions of serious difficulties—why pumps, air compressors and gas engines sometimes don't operate. Five cents a copy, postpaid. Popular Mechanics, 225 Washington St., Chicago, Ill.

THREE GRAPHOPHONES and about 100 records, all new, very cheap, to close the business. G. H. Damon, Victor, N. Y.

FOR SALE—Fine German microscope complete with oil immersion and other objectives; eyepieces, and substage attachments. Worth \$150; \$75.00 takes it now. H. H. Brancher, Emporia, Kan.

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FOR SALE—One 2-hp. Leighton, one 3-hp. Wonder, one 4-hp. Brown, one 7 to 10-hp. Erd motors, all in perfect condition; also one 25x5 hunter cabin boat, slightly used, equipped with a new 3-cylinder 12-hp. "Syracuse" and two 1907 model Syracuse motors; every one a snap. Syracuse Gas Engine Co., E. Genesee and Cherry Sts., Syracuse, N. Y.

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INTERNATIONAL Correspondence School Steam Electric course to exchange for Motorcycle. Roy Milloy, Kearsley House, Flint, Mich.

If you want to buy or sell an I. C. S. or A. S. C. course or bound volumes, it will pay you to get my terms. M. C. Tuttle, McLeansboro, Ill.

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FRICION transmission, nearly new, transmit, 10 hp., \$10. Michigan Special Universal Joint for 1-in. shaft, new, \$5. 3/4-in. carburetor, \$2. Walter Potter, Oxford, N. Y.

1 K. W. Field Rheostat; \$50.00; never been used. T. F. Randolph, Roseville, Ill.

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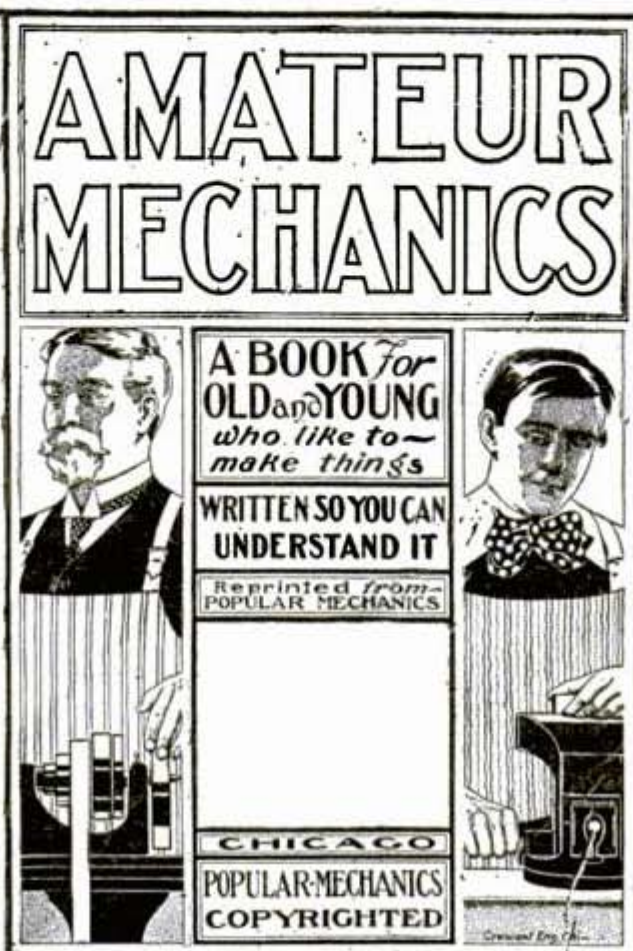
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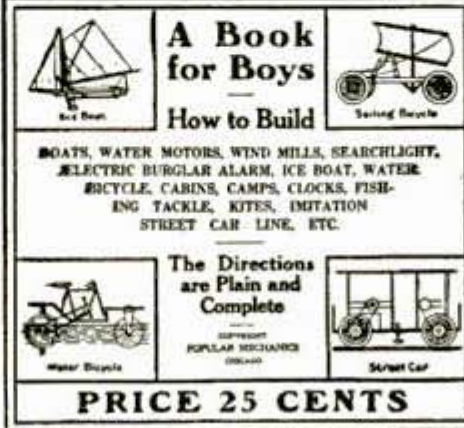
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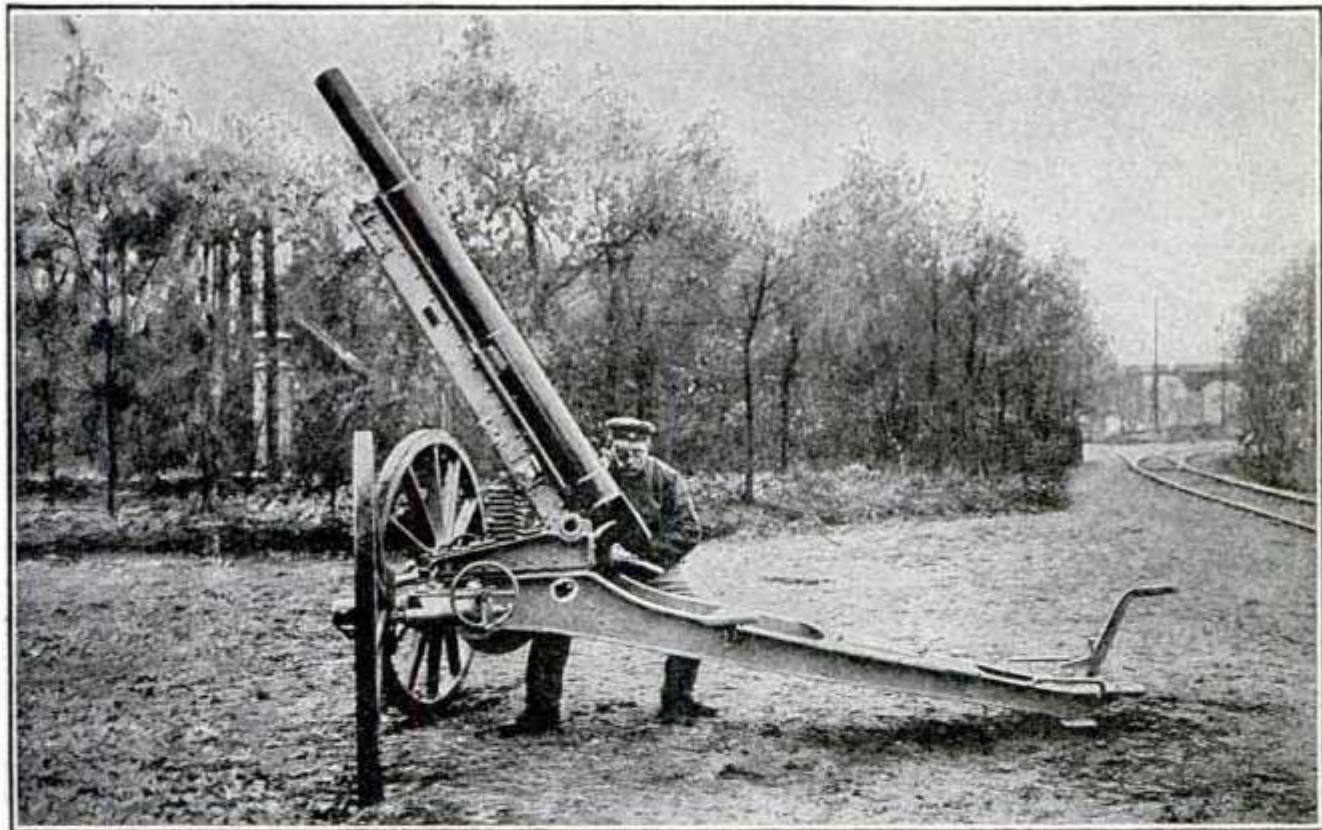
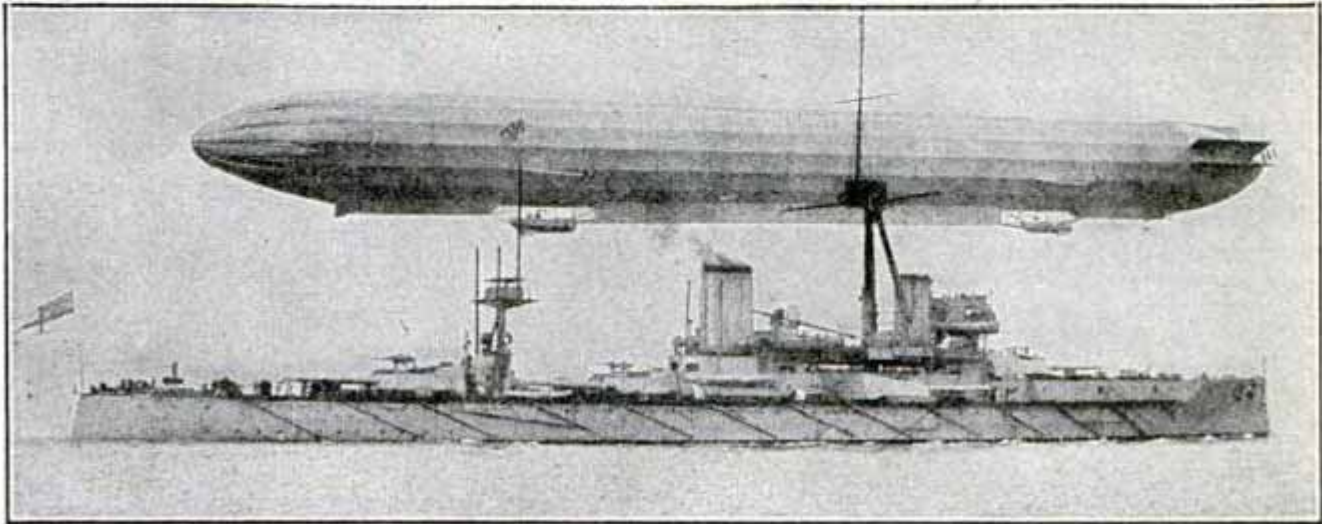
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Vol. XI.

MAY, 1909.

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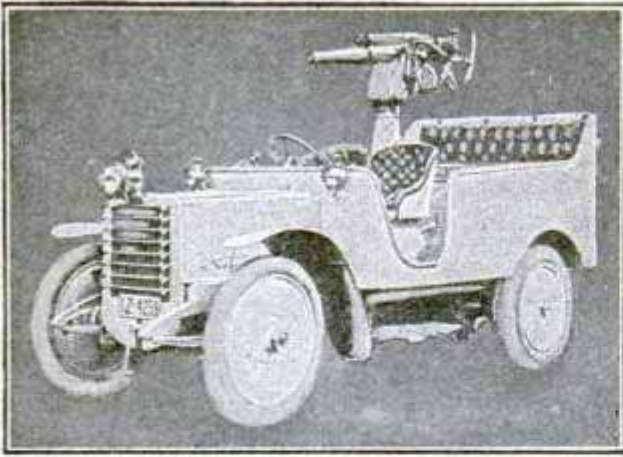
GERMANY PREPARES TO FIGHT AIRSHIPS



Upper View Shows Comparative Length of English Battleship "Dreadnaught" and Zeppelin's Airship: About Equal as Mark for Gunners—Lower Picture Is New German Field Piece for Firing Overhead. The "Zeppelin" Carried 25 Men a Distance of 150 Miles in 4 Hours

German military experts have devised the two guns shown in these illustrations as weapons with which to fight airships. One is mounted on a specially devised gun carriage and the other is

mounted on a high speed automobile of open construction. The gun carriage outfit is so devised that when brought into play the wheels are swung and locked together, giving greater stability



Auto Gun to Shoot Airships

and more room for the gun crew to work. The muzzle can be elevated to an angle of at least 60 deg., and the rapidity with which it can be fired gives it a fair chance of hitting its flying mark.

The advantage claimed for guns mounted on automobiles is in the fact that the machines can chase the airships across country, keeping under them, or nearly so, and firing until the aerial fighter is brought down. In a country having fair roads it would be hard for an airship to sail completely out of range in the day time.

ICEBOATS TOWED BY AUTOMOBILES

In the winter games held in Northern Sweden in January and February, automobiles were used to tow the iceboats across the ice to the starting point. The rubber tires were covered

with a chain tread to enable them to grip the smooth ice.

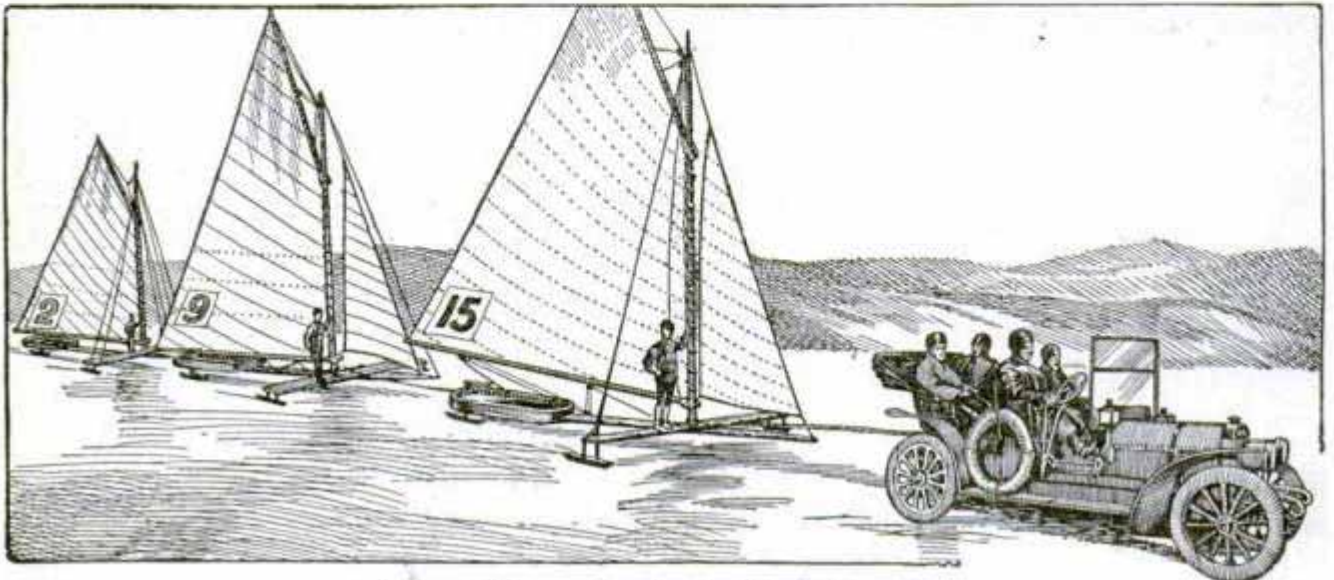
HOUSE WITH TREE-ROOF AS WELL AS ROOF-TREE

The piece of land upon which this curiously joined tree and house are located was too small to contain both separately, but rather than lose the tree the owner built the house around it. The property is in Des Moines, Iowa, where it attracts considerable attention.



Curious House in Des Moines

It is known as the house with a tree-roof as well as a roof-tree.—Contributed by E. M. Fellows.



Automobiles and Iceboats Work Together



SAND MODELING ON CALIFORNIA BEACH

The figure of the mother and child, modeled of sand on the shores of Santa Monica bay, Cal., is a sand sculptor's idea of "Cast up by the Sea." The lines of the figures, with the thin veil of sand covering them, are excellent for work in such material, but the faces do not bear the tragedy, or, at least, the repose, of death.

A BABY CARRIAGE THAT IS NOT A PERAMBULATOR

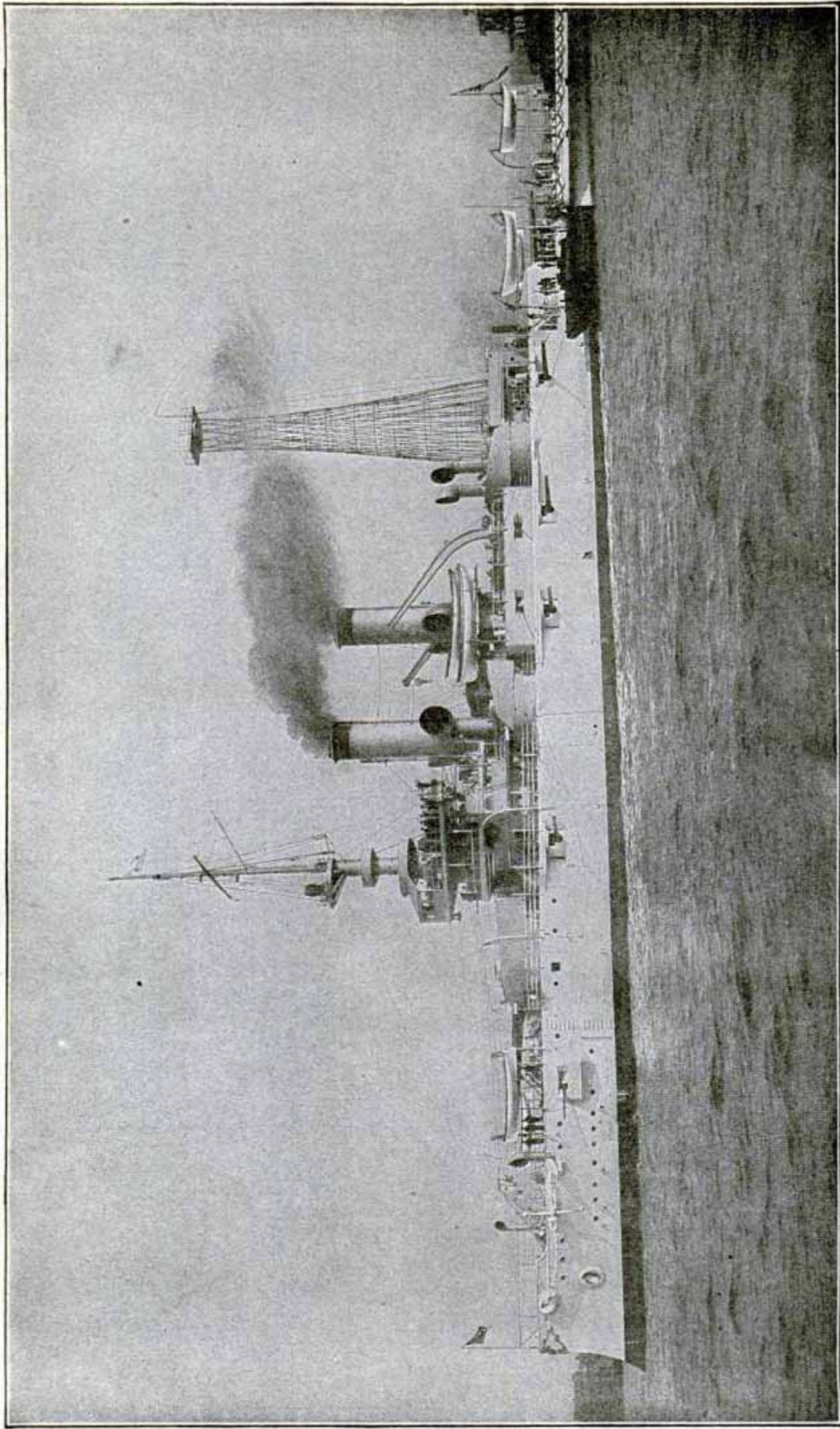
This outfit is the latest and one of the most ingenious European substitutes for a perambulator. It is a hammock chair in which a child can be safely strapped, and it is hung suspended between monsieur and madame by straps that pass over their shoulders. It is easily carried under one arm when not in use and takes up no space in crowded street cars or busses.

The average American husband and wife are usually too heavily burdened with self-consciousness to appear in public as part of such an outfit, therefore it will probably not be adopted to any extent in the United States.



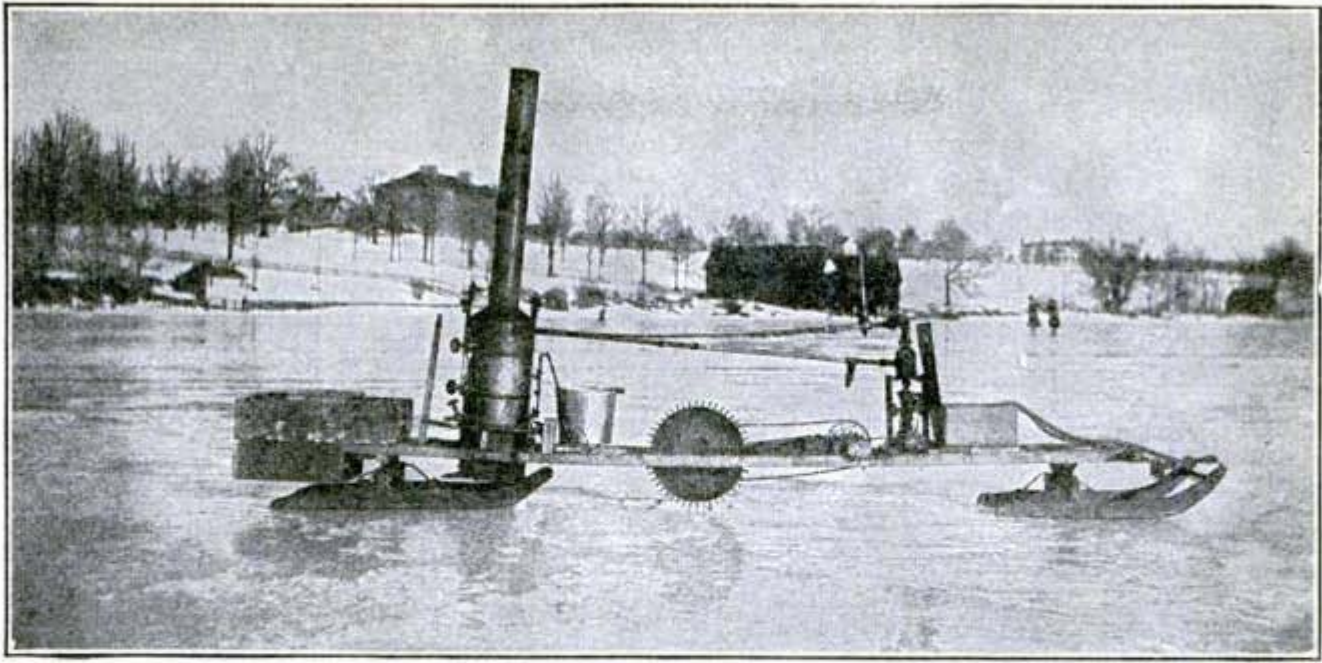
Working in Harness

The sleet storms of last winter, more numerous in many sections than for years past, have more than exhausted the reserve stock of poles of many telephone companies.



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Latest Picture of U. S. Battleship "Idaho"



STEAM-PROPELLED ICE AUTO

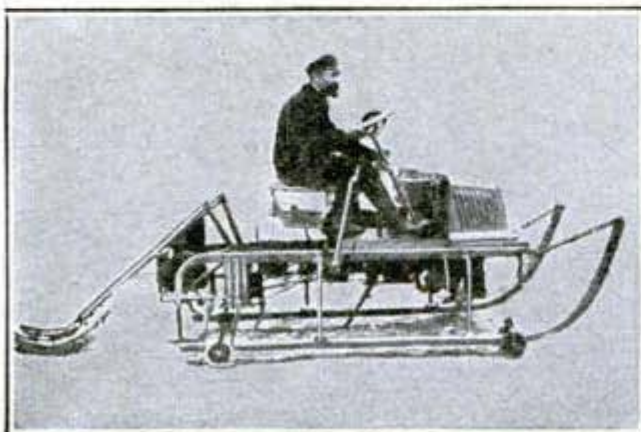
This ice motor-sleigh, home-made and steam-driven, but remarkably ingenious in many respects, makes an easy 15 miles an hour over rough ice. The length of the outfit is 12 ft., and its width is 15 in. The engine probably develops a little over 1 hp. The drum by which the sleigh is propelled over the ice is 18 in. in diameter, constructed of hardwood, with a tire shrunk on and drilled for 48 large wooden screws. These screws are cut on a slant and as the drum is revolved by the engine they dig into the ice. The drum is hung in the same manner as a swing saw, which enables it to rise and fall to meet the requirements of rough ice.

The bobs are taken from an ordinary sled of the type used for coasting down

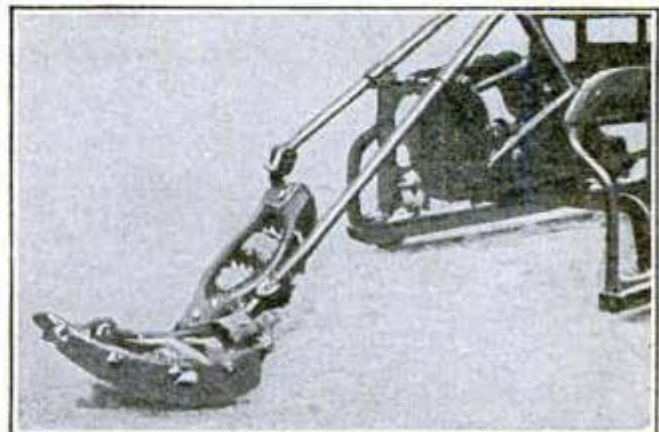
hills. The handle seen just back of the boiler is connected with the small pump used to fill the boiler with water. It is worked by hand.—Contributed by George F. Brewster, Wolfeboro, N. H.

RUSSIAN MOTOR-SLEIGH

The motor-sleighs now being built in many countries probably differ more in method of construction and propulsion than do the different makes of automobiles. The reason for this is doubtless because no type of sleigh has yet proved itself of enough practical value to have its means of propulsion copied to some extent by other manufacturers. The motor-sleigh shown in this illustration is of Russian make, and is propelled by a pair of pushers closely patterned after the hind legs of a grasshopper. These pushers work alternately,



Used in Russia



Near View of Pushers

thus providing a continuous forward motion to the sleigh. The small wheels on the runners are to prevent skidding.

THE HEALING POWER OF RADIUM

In his famous lecture on "Radium in Surgery," delivered in the clinical theatre of the London hospital a short time ago, Sir Frederick Treves explained what might, and what might



Curing Facial Blemishes with Radium

not, be expected from radium as a healing force. He warned the medical profession and the public not to be too sanguine, but, at the same time, he specified a number of diseases and skin affections, such as naevus, angioma, eczema, etc., on which radium has an ascertained and powerful effect. Of its uses in cases of cancerous growths he believes it is too early as yet to speak.

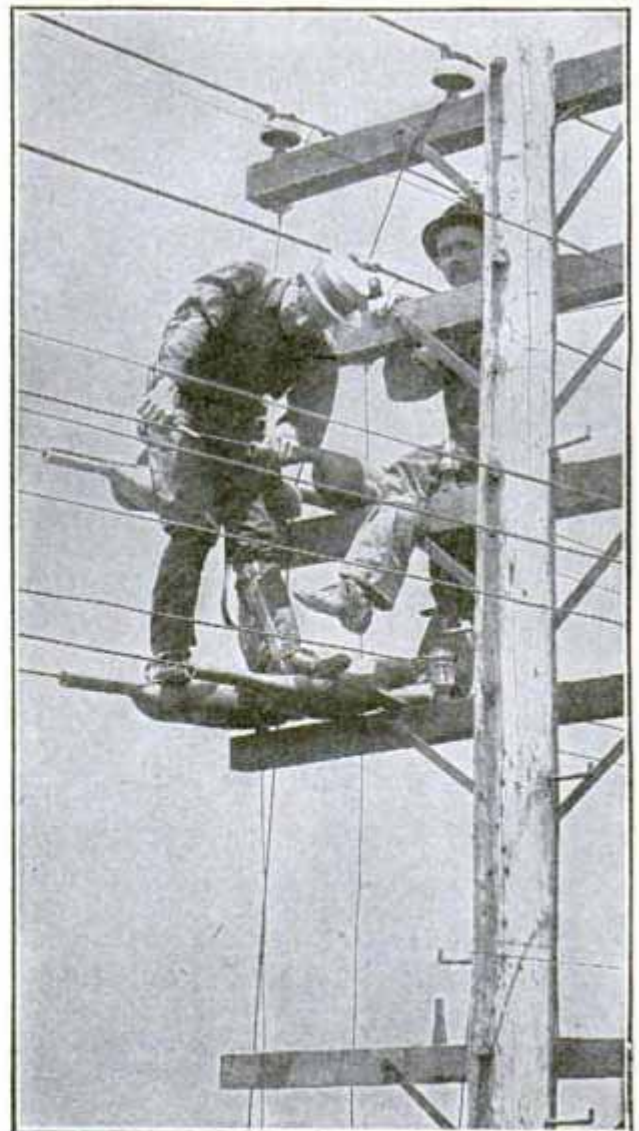
Radium is a mysterious remedy, for as yet no one knows how or why it operates beneficially upon the human body. The medical profession and scientists in general entertain high hopes of its future, the one obstacle to its use in surgery at present being its enormous cost.

The illustration shows the method of

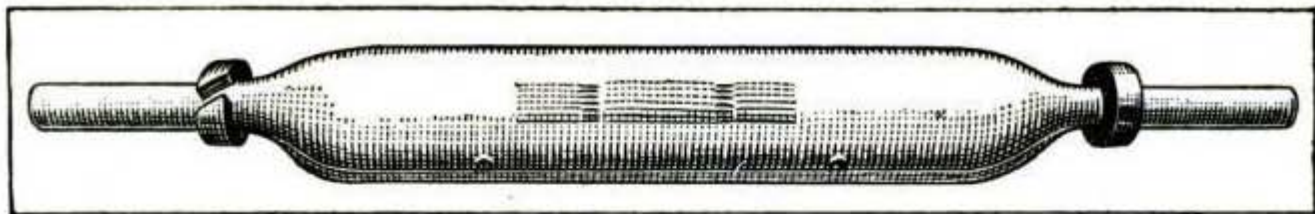
applying the radium remedy for such facial blemishes as birthmarks, nearly all forms of which can be cured by it. At present, the radium is applied by means of a tube, but it has been found that it is much better to apply it from a flat surface, and a few experimental instruments have been made. Some idea of the cost of the cure may be gained by the fact that one of these appliances, having a surface scarcely bigger than a postage stamp, and containing only 1.35 grains of the precious element, costs \$1,600. The radium is usually applied for an hour at a time.

LINEMAN'S PROTECTIVE SHIELD FOR HIGH-TENSION CIRCUITS

The necessity of working on electric wires carrying as high as 8,000 and 10,000 volts, and the disadvantage of



Shields in Use on High-Tension Wires



A Close View of the Shield

shutting off the current when such work is being done, has made the novel protective shield here shown, or something of like nature, absolutely indispensable for the proper protection of the linesmen.

This curious shield consists of a rubber insulation which slips over the wire and is clamped firmly in place by hard

rubber slip rings at both ends. Both the shield and the rings are slit to admit the wire. The shield is designed for use on wires carrying a tension up to 7,500 volts, but has been used without danger on circuits carrying 10,000 volts, having been tested to 30,000 volts in water.

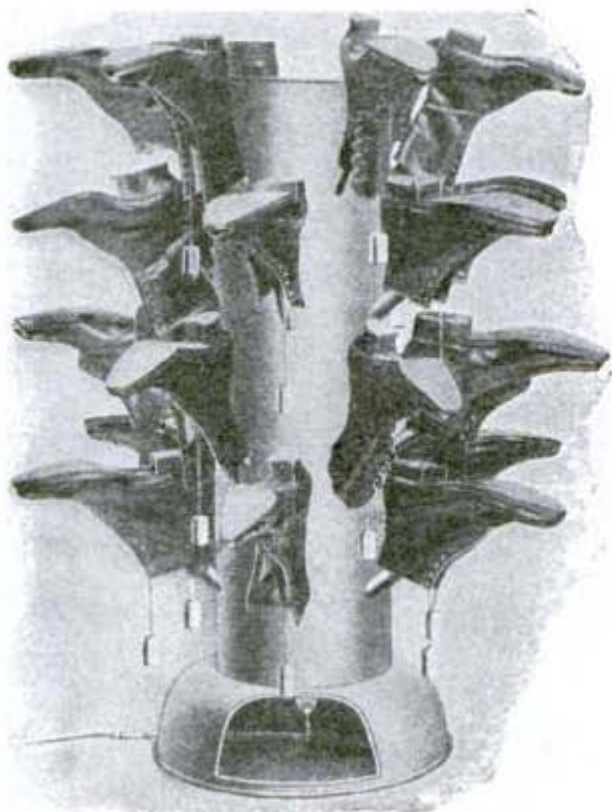
One of the illustrations shows four

HOT-AIR SHOE DRIER

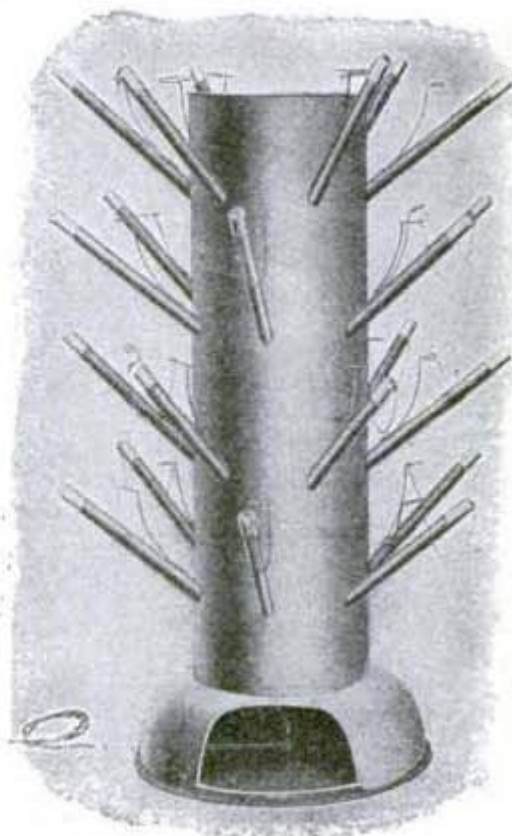
Shoes dried by a well-regulated circulation of hot air inside last longer and keep their shape better than if dried in the ordinary way. The apparatus here shown was designed for such a purpose, and is now being installed in a number of golf clubs, hotels, schools, and large private houses.

The apparatus consists of a cylinder with a gas burner at its base. From this cylinder a number of small tubes branch out, acting as supports for the

shoes as well as conveyers of hot air. When not in use these tubes are capped. With the gas turned only half on the shoes may be placed over the tubes at night and taken off in the morning. When the shoes are taken off the drier, boot-trees should be inserted to keep them in proper shape. The device is made in two sizes, one of which will accommodate six shoes at one time, and the other 24 shoes. The price of the former is about \$9.



Dries 24 Shoes at Same Time



Tubes Capped When Not in Use



The Tented City of Messina

of the shields in use on wires carrying 4,600 volts. The lineman is standing on two shields, leaning against the third, and with the fourth is grasping a wire from which he is cutting the insulation with a knife held in his bare hand. So protected, there is no way for the current to ground or make a short circuit through his body with one of the other wires, therefore he is in no danger from the high tension. It is advisable, however, to take the additional precaution of wearing rubber gloves.

It is also necessary to use only pure Para rubber in making the shields, as reclaimed rubber often contains small metallic particles which interfere with its insulating qualities. Special care must also be taken to protect the shields from grease, moisture, and injury.

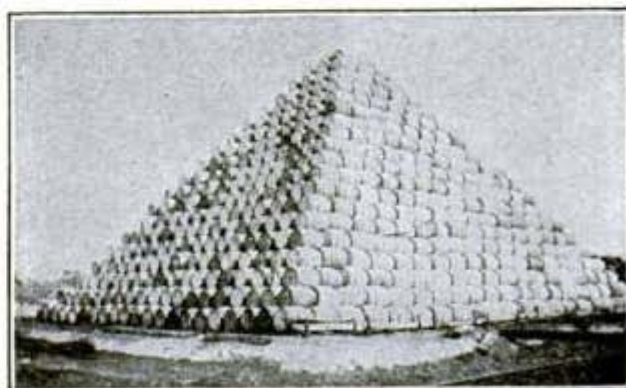
A TEMPORARY RESIDENCE SECTION OF MESSINA

Very slowly, but surely, the survivors of stricken Messina are recovering their nerve and preparing to again make habitable the shaken formation upon which their city had stood since the time of the Caesars. The illustration shows the temporary canvas shacks in which many of the survivors are still living. Some of these have given way

to small houses, notable among which are the 2,500 erected by the American government and 1,000 temporary dwellings built on contract by an English firm. Improvised provision shops have been erected in the open air and under canvas, the electric lighting system has been repaired, and the activity is beginning to bring order out of chaos.

A PYRAMID OF OIL BARRELS

The pyramid shown in this illustration is composed of 2,800 barrels, the property of the Canadian Oil Refining Co. They stand in the company's yard at Petrolia, Ont., which is known as the oil-well city of Canada. Oil-well derricks rise from the front lawns of Petrolia homes and on street corners, as well as from the fields on the outskirts of the little city.



Huge Pile of Barrels

TRAIN DISPATCHING BY TELEPHONE

The New System Enables Orders to Be Handled 50 Per Cent Quicker Than by Telegraph — Opens Up Employment for Injured Trainmen, and Bad or Foggy Weather Does Not Interfere with the Excellence of Its Work—Many Great Railroad Systems Adopting It—Others Experimenting

The past year has seen the second great change in the system of operating trains, and the movement seems destined to become universal. The first change was the introduction in 1850 of the telegraph for train dispatching; the second is the adoption of the telephone in place of the telegraph. Before the introduction of the telegraph for railroad service, the movement of trains was arranged according to a schedule. The roads, being single-track, were provided with sidings at the various stations, and so arranged that trains running in opposite



Way Station Telephone Equipment

Interior of Signal Box

directions were scheduled to meet at certain points. The train reaching the meeting point first was expected to take the siding and await the arrival of the train from the opposite direction. The story told about the introduction of the telegraph is interesting.

In 1850 a train on the Erie railroad, on board which there happened to be an official of the road, arrived at its scheduled meeting point, and was obliged to await the train from the opposite direction. As time passed and the other train did not appear, the official, becoming impatient at the long delay, went to the telegraph office and wired the next station, asking if the expected train had passed. On receiving an answer that it had not, he wired the station agent to stop the train and have it wait until the arrival of the train on which he was riding. He then requested the engineer to take the train to the next station, but found that he objected, because it was irregular and he had no faith in the telegraph. Not until the official had commanded the engineer to start his train, was the movement made. Upon arriving at the next station it was found that the other train had not yet appeared; the telegraph was again employed, and the train moved up another station. This demonstration of the saving in time

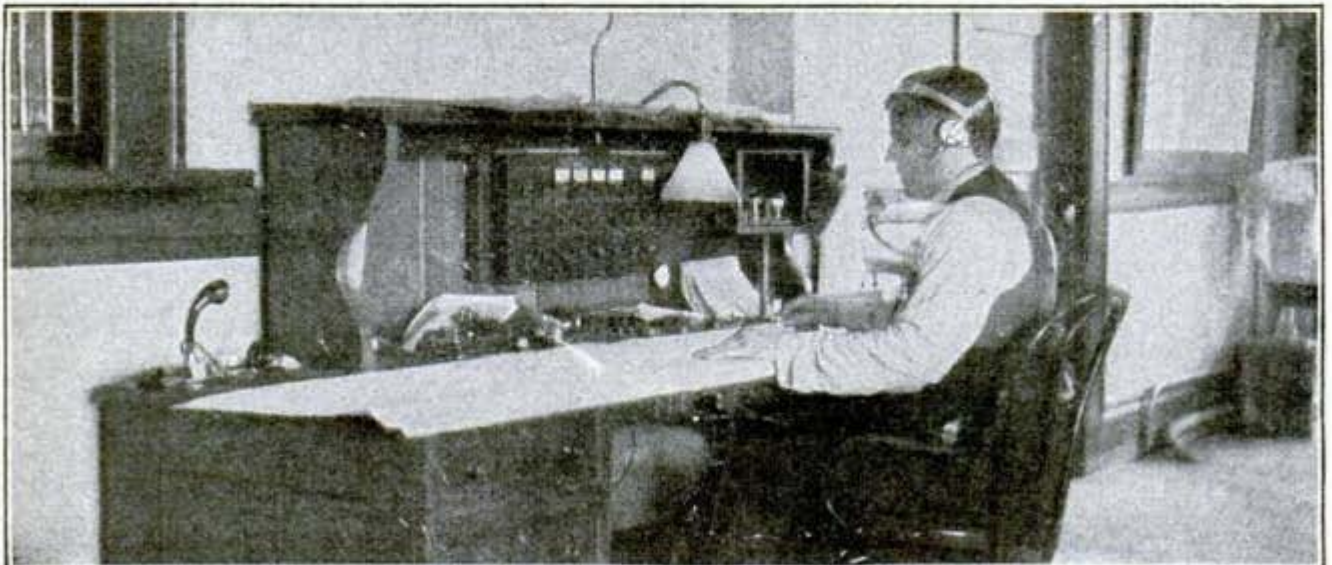
which could be effected by using the telegraph led to the system of dispatching trains which has existed unchallenged until the present time.

The realization of the superiority of the telephone to telegraph as a means of directing trains has come gradually through the demonstration of its excellence as the chief factor in the directing of the cars of the electric interurban lines, now competing with steam passenger service in all thickly settled parts of the country. First adopted by the great railroad systems as a means of directing trains in the terminal yards, its importance and extent of operation has grown, until at least twelve of the great systems have now adopted it on some divisions, and are extending its scope as rapidly as possible. Among these roads are the New York Central; The Lackawanna; Chicago, Burlington & Quincy; Lake Erie, Reliance & Wheeling; Pennsylvania; Illinois Central; Lake Shore & Michigan Southern; Canadian Pacific; Chicago & Northwestern; Northern Pacific; and Chicago, Milwaukee & St. Paul.

The reasons in favor of the telephone are clear and concise. In the first place, counting the time saved in calling and the quicker repetitions, orders are handled about 50 per cent quicker than by telegraph. This means that the dispatcher can dispose of his work that much faster, has more time to figure out movements, meeting points, etc., and can handle a great many more trains on his track, and handle them more promptly. Another important feature is the fact that it works as well in bad or foggy weather as in good, which is not the case with the telegraph. Bad weather does not mean instruments out of adjustment and an operator breaking in the middle of an order with a string of dots like the discharge of a gatling gun, trying to adjust himself and not knowing how. The telephone remains in adjustment in any kind of weather. The signaling apparatus may be affected, but the telephone will not be.

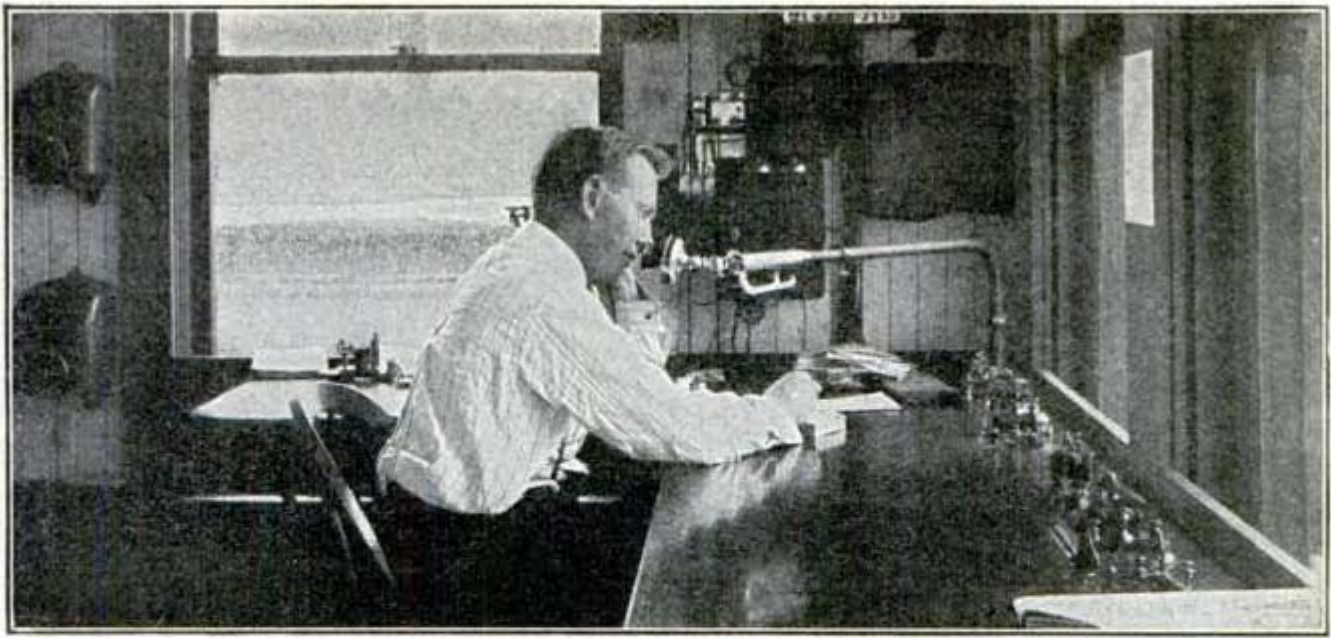
Furthermore, the telephone places the dispatcher in closer and more intimate touch with his operators, which means a decided improvement in the work and deportment of the men on the line. It is more as if they were facing each other, and in such connection men are less prone to indulge in the choice remarks that often fly over the telegraph wires when tempers are lost. Also when derailments or other accidents occur, the dispatcher is able to converse directly with the conductor on the ground, and the conductor being able to explain things in his own way, more can be accomplished in ten minutes than could be done by telegraph in an hour.

Still another important feature is the fact that the telephone system means an opportunity for the employment of injured trainmen and other employes, who, having had actual railroad experience, make more desirable block operators



Courtesy Western Electric Co.

Telephone Dispatching: New York Central Ry. at Albany



Showing Special Transmitter Arm, L. S. & M. S. Ry.

and station agents than strange operators or young men just starting in, necessarily given the post because a knowledge of the telegraph code is required.

The system of operation differs to some extent on the different roads now using the telephone, but an excellent insight into the method of procedure is gained through this description of the equipment of the Chicago & Northwestern railroad, written for the "Northwestern Bulletin" by G. W. Bailey, superintendent of telegraph on that road:

"In the dispatcher's office is located a box about 12 in. high, 18 in. long, and 3 in. deep, with a row of push buttons across its face. Inside the box is a clock and three small relays or magnets, all connected. Each push button corresponds to a certain station. Each station is equipped with a box containing a clock, two relays, two coils, four cells dry battery and a 4-in. vibrating bell, which can be heard a considerable distance even out on the platform. The dispatcher desiring, say, four stations, presses the push buttons in his box corresponding to those stations, then presses a battery button in the lower middle face of the box, and the bells in these particular stations ring until shut off by the operator of each. They make such a racket that he is usually prompt in answering. By this method as many as 28 stations can be called in 30 seconds. This calling being practically instantaneous it can be plainly seen that a great saving is effected over the old plan of calling by the telegraph key, by which it is a common occurrence to waste from 15 minutes to an hour calling one office.

"For talking purposes the train dispatcher has a breast transmitter and a cap receiver, which leaves both hands free. Each station is equipped with a swinging arm transmitter, which can be moved into any desired position, and a cap receiver. The train dispatcher's circuit is for the exclusive use of the dispatcher in handling trains, and no other business is transacted over it, except as he may direct. The dispatcher is cut in on circuit at all times, but stations are not. It is not necessary for way stations to ring dispatcher, all they need do is take down receiver and pronounce the name of their station. If the line is busy when they take the receiver off the hook, they simply wait until it is clear. Stations desiring to communicate with each other must ask the dispatcher to call the station for them, this arrangement giving the dispatcher entire control of the use of the line.

"In handling train orders by telephone, it should be remembered that all rules and regulations governing train movements remain the same as under the telegraph. In issuing a train order the dispatcher, after calling the stations he

wants, proceeds with his order in the same form and formula as by telegraph. The names of all stations, conductors, train and engine numbers, and time are first pronounced plainly, then spelled out letter by letter. Each figure is called out separately. While speaking the order the dispatcher is writing it in his record book, which is quite a material safeguard over the telegraph practice. When he is done speaking he is done writing and ready to hear it repeated by the operators. This reduces his speed of conversation to his ability to write it down, and also gauges the speed for the receiving operator, thus not hurrying him unnecessarily. All operators concerned in the order listen to each other repeat, thereby checking each other. The dispatcher underscores each word and figure in his record book as it is being repeated by each operator."

The following is an example of a dispatcher's order, the hyphenated words and figures being spelled out letter for letter and unit for unit. The orders as delivered do not show these spacings or brackets, which are merely used for this illustration:

No. T-w-e-n-t-y T-w-o (Double Two) Engine S-e-v-e-n-t-y S-e-v-e-n (Double Seven) S-m-i-t-h will meet No. T-h-i-r-t-y F-i-v-e (Three Five) J-o-n-e-s at Bangor (B-a-n-g-o-r).

HAT DEPOSIT-BOX FOR EVERY THEATRE-GOER

In an endeavor to solve the problem of the big hat, a European theatre has built a new cloak room which has a



A Place for Every Hat

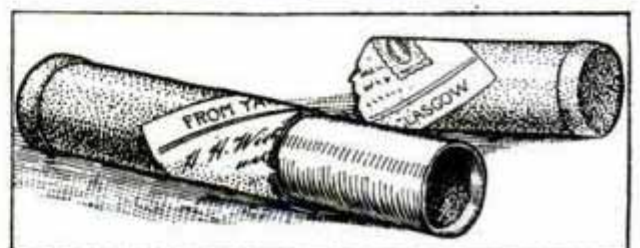
safe-deposit box for every seat. The boxes are large enough for the largest hat, as well as for the parcels a woman often carries with her to a matinee

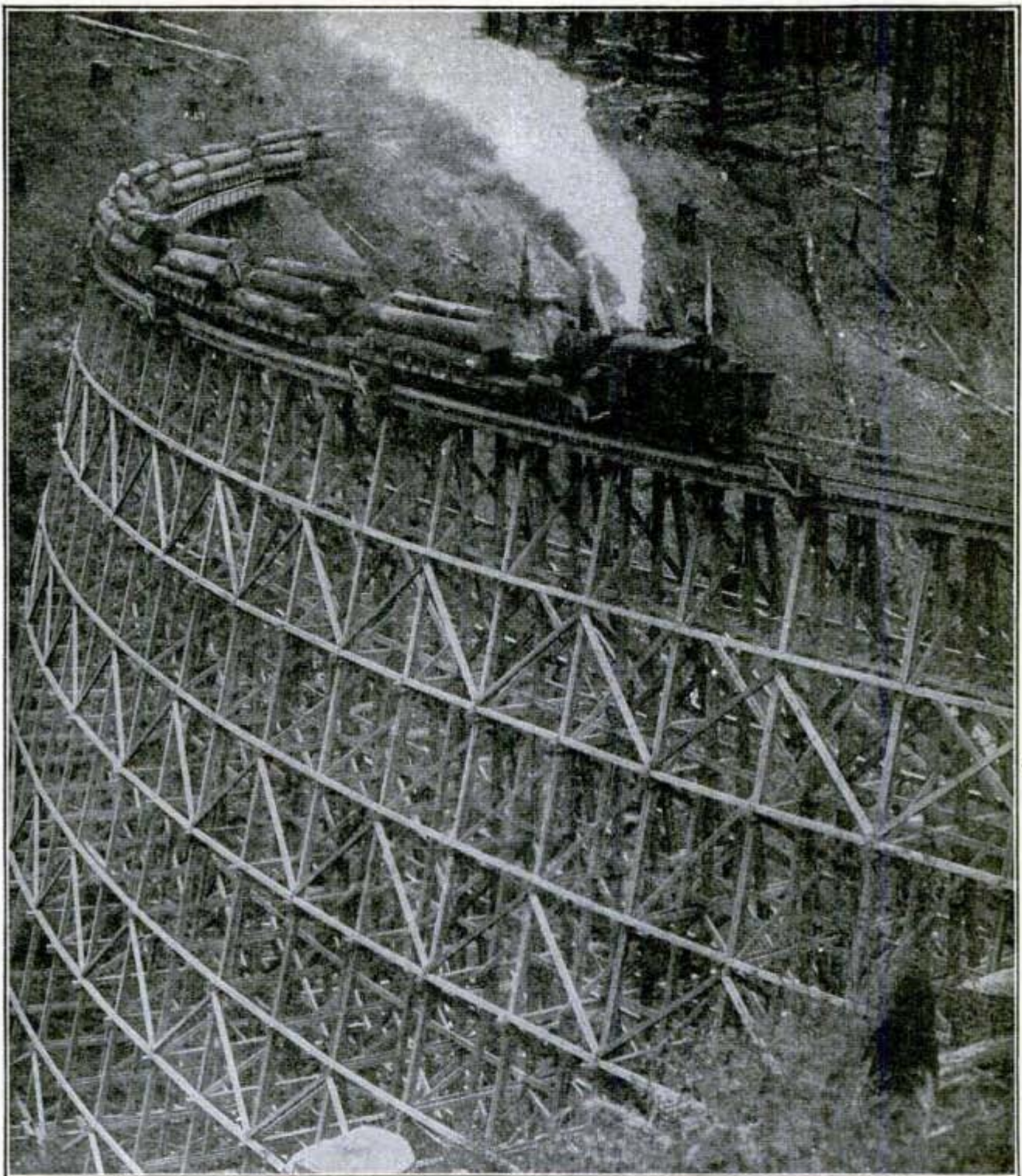
performance. The person holding the ticket for the seat gets the key to the box, and personally locks up the article deposited.

The Japanese steamship "Aki Maru" recently made the 4,240-mile trip from Yokohama to Seattle without being out of communication by wireless with either shore.

A NEW IDEA IN MAILING TUBES

This drawing illustrates a new idea in mailing tubes which is infinitely in advance of anything else of the kind. It is in two sections, fastened together by pasting the paper bearing the address around it. Made fast in this way, it carries its contents as safely as the ordinary one-piece tube. The person receiving the tube simply gives the two sections a countertwist and pulls them apart. This is much more satisfactory than digging at the contents of a one-piece tube, with the probability of tearing the inclosed matter before its release is accomplished.





LOGGING TRESTLE IN WASHINGTON

The illustration shows a logging train rounding a trestle 150 ft. high on a logging line near the Columbia river in Washington. The train is composed of 25 heavily loaded cars, drawn by a light locomotive of only 57 tons' weight. The road is but 19 miles long and the train makes two round trips a day, besides the required switching. The construction of so high a trestle, of timbers, and built on a curve makes a

beautiful but difficult piece of engineering work.



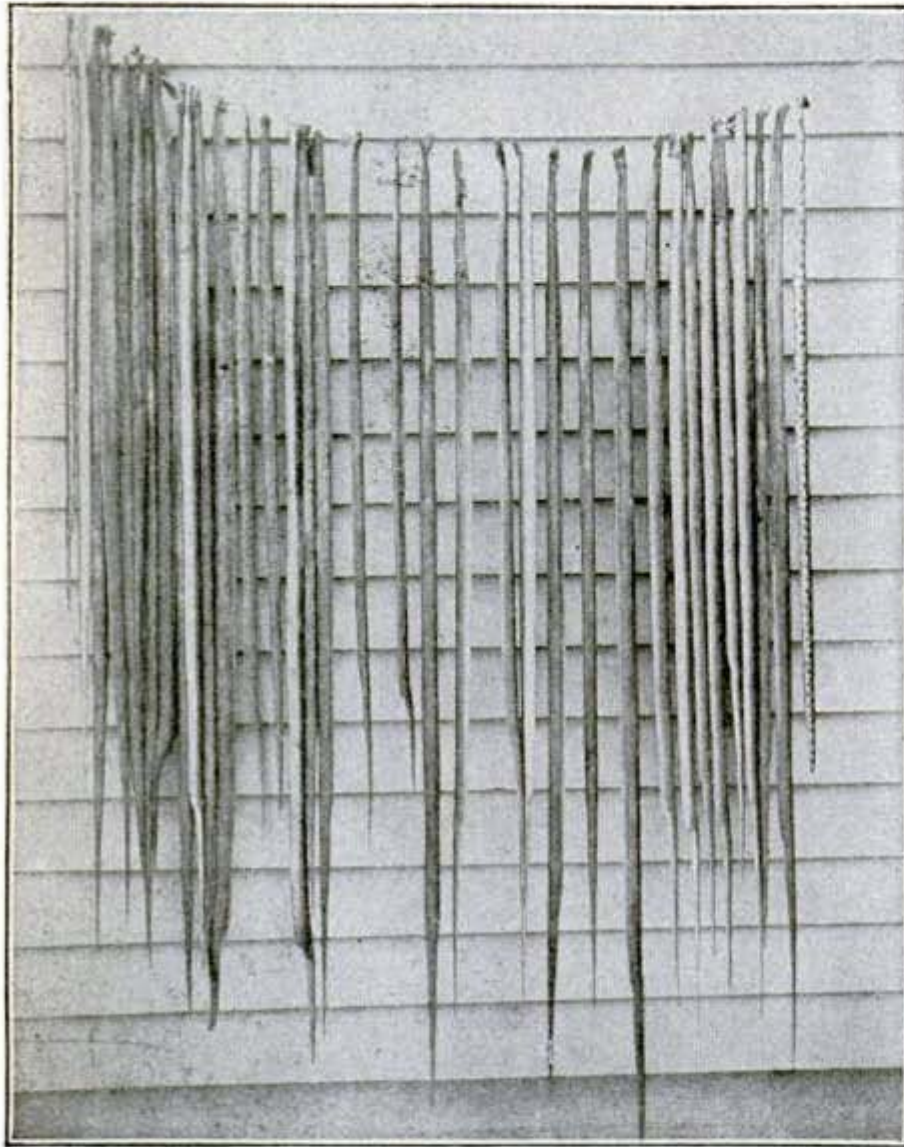
To demonstrate that the electric chair does not kill, but makes victims comatose, Charles Quill took his place in an electric chair and 1,800 volts passed through his body. He was not injured.



Reinforced concrete will be largely used in rebuilding the Italian earthquake cities. It is proposed to limit height of buildings to 33 ft.

HUMAN BODY ENCASED IN SOLID CONCRETE

While a gang of men were at work constructing a large concrete sewer in Seattle, Wash., a cave-in occurred



The Catch of the Season in Ohio

which seriously injured a number of the workers and killed one. The man killed was A. A. Stangel, and the position of his body when recovered two weeks after the accident was curious. The weight of the heavy mass falling upon him brought instant death and forced the body deep into the concrete. Many days of work were required to clear the debris away. When this was accomplished it was found that the concrete had set so firmly around the body that it had to be literally chiseled away.

The deepest bore ever made for coal reached a depth of 5,631 ft.

SNAKES CAPTURED IN TAN- GLED BALL

Two young men were momentarily discomfited when they unearthed these snakes while digging for a mink in Lorain county, Ohio. The snakes were tangled up in a ball and looked like a highly magnified mass of earth worms deposited in a can for fishing purposes. Armed with a spade and axe, the only weapons at hand, the young men killed 41 of them, all of which, with the exception of a few black-snakes and a milk-snake, were blue-racers. The mink and three large lizards were also found in the same hole.

The catch was made on Feb. 17, and caused considerable excitement in the neighborhood, as such is rare in northern Ohio, especially in mid-winter. Some of the snakes would have grown to the diameter of an ordinary teacup under the reviving influence of a few weeks of warm weather. The reptiles were on exhibition for several days. — Contrib-

uted by D. D. Grissinger.

ATHLETES BREATHING OXYGEN

Oxygen as a stimulant for athletes just before the game or trial of strength, is hailed in England as almost as great an asset as long and strenuous training. Dr. Leonard Erskine Hill, lecturer on physiology at the London hospital, is a firm believer in its power, and insists that men who inhale it before making efforts are more likely to win games and break records than those who do not.



Courtesy London Illus. News

Stimulating Athletes with Oxygen

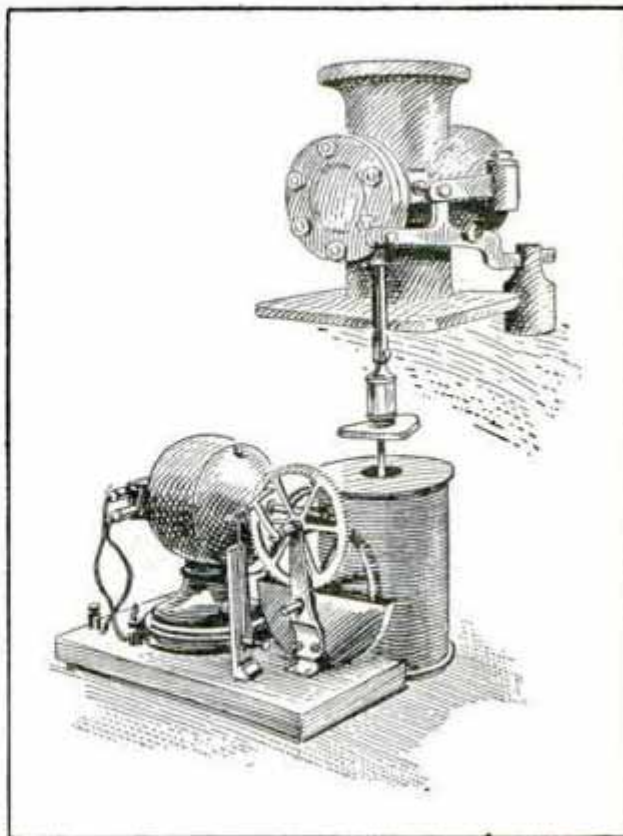
As one example of his idea he set two students boxing at the hospital. One was a trained man and the other a novice. At the end of the second round the untrained man was tired out. Oxygen was administered to him with the result that he began work again almost as fresh as when he started. The illustration shows a team of English football players inhaling the oxygen before a game.

a specially designed steam-valve chest, a motor-driven automatic timing switch, an electromagnet and a light brass watertight casing. The latter is not shown in the illustration. The mo-

TIME-SIGNALING ATTACHMENT FOR MARINE WHISTLES

The quick manipulation of a steam whistle to indicate the movements of vessels by crisp, clear blasts has become a necessity, and to accomplish this the troubles due to condensation of steam have to be eliminated. This is accomplished in the apparatus here illustrated by a draining device which clears the steam supply pipe. The drain operates automatically, being open when water is in the pipe and closed when steam only is present.

The complete apparatus consists of



Courtesy Marine Engineer

Electrically Operated Whistle

tor attachment is to meet the requirements of time-signaling. By means of a geared wheel and pinion a radial arm comes into contact every 52 seconds, giving a time blast of 8 seconds. These intervals can be modified or arranged to suit any condition that may be desired.

The switches which control the whistle from the bridge are designated as "time control," "silent" and "signal control," the first being for the automatic timing of the blasts and the last to suit the desired signal. The advantages of the whistle are that it is under sensitive and absolute control, the action is decisive, and the troubles due to condensation of steam are eliminated, making the blasts sharp and clear. The ordinary means of operating the whistle are available at all times should the necessity develop.

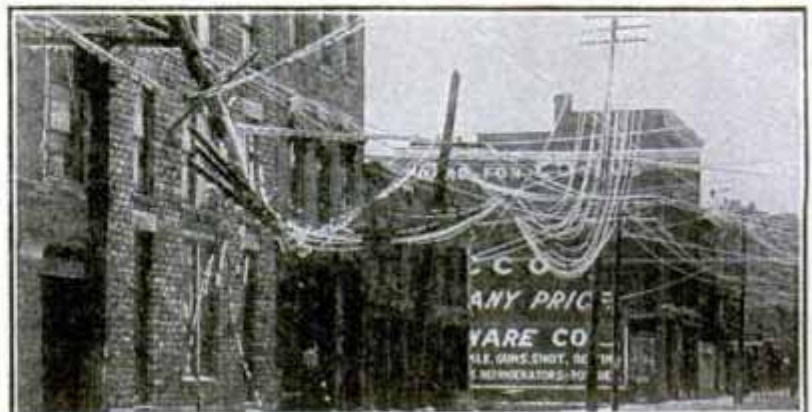
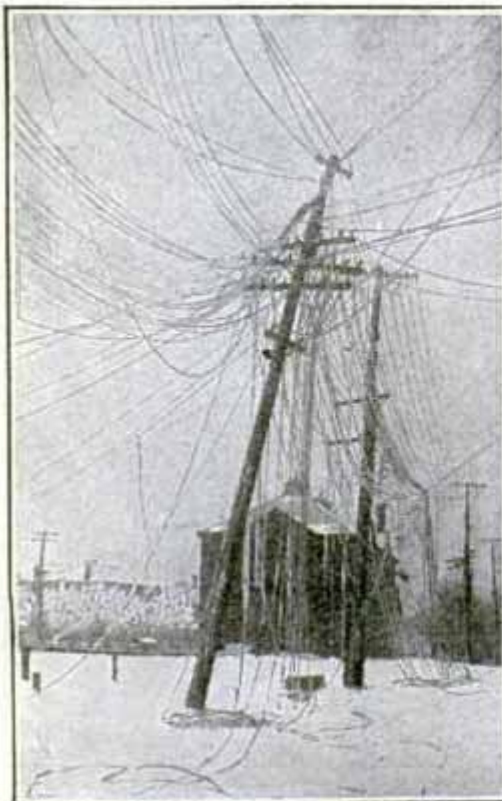
EFFECT OF A SLEET STORM IN OHIO

A severe sleet storm that swept over northern Ohio on February 14 was disastrous to many telephone and telegraph lines. The damage ran into many thousands, and for days after

hundreds of linemen were kept busy. Two of the photographs show wires and poles down in Sandusky and the other testifies to the same devastation in Conneaut. The weight of ice that formed upon the wires was extreme, breaking and casting the heavy poles to the ground, as well as wires and cross-pieces.

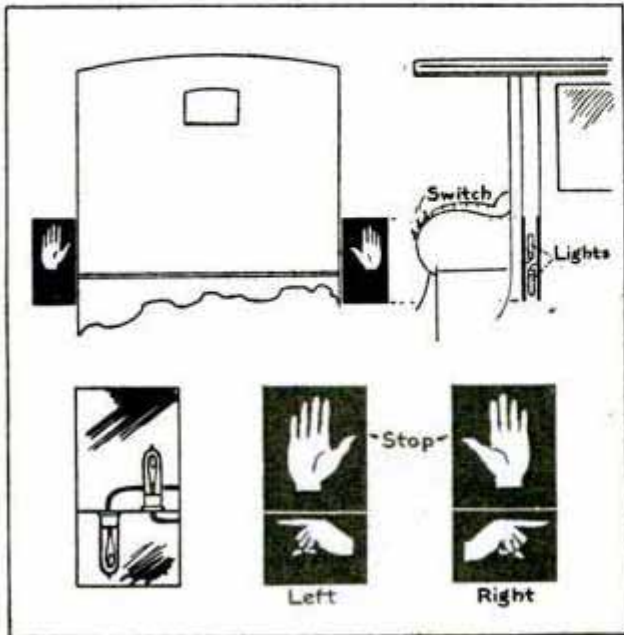
NIGHT-SIGNALING AUTO DEVICE

A signaling device which notifies vehicles in the rear that the automobile displaying it is going to make a stop or turn is being advocated as a means of preventing rear-end collisions. The device, consisting of thin plates, which in the daytime slide out of sight in recesses in the frame of the car just back of the driver's seat, is only displayed at night. The plates, one on each side of the car, bear warning "hands," which are illuminated by the throwing of a switch. When the driver intends to stop the machine, the vertical hand on each side is illuminated. Under the vertical hand on each plate is a hand which points horizontally. If a turn to the



Wreck of Telephone Lines in Northern Ohio

right is to be taken, the horizontal hand on the plate on the right side of the machine is illuminated; and if the turn is to be to the left, the horizontal hand on the left side is brought into play. The illuminating lamps behind each plate are so arranged that the lighting up of the vertical hand does



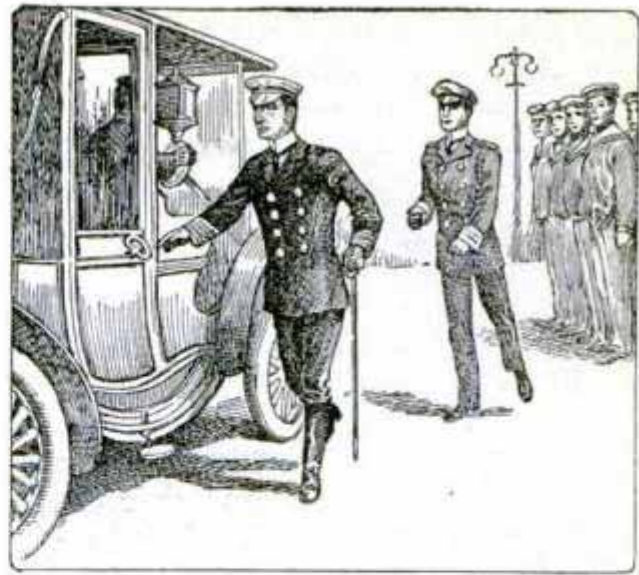
Night Safety Signals

not illuminate the horizontal one, and vice versa, although both are on the same plate.

ENGLAND TO HAVE AUTOMOBILE MILITIA

Ordinary touring automobiles, motor buses, and taxicabs are being organized into a huge and unique system of transportation for troops and supplies in the new plans for adequate home protection in England. The adaptability of the automobile for such purposes was well demonstrated in a recent test in which a battalion of infantry of full strength was transported from London to Hastings, regarded as the most vulnerable point for an invasion, and back again on the same day.

The troops were transported in several hundred cars lent by members of the automobile association. The distance covered was about 150 miles and the task was by no means light, as the battalion comprised some thousand officers and men, machine guns, ammunition train, medical stores, en-



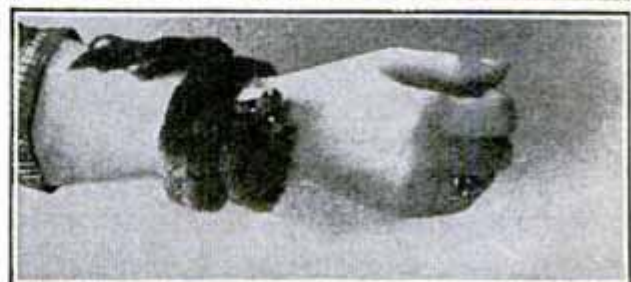
Naval Officers Hurrying Off by Motor to Join Ships

trenchment implements, commissariat, water wagons, and camp equipment.

In case of threatened invasion it is planned to call out thousands of chauffeurs and autos to rush the troops to different points on the coast.

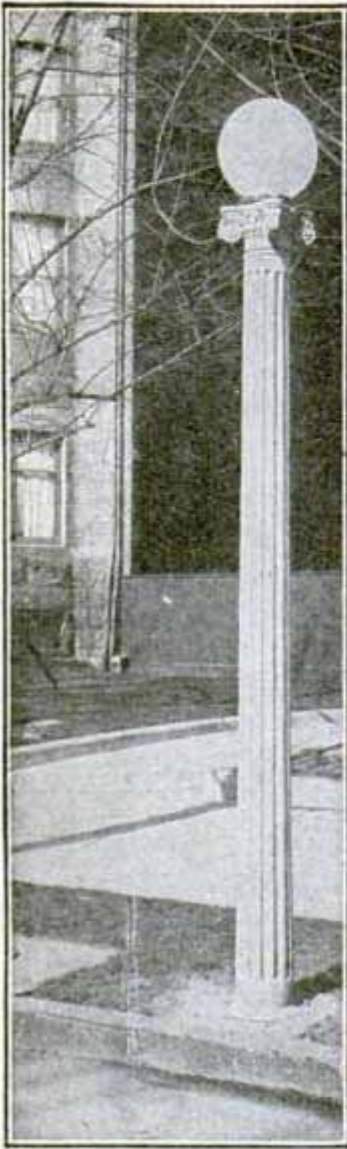
BEASTIE BANGLES

The title of these bangle novelties is not meant to imply that the fad is a beastly one in the slang sense, simply in the sense that they are made of small fur animals. They are produced by a German firm, seemingly inspired by the old claim that if the wrists and ankles are kept warm the whole of the body will be warm.



European Bangle Novelty

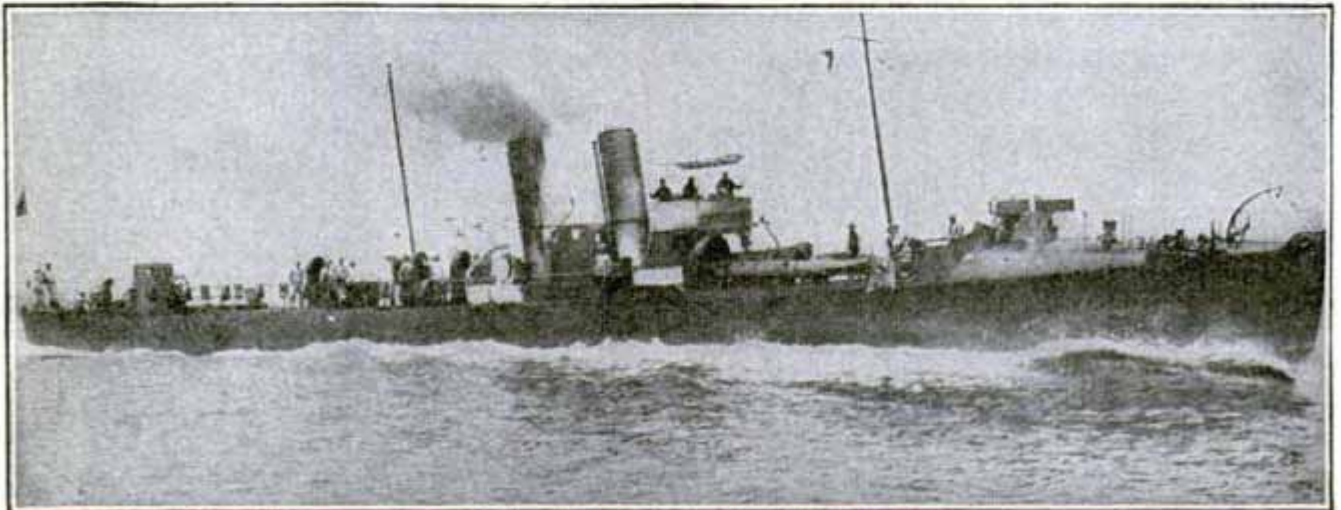
CONCRETE LAMP POSTS FOR WASHINGTON



The concrete lamp post here shown is being placed in many of the residential districts of Washington. The columns are fluted and have an Ionic capital. Their use gives great attractiveness to the streets on which they are placed, as well as distinction to the houses in front of which they stand. They are placed 100 ft. apart on alternating sides of the street. Globes of frosted glass, clear glass, and the so-called "rotten" glass are being tried.

AN ITALIAN TORPEDO BOAT DESTROYER

The "Cassiopeia" is one of the swiftest torpedo boat destroyers in the

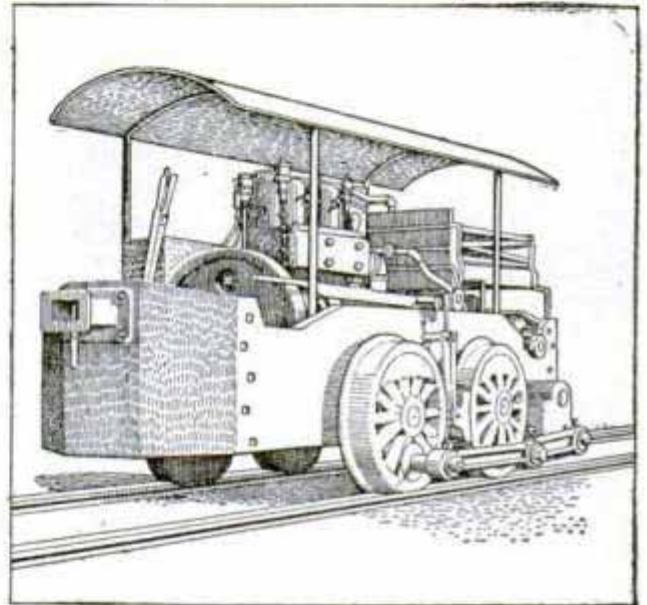


A Mediterranean Fliver

Italian navy. Designed in England and built in Naples, she has a speed of $34\frac{1}{2}$ miles an hour. Her length is 210 ft. and her armament consists of two torpedo tubes, five 6-lb. quick-firing guns, and one 12-lb. gun. Her engines have a capacity of 6,000 hp. under a boiler pressure of 220 lb.

LIGHT ALCOHOL FUEL LOCOMOTIVE

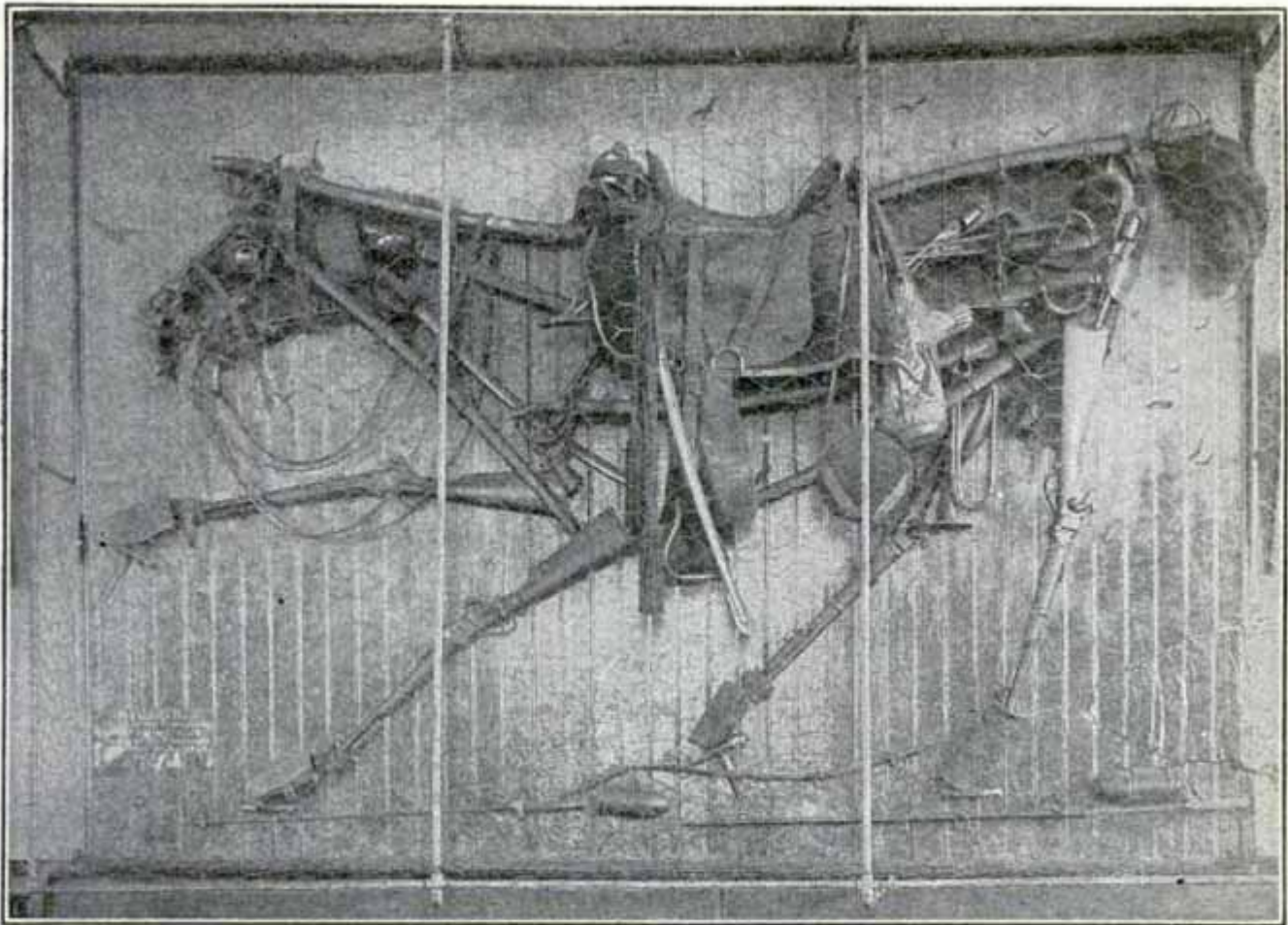
The accompanying illustration shows a unique light alcohol locomotive, designed for use in mines, stone quarries and brickyards. It is also particularly



Compact Alcohol Locomotive

desirable for use in lumber yards where there is danger of fire from sparks.

This locomotive is of 3-ton capacity and measures 10 ft. over all, with driving wheels 22 in. in diameter. It will haul 100 tons at a speed of 5 miles an



HORSE MADE OF CAVALRY EQUIPMENT

The survivors of the cavalry post of the Grand Army in Philadelphia recently set up a unique exhibit at post quarters. It was the figure of a horse made up entirely of army and cavalry equipment used by them during the Civil war. Carabines form the spreading legs of the animal, stirrup leathers and cartridge boxes make the hoofs, the tail is a soldier's plume, an army revolver the curve of the hip, and a similar weapon the curve of the nostrils. The back is outlined in sabres and bugles.

hour on level track. The engine is of the 2-cycle reversible construction. The use of the reversible engine eliminates the necessity of a reverse gear. Vibration is eliminated by providing springs on which the whole mechanism rests.

A FISH THAT IS NEARLY ALL MOUTH

The ray fish, found in San Francisco bay, is in many respects a queer example of sea life, and especially so the specimen recently caught in a net by a Greek fisherman. About 2 ft. in length, it has a mouth out of all proportion, presenting a fearful looking

opening. In fact, this special ray fish is nearly all mouth, and has puzzled all scientists who have examined it.

As specimens of the ray fish are seldom secured, this one has been added to the Stanford University collection.



"All-Mouth" Fish



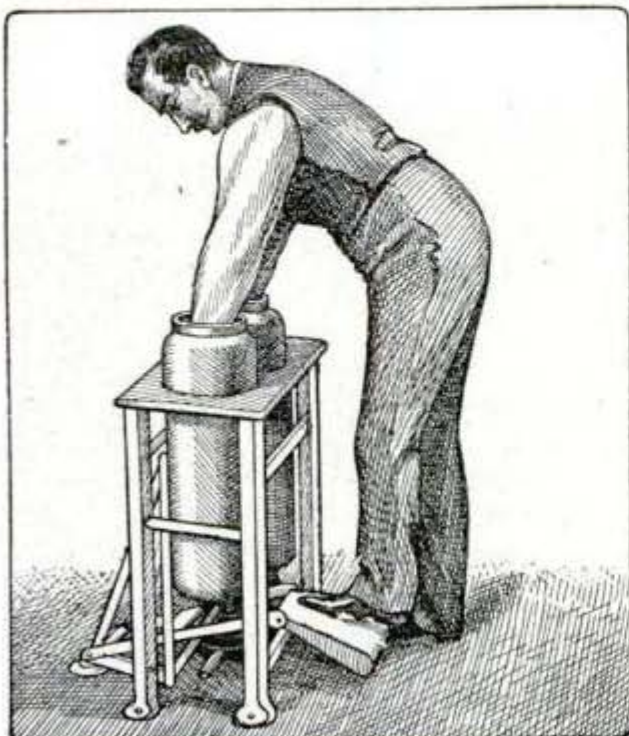
It Is No Child's Play to Bring Down One of These Giants

FELLING BIG TREES IN OREGON

From the standpoint of lovers of big trees, the lumberman is a vandal, and it does seem a shame to cut down such magnificent trees as these, but such is the history of industry. The work of nature must be destroyed to furnish material for the work of man. The trees shown in these photographs were felled near Astoria, Oregon, the place made historic by John Jacob Astor and Washington Irving. One illustration shows a woodman lying in the gash made by his saw and axe, and the other shows woodmen at work felling another tree. One of the trees in this photograph is a cedar and the other is a fir. The method of cutting big trees is clearly shown. These trees started to grow probably 800 or 900 years ago.

SURGICAL GLOVES PUT ON BY MACHINERY

To put on a pair of rubber gloves of the kind often used in European hospitals by surgeons during operations is a difficult and tedious task, even with the aid of an assistant, but a London surgeon has just invented an ingenious



Putting on the Gloves



Ready for the Operation

contrivance that accomplishes the task by machinery in a few seconds.

The apparatus consists of two cylinders from which the air can be partially drawn by a piston worked by a pedal. At the top of each cylinder is a flanged rim, over which the opening of the glove is stretched and fixed with the fingers hanging vertically into the cylinders. The glove when in this position completely closes the cylinder. When the operator treads on the pedal the piston is pulled downward, producing a partial vacuum in the cylinders. The difference in atmospheric pressure thus produced stretches the gloves to a size that will allow the hands to be easily pushed into them. Air is then admitted into the cylinders and the gloves contract upon the hands with a sudden snap.

The glimmering of gun barrels may be prevented by rubbing them over with the juice of a green hazelnut pod.

INGENIOUS MIRROR SCHEME FOR APARTMENTS

A number of the newest and most expensive apartment buildings in Chicago and New York, built without too



Triple Mirror Arrangement

much economy of space, have cleverly arranged twin closets about 3 ft. apart in the bedrooms. The doors open in opposite ways, swinging toward each other, and in their fronts are mirrors.

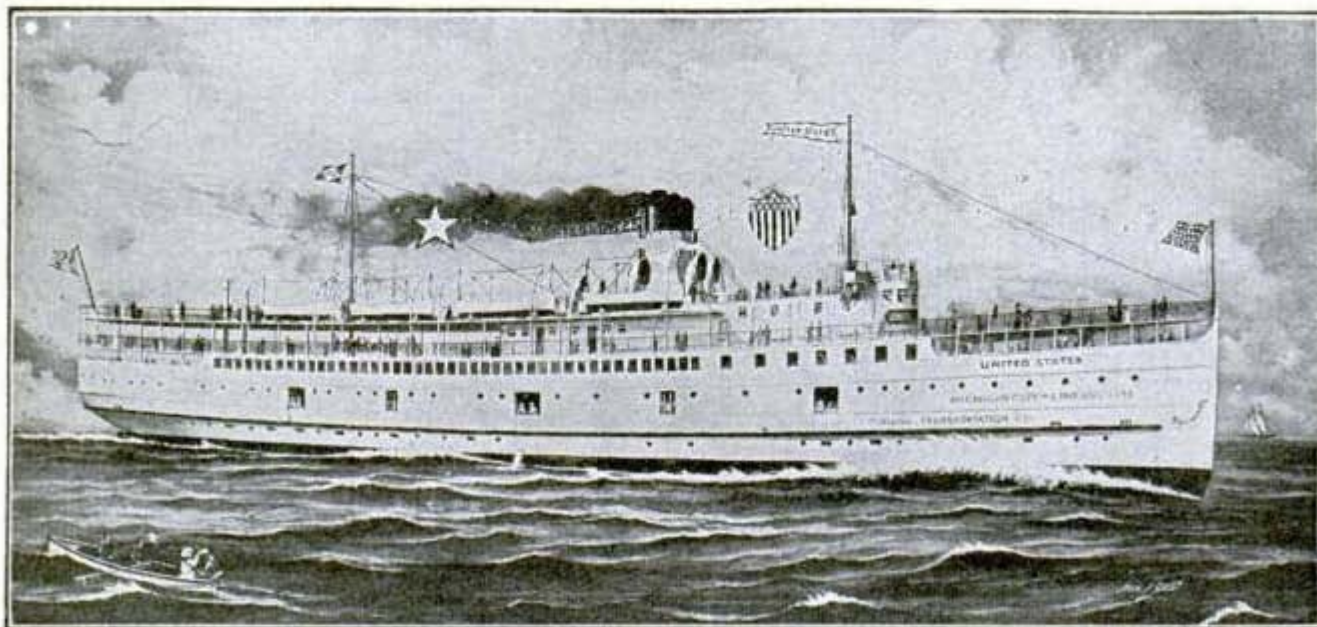
The flat wall space between is set with a larger mirror of the same height, and by swinging and adjusting the doors it is possible to get a view of oneself from the front, either side, and the back.

The arrangement is really a triple mirror scheme on a large scale, and one that takes up practically no room at all, as the doors are swung closed when not in use, becoming in reality an attractive set of mirrored panels.

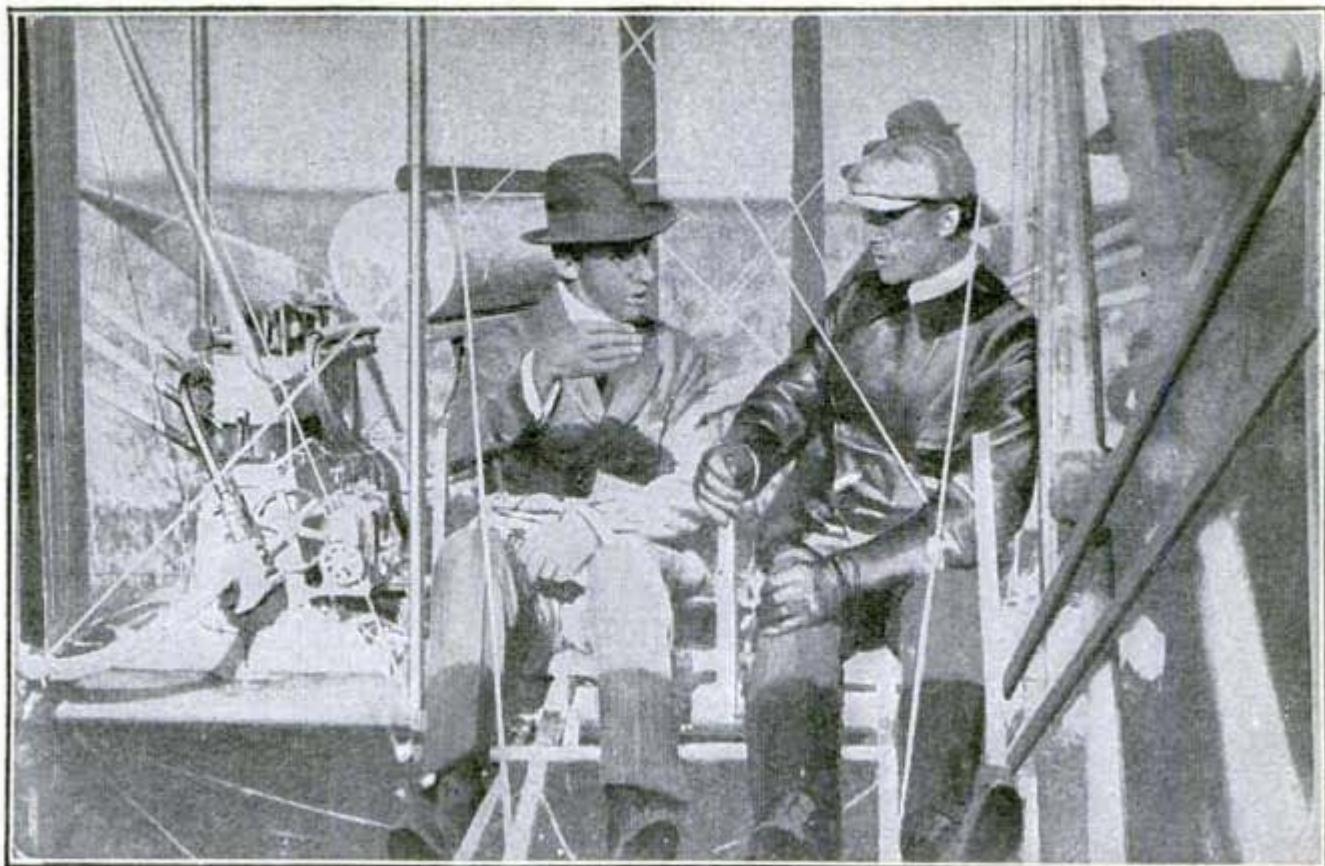
NEW LAKE STEAMER HAS MANY NOVEL FEATURES

The new lake steamer "United States," built for passenger service between Chicago and Lake Michigan ports has many interesting and novel features. Among other things there will be signed photographs of all the governors of the United States in panels between the windows in the main cabin; a large map of the United States carved in wood, each state being cut out of the wood native to itself; an oil painting representing a number of important historical events in the country's history; and the staterooms and officers' rooms, instead of being numbered as on most boats, will be named after states of the Mississippi valley.

The electrical features of the boat are interesting, also. The electric



New Great Lakes Steamer "United States"



King Alfonso Studies Aeroplanes with Wilbur Wright

plants, consisting of turbine generators, will supply current for one thousand 16-cp. lamps. Just back of the aftermast will be an electric flag, 20 ft. long and 12 ft. wide, which will be made to ripple by the operation of the lights. The name of the boat, in electric letters, will be placed just back of the smokestack, and every few moments while the vessel is in actual service, a streak of lightning, made by the operation of electric lights, will flash to the name, which will be spelled out letter by letter.

A wireless telephone system will keep the boat in constant communication with the shore, and bulletin boards and a small newspaper will keep the passengers informed of all important news of the moment received from the land in this way.

The speed of the new steamer will be 19 miles an hour and she will carry 2,000 passengers.

China, for the first time in its thousands of years of existence, is preparing to take an official census. Hitherto an estimate of its population has only been guesswork. An enormous amount of work is involved.

KINGS AND AVIATORS

When an American statesman, multimillionaire, or society leader wishes to be presented at court he must make application to the American ambassador and await results, often to be disappointed by a refusal. Verily, how potent a thing is genius! When Wilbur Wright went to France he was too busy to bother with kings, so kings bothered with Wilbur. Instead of his applying to American ambassadors for an opportunity to be presented at court, kings made application to his business manager for an opportunity to be presented to him on the field of aviation.

Both King Edward of England and King Alfonso of Spain have journeyed to Pau, France, to meet the great American man-bird and watch him fly. This photograph was taken while King Alfonso was seated beside Wright in his aeroplane soliciting information. This king wished very much to fly, but his country and his queen would not permit him to do so.

France possesses a total of 43,550 automobiles in active service, while England has close to 75,000.

HUNG BY FEET FROM HIGH FLAG POLE

Hundreds of citizens of San Leandro, Cal., were subjected to twenty minutes of intense nerve strain on a recent Sunday morning while Frank Bedwell, an employee of the Pacific Telephone Company, hung head downward from a point on the town flag pole 130 ft. above the ground. At the end of 20 minutes linemen of the company succeeded in rescuing him.



ELECTRIC YACHT HAS SPECIAL CHARGING BOAT

Having a decided fancy for electric launches, which have no prime mover in the shape of reciprocating engines, and from which noise, heat and vibration are absent, Benjamin Douglas, jr., has built an electric yacht which is charged by an auxiliary electric charging launch. The latter, which is called the "Kilowatt" and is 35 ft. long, with a 9-ft. beam and a 2-ft. draught, follows the electric yacht from port to port. The charging is done only while the boats are in port, this being made possible by the fact that the owner stays at each port a considerable time, making daily runs from it as his fancy may choose.

The "Cascapedia," the name borne by the electric yacht, is equipped with 88 batteries, which re-

quire a 220-volt charging plant. The "Kilowatt" is merely a floating charging station, having a 6-cylinder 40-hp. gasoline engine, and a 20-kw. dynamo, operated at 220 volts. The dynamo is directly connected to the forward end of the engine, and the mechanism is so arranged that the reverse gear or clutch is thrown out of engagement when the engine is operating the dynamo. With the clutch thrown in operation the engine propels the boat at a speed of 9 miles an hour. The boats are cruising in Florida waters.

IRON ANVIL CONVERTED INTO COPPER

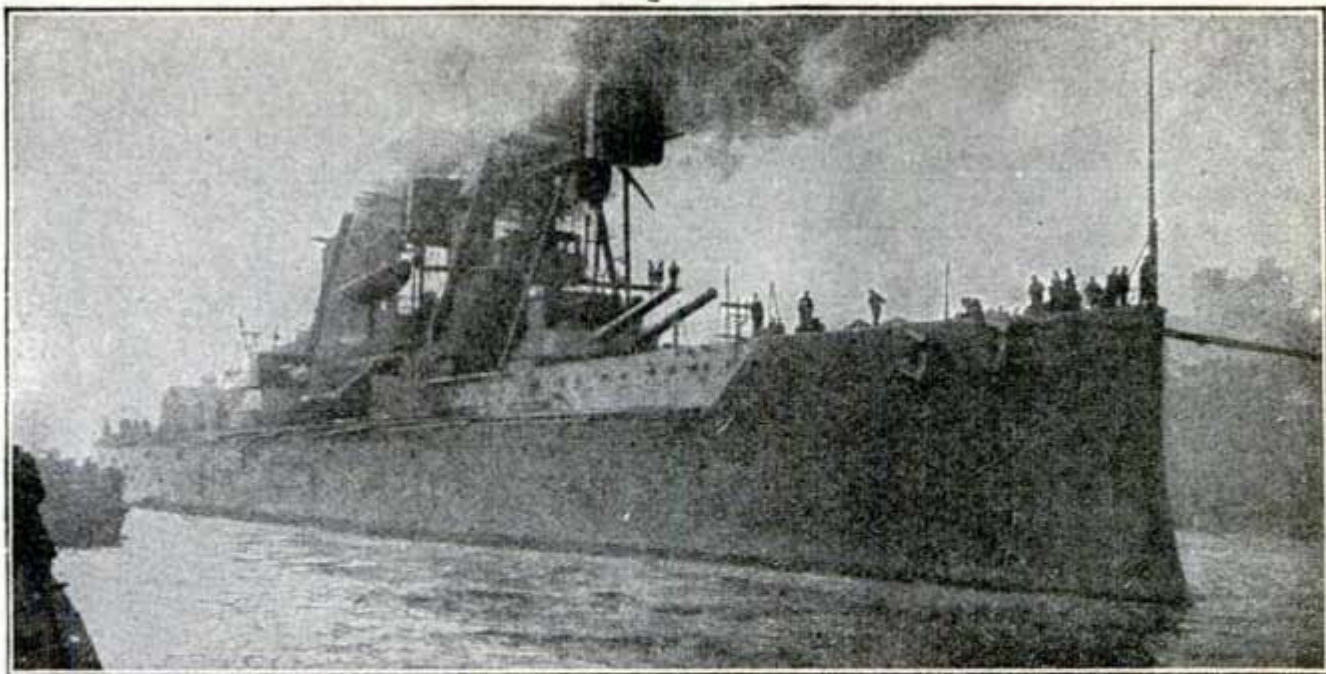
The accompanying illustration shows a 50-lb. iron anvil converted into 94 per cent pure copper by immersion for four years at the bottom of a flooded copper mine at Red Mountain, Colo-



Copper Anvil That Was Once Iron

rado. The change is made by the chemical action of the copper-charged water decomposing the iron and leaving copper in its place.

"The displacement of iron by copper is a very common occurrence, and a chemical reaction which is made use of in the metallurgy of copper," says R. D. George, director of the Colorado state geological survey, connected with the University of Colorado. "The waters in copper mines are often so highly charged with copper in the sulphate form that it is practical to convert it into solid copper. To this end, sluice boxes are often filled with scrap-iron and so arranged that the mine drainage passes through them. The iron is soon eaten away and the copper from the water takes its place. In the



This Battleship Knows No Superior

great Rio Tinto mine of Spain this process is used almost exclusively. The ores consist of sulphides exposed to the weather and bleached. The solutions running away from these sulphide ore heaps are conducted to vats filled with iron, and the precipitation is accomplished.

"I have a piece of iron rail from a mine near Butte, Montana, which has been almost completely replaced by copper. An old shovel and a piece of tram rail almost completely replaced by copper were recently found in the workings of an old mine near Georgetown, Colo."

William Walsh, state inspector of mines in Montana, records instances of steel rails being replaced by 40 per cent copper where they have been under water in mines.

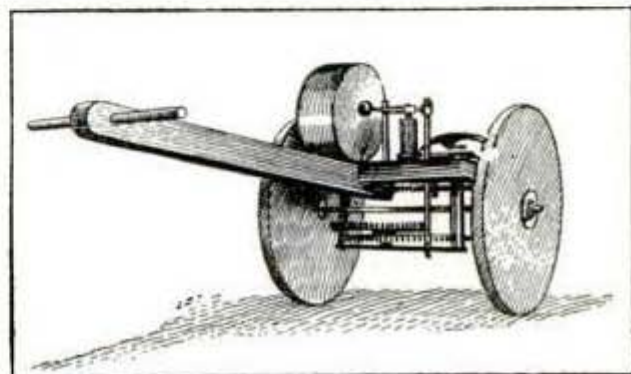
ENGLAND'S GREATEST BATTLESHIP

This illustration shows the British battleship "Superb" receiving the final touches which will complete it for the sea. It is the same type as the "Dreadnought," the ship which gave this latest type of war vessel its name, but it is even more powerful than the bearer of that name. England already has six battleships of the "Dreadnought" type in commission, six more are completing for sea, while two are

in the first stages of construction. Germany has launched four of the new type, and has five others in different stages of construction; the United States has launched four, has three building and two more planned; and France has six under construction.

A TAXI-VEHICLE OF THE ELEVENTH CENTURY

The taxi-vehicle here described attests to the mechanical genius of the Chinese nation in the year 1027 A. D., and is a curious forerunner of the modern taxicab. The chariot was of wood, and at each revolution of its wheels 18 ft. was covered. On its body were fixed two carved wooden figures of men armed with drumsticks. At every 1,800 ft. covered, the registering mechanism caused one of the figures to raise his stick and strike a drum. At the completion of every



The First Taxicab

18,000 ft. traveled, the second figure struck a bell, which, in shape, is curiously like the gong of a modern fire wagon. The reason for such a machine is not recorded.

HOUSE WRECKED BY TRAIN WRECK

The damage to this house was caused by the wreck of an Erie freight train



Two Cars Pitched Upon This House

in Elmira, N. Y. The wreck was the result of a break in an air-brake hose. The cars in the middle of the train buckled, two being forced into a perpendicular position. The end of one fell upon the house and the other crashed into the second-story window. The house withstood the shock of the original impact much better than that caused by the removal of the cars, the latter being responsible for most of the damage.

HOP PICKER PROVES A FAILURE

Some time ago a hop picking machine was invented which was expected to rejuvenate that industry in Califor-

nia. Reports now state that after a season's trial by one large hop grower, in which more than \$40,000 was spent trying to perfect it, the machine has been declared a failure. It is claimed that the machines wasted as much hop as they picked, and were not as economical in operating as was expected. Further reductions of hop acreage in California are now expected, and in the Sacramento district sugar beets, alfalfa and garden truck are being substituted.

MAGAZINE FOR THE BLIND BY THE BLIND

The Zeiglar magazine for the blind, printed every month in both American-Braille type and New York point, not only furnishes the blind with a magazine they can read but also furnishes an occupation for the blind. Already the plant, which is located in New York, employs one girl who is totally blind, two who are partly so, and one who is not only blind but deaf and dumb. One of the proofreaders is a blind man who is working his way through Columbia University. Gradually more will be taken on, it being the intention of the publisher to employ blind girls as rapidly as possible, adding only one at a time, that they may be trained.

The blind girls collate faster than the girls who have their sight. To "collate" means to place the sheets of the magazine together in the order in which they are to be stitched. As the damp sheets fall from the press they are hung over bars in the drying room. When dry they are placed in piles on a long table—page 1 in the first pile, page 2 in the second pile, etc. Then in rapid succession the girls pass from one pile to another, putting the sheets together.

Each blind girl is led to and from her work by one of the seeing girls. The blind girls do their work faster because there is nothing to distract their attention. Their work is everything to them.

SHACKLETON ALMOST REACHES SOUTH POLE

Union Jack Planted 111 Miles from Pole—Eight Distinct Mountain Ranges Were Discovered—Coal Mixtures Were Found in Limestone

In one of the most dramatic dashes ever made to reach either the south or north pole, Lieutenant E. H. Shackleton, of the British navy, carried the union jack presented to the expedition by England's queen to within 111 miles of the south pole, 340 miles farther than Scott's record of 1902.

From a mechanical standpoint the feature of the trip was the use of motor sleighs in the first stages of the dash, and, although the first reports said little of them, it is believed that their use enabled the party to cover a greater distance over rough country than could have been accomplished by dogs and Siberian ponies alone.

Space is not available to give the whole story of the great expedition, but Lieut. Shackleton's story of the final dash, and the return, is dramatically interesting. The food stations along the route were named after the horses killed, and the food consisted mostly of their flesh. The total distance of the dash, including relays, was 170 statute miles. The main result of the expedition was a good geological collection. Coal mixtures were found in limestone, and eight distinct mountain ranges were discovered.

"On Nov. 26," says Shackleton, "we reached the 'Discovery' expedition's southernmost latitude. The surface was now extremely soft, with large undulations, and the ponies were attacked with snow blindness. On Nov. 28 the pony, Grisi, was shot, and we made a depot in latitude 82.45; longitude 170, for oil, biscuit, and pony meat. Steering southwest, we approached a high range of mountains trending to the southeast. On Dec. 2 we found a barrier that, influenced by great pressure and ridges of snow and ice, had turned into land. We discovered a glacier at latitude 83.33; longitude 172. We started on Dec. 25 to ascend the glacier, the surface of which was so crevassed that it



Lieut. Shackleton and the Point He Reached

took a whole day to fight our way 600 yards.

"On Dec. 7 the pony, Socks, breaking through a snow lid, disappeared in a crevass of unknown depth. The single-tree snapping, we saved Wild and the sledge. The party was now hauling a weight of 250 lb. per man. The clouds disappearing on Dec. 8, we discovered more mountain ranges trending south southeast. Moving up the glacier over the treacherous snow covering the crevasses, we frequently fell through, but were saved by our harness, and pulled out with an Alpine rope. A second sledge was badly damaged by the knife edged crevasses.

"On Dec. 18 we reached an altitude of 6,800 ft., and in latitude 85.10 we made a depot and left everything there but our food, instruments and light camp equipment, reducing our food rations to 20 oz. per man daily.

"We reached on Dec. 26 a plateau after crossing ice falls at an altitude of 9,000 ft., thence rising gradually in long ridges to 10,500 ft. Finishing the relay work, we discarded our second sledge. There was a constant southerly blizzard, the wind drifting the snow, with a temperature ranging from 37 to 70 degrees of frost. We lost sight of the new mountains Dec. 27. Finding the party weakening from the effects of a shortage of food and the rarefied air and cold, I decided to risk making a depot on a plateau.

"We proceeded on Jan. 4 with one tent, utilizing the poles of the second tent for guiding marks for our return. The surface became soft and the blizzard continued. For 60 hours during Jan. 7, 8, and 9 a blizzard raged with 72 degrees of frost and the wind blowing 70 miles an hour. It was impossible to move. Members of the party were frequently frostbitten in their sleeping bags. We left camp on Jan. 9 and reached latitude 88.23, longitude 162. This is the most southerly point ever reached. Here we hoisted the union jack presented to us by the queen. No mountains were visible, and we saw a plain stretching to the south. We could go no farther, but undoubtedly the geographical south pole is situated on a plateau from 10,000 to 11,000 ft. above sea level. The altitudes of the new mountains ranged from 3,000 to 12,000 ft. approximately. Violent blizzards in latitude 88 degrees show that if a 'polar calm' exists, it must be a small area.

"Our return was forced. We picked up our depot on the plateau, guided by our outward tracks, for the flags attached to the tentpoles had been blown away.

"On the morning of Jan. 26 our food was finished. It was slow going. Sixteen miles were covered in 22 hours'

march. The snow was 2 ft. deep, concealing the crevasses. We reached the lower glacier depot in latitude 83.45 degrees on the afternoon of Jan. 27. There we obtained food, and proceeding, reached the Grisi depot, named after a dead pony, on Feb. 2. There was no food remaining.

"The entire party were prostrated by dysentery on Feb. 4 and were unable to move. The dysentery continued eight days, but helped by strong southerly blizzards we reached the Chinaman depot on Feb. 13. The food had again run out.

"The blizzards continued, with 50 degrees of frost. We discarded everything except our camp outfit and geological specimens, and on Feb. 20 reached the next depot, all our food being finished. Helped by a southerly blizzard, which was accompanied by 67 degrees of frost, we reached, on Feb. 23, the depot at Minna Bluff, which had been laid by the Joyce party in January."

At the same time the dash for the pole was being made Prof. J. K. Davis and a small party, forming the reserve force on the "Nimrod," the expedition's ship, made an independent trip to the magnetic pole, latitude 72.25; longitude 154 degrees east, where he planted the union jack.

ZEPPELIN'S GREATEST FLIGHT

Count Zeppelin's great airship, the pride of the German people, created a world's record in a flight during the latter part of March by carrying 26 persons. The huge dirigible ascended from Lake Constance bearing Count Zeppelin, 10 aeronautic experts of the German army, and 15 soldiers. Rising as majestically as an eagle, it flew a distance of 150 miles and was in the air 4 hours.

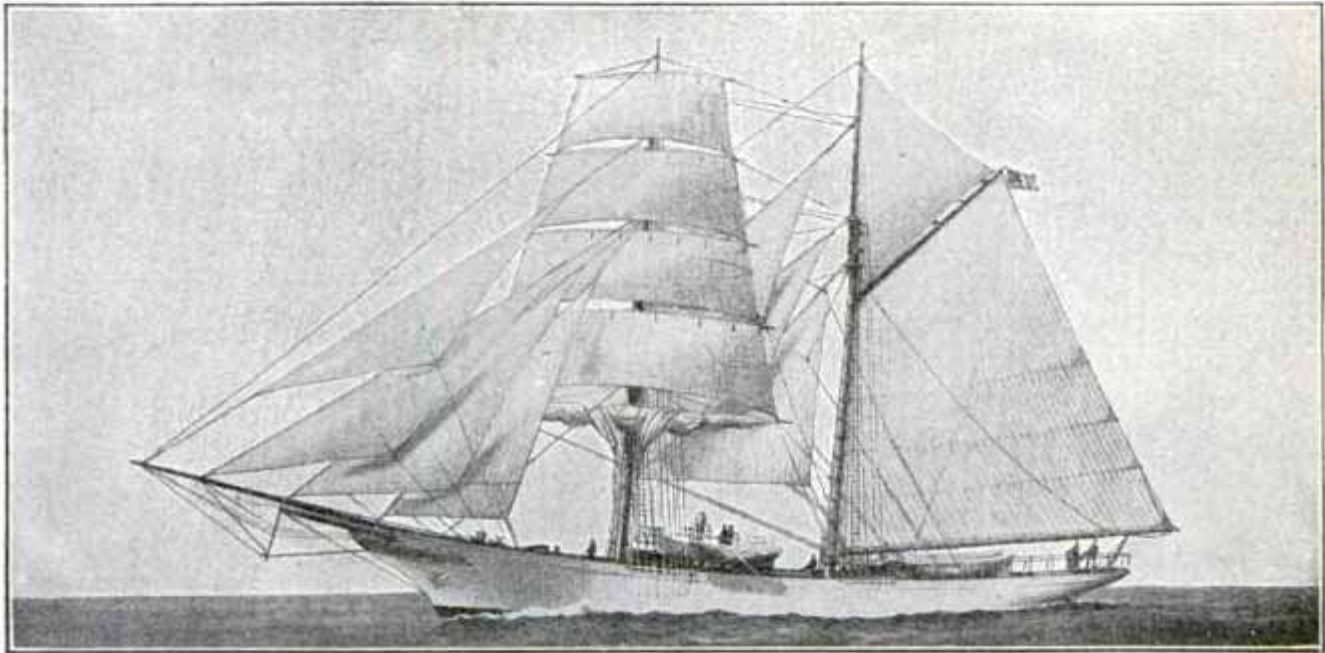
All Germany was aroused to additional enthusiasm by the flight. The comparatively great weight carried convinced the experts that an equal weight of explosives could be carried with the same facility.

FIRST NON-MAGNETIC SHIP EVER CONSTRUCTED

**It Will Be Used for a Magnetic Survey of the Oceans—The Reason
Such a Survey is Necessary**

It is a well known fact that while in one part of the ocean the needle of a compass points practically due north, in other localities the variation, as the mariner terms the angle of departure of the compass from the true north, is several degrees or more. This variation exists on land as well as on the ocean. At present in the United States

line of "no variance" is continually changing, both on the land and on the ocean, and for this reason the Carnegie Institution of Washington undertook a series of surveys to determine the magnetic conditions all over the deep water seas. The first step in the ocean work was a magnetic survey of the Pacific ocean, very little having been accom-



This Ship Will Undertake a Magnetic Survey of the Oceans

the line of no variation begins at the eastern part of Lake Superior and Michigan and runs through Ohio about half way between Columbus and Cincinnati, and after passing through the eastern parts of Kentucky and Tennessee, cuts through South Carolina and enters the Atlantic ocean near Beaufort, South Carolina. For all places on the east side of this line the variation of the needle is west, and for all places west the variation is east. This variance, for many years considered as a senseless caper of the compass, is due to terrestrial magnetism, or, in plainer words, the magnetic force exerted by the earth, and recognized by its effect upon magnetised needles and bars.

It is also a well known fact that the

plished except through shore observations on some of the islands and along the coast. Observations were made from the converted wooden yacht "Galilee" in three voyages during a period extending from 1905 to June, 1908, but this was only a good beginning of the work, and to continue it along the most scientific and exacting lines a unique survey ship is now being constructed.

The experience gained with the "Galilee" proved that it would be advantageous to have a thoroughly non-magnetic yacht with auxiliary power and every detail arranged specifically for making magnetic observations, and this is what is now being done. The result will be the first ship ever constructed

in which iron and steel and other magnetic metals will practically have no part. With the exception of thin cast-iron liners in the cylinders of the bronze internal combustion engine, and the steel cams necessary for operating the valves, aggregating less than 600 lb., there will be no magnetic materials used.

The hull will be constructed as thoroughly and substantially as any merchant ship afloat. The keel, stem, stern-post, frames and dead-wood will be of white oak; the deck beams, planking, and ceiling will be of yellow pine, and the deck of Oregon pine in long lengths. The fastenings will consist of locust-wood nails, copper and bronze bolts, and composition spikes. All metal deck fittings, and metal work on spars and rigging will be of bronze, copper and gun-metal.

The vessel will be 155 ft. long, 33 ft. beam, 12 ft. draft, and barkentine rigged. She will carry nearly 12,900 sq. ft. of plain sail, which will give her full sailing power. The engines will be used only for the purpose of manoeuvring when in port or crowded roadsteads, and during a calm at sea. Her speed under steam will be only six or seven miles an hour.

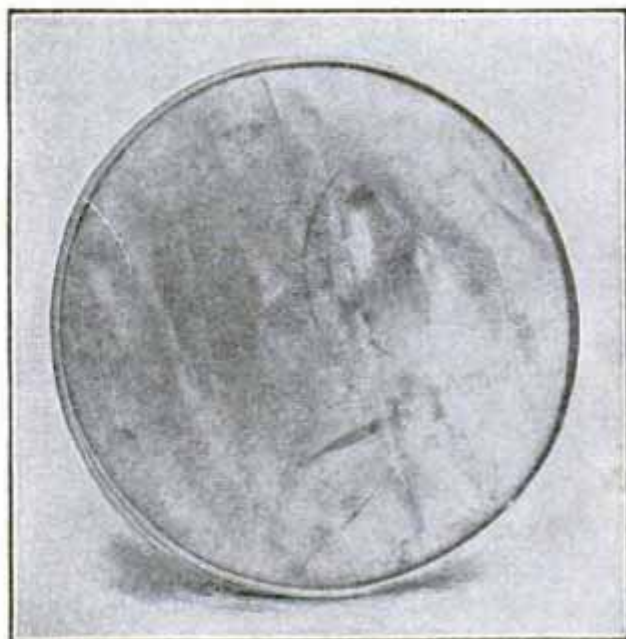
TRAIN WRECKED BY COW

The shattered engine shown in this illustration came to grief by hitting a cow in the Chattanooga yards of the Central of Georgia railroad. The train was running at a speed of 15 miles an hour when it hit the animal, throwing it ahead. Before the engine could be stopped it had run upon and over the cow, leaving the tracks and turning completely over. The engineer and fireman were horribly scalded.—Contributed by C. R. Stegall.



HISTORIC OLD DRUM HEAD

An object of more than ordinary historic interest is an old drumhead that is part of a drum used on the United States frigate "Constitution." There can be seen on its surface several dis-



Stained with Blood

tinct bloodstains, from which the conclusion is drawn that the drummer was killed or severely wounded while beating to quarters or when giving any one of the numerous calls required in those days when a drum was used for signaling to the men while a ship was in action with an enemy. An attempt has evidently been made to remove the

bloodstains, at some time, and probably the want of success caused the sheepskin to be taken from the drum shell and placed in a locker, where it was found when the old frigate was first remodelled some three-quarters of a century ago. It was given to Mr. Bourne, then a resident of Charlestown, by an officer of the Navy Yard over 50 years ago. Mr. Bourne gave it to Albert Plummer, who lived in Auburndale. Mr. Plummer has owned the relic many years. Thinking that so valuable a relic should be in the care of some society for the preservation of things historical, he has recently given his treasure to the Lynn Historical Society.



The Beehive Hat

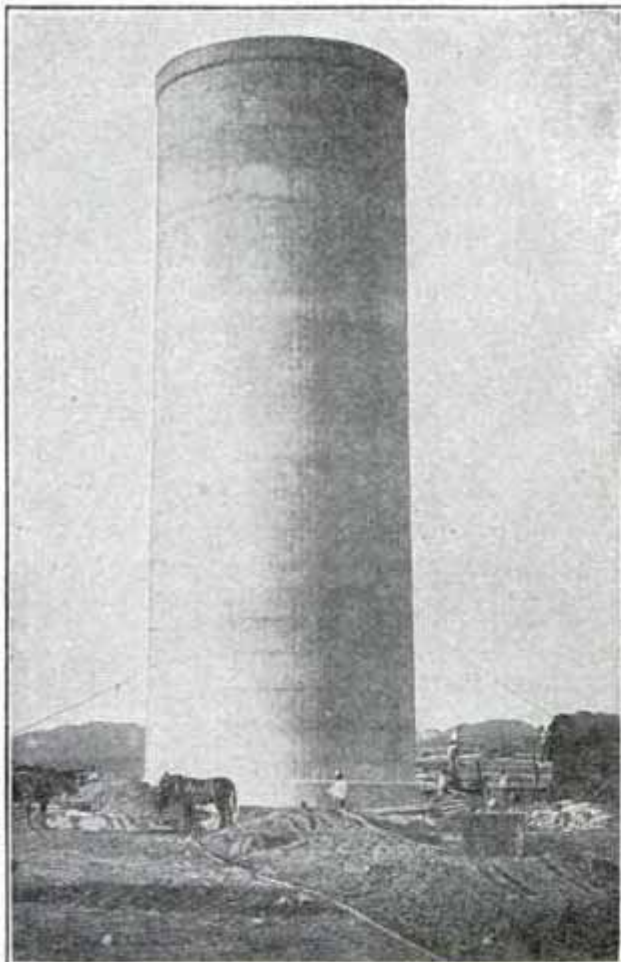
GREAT CONCRETE TANK BUILT IN MEXICO

Although the Rio Grande is the dividing line between two races and two civilizations as dissimilar as any other in the world, new landmarks here and there show that the American idea, backed by American "push," is slowly but surely finding a foothold. At a



The Empire Hat

Latest ideas from the Paris hat makers—There should be great possibilities in a "Windmill" for some bright hat mechanic.



Concrete Tank in Mexico

point near Guaymas a Los Angeles contractor has completed a water tank that is interesting in construction as well as in the fact that it is in Mexico. It is built entirely of concrete, is 110 ft. high and has a diameter of 30 ft. It is not built on a high frame, as is usual with such tanks, but rises from a huge concrete slab in the ground, giving it a reservoir capacity of 400,000 gal. Two concrete smokestacks, one of which is 150 ft. high, have also been built in the vicinity. The work is being done in connection with the building of the Cananea, Yaqui River and Pacific railroad, and before all is accomplished concrete bridges will carry the tracks across Mexico's larger rivers.

CUTTING A SHIP CHANNEL THROUGH ROCK RIVER BOTTOM

United States Government Will Expend \$6,000,000 in Cutting Through Lime Kiln Crossing in Detroit River—Task Necessitates Greatest Cofferdam in the World—Dry Land Made of Huge Stretch of River Bottom

For nearly 40 years projects for improvement in the Detroit river have steadily progressed in the vicinity of what the lake charts designate as the Lime Kiln crossing, but in spite of every effort on the part of the United States government, the original channel through the narrow passage lying just south of Detroit has never been satisfactorily completed, although millions of dollars have been expended. Now the government is undertaking the stupendous task of cutting a new channel to the westward of the original, at the same time continuing to improve the old channel.

The plans for the new channel, the work on which is now actively under way, provide for a channel approximately 14 miles long and from 22 to 26 ft.



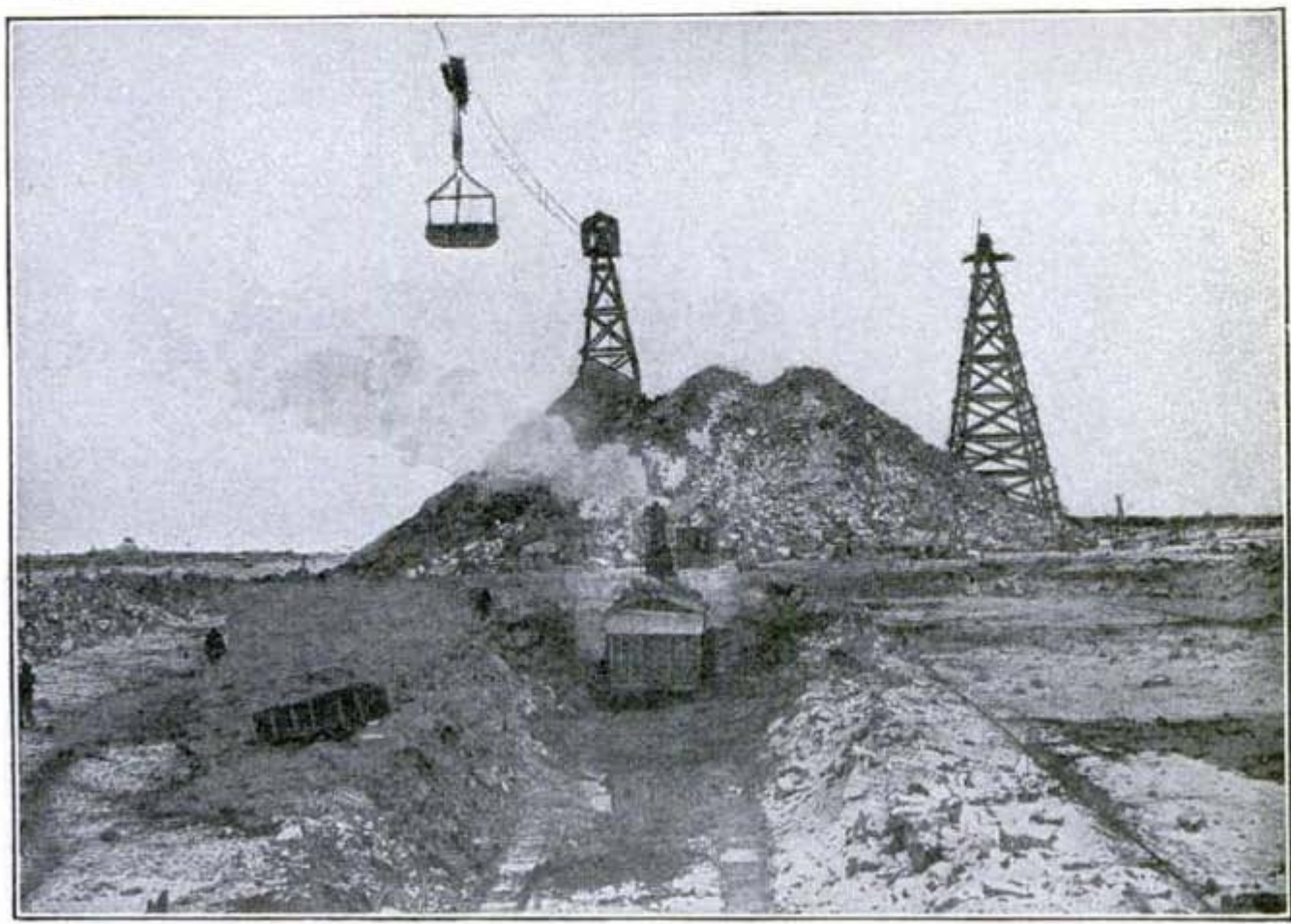
Pneumatic Drills Preparing the Way for the Blasts

in depth, at an estimated expenditure of \$6,000,000. So great is the undertaking that it is probable that its completion will require from five to seven years of constant work during the open seasons, and to shorten this time as much as possible the specifications have been divided into four sections, for each of which a separate contract has been let.

The most difficult stretch is Section 2, which extends over the Lime Kiln crossing, and involves almost exclusive rock channeling. As the original water depth over this stretch was but from 2 to 4 ft., something like an average of 20 ft. of solid limestone must be blasted out for more than a mile, and to a width of 300 ft. To facilitate this work a giant cofferdam, the largest in the world, was begun, and now, as shown in the illustrations, the work of cutting out the limestone is rapidly progressing.

In constructing the cofferdam, which is 6,000 ft. long and has an average width of 1,600 ft., a core of huge blocks of stone was laid on the bed of the river and laboriously piled up until the surface of the water was broken by rippling eddies. Then a coating of clay and silt was dumped on the up-river side of the barrier, to fill its interstices and make it watertight. In the mean-

time a great compressor plant was built and engines installed. Along the walls of the cofferdam an 8-in. pipe line was laid, and near the center of the north wall a spillway was erected and a battery of 8-in. pipes put in place. When the compressors were started and the air was released from the high-pressure feed



First Gash in River Bed and the Conveyer—Great Steam Shovel Gathering Up the Shattered Rock

lines beneath the 8-in. pipes, the water within the cofferdam was literally lifted up and beyond the enclosing walls. Just beyond the air lifts two centrifugal pumps, operated by steam, added their quota to the millions of gallons of water being forced out each day, until acre after acre of the seamed limestone bed of the river were exposed for the first time in the history of man.

Within the enclosure of the cofferdam two small islands were piled up to serve as the foundation for two great conveyer derricks which now thrust their heads 105 ft. into the air. Following the line of survey stakes that marks the course of the channel, two small cars, called "channelers," run back and forth along each side, dragging high pressure air hose. At one side of the channeling machine, a steel bit, raised and lowered by compressed air, hammers at the rock under a 90-lb. pressure, in addition to its own weight. As the bit, which is 12 ft. long, cuts its way into the rock, showers of pulverized limestone shoot into the air in the shape of sticky mud. In the space between the channeling machines lies what is known as the core. Here are the hundreds of thousands of yards of rock that must be cut away, and sprinkled over its surface are the pneumatic drills, snapping viciously under the air pressure. As soon as the channelers have cut away the edges of the core sufficiently, explosives are rammed home in these holes, each of which is so connected by electric wires as to make possible the simultaneous explosion of the entire blast. As rapidly as the core is torn free, the big steam shovels move in and pile the debris into the huge skips or buckets hanging on the cable-way.

To excavate the channel through the limestone will require the removal of something like 1,500,000 cu. yd. of solid material, and when this great task is accomplished a great volume of water will again hide the deepened river bed from the eyes of man and great ships will find safe passage over it.

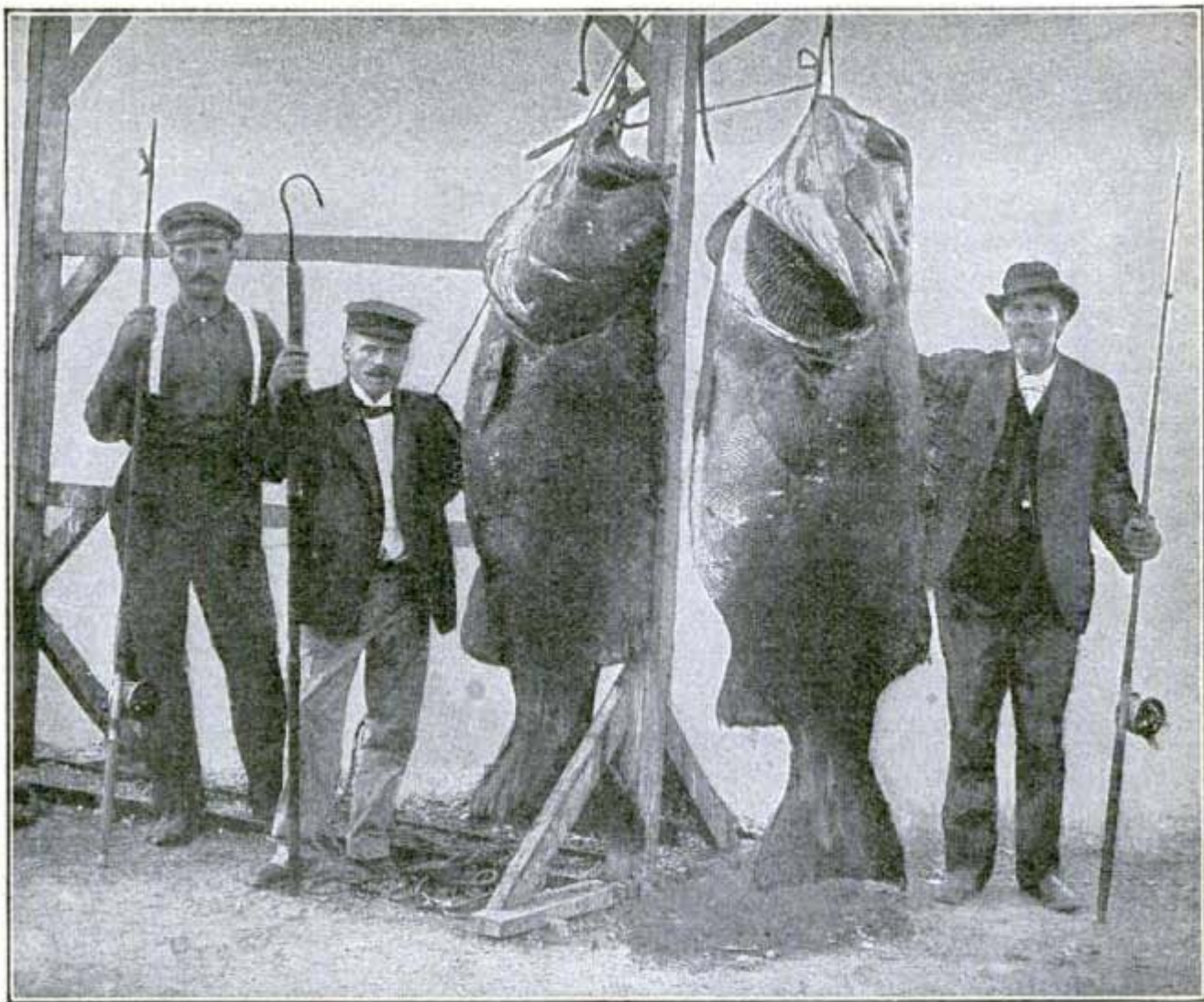


WIRELESS ROOM OF U. S. S. "GRESHAM"

When the "Republic" was rammed by the "Florida" the revenue cutter "Gresham" was one of the ships which responded to the wireless calls for help. It was from this room that the "Gresham" received and answered the "Republic's" appeals.

QUELLING A FIRE IN BUDAPEST THEATRE

A few months ago while a play was being given in the National theatre in Budapest, Hungary, the curtain caught fire from a torch in the hands of one of the actors and the flames spread rapidly. The iron curtain-supports dropped down, releasing the water from a large reservoir above, which serves under ordinary circumstances for the production of artificial rain. This flood of water overwhelmed the entire



The Larger Weighs Over 400 Pounds

stage, completely removing all danger of a serious fire, but, as the electric installation was not adapted for an impromptu bath, the lights went out all over the house. The audience, however, retired quietly, no one being injured, but after an investigation the government officials recommended that every electric installation be so arranged as to be capable of withstanding the flood of water following the release of the safety-reservoir.

TWO GIANT FISH CAUGHT WITH LIGHT TACKLE

Of the many species of fish which are annually caught at Santa Catalina, California, few attain the size of the two black sea bass or Jew fish shown in the photograph. The larger of these fish weighs over 400 lb., and was brought to gaff after an hour-and-a-half fight with the fishing tackle held by the fish-

erman on the right. The fish was played on 900 ft. of No. 24 cuttyhunk line. The amount of line generally used to play these monster fish is from 600 to 900 ft. After the "strike" is made the fish will usually sulk on the bottom and the fisherman is compelled to play him until he is near enough to the surface to be gaffed by the boatman.

SOLDIERS TO ADMINISTER THEIR OWN ANAESTHETIC

Reports from Germany state that a professor in the Virchow hospital of Berlin has discovered a new narcotic and anaesthetic which a wounded soldier can administer to himself on the battlefield without danger of serious results.

The mixture consists of 2 parts ethyl-chloride, 4 parts chloroform, and 12 parts sulphuric ether. This mixture boils at a very low tempera-

ture; in fact, at the normal temperature of the human body. If anyone clasps a phial containing it in his hand for a few moments it boils gently. The patient inhales the vapor and quickly it produces freedom from pain, then sleep. If the phial is held so that the patient continues to inhale the vapor his sensory nerves become blunted, and he rests quietly instead of tossing in agony on the battlefield. It is claimed that unconsciousness will come before the amount inhaled would be dangerous, thus making it impossible to administer an overdose.

The professor insists that its harmlessness recommends it for use in war, and suggests that each soldier be provided with a tube of it, which he could use for himself until taken care of by a surgeon.



FIXTURES FOR HIGH CANDLE-POWER ELECTRIC LAMPS

These ceiling fixtures are for high-candlepower electric lamps, and they produce a combination that effectively avoids glare, yet distributes an even intensity of light over a large working area. The designs are artistic and ornamental by daylight as well as when illuminated. The third in the group of three is provided with a diffuser which permits a subdued light to be thrown on the ceiling, thus adding to the cheerful effect of the room. The shades are made both of frosted and art glass.



GETS DOCTOR'S AID BY WIRELESS

While the steamer "Asuncion" was some hundred miles distant from Eureka, Cal., a sailor fell to the deck from the rigging and received injuries which caused severe internal hemorrhages. Wireless messages were immediately sent out asking for medical advice. The messages were picked up by the station at Eureka and a physician called. His instructions for treatment were sent back through the air to the ship, in all probability saving the man's life.

TRAINING MEN FOR RESCUE WORK IN MINE DISASTERS

By John L. Cochrane

In addition to the actual experiments in testing explosives at the U. S. government experiment station at Pittsburg, important experiments are being made in rescue work. One part of the station has been fitted up as a miniature coal mine. This is a large glass-encased, air-tight room which contains difficult passages and various obstructions such as are found in coal mines after an explosion. In different parts of the passages are placed dummy asphyxiated miners, deadly gas is then forced into the room, and a rescue corps of men who are being trained in the work enter it daily, clad in helmets which supply them with oxygen while they work. The men work in the gas-filled chamber for two hours, removing obstructions, picking up the dummies, placing them on stretchers, and carrying them away.

One-half of the large building in which the rescue room is located is used as an auditorium, and several hundred miners and operators can watch the rescue drill from this vantage.

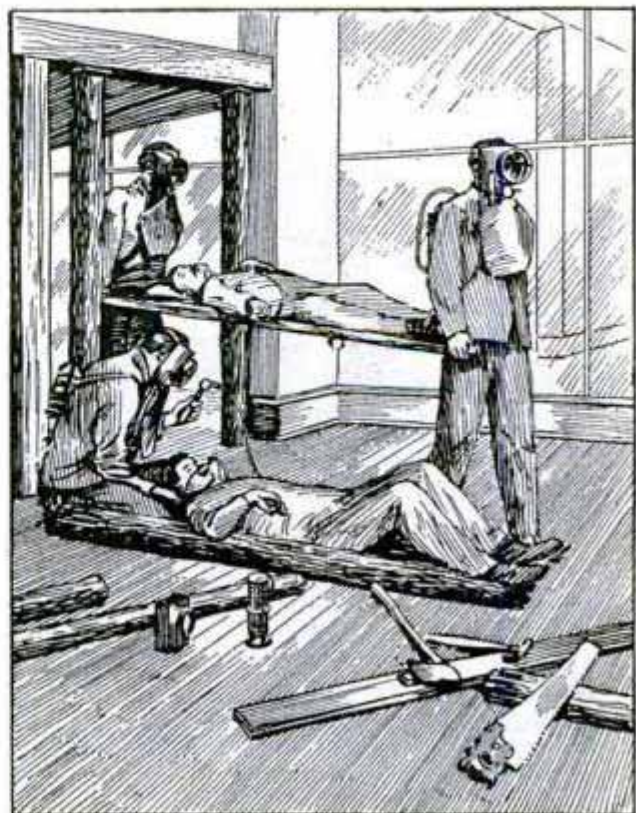
There has been but little opportunity so far for the rescue corps to demonstrate its efficiency in the actual mines, but in one instance in which the helmeted men were fighting a mine fire, they were able to pick up an unconscious man and carry him to a place of safety, where he was given oxygen treatment and recovered his senses in a short time.

It is not the intention of the U. S. government to furnish rescue corps whenever and wherever there is a disaster. The present corps was organ-

ized with the idea of encouraging the mine owners and miners to form such organizations themselves. Invitations have been issued to operators throughout the country to send picked men to the experiment station, where they watch the government rescuers at work and later go through the same training themselves, thus gaining the necessary confidence in the use of the helmets.



Already a number of large mining companies have taken advantage of the invitation, and others are organizing rescue corps at their mines.



AMERICA'S FIRST RAILROAD TRACK BUILT 100 YEARS AGO

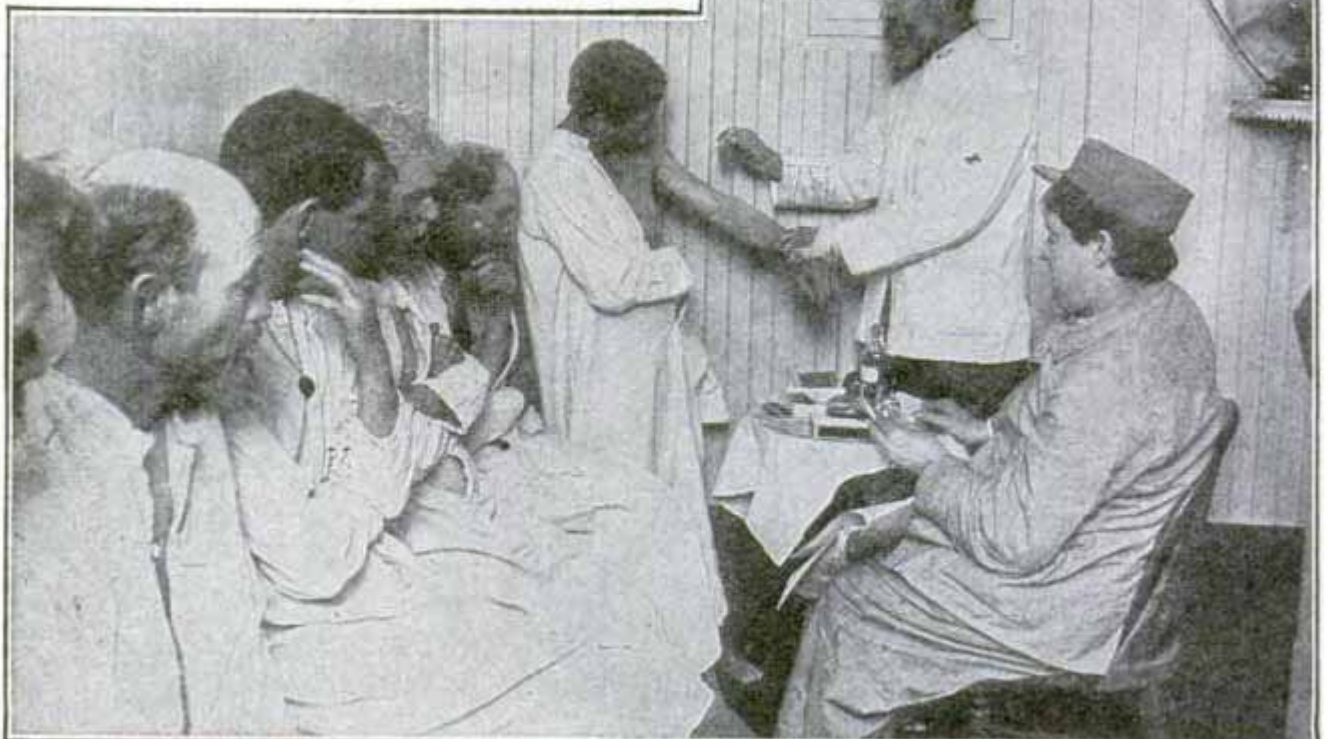
According to Frank H. Taylor, of Philadelphia, the first practical railway track built in America was constructed in Philadelphia in 1809. At that time, remnants of the line of defenses erected against the rebel colonists by British troops in 1777 still remained, and here a civil engineer named John Thompson, and a Scotch millwright named Somerville, constructed a track of wooden rails while the staid citizens of Philadelphia looked on in amazement. The rails rested on sleepers 8 ft. apart and the roadbed had a grade of $1\frac{1}{2}$ in. to the yard. When completed this experimental piece of railway track extended 180 ft. Upon this a car with grooved wheels was placed, and it was found that one horse could pull a heavy load upon these rails with more ease than could several horses upon a wagon road. Thereupon John Thompson secured a contract to build such a line from a quarry to a river landing, 10 miles distant. This line, the first of its kind in America, was operated for 19 years, horses being the motive power.

The son of this engineer, John Ed-

gar Thompson, afterwards had an important part in the building of the early railroad lines which now form part of the Pennsylvania system, and later he became president of that corporation.

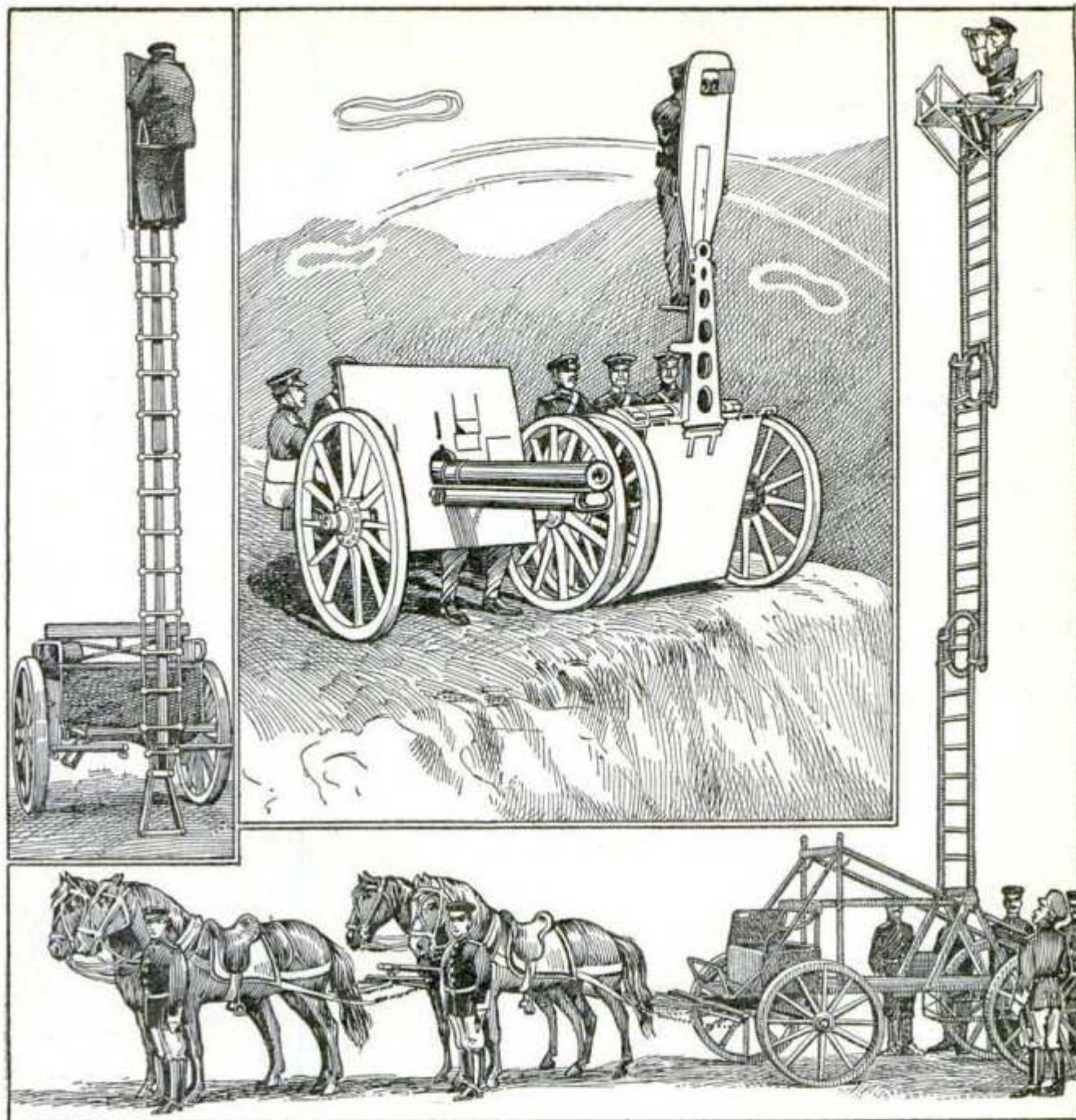
VACCINATING NEW YORK'S MUNICIPAL LODGERS

One of the practices which tends to keep the municipal lodging house of New York from becoming too popular with certain types of unfortunates is the vaccination ordeal through which many have to go. Among other restrictions, the rules forbid a lodger the wearing of any other clothes when going to bed than those provided by the institution, all apparel worn by the lodgers on entering the institution are fumigated in order that vermin and germs of disease may be destroyed, all applicants must take a bath unless excused by the doctor, bottles of liquor must not be brought in, and statements must be absolutely truthful.



Where Baths and Vaccination Are Compulsory

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TYPES OF ARMY OBSERVATION DEVICES

Three types of the observation wagons or trucks now being experimented with in European military circles are shown in these illustrations. Two of them are formed from the front trucks of field guns, the steel shafts forming the observation posts. In one instance the shafts are fitted one upon the other, thus providing a considerable height. The ascent is made by means of a rope ladder and the observer is protected by an armored shield. The third type is a wagon constructed purely for observation. The

ladder, which is of steel tubing, is made in three sections, easily erected.

It is believed by military experts that such devices will be of great assistance to artillery, as they make possible the placing of the gun under cover by providing a vantage point from which to watch the effects of the fire. One of the greatest fights at Port Arthur during the recent war was for the capture of a certain commanding position, not on which to mount guns, but from which to watch the effect of the gunfire.

AN INGENUOUS TEAPOT

The illustrations of this ingenious teapot, showing it in its vertical and horizontal positions, are sufficient in themselves to explain its original and practical features, but a few lines will



The Two Positions

not be amiss. A strainer occupies one-half of its upper part, and in this is placed the tea leaves. The pot is then set in its vertical position and the boiling water is poured in until the lower part is filled almost to the height of the bottom of the strainer. The pot is then tipped backward onto its back and in this horizontal position the water floods the strainer and is impregnated with the tea. When the infusion is thought to be sufficient, the pot is again righted, this action separating the tea from the tea leaves. The tea is then poured out, and if it is too weak, the pot is again replaced for a few minutes in its horizontal position.

With such a teapot it is possible to regulate the strength of the beverage at will, and also to avoid impregnating it with the products of the tea leaves so detrimental to the nervous system.

NATURE PROVIDES LARGEST FOUNTAIN IN THE COUNTRY

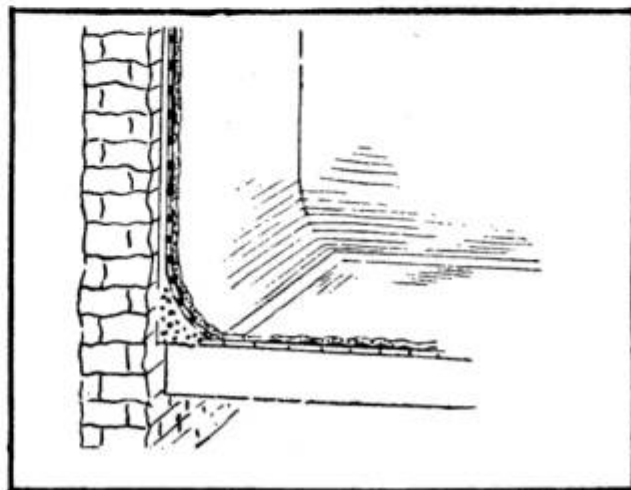
Near the Great Falls of the Missouri in north-central Montana are a number of very large springs that present unique geologic features and suggest an interesting problem as to the source of the water. These springs, known locally as Giant Springs, were

discovered in 1804 by Captain Lewis, of the Lewis and Clark expedition, and were then described as the largest fountain in the United States.

The springs issue through large joints in a medium of coarse-grained sandstone at the river's edge and in the bed of the river itself. This situation of the springs makes exact measurement of the flow rather difficult, but the difference between the measurement of the flow of the Missouri river above the springs and below them is assumed to be the amount of water coming up from them. This amount is approximately 638 cu. ft. a second, which is equivalent to more than 400,000,000 gal. every 24 hours. The water which boils up from this veritable underground river is clear and relatively pure, containing no more dissolved salts than the average well water of the region.

BASEBOARDS UNNECESSARY WITH CEMENT FLOORS

The wooden baseboard which collects dust, grows old and black, and soon becomes unsightly, is no longer needed if the flooring is of cement or concrete. By carrying the cement or concrete floor up on a curve, as suggested by a hotel magazine and shown in this drawing, the baseboard is done away with, along with the right-angle corner which collects dust. Above all, it will keep the furniture of the room away from the walls, thus saving the paper or calcimine, and the plaster.



No Corner to Catch Dirt

The chief mission of the baseboard is the covering of the openings left in the old style of construction in which the plaster meets the floor, and incidentally serves as a runway for rats and mice.

ELECTRIC RAMMER FOR BIG GUNS

Ramming home shells and powder charges in the big guns of the U. S. battleships is simplified by this electric rammer motor, made in the naval gun factory at Washington from special designs. It is telescopic and when not extended is only a few feet in length. In shape it resembles a rapid-fire gun to some extent.

THE COLOR OF WARSHIPS

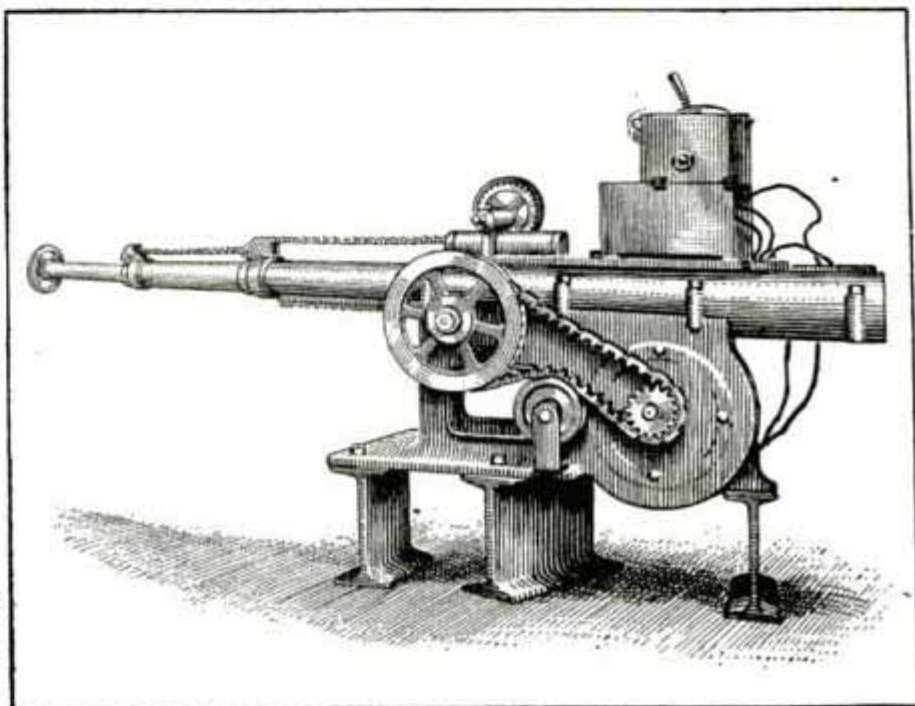
During the period of the Spanish war, the United States battleships, previously pure white, adopted the grey tints which were then becoming general in foreign navies. White was again used when the ships were refitted after the war and has been used up to a few months ago, but the department has adopted slate grey as the standard color for the larger vessels and all will be repainted as the opportunity offers.

It is not alone on account of the comparative invisibility of the grey that it has been adopted, for the color of the coat of paint is one of the things that might be left until war threatened without serious menace to the fleet, but because the cost of keeping the ships smart and presentable is much more expensive if painted white than when grey is used.

Torpedo boats are usually painted a dark olive green, as their low free-

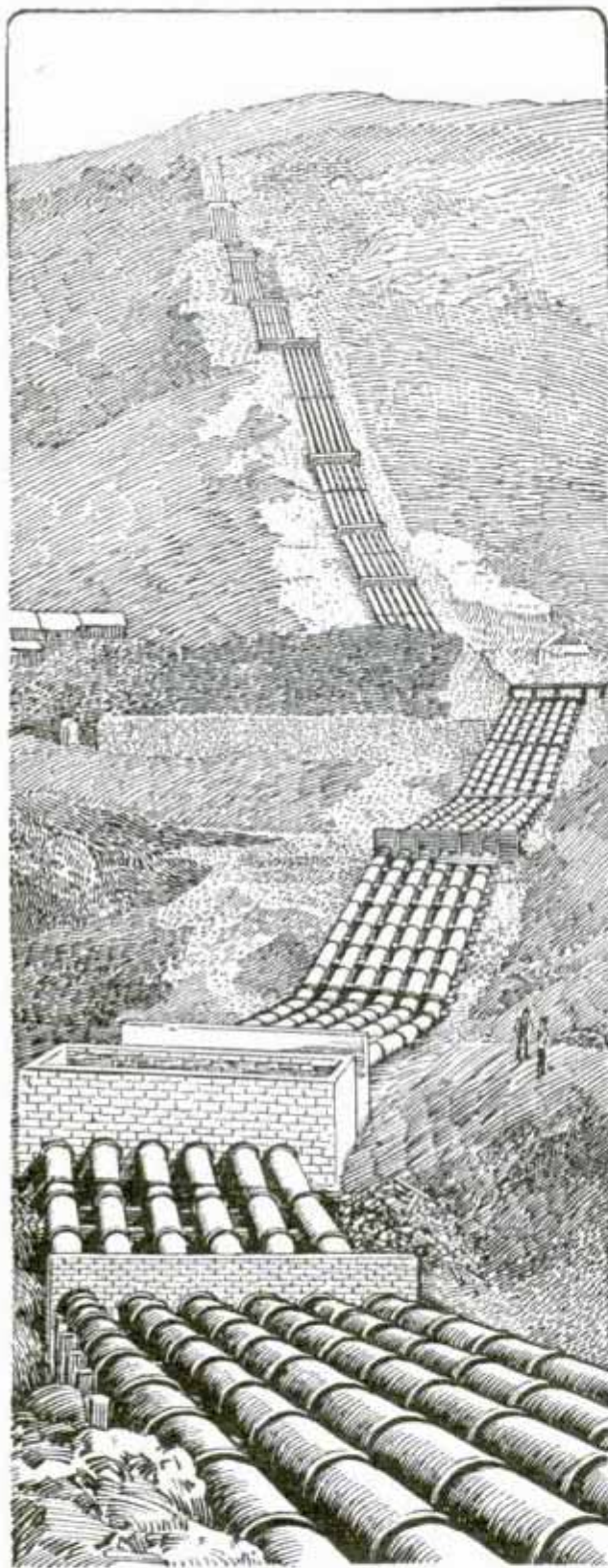
board, and absence of superstructure seem to make it most suitable for them.

An interesting story of changes in the color of battleships is told in connection with the career of the late Commodore Fyffe, of the American navy, occurring some few years ago. In those days a naval vessel often remained in port for months after a long sea trip and the foreign residents of the port, especially those from the country the ship represented, began to look upon



Electric Rammer

her as belonging to them. They "liked" or "disliked" her anchorage; thought she ought to lie farther out or farther in; wrote letters to the captain protesting against evening gun-fire, etc. According to the story, Fyffe had his ship at Yokohama for just such a period, and some of the American residents found that the color of the vessel did not suit them. To give them a wholesome lesson of just how much they had to do with the question, he had one side of the ship painted red and the other green. The painting was done toward nightfall, and when the sun rose the bright green side of the ship was toward the town. Later in the day Yokohama was thrown into consternation by seeing the ship turn red as she swung and presented her other side.



SCOTCH PIPE-LINE BUILT BY GERMANY

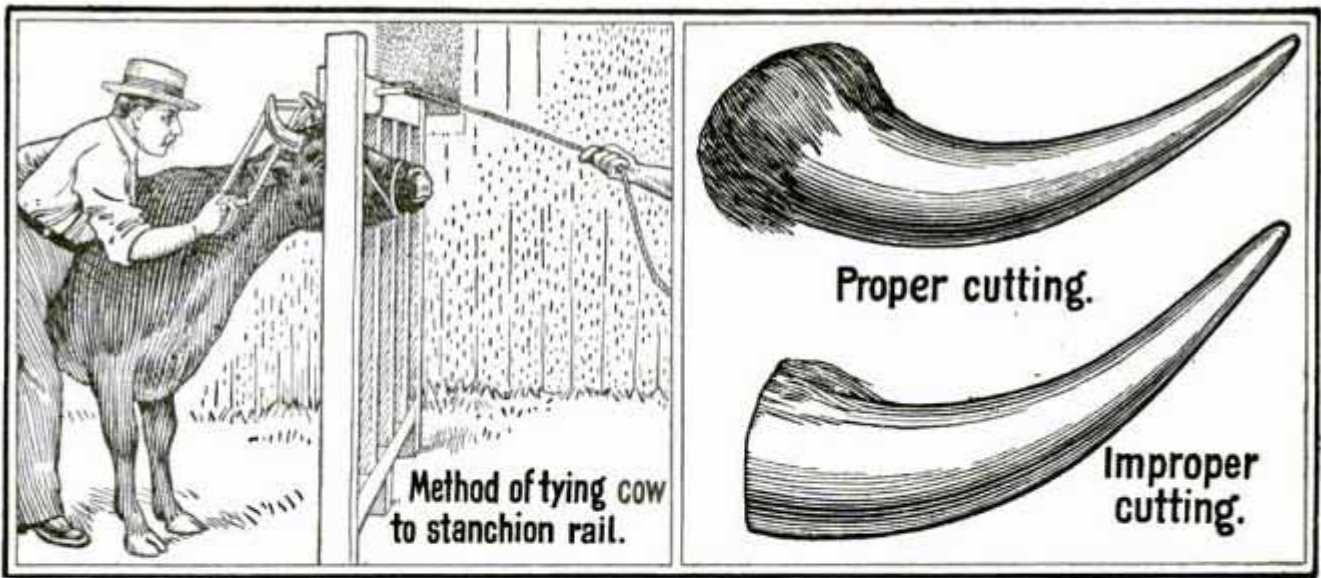
The illustration shows the series of pipe-lines, or "pipe track," as it is called in Great Britain, which was constructed in connection with the great water-power project for the manufacture of aluminium at Kinlochleven, Scotland. An artificial lake was formed near Loch Leven, and the water is conveyed through a rein-

forced concrete tunnel for a distance of $3\frac{1}{2}$ miles to a ridge overlooking the factories. From this ridge it is conveyed through the pipe lines as shown in the illustration. The lines are 6,000 ft. in length, and the pipe of which they are constructed is 30 in. in diameter and 20 ft. in length, varying in thickness with the head of water. The contract was not filled in England because no English firm could compete with the German manufacturers, this condition being possible through the fact that England is a free trade country. Therefore the contract, worth \$500,000, went to England's most feared business rival.

THE DEHORNING OF CATTLE

By R. W. Hickman, V. M. D., Chief of Quarantine Division, U. S. Bureau of Animal Industry

The dehorning of cattle can be very satisfactorily performed without other apparatus or instruments than a good strong clothesline and a sharp meat saw, or a miter saw with a rigid back. The method of controlling the animal with the clothesline is shown in one of the illustrations. The heavy line is passed around the upper part of the neck and tied in a knot that will not slip, otherwise it will choke the animal. The free end of the rope is carried between the horns, through the stanchion to the front, up over the horizontal stanchion rail, then down underneath the neck and up and over the top of the stanchion rail to an assistant, who should hold it firmly. The stanchion is then opened, allowing the animal to withdraw its head, and the rope, held tightly, is passed once around the muzzle, up over the stanchion rail and through to the front again to the hands of the assistant. This effectually restrains the animal and the dehorning operation can be commenced. If the stanchion rail is too wide to permit of properly securing the lower part as well as the upper part of the animal's head, the turn of the



rope around the muzzle may be omitted and the last lap of the rope carried around the stanchion rail to the front and to the hands of the assistant. Care should be taken that the rope pass each time over the neck of the animal between the horns in such a way as not to interfere with the work of the saw. The rope must be held by an assistant instead of being tied so that should the animal throw itself off its feet during the operation it can be promptly slackened. This, however, is rarely necessary, for as soon as the head is secured, the operator should be ready, standing

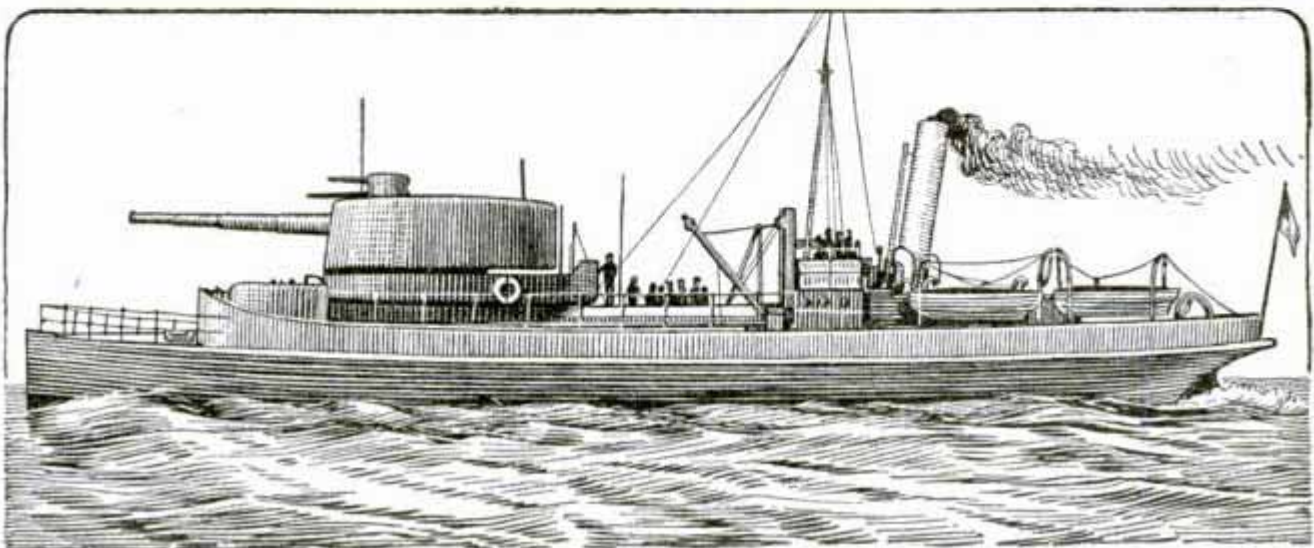
at the right shoulder of the animal, to saw off first the right and then the left horn.

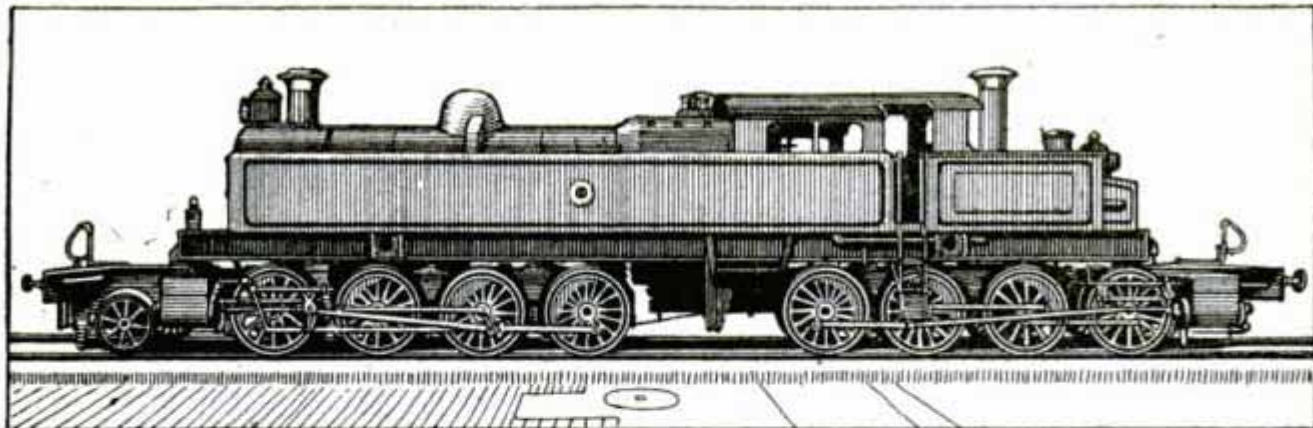
The horn should be severed from a quarter to a half inch below where the skin joins the base of the horn, cutting from the back toward the front. If the cut is made too high, an irregular, gnarly growth of horn is very apt to follow.

The worry, pain and cruelty often inflicted by cattle upon their mates before being deprived of their horns is much more to be considered than the pain of the dehorning operation.

GREAT GUN ON LITTLE SHIP

One of the most remarkable gun trials ever carried out by the British navy was the mounting of this huge gun and its barbette, designed for a great "Dreadnaught," on the old screw gunboat "Drudge," a vessel of only 870 tons. The gun and barbette seem to be almost half the size of the ship.





This curious locomotive is part of the equipment of the Great Southern railroad in Spain. It is a tank locomotive and has two sets of drivers, arranged in such a manner that no matter which way the locomotive is running one set works backward.

ENDLESS CHAIN CROSS-CUT SAW

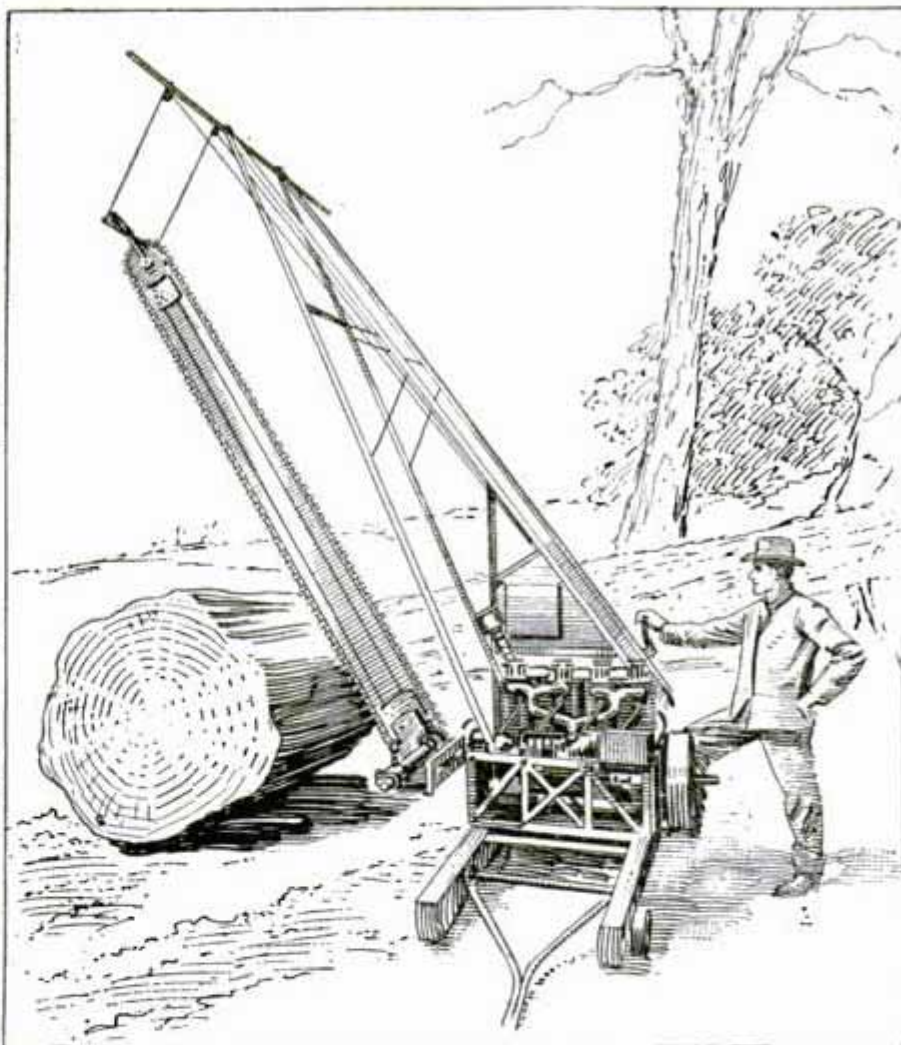
The endless chain cross-cut saw shown in this illustration is interesting as an invention for which much is claimed. Driven by a 30-hp. gasoline engine the saw travels at a speed of 2,000 ft. per minute. It is said that it will fell a tree 8 ft. in diameter in less than 15 minutes, and cross-cut a log section in eight minutes. The machine sets on a turntable and can be swung to cut in all directions and angles without moving the sled upon which it rests.

TWENTY - FOOT HANDS FOR TOWER CLOCKS

Each of the four sides of the tower of the great Metropolitan Life building in New York will have a huge clock, the minute hands of which will be 20 ft. long, 14 ft. of this being from center pin to tip, and 6 ft. in counterpoise. The hour hands will be 11 ft. in length, and each pair of hands will weigh 1,700 lb.

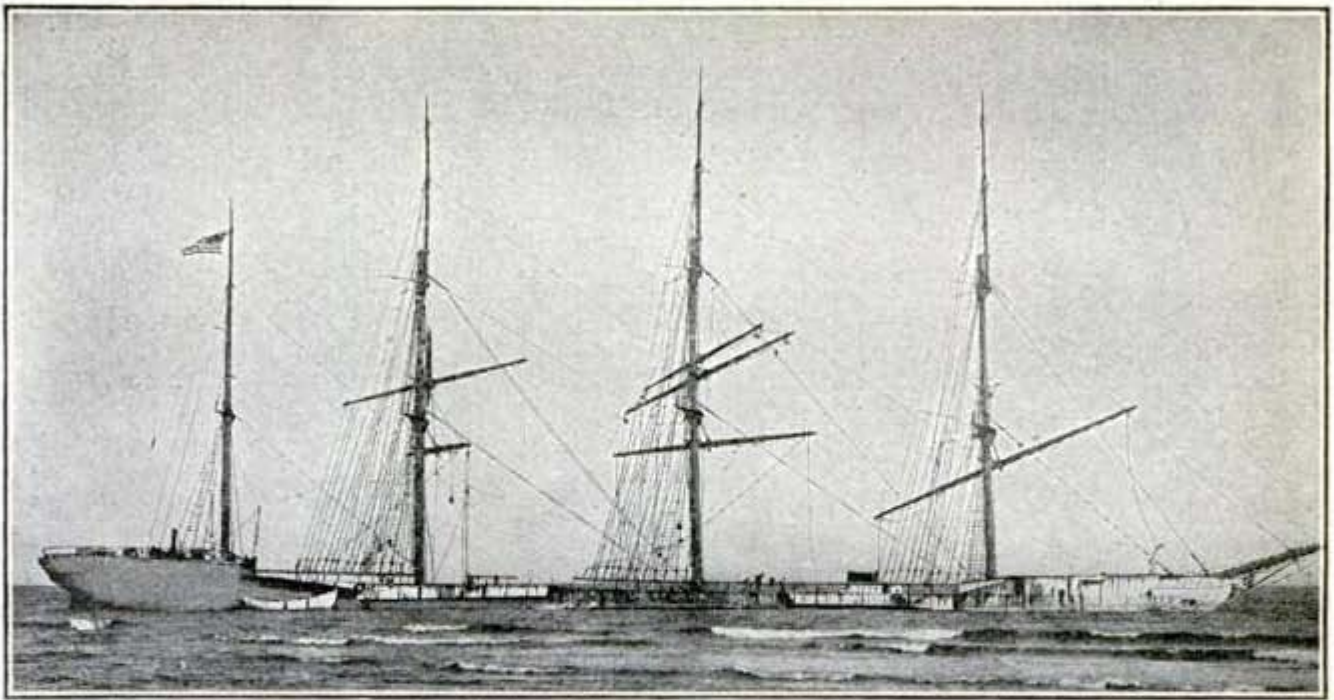
The hands are made of manganese and bronze and are of bridge truss con-

struction. Over each hand will be a covering of wire-glass which will allow of electric illumination at night. The clocks will be about 400 ft. above the street level, and it is estimated that on clear nights the time the hands mark



As Set for Vertical Cut

will be seen 24 miles distant. A 7,000-lb. bell, with a hammer weighing 170 lb., will boom forth the hours, and four smaller bells will ring out chimes.



SHIP INTACT AFTER SEVEN YEARS' BUFFETING

When the 4-masted sailing ship "Sindia," homeward bound from the Orient, blundered ashore at Ocean City in December, 1901, experts predicted that she would go to pieces in a week, and when she still remained staunch at the end of seven days they marveled. But now the remarkable old wreck is well started on her eighth year, and as far as appearances are concerned is likely to remain there indefinitely.

Every winter the wind and the waves beat the ship deeper into the sands, but no impression is made upon her solid sides. She now holds the record as a long-lived wreck.

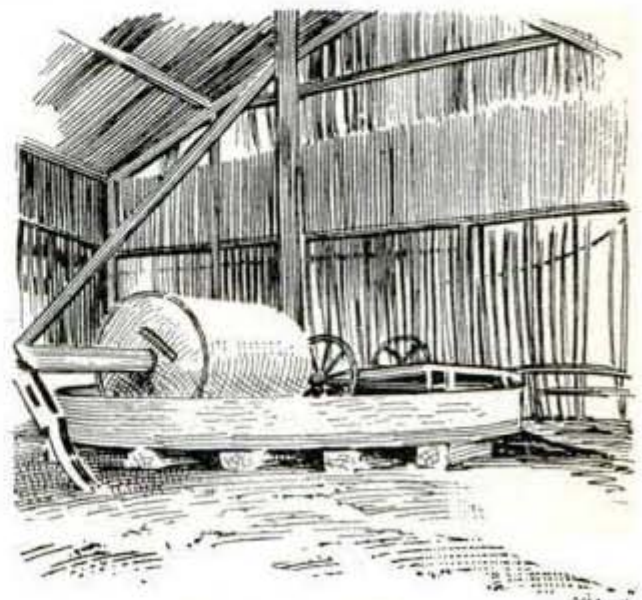


GRINDING COROZO NUTS FOR VALUABLE OILS

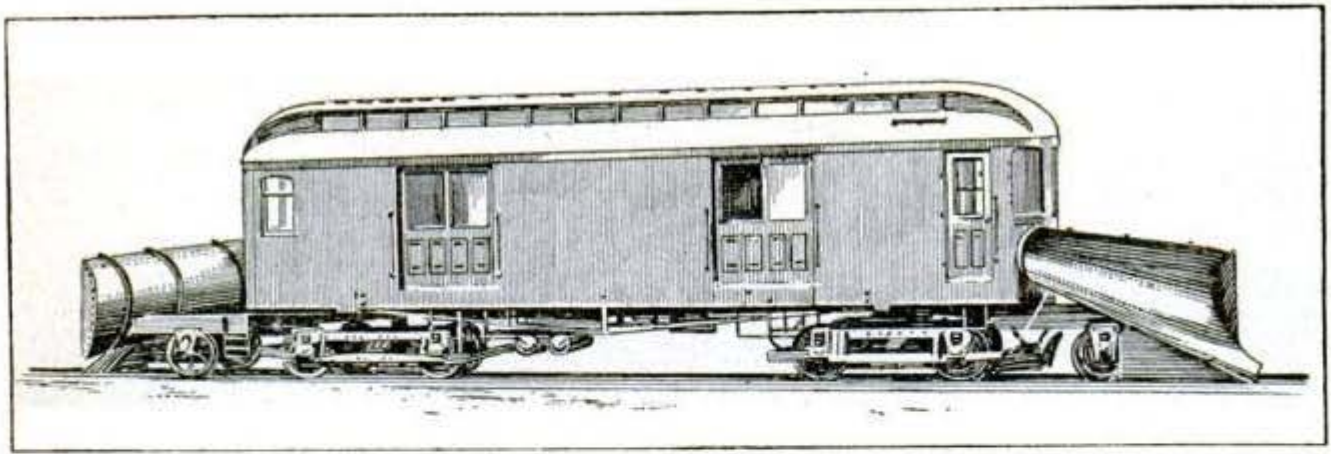
A palm found in Columbia, the most northern of the South American countries, bears great clusters of small nuts from which are extracted two very valuable oils. One is procured from the hull and a thin layer of pulp inside the skin, and the other from the nut itself. The former has a brilliant red color, but the latter is dark, although refining into a clear, white, lard-like substance. These oils are used in the manufacture of soap and for other like purposes.

The system of extracting the oils is crude, as this illustration shows. The nuts are spread on a circular floor, and a large section of a tree, usually about 4 ft. in diameter, is rolled over them until the outer covering is removed from the nut. This pulp is then placed

in a trough and cold water poured over it. The red oil rises to the surface and is scooped off. The nut is then ground by the same method and the dark oil obtained. The palm is known as the Corozo.



Primitive Oil Mill



COMBINATION BAGGAGE CAR AND SNOW PLOW

In clear weather this car, which is used on an electric system running out of Chicago, is primarily a baggage and express car, but at the first threat of snow it is quickly converted into an efficient snow-fighting machine of more than ordinary strength, at the same time continuing its duties as a baggage car. Its snow-fighting equipment is a set of detachable plows, made of heavy steel plate reinforced with angles carried on pilot trucks.

FIRST TYPE OF U. S. SUBMARINE

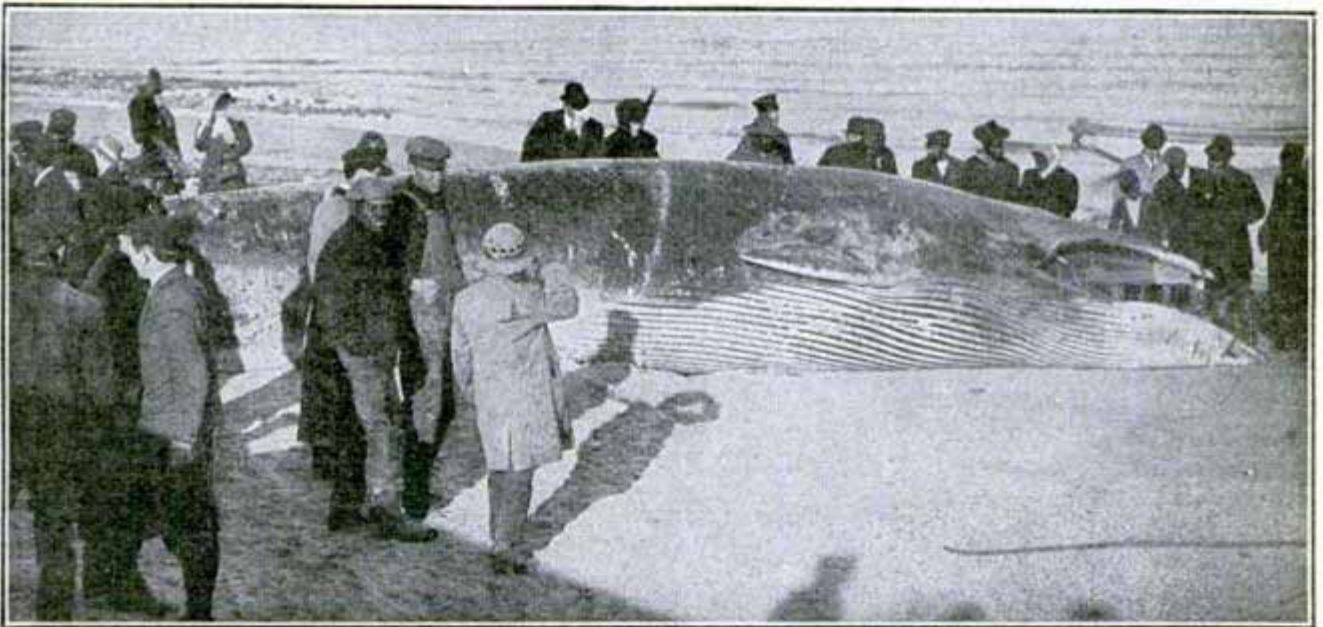
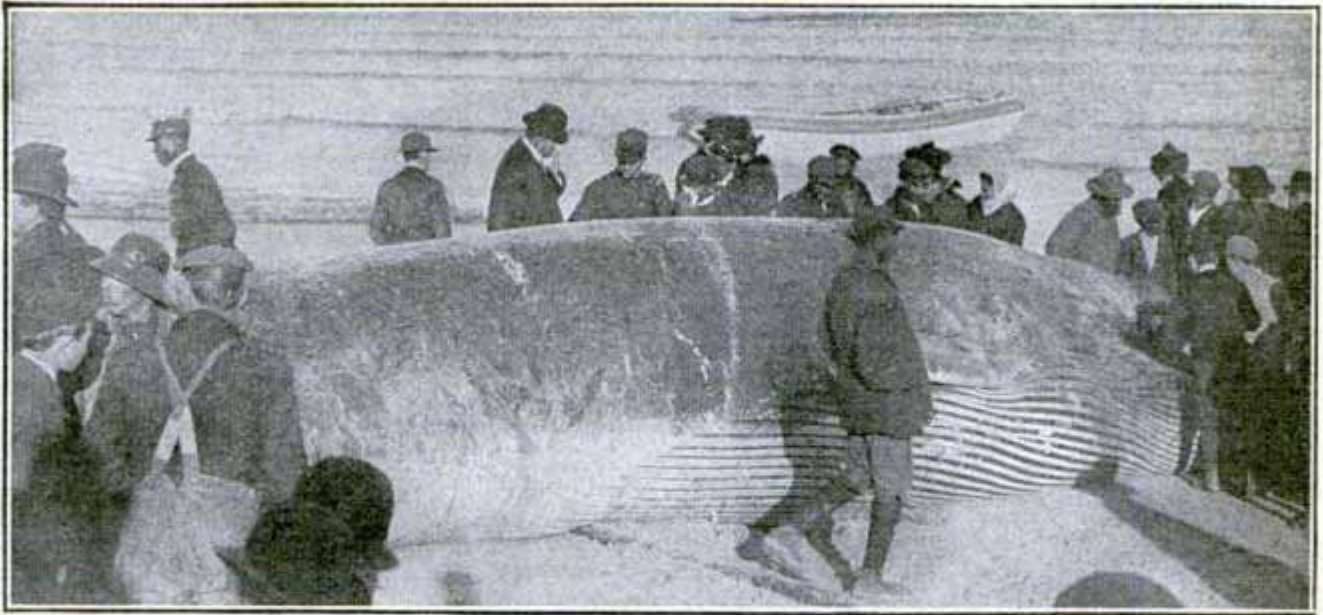
During the Civil war the U. S. government spent \$30,000 in experimenting with this crude submarine, only abandoning the idea after a number of lives had been lost. The hull is 35 ft.

long, and 8 ft. in diameter at the widest part. It was called the "Intelligent Whale," and was propelled by hand power. Lying in the New York Navy Yard, it is interesting as a relic of one of America's first attempts in submarine navigation.



A Submarine of the Civil War

WHALE TOWED UP ON BEACH BY STREET CAR



Whale Killed by Ship's Propeller

This whale, 42 ft. 6 in. long and weighing probably 8,000 lb., was found entangled in a pound net in Chesapeake bay near Old Point, Virginia, two days after the globe-girdling fleet had entered. It was dead when discovered, and fishermen in a motor-driven dory towed it to the shore, where the efforts of 25 men proved too puny to drag it up on the beach. Finally, one end of a large hawser was made fast to its tail, and the other end was carried to an electric car. After considerable suspense the great hulk was hauled above the high water mark.

Owing to the fact that the giant lower jaw of the whale was cut through

entirely, and the head bruised and battered, it was concluded that it had been struck by the propeller of one of the warships, or of the fleet of steamers that greeted the home-coming fleet.

THE FUTURE OF AERIAL NAVIGATION

In a recent publication, an English aerial critic makes the statement that anyone looking at the great surface of the aeroplane exposed to the elements cannot dispute that it is a fair-weather machine only, and as such has little, if any, commercial value. Also that a combination helicopter and

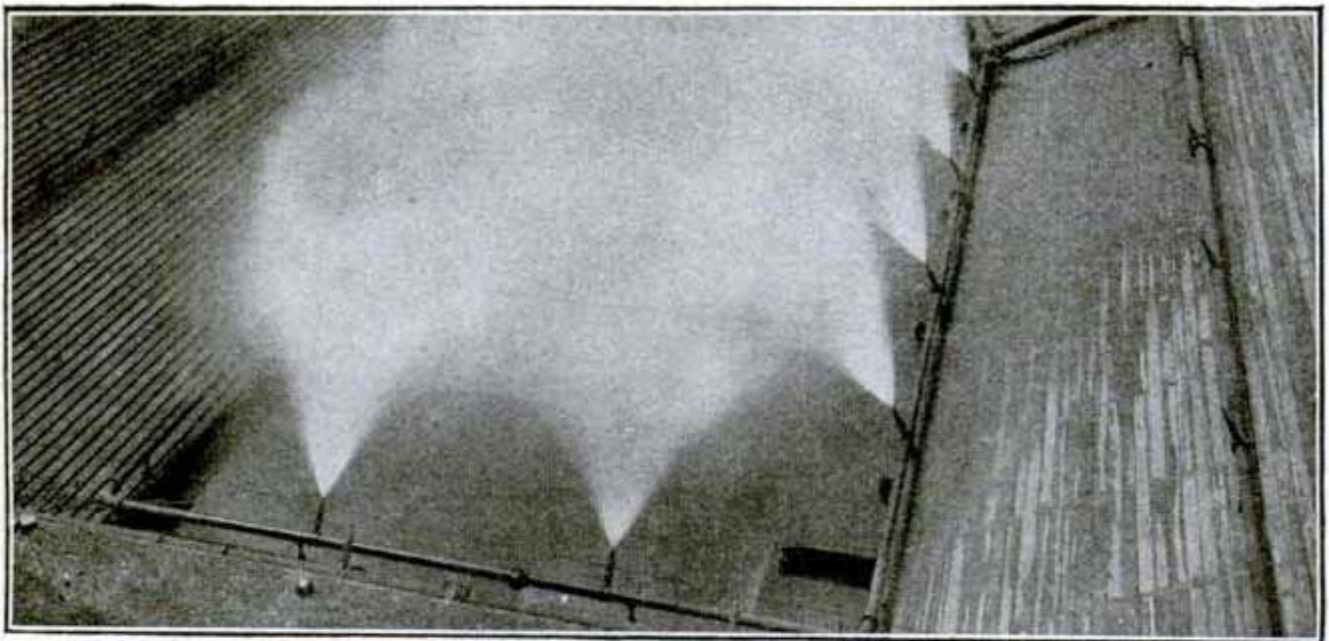
areoplane will be the future flying-machine, on account of its being able to rise and settle vertically, thus requiring no special starting or alighting place.

Another English critic, in an article in the London Motor, differs with his compatriot, insisting that the aeroplane is only in its infancy and subject to many changes which will overcome the obstacles mentioned. His idea is that for commercial purposes the flying-machine will be of a large type, but the planes will be narrow. Many experts hold that narrow planes are more efficient than large ones. He believes also that the flying-machine for pleasure purposes will be no larger than a small automobile, and that it, too, will be equipped with narrow planes. The future aeroplane, he be-

lieves, will carry a device for launching itself off the ground like a rocket, without any special preparations.

SPRAYING WATER FOR TURBINE PLANT

The accompanying illustration shows a unique arrangement of centrifugal spray nozzles used in a Philadelphia steam turbine plant, in spraying water for condensation. There are forty-eight 3-in. nozzles arranged in two rows around a concrete tank 140 ft. long by 40 ft. wide. One row is at the very edge of the tank and the other is about 15 ft. back, a wooden slope draining the water back into the basin. The other view shows the spray falling into a canal which returns the water to the power plant.



The Water Is Sprayed to Cool It

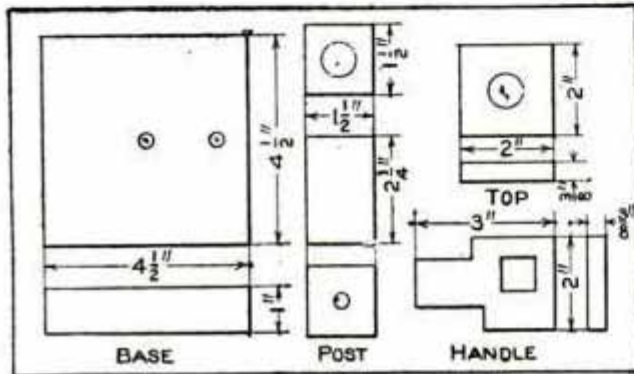
HOME-MADE MISSION CANDLESTICK

There are many kinds of mission candlesticks, but few of them carry out the mission design throughout. Herewith is illustrated a candlestick which may be made from the various woods that will have the style and lines



of mission craft work. The base is made from 1-in. material, $4\frac{1}{2}$ in. square. Two holes are bored and countersunk

for screws to hold the post and handle. The post is $2\frac{1}{4}$ in. high, bored in one end to fit the size of a candle. The



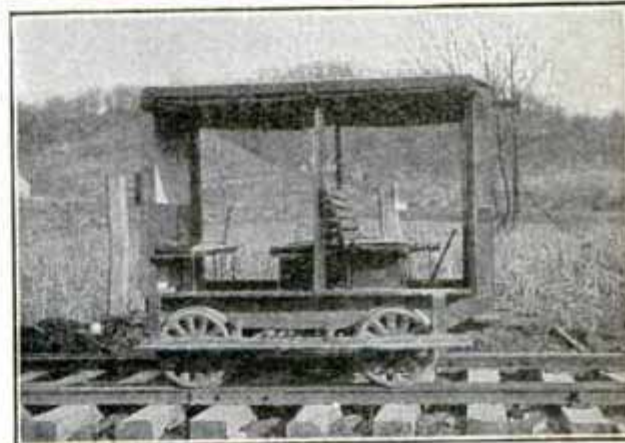
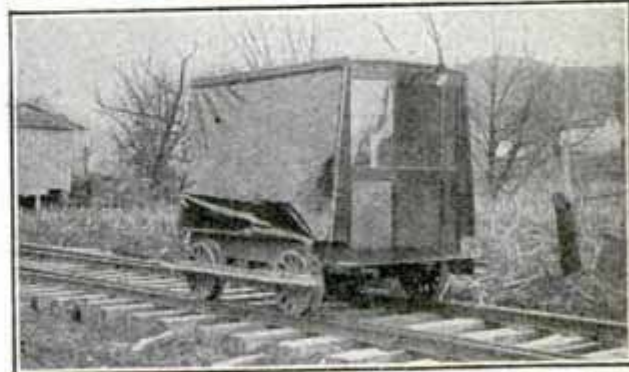
Details of Candlestick

post is covered with a $\frac{3}{8}$ -in. thick cap, 2 in. square. This, also, is bored to fit the candle. The handle is $\frac{3}{8}$ in. thick and 3 in. long with a $\frac{3}{8}$ -in. square mortise and is notched to fit the base. The wood may be selected to match any other piece of furniture and finished in any of the mission stains.

GASOLINE PASSENGER CAR

A small gasoline passenger car has been put into operation recently between Sharpsburg Junction, and Sharpsburg, Ohio, on a branch of the Marietta, Columbus, and Cleveland railroad. It is equipped with a 6-hp. water-cooled motor which drives it at a maximum speed of about 25 miles per hour. It has a seating capacity of 12, including the motorman.

The car complete weighs about 1,000 lb., and as may be seen by the accom-



Has Handles for Lifting

panying pictures, has handles for lifting it from one track to another. It makes four round trips daily over a track $2\frac{1}{2}$ miles in length.—Contributed by C. O. Wilkes, Athens, O.

SEARCHLIGHTS IN NAVAL WARFARE

The area commanded by the searchlights of a battleship would seem to be of sufficient extent to keep torpedo boats out of torpedo range, but the defense of a fleet from these little fighters by searchlights is not so simple as it seems. To begin with, a torpedo boat is a difficult object to hit at night, and the searchlight beam serves to embarrass the gunner almost as much as it aids him.

This fact, according to the London Electrical Review, is in a large measure due to the peculiar character of the arc light. The preponderance of blue and violet rays makes the object caught by the beam of light appear to the gunner like a white phantom, moving in a luminous fog amidst a number of scintillating points of light. If these blue and violet rays could be filtered out, absorbed, or otherwise disposed of, leaving the red and yellow end of the spectrum largely predominating, the task of the gunner would be made much less difficult. The luminous fog the gunner sees around the object he must hit is caused by the reflection from various particles of dust and moisture in the atmosphere. A breaking wave top, passing bird, or spray, at close quarters, causes flashes of bright reflected light, far more conspicuous by contrast than the rather veiled reflection of the distant object itself. Of all the rays given out, the blue ones and those of shorter wave length are the most easily absorbed, and consequently the rays that have traveled as far as the torpedo boat and have been reflected back are very much weaker than those which have traveled out only as far as the dust particles and return the shorter distance. The

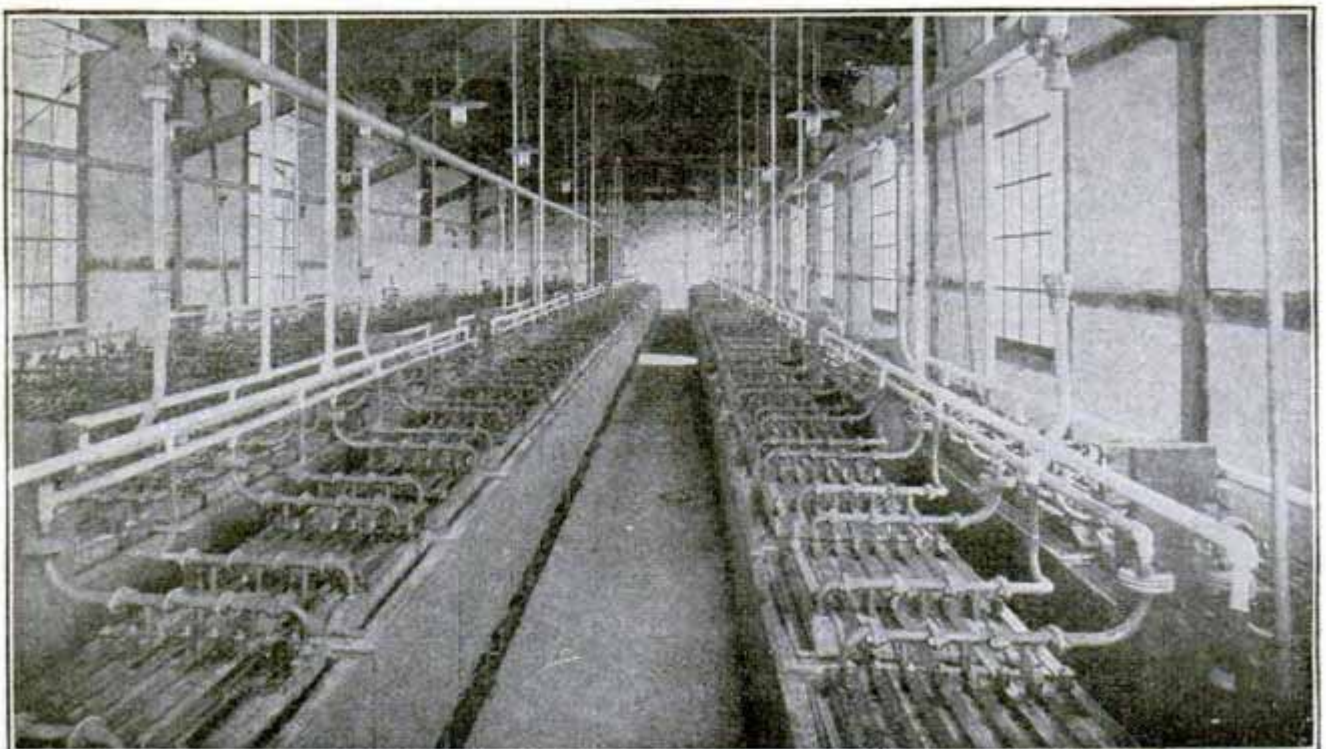
effect is to reduce the contrast between the large volume of reflected light arriving from the torpedo, and the smaller volume of brighter light reflected from the atmosphere.

Another cause of error in judging the position of a boat picked up by a searchlight is due to high refractive power of the smaller wave lengths of the rays, giving a false impression of the boat's position.

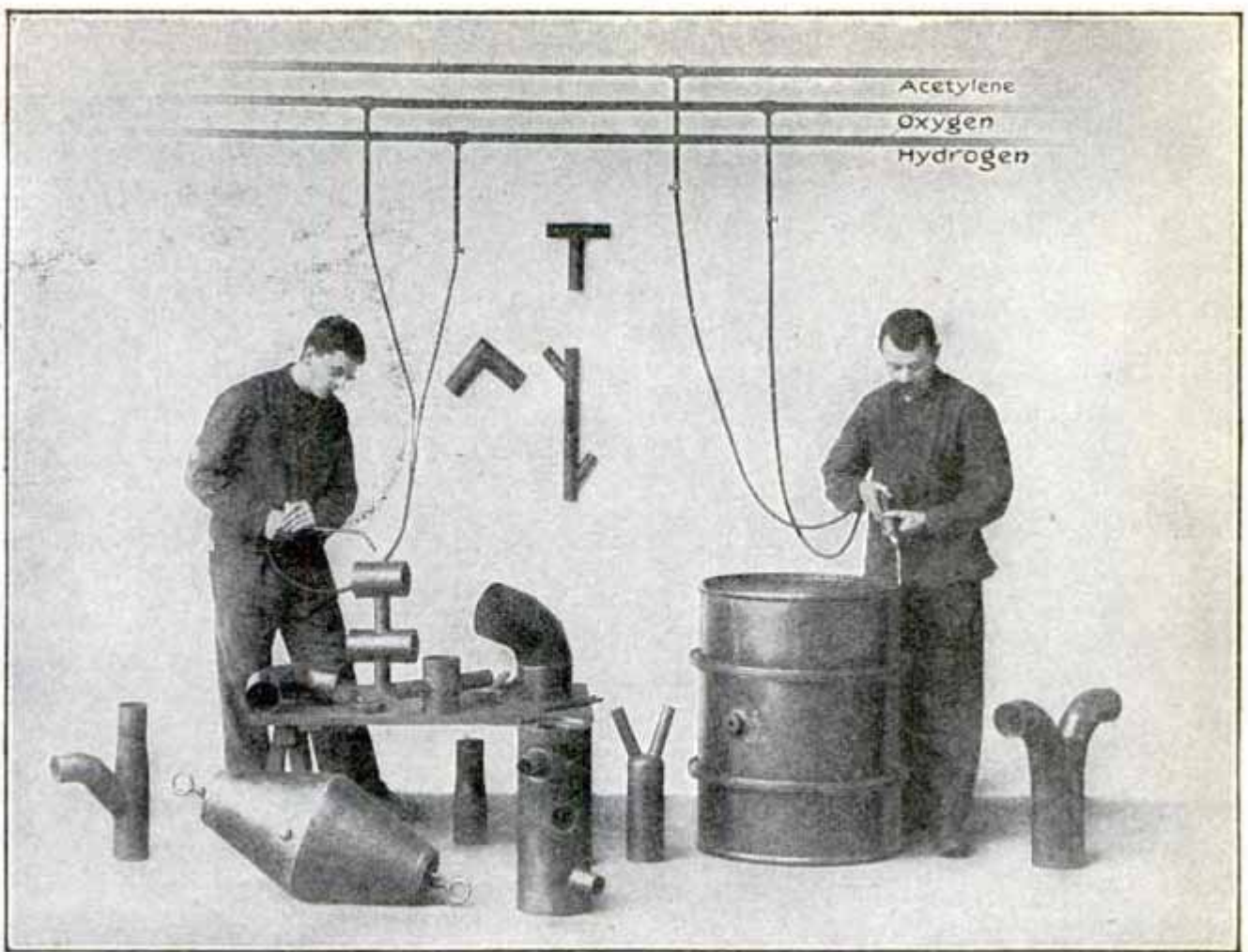
Another disadvantage, and a grave one, in the use of the searchlight is the fact that the beam of light thrown is visible in all directions. A fleet expecting torpedo boats in the vicinity is loath to use its searchlights until the very last moment, because the switching on of a single searchlight at once gives the position of the fleet to the enemy, if they be within its radius of vision.

This leads to the question of polarizing the light, which, next to the suppression of the violet end of the spectrum, is the chief problem that must be solved before the searchlight reaches its supremacy. Both, however, offer complications.

With the light polarized, the beam would be hardly luminous at all as a beam of light, while it would serve to illuminate the object on which it was



Room Where Oxygen Is Generated Electrically



The Two Combinations of Gases in Use

directed equally well. The reason for this is that the polarized light, striking many particles in the atmosphere at an angle approaching the value of the polarizing angle, can only be reflected to a very imperfect extent, while that which returns from the object illuminated has experienced reflection at an angle in no way approaching that of the polarization.

ELECTRIC APPARATUS PRODUCES OXYGEN AND HYDROGEN FOR BRAZING

These illustrations are of electric plants in Germany designed for producing hydrogen and oxygen for brazing or welding with an oxy-hydrogen blow-pipe. Acetylene gas may be used instead of hydrogen by providing a generator for the purpose.

The cost of operation of such an apparatus is less than a cent for every 5 cu. ft. of gas generated. The cells are very similar to storage batteries, the

elements being so arranged that the oxygen and hydrogen may be collected from the cathodes and anodes by the system of piping provided. The gases are piped to the work benches where the oxy-hydrogen flames are utilized for welding or brazing. The larger plants installed have a capacity of 4,500 cu. ft. of hydrogen and 2,000 cu. ft. of oxygen for each 24 hours of operation.

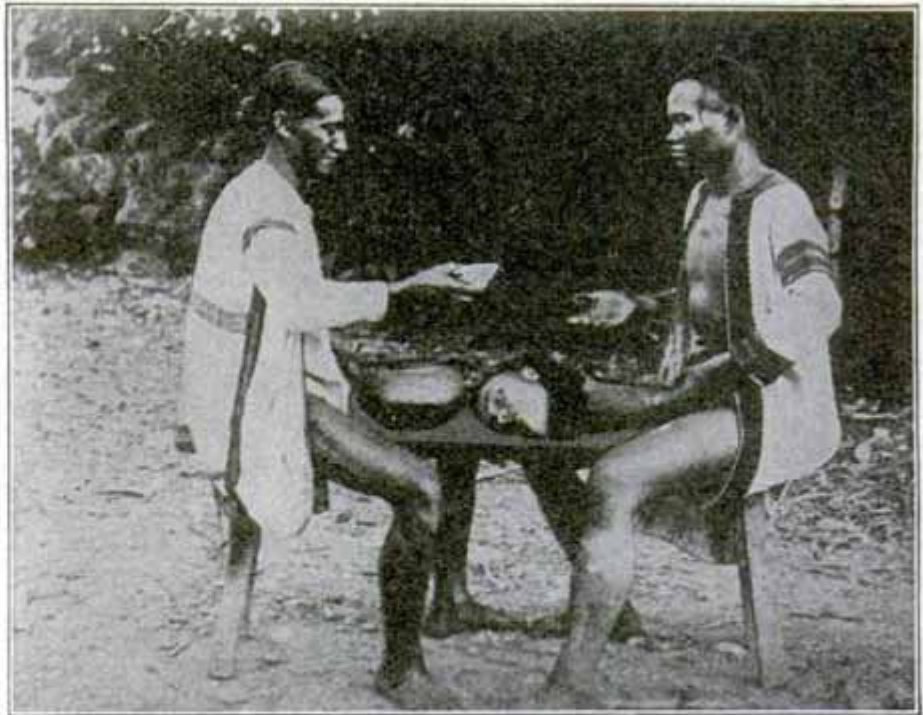
The heat produced by the oxy-hydrogen flame is most intense, reaching more nearly that of the electric arc than any other known process.

A steel firm in Sheffield, Eng., is placing on the market a steel with from three to seven times the cutting power of existing high-speed steel. A professor of metallurgy at Sheffield university says it will work for a considerable time on the hardest material with the cutting edge at a bright red glow.

ELECTRICITY USED TO CAPTURE HEAD HUNTERS

In the last couple of years the Japanese police on the island of Formosa, which belongs to Japan, have been waging a war against the head-hunting natives who infest the entire east coast of the island. They number about 100,000 and all efforts to civilize them have failed. Not long ago the Japanese resorted to electrocution as a means of punishing them for killing 300 Japanese treasure hunters. Wire fencing, charged with electricity, was run around their villages, and as they fled from the guns they ran into the electric traps.

One of the illustrations shows four head-hunters, a gruesome trophy, and two of their captors. In the other illustration two head-hunters are shown celebrating the taking of a human head.



Two Formosa Head Hunters and a Captured Head

Reports from Quebec state that deposits of asbestos have been found at a depth of 400 ft., which is 200 ft. deeper than the deepest before this strike.

—◆◆◆—
Zeppelin's airship recently attained a height of 3,000 ft., a record for dirigibles.

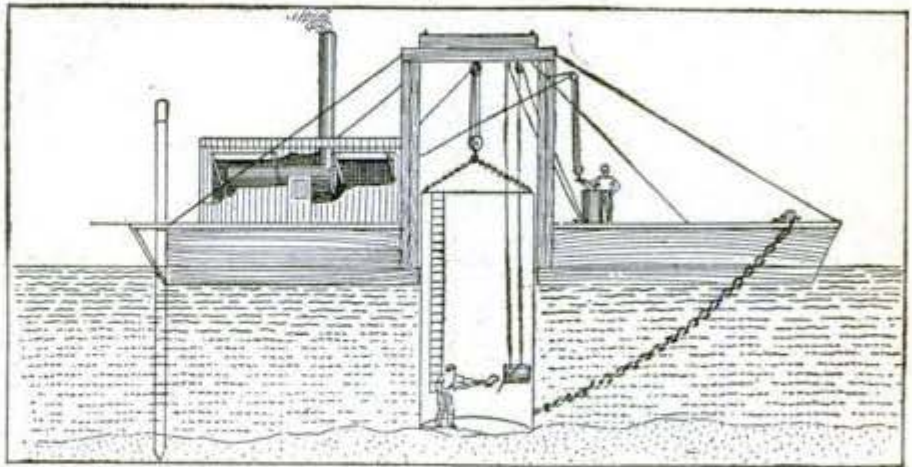


Japanese Police Guarding Four Head Hunters

RIVER-BED PROSPECTING IN CALIFORNIA

One of the latest devices for the expert prospecting of river bottoms, or low-lying ground where water is a factor in preventing the recovery of placer gold, is shown in this illustration. The barge is 20 ft. long by 60 ft. wide, and the caisson, the main chamber of which can be adjusted to any reasonable depth, is 5 ft. in diameter, constructed of steel.

The water is dispelled from the caisson by compressed air, forced through a tube or combination of tubes. The material mined by the workers is raised through automatic gates and hoisting tubes to the deck. An air pump of sufficient capacity to dispel the water at different depths is the main factor of the equipment.



Novel Method of Mining Gold

ELECTRIC SHIPS FOR ATLANTIC TRAVEL

Reports from one of the U. S. consuls in Scotland state that although the turbine and suction-gas systems of ship propulsion have not yet reached perfection, British engineers are seriously experimenting with electric propulsion, with the idea of installing powerful generators on fast trans-Atlantic ships.

An attempt is being made to run a bill through the Michigan legislature taxing automobile owners 10 cents for each horsepower per year.

ANCIENT TREE DESTROYED

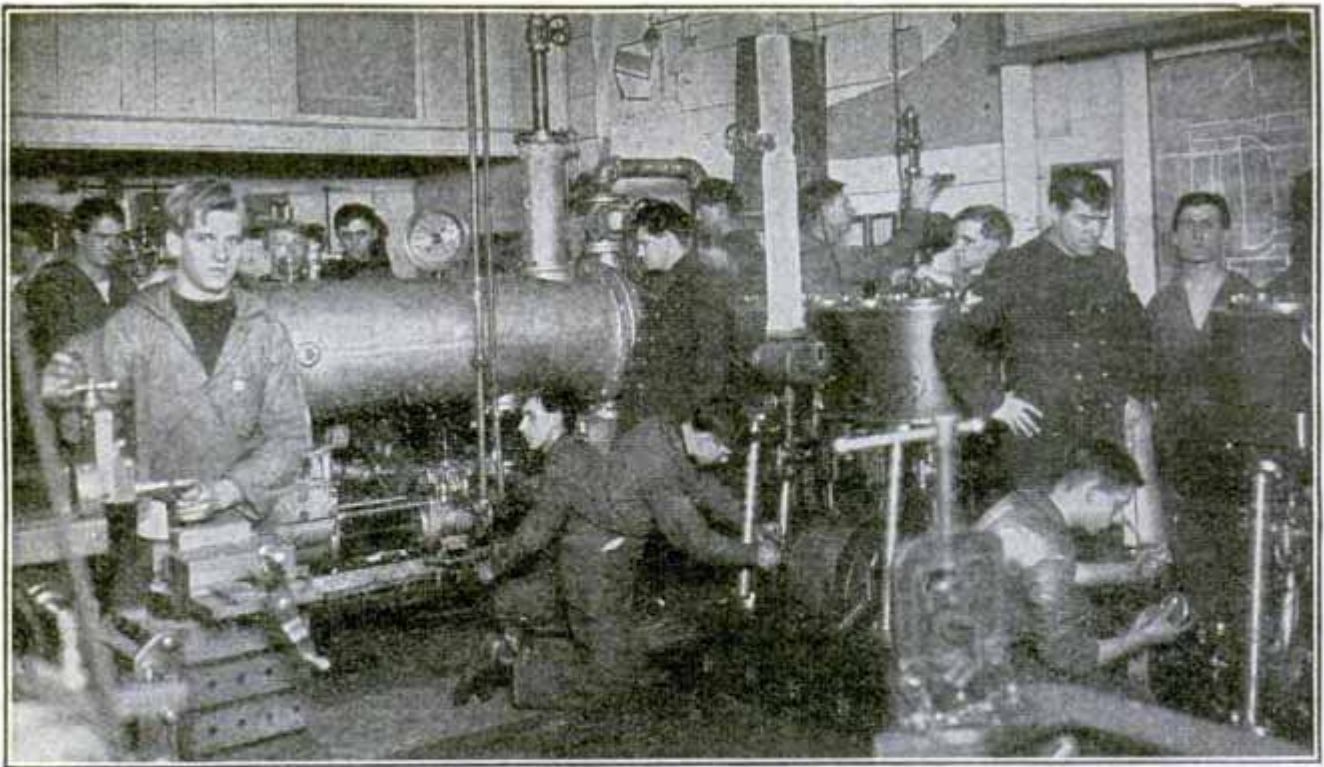
All that is left of Yeadon's giant oak, the oldest and largest white oak tree in the United States, beneath whose spreading branches many treaties were made by whites and Indians, is shown in this illustration. Until the middle of last February it was still standing in Darby, Penn., but its life of centuries was brought to an end by a terrific wind storm which tore it out by the roots. The great tree was 90 ft. high, with a sweep of branches from east to west of 115 ft. and from north to south of 111 ft. It has a circumference of 33 ft. at its base.



John Bartram, the royal botanist of the colonies, and a friend of Wash-

ington, was interested in this oak, which was huge 140 years ago.—Contributed by S. R. Howard.

For the first time in years the army has its full quota of men, 77,753.



MECHANICAL SECTION OF NAVY ELECTRICAL SCHOOL

In the mechanical section of the United States navy's electrical school in New York the boys who are to become the future electricians of the American battleships are instructed in the practical work of running the lathe, bench work, and the running and care of the shaper, and drill press.

CHURCH BUILT FROM ITS CLAY EXCAVATION

This church, located at Richardson, N. D., was constructed from brick made on its own site from material obtained



from the excavation required for its foundation. The church cost \$110,000, and required 300,000 bricks.

TO CHRISTEN AIRSHIPS

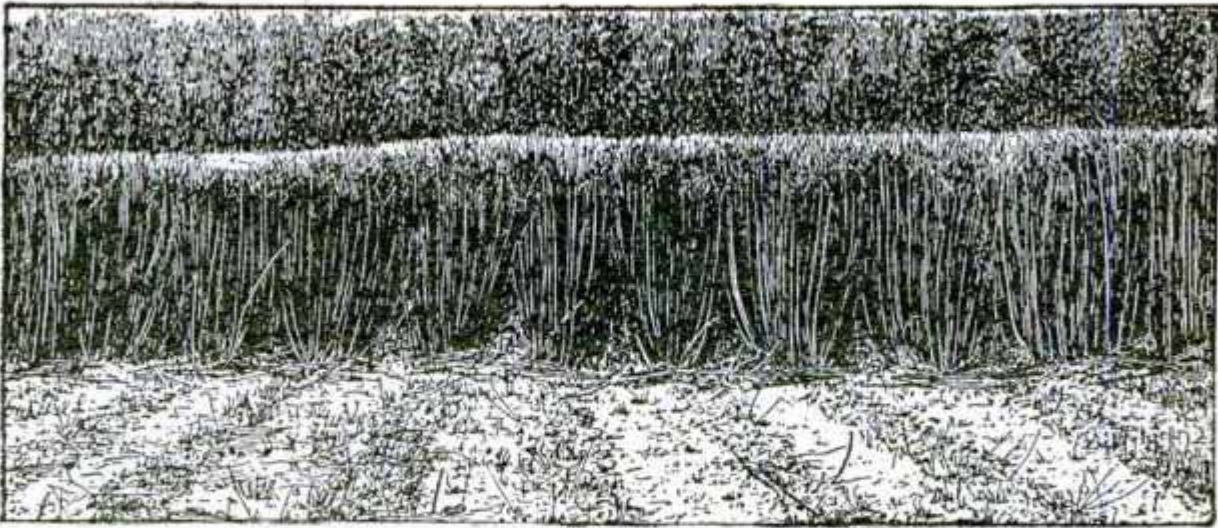
As the christening of a ship of the sea has been an unvarying custom almost since the time such craft came into existence, the American Aeronautic Society considers it only proper, and in fact necessary, to christen the ships of the air. Accordingly William R. Kimball's biplane flying-machine was christened a few weeks ago at the society's flying grounds in New York. It was named "New York No. 1," and practically all the ceremonies attending the launching of a ship were performed, including the breaking a bottle of champagne on one of its steel bars.

The ceremony is claimed to be the first official christening of a craft of the air in any part of the world, and is particularly appropriate because the science of flight is still in its infancy and needs baptism.

The Pittsburg police prohibit the use of Maxim's gun silencer, because the no-report feature is an asset to crime.

THE BASKET WILLOW INDUSTRY

By W. F. Hubbard, U. S. Forest Service



A Hedge of Willows



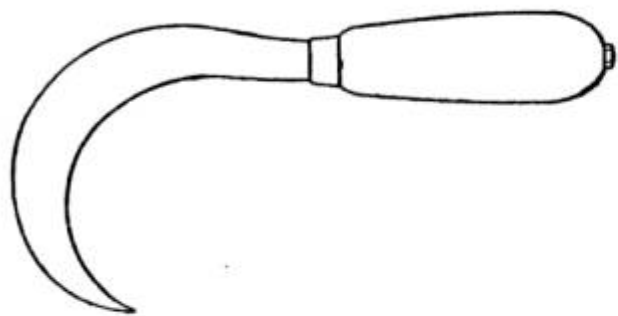
Willows in the Pit, Sprouted and Ready for Peeling

Although introduced by German immigrants in the period between 1840 and 1850, willow growing in America is a form of agriculture progressive only in restricted localities throughout a relatively small portion of the country. Although the idea is common that willows grow only on

swampy ground, it takes but little experience to explode this fallacy. Hence all serious attempts at willow culture are made on well-drained soil, even though it be of poor quality.

When grown as an article of commerce, the willow is removed from all natural competition, and therefore

should be planted in soil suited for its development. Experience in both Europe and America show that rods grown on moist, rich, well-drained bottomland are more flexible, tougher,



Knife for Cutting Willows

and less branchy than those grown on undrained marsh land. This does not mean that valuable fields should be given over to the willow. The most exacting of trees, which the willow is not, is far less sensitive to soil conditions than any farm crop, and willows thrive on land that produces even a very poor quality of grass. Ground that is frequently covered with water may grow willow of high quality, but it must be well drained, as long-continued inundation is fatal to all species.

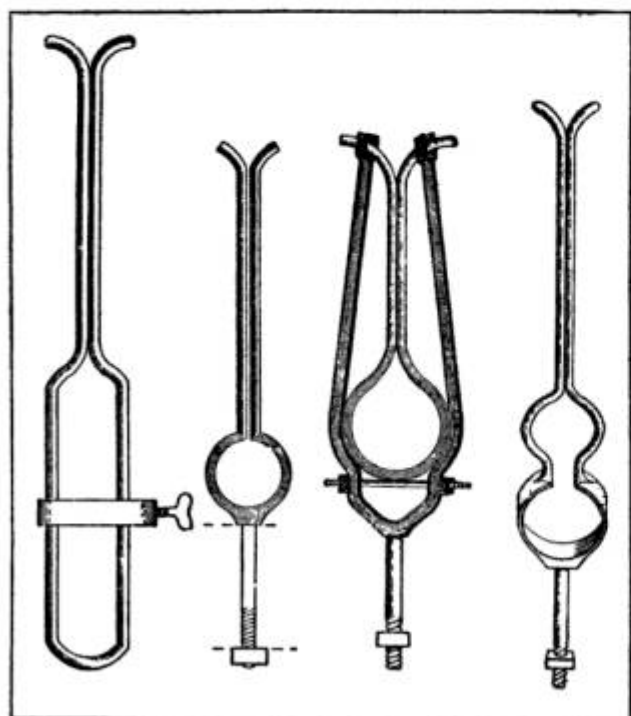
In many places willows are grown on ordinary corn land, but generally they are planted in low-lying fields subject to occasional inundation, or in the swales and low places of grain fields, subject to the overflow or drain-

age of sudden rain storms. When planted upon high ground the land chosen is deep and heavy; but when the willow bed, known as a "holt," is subject to inundation, the land may be of poorer quality.

In most parts of the country the ground is prepared for willows exactly as it would be for corn or wheat. The work is generally done in the preceding autumn. Often when the willows are to be planted on waste bottomland, subject to inundation, the wild growth is simply cut down and burned on the field and the willows planted either with preliminary cultivation or in the raw soil. Almost without exception the willows are planted from 9 in. to a foot apart, in rows $2\frac{1}{2}$ ft. to a yard apart. This makes possible the running of a plow through the rows.

Unless the planting has been very well tended through the year, the first-year rods may be of little value. In the second year the rods of a carefully cultivated willow farm should have at least half the value of a full crop, and from the second or third year it should yield at least 12 good paying crops before the planting is exhausted. Where steam peeling is practiced, the willows are generally cut as soon as the leaves have fallen in November, so that they may be stripped in the winter.

In districts where sap peeling is common, the rods are allowed to stand on the stump until spring. The cutting is generally done with the type of knife shown in one of the illustrations. After cutting, the rods are immediately sorted into four sizes and bundled. About 40 lb. is put in each sorted bundle, and these are immediately taken to the pit, which is usually a series of shallow ponds of water, not over 4 in. deep, in which they are stood on end. After the rods have remained in the pit two or three weeks they become almost entirely covered with tender, green foliage. In this condition they are ready for the peeling, which should begin at once. The appliance used for removing the bark is called a "brake." It is usually fastened to a beam at a



Tools for Peeling Bark

convenient height and the rod passed through it, first in one direction and then the reverse. This loosens the bark so that the strippers can peel it off, either with the fingers or with dog-wood hand brakes. After sufficiently

FLEXIBLE WIRE MAT

Owing to the almost prohibitive price of rubber matting, caused to a great extent by the demand for rubber in the manufacture of automobile tires, a

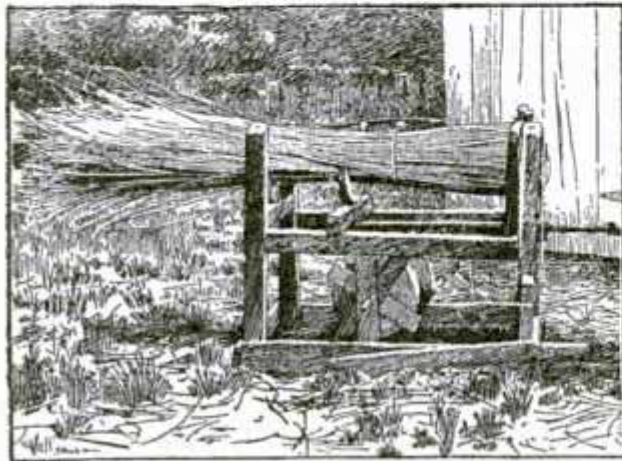


Drafting (Sorting) the Willows

drying, the rods are tightly bundled by a machine or by hand, and in this form are shipped to the manufacturer.

The best willow raised in the United States, and that which commands the highest price, is grown on well-drained bottomland in Pennsylvania and Maryland. The average net profit per acre in Maryland is estimated at about \$50 a year.

wire mat is a necessary substitute in many cases. The objection to wire mats of the usual construction is in the fact that its frame is rigid and usually becomes sprung and out of shape after a short usage, but a flexible wire mat which is durable and always lies flat is now being placed upon the market. Its chief advantage is in the fact that it can be rolled up.



Bundling Machine

GERMAN DIRIGIBLES EQUIPPED WITH GUNS

For the past few months experiments have been carried on by German military authorities with small cannon and machine guns for the equipment of that country's airships. So satisfactory were the results that the rigid dirigible airships of the Zeppelin type will soon carry such guns, the danger resulting from the recoil and escape of gas having been overcome by a secret method.

HOW TO MAKE AND FINISH A MAGAZINE STAND

For the magazine stand shown here with there will be needed the following pieces:

- 1 top, $\frac{7}{8}$ in. by $15\frac{1}{2}$ in. by $16\frac{1}{2}$ in.
- 1 shelf, $\frac{7}{8}$ in. by $11\frac{1}{2}$ in. by $12\frac{1}{2}$ in.
- 1 shelf, $\frac{7}{8}$ in. by $12\frac{1}{2}$ in. by $14\frac{3}{4}$ in.
- 1 shelf, $\frac{7}{8}$ in. by $13\frac{1}{2}$ in. by $16\frac{1}{2}$ in.
- 2 sides, $\frac{7}{8}$ in. by $14\frac{1}{2}$ in. by $33\frac{1}{2}$ in.
- 1 brace, $\frac{7}{8}$ in. by $3\frac{1}{4}$ in. by 17 in.
- 1 brace, $\frac{7}{8}$ in. by $2\frac{1}{4}$ in. by $11\frac{1}{2}$ in.
- 6 braces, $\frac{7}{8}$ in. by 2 in. by 2 in.

Order these pieces mill-planed on two surfaces to the thickness specified above and also sandpapered. Quarter-sawed white oak makes the best appearance of all the woods that are comparatively easy to obtain. Plain sawed red or white oak will look well but are more liable to warp than the quarter-sawed. This is quite an element in pieces as wide as these.

Begin work on the sides first. Plane a joint edge on each and from this work the two ends. The ends will be square to the joint edge but beveled to the working face. A bevel square will be needed for testing these beveled ends.

To set the bevel make a drawing, full size or nearly so, of the front view and place the bevel on the drawing, adjusting its sides to the angle wanted. Work from a center line in laying off the drawing.

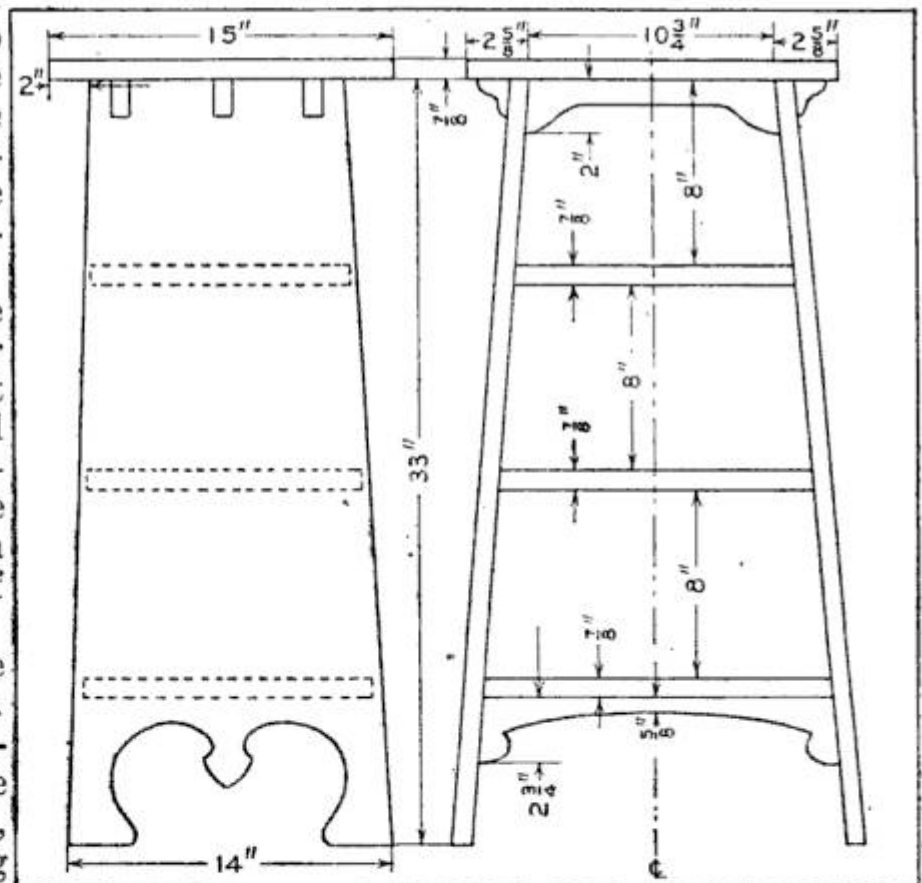
Having planed the ends, lay off the sides. This is done by measuring from the joint edge along the bottom 14 in., from the joint edge along the top $1\frac{1}{2}$ in. and from this 11 in. Connect the points by means of a pencil and straightedge.

Before cutting off the joint edges of the pieces measure off and square lines across to indicate the locations of the shelves. Put both pieces together and mark across both joint edges at

once to insure getting both laid off alike.

The design at the bottom can be varied to suit the fancy of the worker. For such a design as is shown, draw on paper, full size, half of it; fold on the center line and with scissors cut both sides of the outline by cutting along the line just drawn. Trace around this pattern on the wood, and saw out with compass or turning saw.

The shelves may now be made. The bevel of the ends of the shelves will be the same as for the ends of the side pieces. The lengths may be obtained by measuring the drawing. Remember that length is always measured along the grain and that the end grain of the shelves must extend from side to side in this stand. The widths may



Details of the Magazine Stand

be obtained by measuring the width of the sides at the points marked out on them for the location of the shelf ends. It is best not to have the shelves the full width of the sides, since the edges of the shelves are to be faced with leather. Make each shelf $\frac{1}{2}$ in. less than

the width of the side, at the place that the shelf is to be fastened.

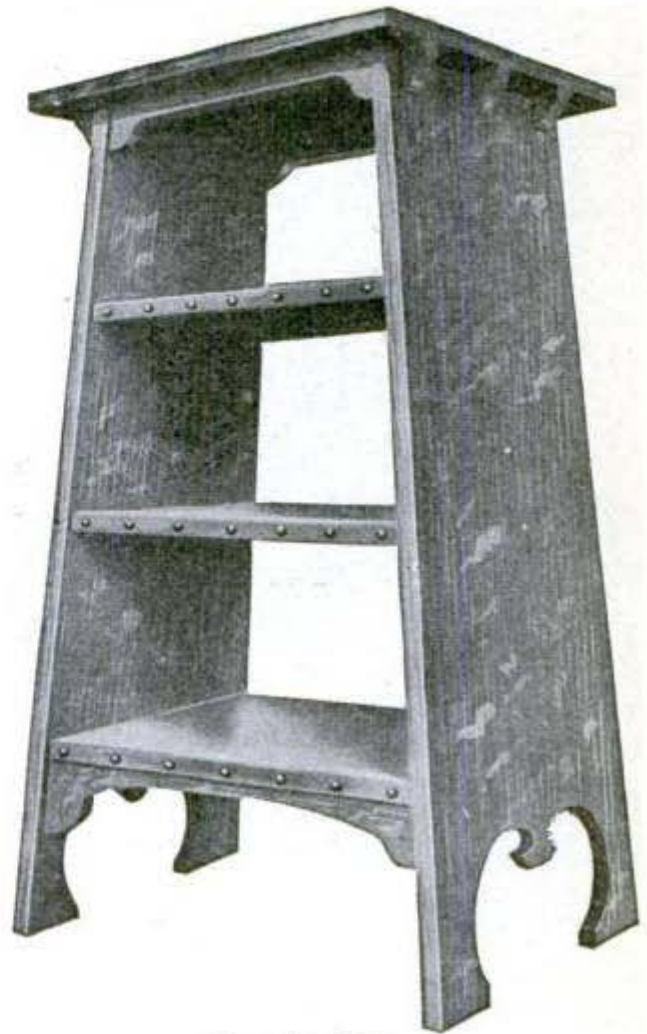
The top will be squared up in the usual manner, 15 in. wide by 16 in. long.

These parts may now be put together. They may be fastened in any one of a variety of ways. Round-head blued screws may be placed at regular intervals through the sides. Finishing nails may be used and the heads set and covered with putty stained to match the wood. Finish nails may be placed at regular intervals and fancy headed nails used to cover the heads.

The braces should be formed and fitted but not fastened until the finish has been applied. Thoroughly scrape and sandpaper all parts not already so treated. Probably no other finish appeals to so many people as golden oak. There is no fixed standard of color for golden oak. Different manufacturers have set standards in their part of the country, but the prevailing idea of golden oak is usually that of a rich reddish brown.

Proceed as follows: Egg shell gloss: 1.—One coat of golden oak water stain, diluted with water if a light golden is desired. 2.—Allow time to dry, then sandpaper lightly with fine sandpaper. This is to smooth the grain and to bring up the high lights by removing the stain from the wood. Use No. 00 sandpaper and hold it on the finger tips. 3.—Apply a second coat of the stain diluted about one-half with water. This will throw the grain into still higher relief and thus produce a still greater contrast. Apply this coat of stain very sparingly, using a rag. Should this stain raise the grain, again rub lightly with fine worn sandpaper, just enough to smooth. 4.—When this has dried, put on a light coat of thin shellac. Shellac precedes filling that it may prevent the high lights—the solid parts of the wood—from being discolored by the stain in the filler, and thus causing a muddy effect. The shellac being thin does not interfere with the filler's entering the pores of the open grain. 5.—Sand lightly with fine sand-

paper. 6.—Fill with paste filler colored to match the stain. 7.—Cover this



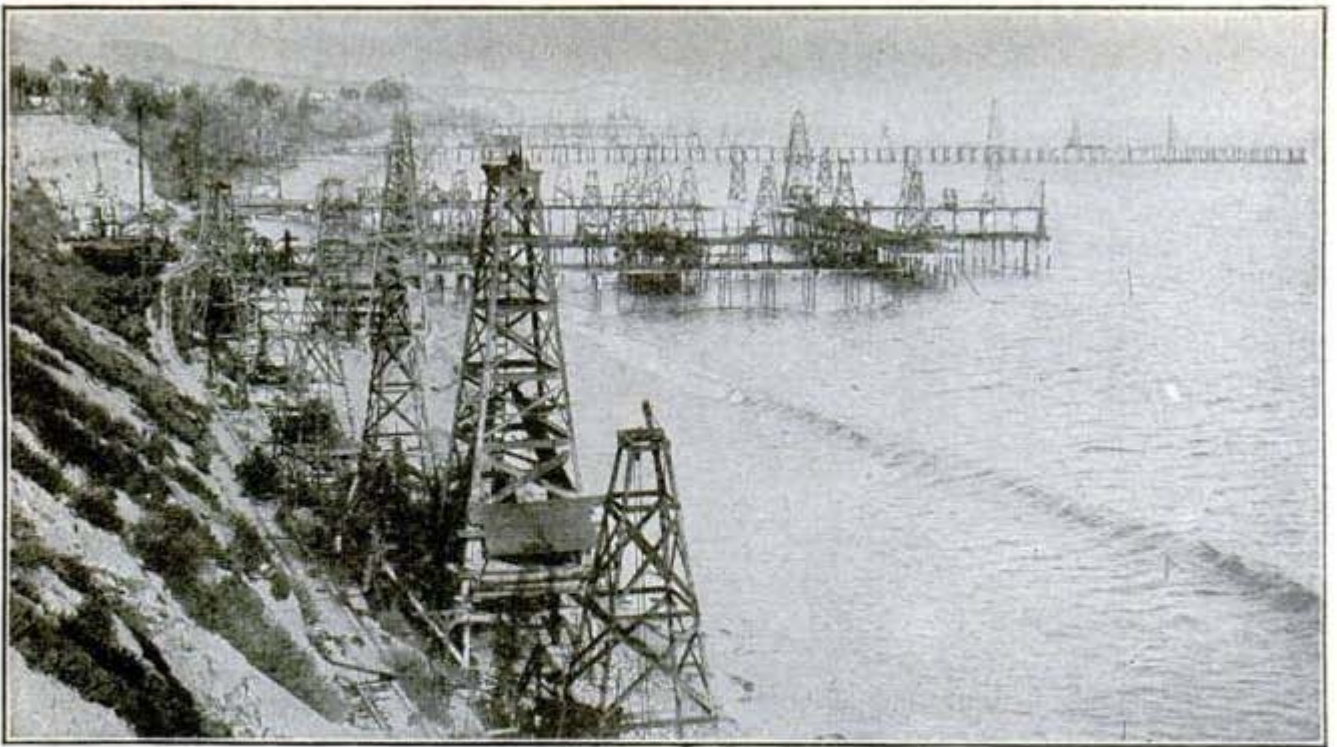
Completed Stand

with a coat of orange shellac. This coat of shellac might be omitted, but another coat of varnish must be added. 8.—Sandpaper lightly. 9.—Apply two or three coats of varnish. 10.—Rub the first coats with hair cloth or curled hair and then with pulverized pumice stone, crude oil or linseed oil.

Affix the braces just after filling, using brads and puttying the holes with putty colored to match the filler. The shelves may be faced with thin leather of a color to harmonize with the oak, ornamental headed tacks being used to fasten it in place.

The links of the chains to be used as part of the gear of the locks of the Panama canal have withstood 147,000 lb. pressure under tests.

The keel of the 21,000-ton U. S. S. "Florida" was officially laid on March 9.



Oil Wells at Sea

OIL WELLS RISE FROM THE OCEAN

Pumping oil from under the ocean seems an extraordinary venture, but petroleum companies are doing this along the coast of California. At Summerland long piers extend far out into the ocean, and on these derricks have been built. Down through the water and the sandy ocean bottom are pipes leading to deposits of petroleum. The sight of oil wells at sea is certainly unique.

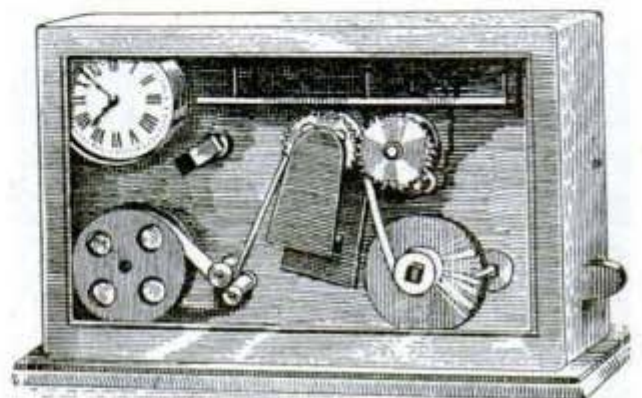


INSTRUMENT MAKES RECORD OF AUTOMOBILE'S SPEED

This apparatus is designed to make a record of the speed of an automobile and consists of a clock movement and a speed-indicating movement. The clock movement actuates a recording arm which records the passage of time upon a spool of paper with a silver pencil. The speed-indicating movement is actuated by the turning of one of the wheels of the automobile through a flexible cable, and a second pencil-carrying arm.

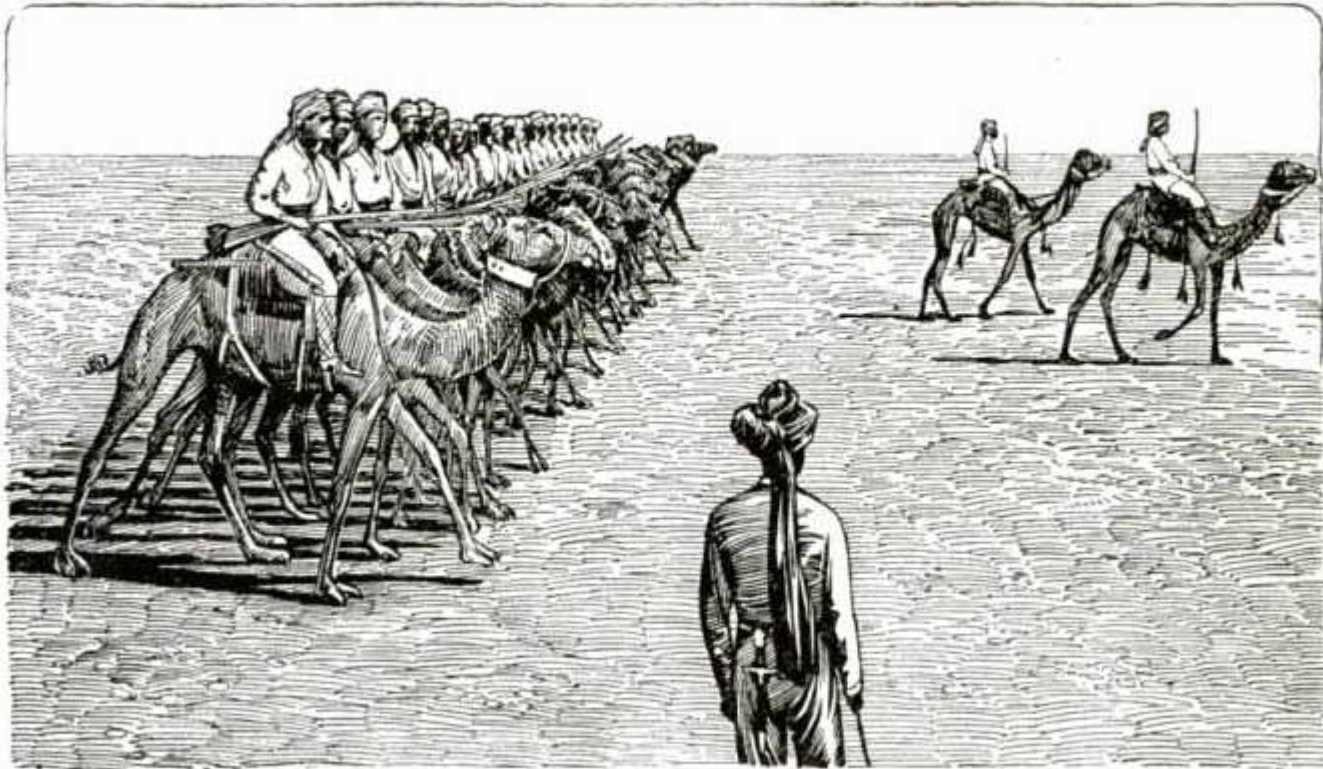
The strip of recording paper passes over the drum at a regular speed as determined by the clockwork mechanism,

but the actual intervals of time are correctly marked from the clock by the time-recording pencil in a sinuous line that denotes hours and half hours. When the automobile is running, the rotary movement of the wheel to which the flexible cable is attached is transformed into a lineal movement, the pencil making the record on the spool of paper, so that the speed of the car at any given moment is ascertainable. At the completion of each half mile of the journey, the pencil receives a momentary displacement from its line of travel, so that a series of tiny peaks appears along the speed-recording line to denote the distance covered. Thus speed and distance in relation to time are recorded.



The Recording Instrument

CAMEL CORPS OF INDIAN SOLDIERS



Detachment of Camel Troops on the March

The camel is put to as many uses as a horse, not the least important of which, in India at least, is its use as a war-charger for the native soldiers. This illustration shows the camel corps of the Maharajah of Bikanir, a province or state in India. Such a corps is of great value in the case of a sudden raid, as it can advance 70 or 80 miles in a day, carrying a week's supply of food and water as well as the soldiers.

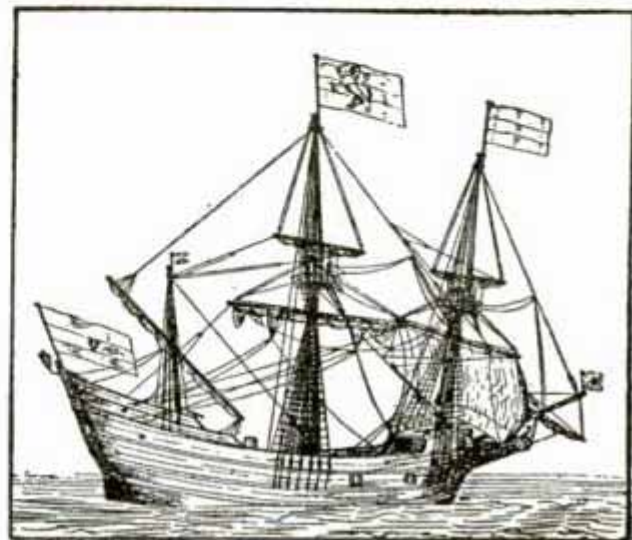
HOLLAND REPRODUCES HUDSON'S SHIP

In the festivities to be held in New York next September, celebrating the 200th anniversary of the discovery of the Hudson river by Hendrick Hudson, his ship the "Half Moon" will be one of the leading features. It will be shipped across the ocean by Holland, who is building it as her offering for the celebration. The keel was laid in October, 1908, in the Royal Naval dockyards at Amsterdam, and it is being patterned as near as possible after the original ship. The measurements of

the original ship were found in the archives of the East Indies Co.

The vessel will be 63 ft. long, 17 ft. wide, and will have a tonnage of 83 tons. Three masts will rise from the deck, the fore and main masts rigged with yards, and the mizzen mast with a lateen sail. Her armament will consist of four guns.

Although built of oak, and quite seaworthy, the ship will be navigated only to Rotterdam. From that port she will be shipped across the Atlantic on the



The "Half Moon"

deck of one of the Holland-American liners.

Hendrick Hudson was an Englishman, but his voyages of exploration were entered into under the flag of Holland. He discovered the Hudson river in 1609 while searching for a northeast or northwest passage to China. His last voyage was made in 1610, from which he never returned. With his son and seven infirm sailors he was set adrift somewhere in Hudson bay and was never heard of again.

INEXPENSIVE ICE-MANUFACTURING APPARATUS

Of the many small ice-making machines invented to meet a steadily growing popular demand none are more inexpensive and satisfactory than this machine, manufactured by a Paris concern. In making small blocks of ice it combines simplicity with reliability of action, turning out anywhere from 3½ lb. to 70 lb. of ice per hour, according to size of the machine.



The agitator is turned by hand on the smaller machines, and by a motor on the larger ones. The moulds are first filled to three-fourths their height with water, covered with their caps, and placed in the machine. A mixture of nitrate of ammonia and fresh water is poured in through the round holes in the cover of the machine, and the agitator is turned for 20 or 30 minutes—intermittently, if the operator chooses. At the end of this time the water is found to be completely frozen in the moulds, and the blocks of ice are removed from them by dipping in lukewarm water. The machine is also made to freeze carafes and bottles, and to make ice cream by an arrangement of bottle holders and moulds which can be placed in the round openings serving

to introduce the freezing mixture into the machine.

After a freezing, the nitrate of ammonia can easily be recovered by evaporation and used over again.

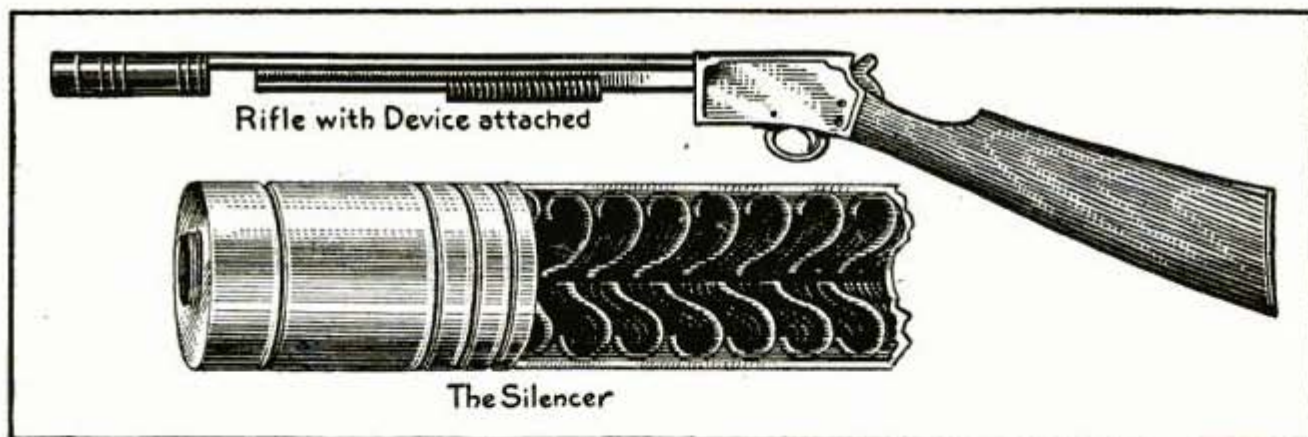
LIFE PRESERVER INFLATED WITH LIQUID GAS

A life preserver which differs materially from the ordinary types of such appliances, combining several novel and valuable features, has been invented by a German. It consists of a hollow belt of rubber, 5¼ in. in diameter, with attachments at the ends so that it can be quickly and easily hooked together beneath the arms. Closely fastened to the upper surface of the belt is a small metallic cylinder, filled with liquid carbonic dioxide. On turning a tap the liquefied gas at once escapes into the belt, volatilizes, and inflates it to its fullest capacity. The whole operation of attaching and inflating the belt requires but 30 seconds.

The advantage of this belt is in the fact that its buoyancy is uniform at all points, allowing a perfectly vertical position in the water to any person wearing it, and that it will easily support a person of even more than 200-lb. weight, although weighing only 4¼ lb. itself. A cork belt of the same buoyancy would weigh over 26 lb.



Life Belt in Position



MAXIM'S NOISELESS FIREARM INVENTION

The device known as the "silencer" with which Hiram P. Maxim has succeeded in making all ordinary firearms practically noiseless appears to be nothing more intricate than a small section of highly polished gaspipe. For the ordinary army or sporting rifle the silencer is 4 in. long, $1\frac{3}{8}$ in. in diameter, and weighs about $5\frac{1}{2}$ oz. It may be carried in the waistcoat pocket like a fountain pen and can be screwed onto the end of a gun barrel in 5 seconds. To fit it to a rifle it is only necessary to cut a small screw thread at the end of the barrel.

The principle upon which the invention is based is centrifugal force. The powder gases, instead of escaping explosively from the muzzle of the gun, which produces the loud report, are caught in the silencer and whirled rapidly about through the small grooves or apartments with which it is provided, escaping gradually. These small grooves are formed by steel disks inside the tube, the bullet passing through a hole in the center.

Successful tests of the device were made recently in a New York office. Among many other guns, a United States army Springfield rifle was used. Without the silencer the report from this gun made the window sashes rattle and pained the ear drums of persons in the room. With the silencer attached only a sharp "swisk" was heard.

The value of such a device in warfare cannot be over-estimated. Smokeless powder has made possible long-distance shooting from hidden positions,

but at closer range the reports of the rifles have often made secrecy of position impossible. The possibility of discharging rifles without smoke or report divulging the position of the men will prove a great asset to any army.

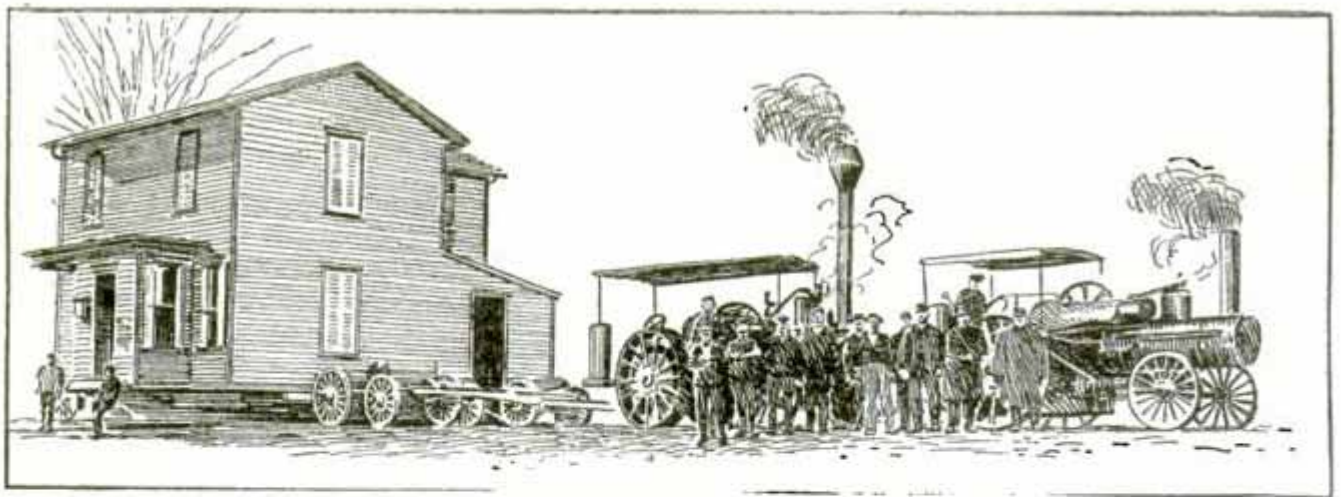
SULTAN OF TURKEY TO HAVE CUT GLASS STAIRCASE

Abdul Hamid, Sultan of Turkey, still clings to his old ideas of gorgeous Oriental luxury, and has ordered a complete staircase of cut glass for his palace. It will be the most dazzling staircase ever seen outside of the illustrations of a fairy story. It will be 25 ft. wide, and the steps are to be beveled and cut with Turkish inscriptions.

ACETYLENE LAMPS FOR MINES

Acetylene lamps are steadily gaining in favor as a means of mine illumination. The flame is not easily blown out, the rapid movement of a miner will not cause it to flicker badly, and it burns brilliantly in an atmosphere so foul that candles fade and go out. By concentrating the rays in a reflector a brilliant illumination can be thrown into any part of a mine for inspection purposes, and the use of the lamps for under-





This House Was Moved Five Miles with Traction Engines

ground surveying has often been demonstrated.

It is claimed that candles remove seven times and kerosene five times as much oxygen as acetylene, and that the products of combustion given off by candles and oil lamps are from nine to ten times as much. It is also claimed that with the acetylene lamp here illustrated a half pound of calcium carbide will give a 10-cp. pure illumination without smoke for 10 hours. The price of the carbide is quoted at 4 cents per pound.

The acetylene lamp is so arranged as to bring the water into contact with the carbide as the gas is burned and in just sufficient quantity. As soon as the pressure of gas reaches the proper point for burning, it holds the water in check until the consumption at the burner has so reduced the pressure as to allow it to flow again.

AERIAL FLEETS OF THE POWERS

France leads the world in the number and effectiveness of its aerial fleet. The French government owns 14 airships and has four under construction. Germany has six; England, two; Italy, two; Belgium, two; the United States, one; Russia, one; Holland, one under construction; and Austria, one contracted for.

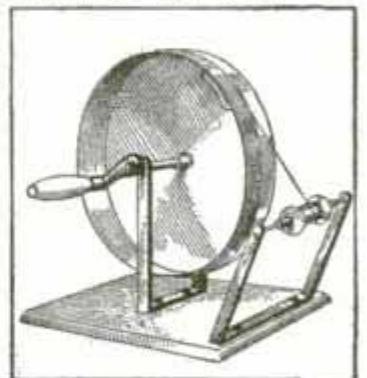
Electric snow melters were used last winter to clear the streets of Berlin.

MOVING A HOUSE WITH TRACTION POWER

Owing to the frequent necessity of clipping the limbs of the trees extending over the roadway and the temporary removal of bridge railings it took these two traction engines, of 36 and 24 hp. respectively, a day and a half to move this house five miles. Two weeks of work was required to jack the house up and place it on the four heavy wagons used to transport it. The house is located at Merchantville, N. J. —Contributed by P. A. O'Donnell.

A THREAD-MEASURING REEL

A thread reel is a more or less elaborate piece of apparatus by means of which thread may be unwound from its spool and transferred to the rim of a wheel for measuring. The circumference of the wheel is, of course, accurately known. The wheel shown in the illustration is a simple form of the apparatus, and the thread is fed upon it from the spool, a single layer covering the surface from left to right. Care must be taken to lay the threads closely without overlapping and to count the exact number of revolutions made. When the width of the wheel is filled, the



thread is cut and removed from the wheel by pushing it off.

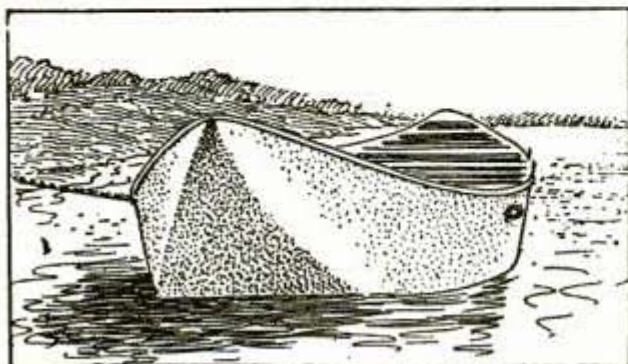
GERMAN AERIAL TORPEDO

An aerial torpedo, consisting of a hollow body, containing a thin cylindrical reservoir, one end of which is attached to the point of the projectile, and the other end to a thin plate screwed into the hollow body, is being built at the Krupp works in Germany. The reservoir is filled with liquid oxygen, and also contains an explosive charge fitted into a cylindrical tube. In the point of the torpedo a hole is bored, widening toward its front, and in this is inserted a pill of platinum sponge. The platinum is ignited by the escape of hydrogen when the point of the torpedo has pierced the covering or envelope of the dirigible airship or balloon, and in its turn sets fire to the explosive charge.

The method of propulsion is still held secret.

THE CONCRETE BOAT BRIDGES OF ITALY

The reinforced concrete pontoon here shown is part of a bridge on the river Po in Italy, formed of a number of boats, some of which are removed when a vessel desires to pass. There are many such bridges crossing the Italian rivers, some of which are still composed of wooden boats, although concrete is rapidly taking the place of wood in such construction because of its longer life and the absence of any expense for repairs. The pontoons are usually



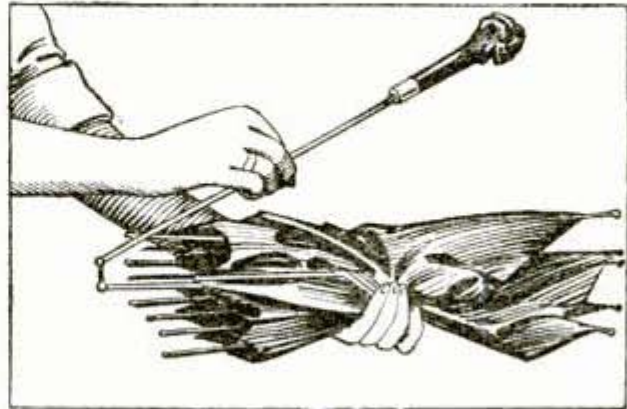
Courtesy Scientific American

Reinforced Concrete Pontoon

about 45 ft. long, 12 ft. wide, and 3½ ft. in depth.

NEW FOLDING UMBRELLA

This folding umbrella is so constructed that the ribs and the center rod, being hinged in the middle, will



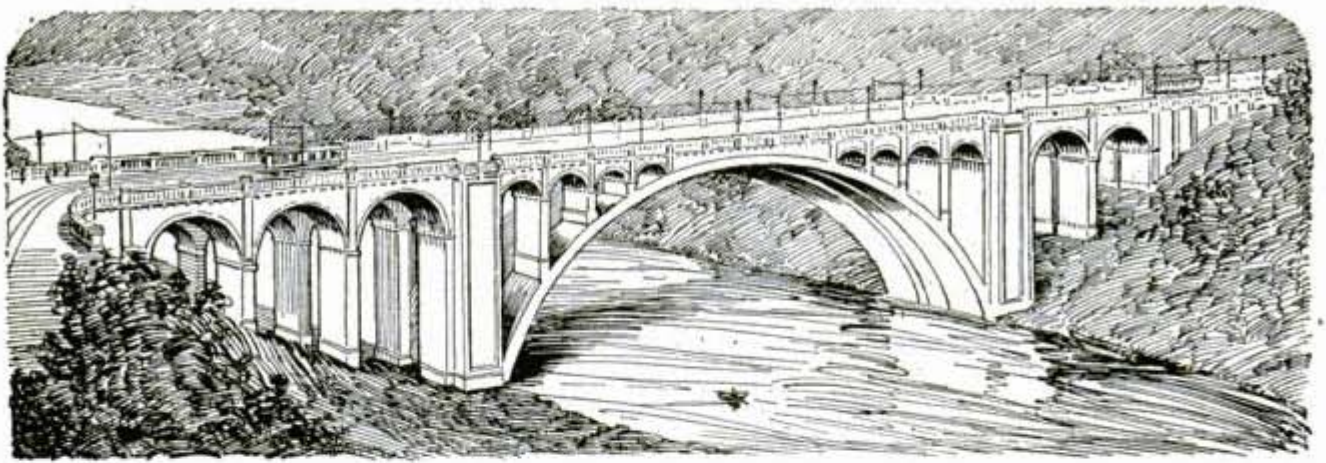
Folds to 16 In. Long

fold to half their length. When folded and slipped into its case it is only 16 in. long and can easily be carried in the overcoat pocket or in a satchel. When extended, each rib snaps into a clamp which holds it perfectly rigid, and the two sections of the center rod screw together in a firm joint. Only half a minute is required to either set up the umbrella or to fold it. When set up it can be carried open or closed in exactly the same manner and with the same appearance as an ordinary umbrella.

DESTROYING FOG BY MEANS OF ELECTRICAL DISCHARGES

Sometime ago Sir Oliver Lodge, the famous English scientist, came to the conclusion that the growing infrequency of heavy fogs in London, especially in parts where great electrical power plants are located, was due to the discharge of electricity into the air. Following out this idea he began experimenting, and recently in Liverpool succeeded in completely clearing away for a radius of 60 ft. a thick fog.

The scientist's apparatus consists of a series of disks at the tops of poles from which he drives high-voltage elec-



Plan of Concrete Bridge 708 Ft. Long

tricity into the fog-laden air. The current acts directly upon the constituents of the fog, the electric influence whirling these hither and thither, causing them gradually to fall to the ground.

Preparations are being made for an exhaustive test of the idea in London.

ELECTRICITY IN THE NAVY

According to Lieut. Commander E. T. Witherspoon, of the U. S. Navy, the past quarter of a century has advanced the value and effectiveness of the Navy a hundred years through the adoption of modern electrical inventions. He estimates that the electrical equipment of the latest first-class battleships costs \$600,000.

GREAT CONCRETE BRIDGE FOR CLEVELAND

Work has been commenced on a great concrete bridge which will give Cleveland, Ohio, the distinction of having the longest concrete span in the world and one of the finest highway bridges in America. The bridge will be 708 ft. long, with a central span of 280 ft. and a roadway 40 ft. wide, spanning the Rocky river at a height of 100 ft. The approach arches will have spans of 40 ft.

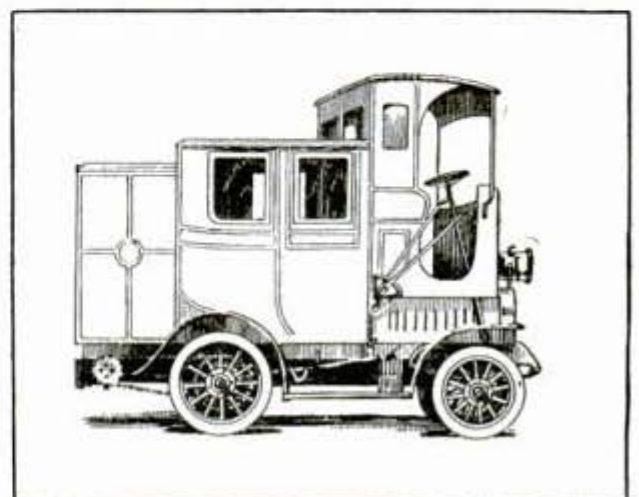
The main arch of the new bridge will be divided longitudinally into two ribs, each to be 18 ft. wide. Provision will be made for a double track street railway, and the rails will be attached to

the steel floor beams of the bridge, which are to be protected by a covering of concrete. The roadway is to be paved with brick laid on a concrete floor. Two subways, each 3 ft. 3 in. by 11 ft. 6 in., will be constructed for water, gas, and electric light connections.

The bridge, which will cost a little less than \$210,000, will not be completed until the latter part of 1910. The next longest concrete span in the world is that of the Wissahickon Creek, Philadelphia. It has a span of 233 ft.

THE MOTOR MAIL COACH SERVICE OF MONTENEGRO

Montenegro, the little principality of the Balkans responsible for much of the recent war rumors in Europe, is up-to-date in its motor mail coach service at least. The main compartment of the automobile is for passengers and



For Passengers and Mail

the rear compartment or box is for the mail. The drive is curious, being from sprockets placed behind the driving wheels, instead of in front as is usual.

An optimist is a man who never stops to open a sandwich.

WHEEL ATTACHMENT FOR TRANSPORTING CANOES

Very few people consider it necessary to build a boat house for a canoe, yet to carry the lightest make, with paddles, cushions, and other accessories is a task for two persons, and even for more when the portage is long.

The wheel attachment here shown makes the transportation of a canoe, loaded with cushions, fishing tackle, provisions for a day's outing, or other objects often carried on such trips, as easy a task for one person as the wheeling of a perambulator. The device, which has been recently patented, consists of a light steel wheel, and a framework which slips into an attachment on the keel of the canoe near the bow. This framework has two arms or clutches into which the bow of the canoe fits, holding it steady when traveling over rough roads. The ends of the clutches have a leather lining to keep them from scratching the polished surface of the canoe.

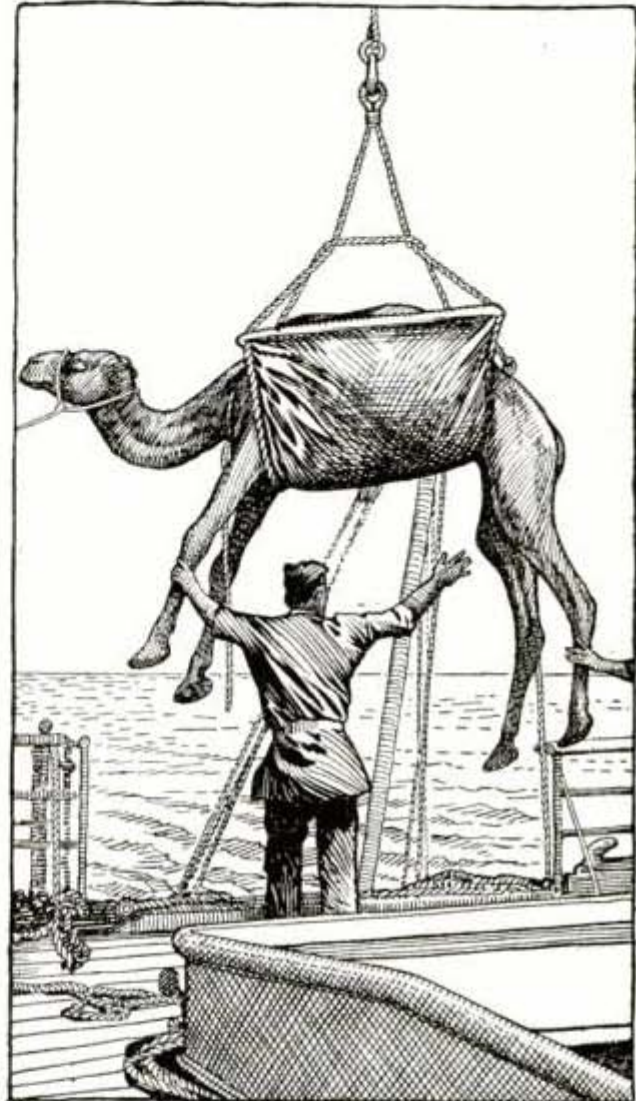
The wheel and frame are of such shape as to be easily stored in the bow or stern.



Wheeling the Canoe

LANDING A CAMEL FROM A SHIP

This illustration depicts the landing of camels at Berbera, British Somaliland, Africa, in the operations of the



Ship of the Desert on Ship of the Sea

British soldiers against Somali Mullah, who is again raiding the African tribes under English protection. He is claimed to have about 70,000 men under him while the British have not more than 5,000 men in that territory.

BURNING COAL AND OIL TOGETHER

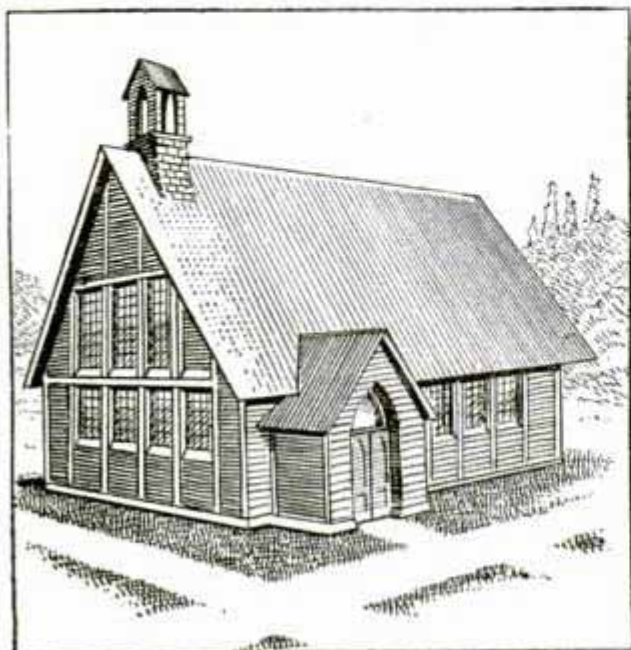
The essential feature of a new process of burning coal and oil fuel together, now undergoing successful tests, is the retort in which the oil changes into gas. The retort is arranged around the fire box, the oil being injected into it from the front of the furnace by a jet of steam through a special nozzle. The

oil travels down the center of the furnace to the end of the fire, then along the back of the fire and to the front again, being all the time within the heated retort. When it reaches the front it is in the form of gas. It there ignites and is blown down on the top of the coal fire, creating an intensely hot flame in the whole of the furnace. The proportion of coal and oil can be varied.

A PORTABLE CHURCH

The first of a number of portable churches, built in Providence, Rhode Island, has been erected by an American church association at Youngstown, Ohio. The mission of the portable church is unique. It is to serve in localities not yet strong enough or rich enough to afford more pretentious edifices, fostering the church spirit until such time as a permanent church can be built. Then it is taken down and moved to some other place.

This first of portable churches is a marvel of ingenious construction. It has the distinguishing characteristics of a house of worship, including a belfry and entrance porch. Its dimensions are 30 by 41 ft. and it will seat 200 people. The sides are made in panels, with outer and inner walls, the interior being sheathed with North Carolina pine, wax finished. The pan-

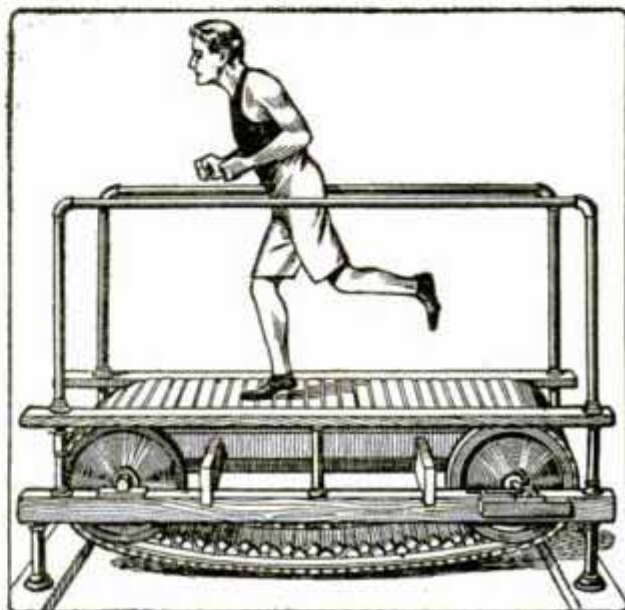


Ready-Made Church

els are joined together with coach screws. The roof, covered with patent roofing, is supported by four wood trusses. The outside of the structure is stained brown. The cost was about \$2,500.

RUNNING 12 MILES AN HOUR IN A SMALL ROOM

This apparatus, perfected by a Cleveland, Ohio, physical culture instructor,



The Running Machine

makes it possible for athletes to train indoors in limited space or in their own homes. The machine is a treadmill, with the exception that, instead of being driven by the man running upon it, it drives the man. It is a motor-driven platform which compels the man upon it to travel forward as fast as it travels backward. The speed is controlled by the athlete himself and can be varied from a slow walk to a fast sprint, a control lever being located in one of the handrails. The athlete in the illustration is exercising at a speed of 12 miles an hour.

Nicholas Antone Berryessa, believed to have been the oldest native Californian, died a couple of months ago at San José. The Spanish, Mexican, and American flags waved over that state during his lifetime.

EDITORIAL

The terrific blizzard which visited Washington March 4th upset not only the outdoor inauguration plans, but worked widespread ruin to all telegraph and telephone lines in that section of the country. It seems impossible that the capitol of this great country could be cut off from all wire communication with the outside world for more than 48 hours, but that is what actually occurred. Newspaper correspondents were obliged to take belated trains and send their reports from Philadelphia. So complete was the wreck of overhead lines that 12,000 men worked night and day for 72 hours to restore communication out of Baltimore. Even then, only emergency messages of the utmost importance were transmitted. Two weeks were required to restore normal conditions, at a cost of several hundred thousand dollars.

Suppose this had occurred during a time of war. Can anyone conceive what might have been the result of this enforced isolation?

It is evident that the public utilities furnishing telegraph and long distance telephone service will be obliged very soon to change their present type of line construction, at least to an extent which will make impossible a repetition of the recent complete shut-down. The substitution of concrete for wooden poles will help some. The same storm when sweeping through Ohio carried down miles of wooden poles both east and west of a section where concrete poles remained standing. The increasing cost of wooden poles is leveling their cost as against concrete or steel poles. But even where the pole line remained intact, the tons of sleet soon broke the wires. The logical and permanent, as well as secure and in the long run economical solution is to place the important trunk line wires underground. This is expensive in first cost, and yet one such line wreck as occurred in the Washington-Baltimore storm would pay interest on a large expenditure. To this should be added the continual cost of repairs which are constantly necessary on exposed wires.

* * *

The electrification of steam railroads is steadily becoming a nearer possibility although the inventors have yet much to accomplish before the motor generally displaces the engine. The opening wedge comes in the form of electrification of terminals in the largest cities where conditions of heavy passenger traffic prevail and where greatest objection is made to the smoke nuisance. Progress along these lines already has been made in New York, Philadelphia and Baltimore, and other large cities are likely to follow in the next few years.

The railroads claim that substitution of electricity for steam out on main lines would involve prohibitive losses by making junk of millions of dollars worth of steam locomotives. This, however, is misleading and far from true, for during the several years necessarily consumed in changing over, say, a thousand miles of trunk line, the future would be taken into consideration. As fast as the steam locomotives on one division were released they would be transferred to other divisions to take the place of worn-outs there, and at the last there would be branch lines of their own, and smaller roads which would absorb a great part of what motive power remained at the finish. There would be some direct loss, and some indirect, such as placing on branch lines

heavier and faster locomotives than the business required; but the loss from this item would be only a fraction of the whole. There would be other millions of dollars, now invested in locomotive repair shops, thrown out of use, but this would bring its own compensation, for the electric locomotive goes to the shop only two or three times a year, where the steam locomotive must be overhauled constantly. Moreover the cost of repairs to the electric machine is insignificant compared to the cost of maintenance of the steam locomotive.

The elimination of smoke, cinders and sparks will contribute to the comfort and luxury of long distance travel quite as much as did the air brake when it displaced the hand brake.

* * *

This country is indebted to Congressman Burton of Ohio, for the defeat of the Ocean Mail Bill which lacked only two votes in the House of becoming a law. The bill which passed the Senate, and was recommended by President Roosevelt, President-elect Taft, The Post Office Department and a majority of the Post Office Committee, provided for a continuation of mail service between this country and South American ports. Inasmuch as the revenue from the sea postage was sufficient to cover the expense, it is difficult to explain so shortsighted and penurious a policy.

Other countries, older than ours, to whom the export trade is a more vital necessity, are every day reaching out and securing South American trade. Europe can no longer maintain itself on home consumption of manufactured goods. Export trade is a necessity. Hence, it is made the object of governmental interest. A trained and effective consular service, mail and steamship line subsidies, ambassadors of trade schooled in the methods by which business must be done in Latin-American countries, careful attention to their ways of banking, proper packing of freight,—all these and many other conditions are employed. On the contrary we are weak or missing in all these respects. It is strange that a people so energetic, and farsighted in many ways, can be so inefficient and blind in this direction. When we do awake and sit up, it will be found we are far to the rear in the race, and years of expensive effort will be required in the attempt to make up for lost opportunities and wasted years. Our action, or rather want of it, is of a piece with our wasteful exhaustion of natural resources. We did not realize they could not last forever. It is the same with our South American opportunities.

In the meantime Japan has joined with Chile in the subsidy of a new steamship line between those two countries, although in 1907 Japan imported only \$317,000 from Chile and exported but \$64,800 in return.

* * *

Disasters are accentuated in proportion to the degree of civilization where they occur. An icequake or tidal wave or some other similar convulsion may rend the Antarctic regions, destroying seals, polar bears and walruses by thousands, but it is no disaster.

Lightning may start a fire, which burns for months, destroying millions of great trees with all the vegetable and animal life they shelter; but if the burned forest is in some practically unknown and uninhabited district, it is no disaster, even though a possible loss to future generations.

Tornadoes may rage, volcanoes do their worst, subterranean caverns collapse, rain fail to fall for years, or cloudbursts overflow the rivers as never before; but if no human habitation was there, it is not a real disaster.

As we civilize, we create disaster. We flock into cities until the streets are overcrowded and accidents to life and limb occur hourly which are unknown in villages and small towns. We actually become a danger to each other by reason of our numbers. Where wireless telegraph saves a thousand from an ocean grave, tens of thousands find fatal diseases in poorly ventilated places of employment. Gas illumination is safer than oil lamps, yet more people are asphyxiated from worn gas fixtures than are burned to death from broken lamps, although lamp users largely outnumber the former. We constantly do new things to safeguard life, but all the while new dangers are created. Where ten are saved on fire escapes, twenty are killed at railroad crossings.

And so the battle wages between safeguards and new kinds of disaster.

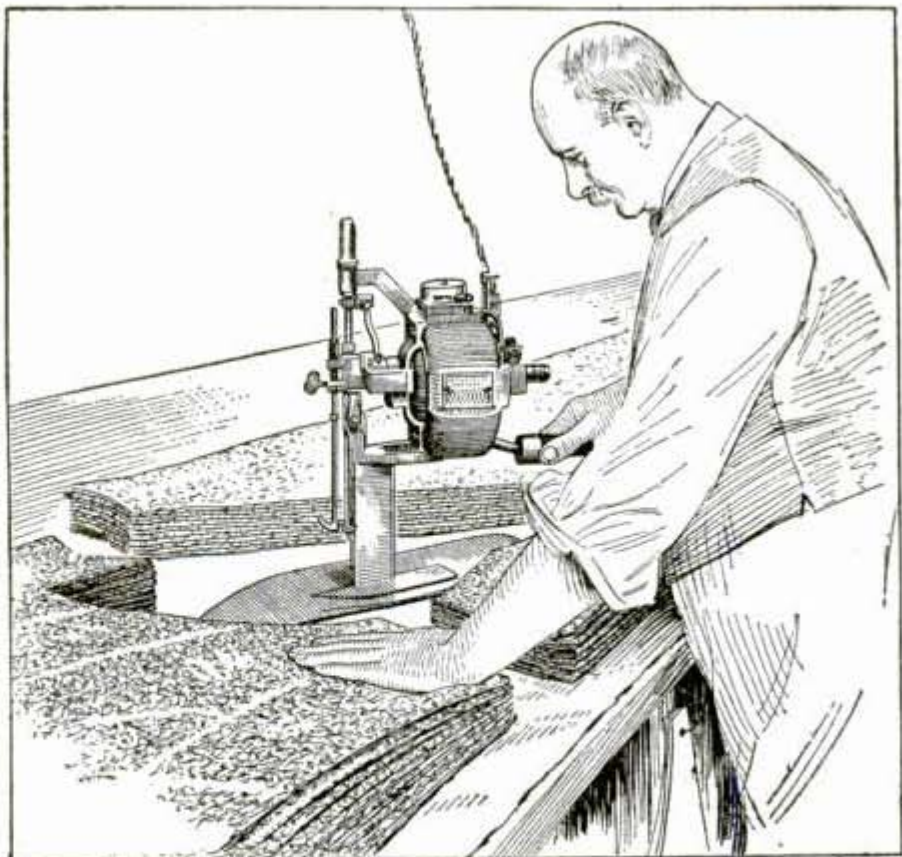
Perhaps some day prevention will precede its cause.

H. H. WINDSOR.

CUTTING THE U. S. NAVY'S CLOTHES

The United States navy has its own clothes factory, located in the New York Navy Yard. The man responsible for the shapeliness of the clothes worn by both sailors and marines is shown cutting 10 double thicknesses of heavy overcoat cloth with an electric cutting machine. The cut-out garments are given to expert seamstresses to finish.

trouble. The moving pictures, which were taken purposely a few months before the trial came up, showed the



MOVING PICTURES AS COURT EVIDENCE

Moving pictures were thrown on a screen in the Brooklyn court recently as evidence in a \$50,000 damage suit brought against a street car company by the guardian of a 10-year boy who was struck by a car in 1905. The injuries to the boy were claimed to have brought on hip

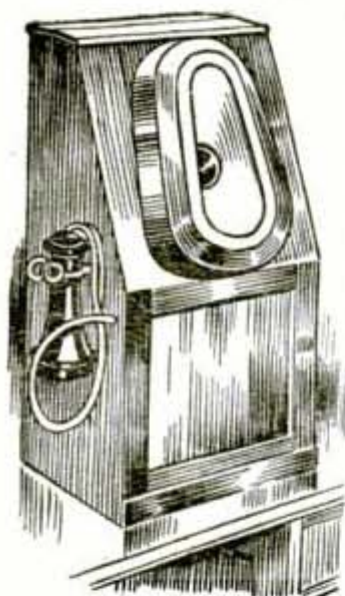
boy running around as lively as his companions.

Cutting 10 Double Thicknesses of Overcoat Cloth with an Electric Cutting Machine

The boy was awarded \$8,500, but not because of the moving picture evidence. Upon the verdict being found for the plaintiff Judge Aspinnall declared that in all probability there never would be another attempt made to establish the validity of a litigant's claim by means of moving pictures. He was firmly convinced that the pictures shown could be so manipulated by the operator of the machine as to give inaccurate and misleading impressions of the agility of the person shown.

A DESK TELEPHONE BOOTH

Many business firms in Washington, D. C., are using this telephone device for privacy.

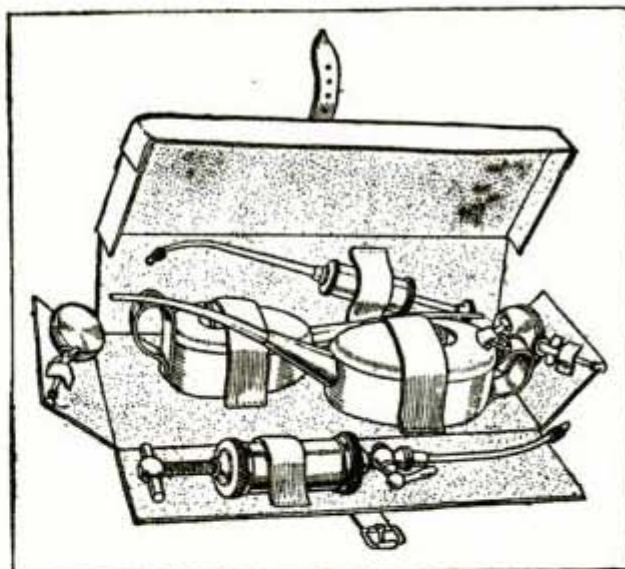


It is a desk telephone booth that just fits the face, in which private conversations can be carried on without anyone in the room being able to hear what is said. The face is placed in the opening of the booth when talking. It is built

on sanitary lines, and is easily cleaned and disinfected.

OILING SET FOR AUTOMOBILES

Oil cans and greasers must be carried somewhere on every automobile, and the problem is how to stow them away so that they will not be damaged by blows from loose tools, will not make a mess of everything with which they come in contact, and yet will be accessible. In such a cabinet as this, each article has its own place, can be removed or replaced without disturbing the others, and has no injurious contact with other articles. The clever folding of the sides of the case al-



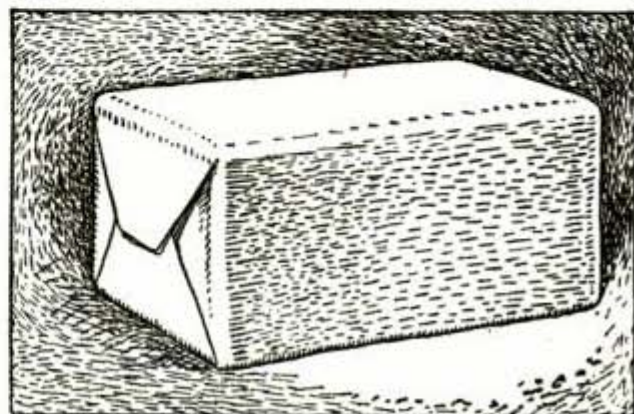
A Handy Kit

lows every article to be revealed by the simple unfastening of one strap. This special case contains six oiling devices. The case is lined with a non-absorbent material.

Through trains will start to run between Seattle, Wash., and Galveston, Tex., in June. The distance is about 2,900 miles, thus making it the longest through-service in the United States.

LUMPS OF SUGAR SERVED IN PACKETS

The better known restaurants in Europe are now serving their sugar in small packets, each packet containing two of the long flat lumps. This method insures the cleanliness of the sugar and protects it from flies. The idea is excellent, especially in restaurants patronized by customers who can afford to pay for service as well as for food.



Paper Covered Sugar

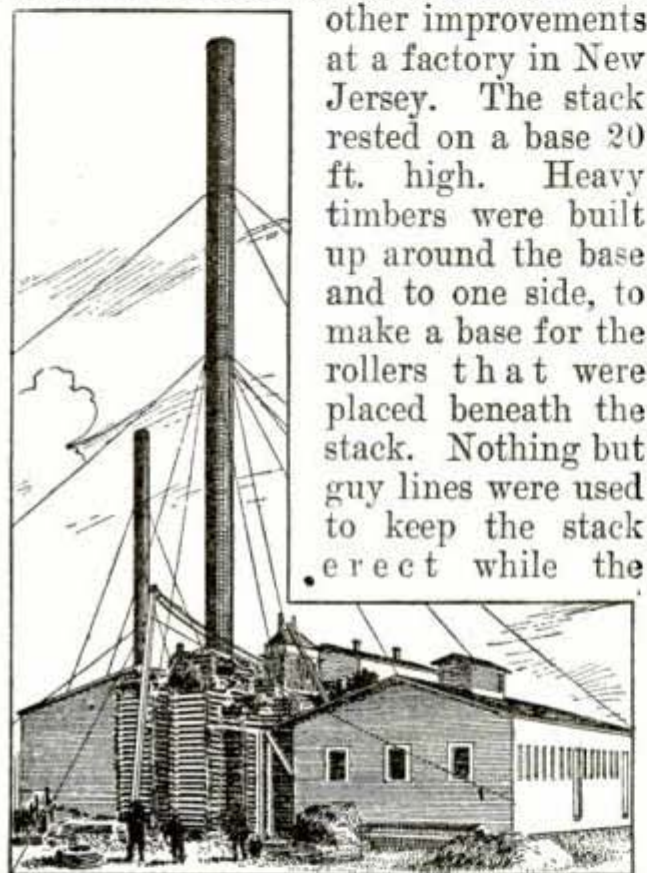


SHOP NOTES



Moving a Large Smokestack on Rollers

A large smokestack, 4 ft. in diameter and 115 ft. high, was moved bodily several hundred feet to make room for



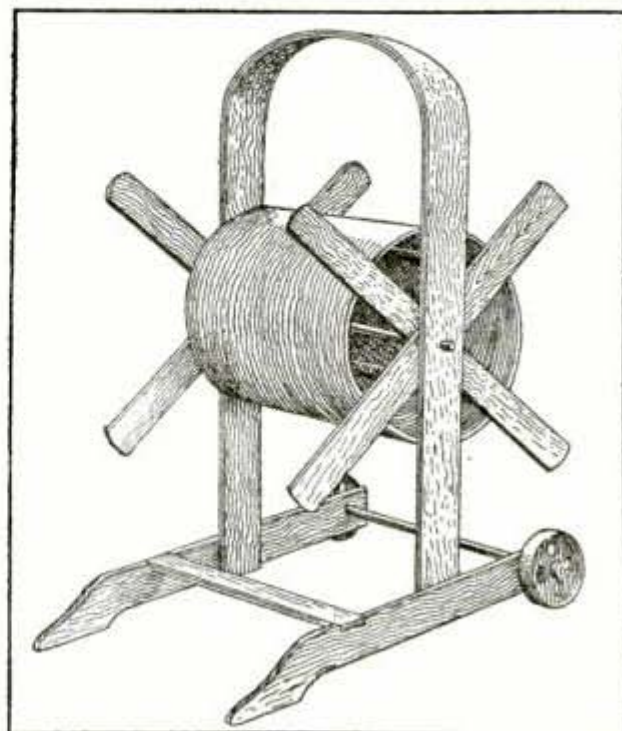
other improvements at a factory in New Jersey. The stack rested on a base 20 ft. high. Heavy timbers were built up around the base and to one side, to make a base for the rollers that were placed beneath the stack. Nothing but guy lines were used to keep the stack erect while the

Moving the Stack Bodily

moving proceeded. The time of moving was much less than if the stack had been taken down and put up again.

Preventing Reel from Cracking Garden Hose

Reels having four sticks between the end pieces for a base on which to coil garden hose usually crack the hose. The breaking of the hose may be prevented by securing an empty cheese box from your grocer and putting it on the four sticks as shown in the illustration. If the sticks are not at the proper place, or should the reel not have any sticks, then cut four pieces of wood that are about $1\frac{1}{2}$ in. square and fasten them

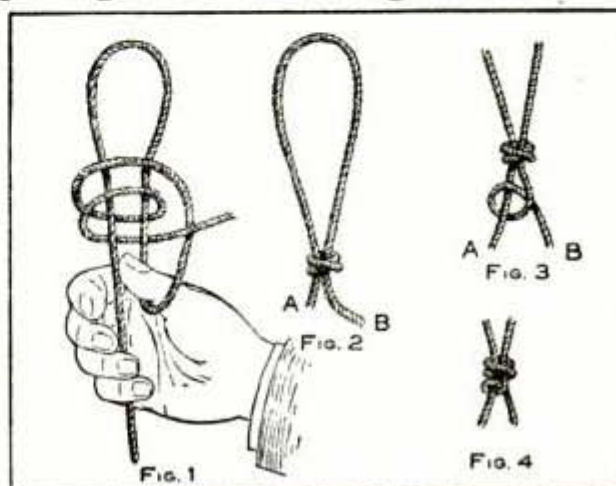


Cheese Box on the Reel

between the end pieces at the right distance from the axle to properly center the cheese box.

How to Tie an Upholsterer's Slip Knot

This knot as used by upholsterers is a good one to use when tying up parcels where a slip knot is necessary and one that will hold until secured. Fig. 1 illustrates the tying of the knot and Fig. 2 the knot tied ready to slide by pulling the end, B. Fig. 3 shows how

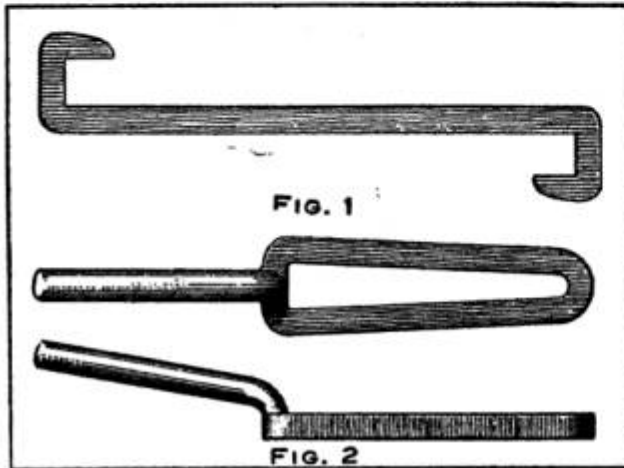


Different Stages of the Knot

the knot is held from slipping by making a half hitch on B over A, and Fig. 4 shows the finished knot that cannot slip.—Contributed by A. Lithgow, Toronto, Can.

Home-Made Wrenches

The accompanying sketch shows the construction of two wrenches made by a correspondent of the Blacksmith and Wheelwright. The wrench (Fig. 1) is

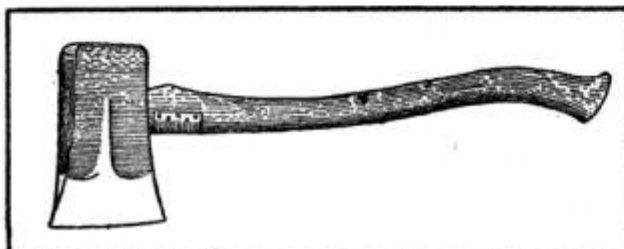


Two Kinds of Handy Wrenches

made from $\frac{1}{2}$ -in. square iron to fit nuts in proportion to their size. Another wrench (Fig. 2) is made to fit various sized nuts. The triangular part is made of $\frac{1}{2}$ -in. square iron with a round forged handle welded to the large end. The triangle will turn nuts varying in size from $\frac{1}{4}$ in. to 1 in. The length of the flat part is 6 in.

Protecting the Place of Wear on an Axe Handle

Axe handles will wear and give away near the axe where the wood strikes when splitting or chopping. The accompanying sketch shows how to fasten a piece of sheet metal with screws or



The Tin Covers the Place of Wear

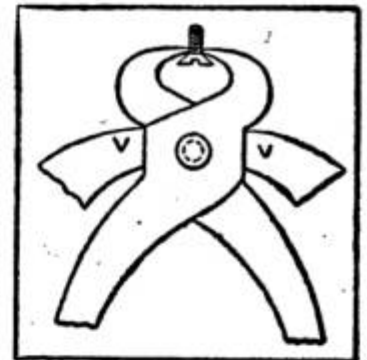
nails at the proper place to protect the handle from the wood.—Contributed by Fredrick M. Perras, Taunton, Mass.

Tar Paper Used for Packing Rings

An engineer for a lath mill had considerable trouble with the rubber packing rings blowing out on the cylinder and steam chest. The trouble was overcome by cutting tarred paper and applying the same as for rubber packing. The packing was placed in and the nuts turned up, then, after the steam had heated the cylinder thoroughly, the nuts were turned up as tight as possible. This packing gave better satisfaction than the rubber.

Holding Small Screws for Filing

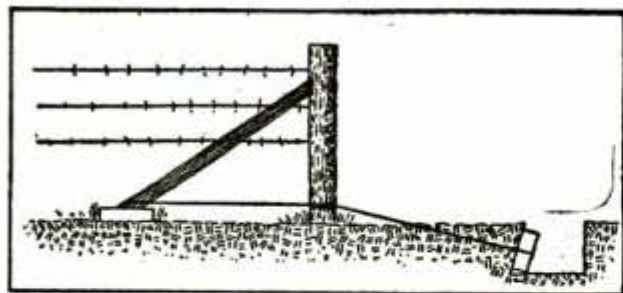
The kink indicated by the accompanying sketch shows a method of holding small screws while filing off the point. Some short screws with bevel heads were a trifle too long and were shortened by this method, says a correspondent of Machinery. The screw was held in a pair of pinchers which in turn was held in the jaws, VV, of a vise. Holding them in this way injured neither the heads of the screws nor the thread.



Anchor for a Fence Post

The accompanying sketch shows a good way to anchor an end fence post. The end of the brace rests on a flat stone and is held in place with a No. 8 gauge galvanized wire looped around the lower end of the brace near the rock and drawn back tightly in notches cut on each side of the post and then extended a few feet farther and anchored under ground to a rock or an iron bar.

The two wires between the post and the brace are then twisted together with a stick to take up the slack. The wire drawing down on the two notches in the

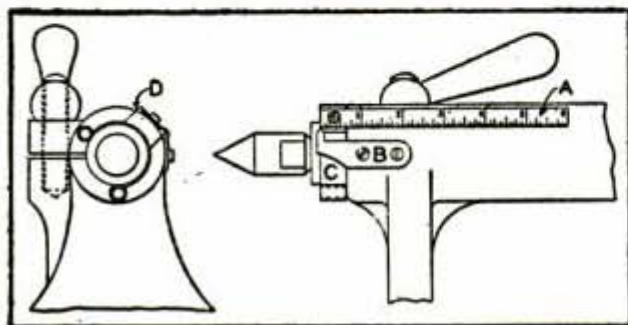


The Anchor Construction

post will prevent the post from raising when stretching the fence wire.—Contributed by W. A. Carver, National Soldiers' Home, Tenn.

Depth Gauge for Drilling in a Lathe

An attachment to determine the depth when drilling and one that can be attached to the tailstock of any lathe is shown in the accompanying sketch. The device is made up of three principal parts: A, the scale; B, the indicator, and C, the spring clip. The spring clip is made of spring steel, hardened and tempered; it is made, as shown, to clip the spindle tightly and yet be able to be moved by hand along the spindle, says American Machinist. To it is soft-soldered a brass piece D, which fits the spring clip on its lower side, and on its upper side is machined, as shown, to fit the scale A, which is held in position by a small screw. The indicator, B, is of sheet brass, made to shape shown, and fixed by two screws to the tailstock. The die or other article to be drilled is placed in the chuck; the drill is advanced by the tail-

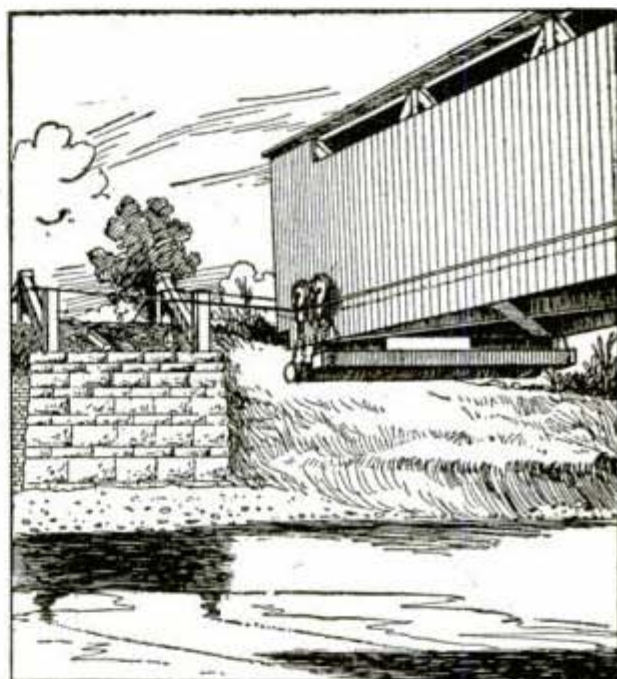


Scale Applied to the Tailstock

stock in the usual manner until its point touches the work; the clip and scale are pushed back until the clip touches the tailstock, when the scale reads at zero, as shown. Any advance of the drill may now be read off on the scale as the actual depth of the hole.

Moving a Bridge on Cables

A small stream had to be dredged out deeper for drainage purposes and a certain wagon bridge over the stream was too low for the dredge to pass under and swing the bucket. The bridge could not be taken apart and reconstructed in the trench left after the



Removing a Bridge Temporarily

dredge. Heavy posts were set in the embankment to the piers and well braced and two 1½-in. cables were attached to them. Grooved wheels were fastened to heavy timbers placed under each end of the bridge. These wheels were placed on the cables and the cables drawn tight, which lifted the bridge clear of the piers and made it easy to draw the whole structure to one side and lower it to the embankment. The cables were removed and the dredge making the bed of the stream 10 ft. lower passed through between the piers. The cables were replaced and the bridge put back on the piers in the same way as it was removed.

How to Frost Window Panes

Glass already set in frames can be frosted with the following mixture: Dissolve 1 part of wax in 10 parts oil of turpentine and add 1 part each of varnish and siccativ. The panes of glass are coated on the outside with this solution and before drying dabbed with a pad of cotton batting. Small portions of color may be mixed with the wax solution if desired.

ous line of reinforcement from the base throughout the entire shoe. The columns are 20 in. in diameter, 8 ft. high and are built of irregular pipe. The cost of making such a structure in cement is far below the cost of a similar structure in wood.

The term "acre foot" used in mining is that volume of water which would cover an acre to the uniform depth of 1 ft. It contains 43,560 cu. ft.



Good Luck Concrete Ranch Entrance

Concrete Ranch or Farm Entrance

The accompanying illustration represents work designed and executed in concrete by a correspondent of *Cement Age*. The large cement horseshoe, a symbol of good luck, represents the name of the ranch on which it is located. The horseshoe was made in a mould constructed by using galvanized iron bent to the proper shape and staked to the ground. Four large bolts were placed where the calks appear and wire was built into the base on which the shoe was to rest. When the shoe was set up and the wires securely tied to the bolts the remainder of the calks were completed. This made a continu-

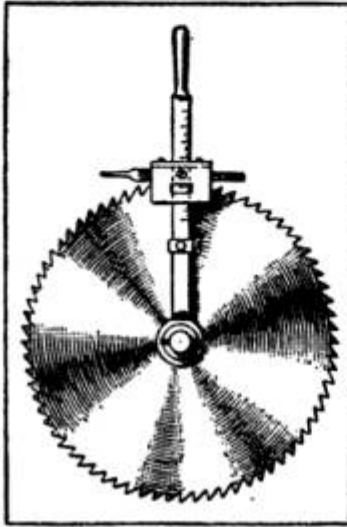
Putting in a New Tailshaft at Sea

A broken tailshaft on a large steam tug was repaired in fairly deep water in a harbor on the Pacific Coast of Mexico. The propeller was first removed by a diver and the tailshaft drawn in toward the engine. The diver slipped a tapered wooden plug, around which was placed a rubber ring to make it watertight, into the hole when the shaft slipped through the stern tube. The plug was forced in tight and secured by means of a wooden chock wedged in between the head of the plug and the rudder post. When the new shaft was put in the stern tube the packing and the gland were replaced

and screwed up sufficiently to prevent a rush of water. A jack was placed on the inner end of the shaft, which forced it into place, pushing out the plug placed in the stern tube. The propeller was put on by the diver. There is no reason why this operation could not be done in mid-ocean, providing the weather is suitable.

A Circular Saw Jointing Tool

The jointing of a circular saw requires a special tool that will make the points of the teeth in a perfect circle. The tool illustrated herewith consists of a handle pivoted on one end to an axle that fits the hole of the saw. The main part of the handle has a holder for a file, and this holder can be set to any radius by the aid of the scale marked on the handle side, says Blacksmith and Wheelwright. When the file holder is set, the handle is turned on its axle, causing the file to take a cut from the ends of the teeth.



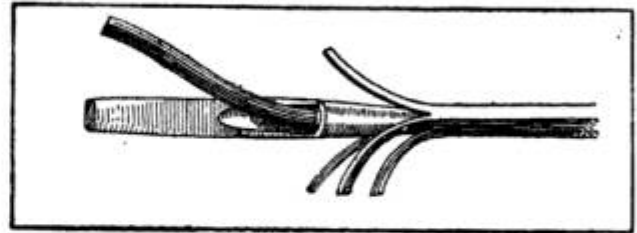
Repairing a Galvanized Drain Pipe

About 18 months ago I noticed a hole the size of an egg in the drain pipe on my house. I did not care to supply new pipes, so I repaired the old one by painting and applying putty around the hole and tying heavy cloth thoroughly soaked with paint around the pipe over the hole. The repair has stood the year and a half without leaking.—Contributed by A. F. Sternberg, Chicago.

If a gasoline engine muffler becomes choked it will cause the engine to miss sometimes because of the back pressure.

How to Make Round Leather Belts

Some small belting similar to that used on sewing machines or the feed shaft of an engine lathe was necessary and not having any on hand of the proper size I made what I wanted in

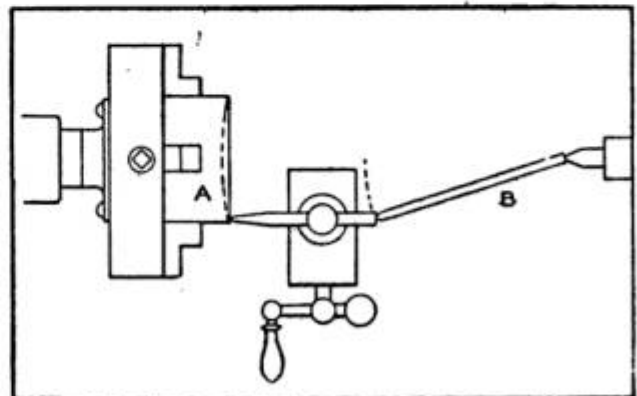


The Leather Is Pulled Through a Belt Punch

the following way: Old belting was cut with a circular saw to the required width, making small square strips, which were drawn through an ordinary belt punch. The punch was gripped in a vise while drawing the leather through. Any desired length could be made, the size depending on the size of belt punch used.—Contributed by H. E. Parker, Winchendon, Mass.

How to Turn Concaves on a Lathe

A concave having any desired arc of a circle can be turned in a lathe in the following manner: The work, A, is held in the chuck and the cutting tool placed in the tool post parallel with the lathe bed. A small hole or center should have been previously made in the back end of the cutting tool. A bar, B, is held between the tailstock center and the back end of the cutting tool by crowding the carriage toward the tailstock while the tool is being fed

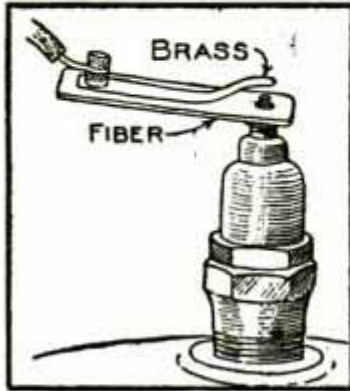


The Tool Cuts an Arc of a Circle

in, either by hand or the crossfeed. The tool will cut an arc of a circle with a radius equal to the length of the bar B, as shown in the sketch.

Spark Plug Tester

The testing of spark plugs on gasoline engines, and especially those used in automobiles, is not an easy task. The plug must be removed or some



device used to show if the connections make the spark properly. The accompanying sketch shows the construction of a simple contrivance to test the plugs while they

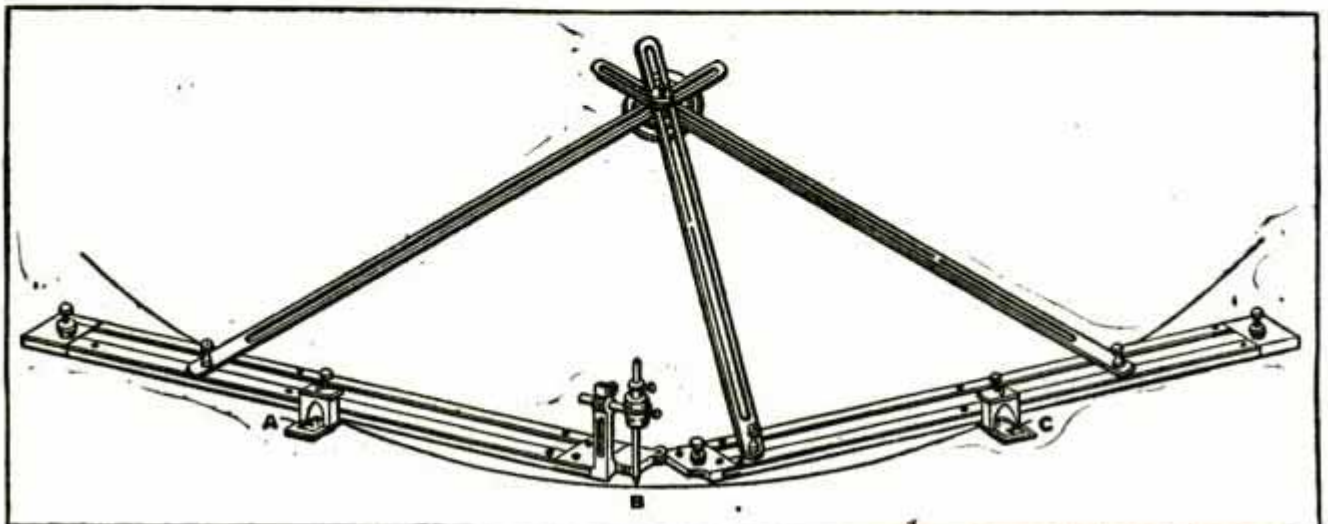
are in the cylinder. The base is made from fiber $\frac{3}{4}$ in. wide and 2 in. long, with a $\frac{3}{16}$ -in. hole drilled in each end. A piece of brass is bent as shown and fastened on one end of the fiber with a binding-post. When the connection is made and the device placed on the spark plug as shown, the spark will be seen between the spark plug screw and the end of the brass strip, if the plug is in good working order.

How to Draw Curves of Large Radii

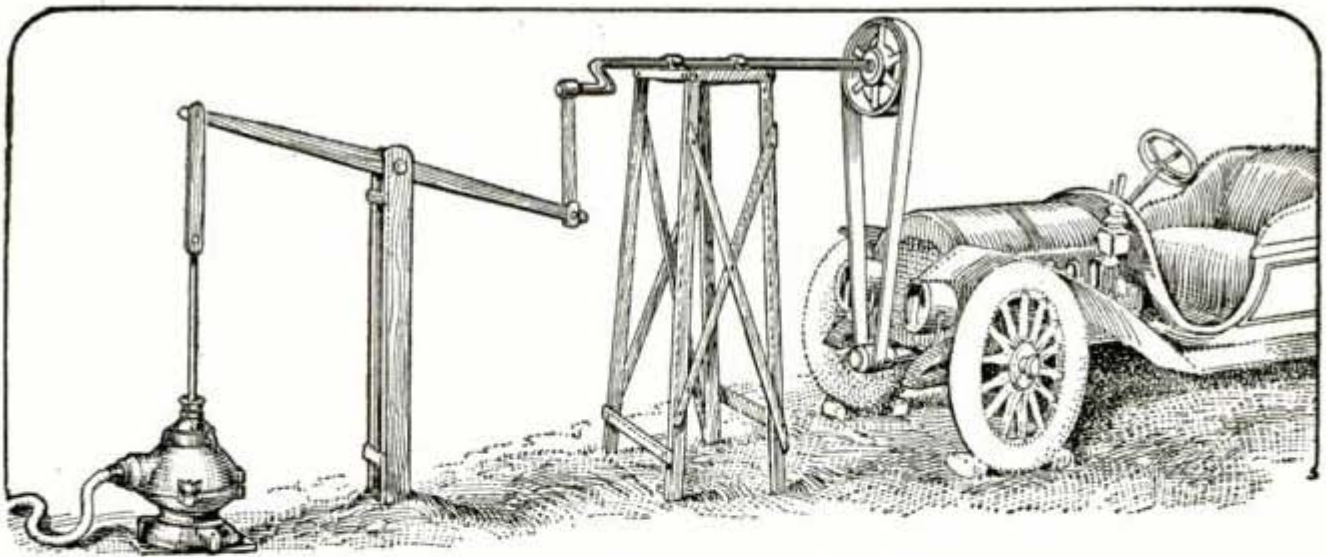
Demonstration shows that if three points on an arc desired are known,

and that if two straight edges are fixed against the three points, one against two of the points and the other against one of these and the third, that if the two straight edges are fixed rigidly together, forming an angle (the vertex or intersection of the straight edges being at the middle of the three points), and that if then the two rigidly connected straight edges are moved so that each of them is constantly kept touching one of the points, the path described by the angle or point of junction of the two straight edges will be that of the desired arc.

A new device, as shown in the illustration, is capable of doing this work for curves of long radius. If a circular arc is to be drawn through the points A, B, and C, then guides are placed at A and C, against which the straight edges of the instrument may ride and at point B is placed a pencil in an adjustable support fixed so that its point will rest at what is the intersection of lines continued from the straight edges. Then the arms extending inwardly from the straight edges are clamped together by means of the thumb screw shown, when the straight edges are held rigidly in their relative position. It is then only necessary to swing the pencil point so that the two straight edges are held against the guides A and C, respectively. While they cannot be shown, the instrument has ball bearings, so that it is raised from the surface of the drawing board about $\frac{1}{8}$ in. and freedom of motion thereby secured as well as rubbing of



Method of Drawing Arcs of a Large Circle



Pumping Water from a 130-Ft. Well

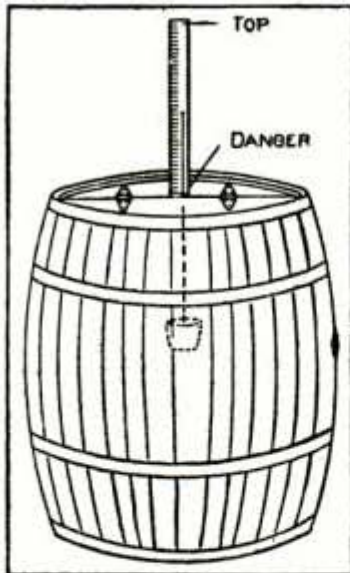
the drawing paper avoided. The guides are provided with nail points, so that they can be easily fixed in a stable position. It is apparent that the arc can be continued in either direction beyond the extreme points selected, so that a full circle can be traced if desired.



Indicator for Water Barrels



The insurance inspector generally finds the barrel of water used for fire protection only half full when passing through a mill. A careful person will keep the barrels full, thereby reducing the risk, says American Miller. The accompanying sketch shows a device that will indicate whether the barrels are full or not when you pass them on your rounds through the mill. A wire, cork, and a piece of board with a scale marked on it will do the work.



As rust will clog up a carburetter, iron pipe should not be used to connect up the gasoline feed for a boat engine; use copper or brass fittings.

Pumping Water with an Automobile

The accompanying illustration shows how a correspondent of Motor Age made use of his automobile for pumping water from a 130-ft. well. A 4-in. pulley was fastened to the mainshaft of the automobile engine over which was run a 3-in. belt to a 36-in. pulley on the shaft that operated the pumping crank. An old mower wheel with the rough tread broken off did service for this large pulley. The crankshaft is a piece of 1 1/4-in. iron bent with a 2 1/2-in. crank on the end. This gives a 5-in. stroke. A pitman connects the crankshaft to a walking beam and the walking beam is connected with another pitman to a common force pump.



How to Bleach Sponges



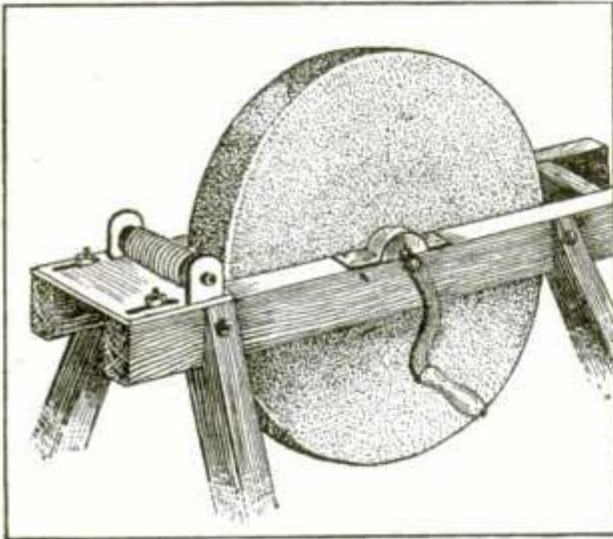
Sponges to be bleached are first cleaned from their sand and other obvious impurities or damaged portions by heating, washing or trimming, then placed for one hour in a solution of 1 part potassium permanganate and 100 parts water. They are then removed and well wrung out and placed in a solution of 1 part sodium sulphite crystals and 100 parts water, after the crystals are entirely dissolved add 2 1/2 parts hydrochloric acid.

The sponges quickly become bleached on soaking and then wringing them out

several times, says Practical Druggist. They are then at once washed out with warm water and placed in a $\frac{1}{2}$ per cent solution of sodium thiosulphate to remove any traces of acid. Alkali must not be used for this purpose, as the sponges are liable to become brown.

Another Way to True a Grindstone

There are different ways to true a grindstone, but the following method is very satisfactory and easy. Large threads are cut on a 6-in. steel bar which has a bearing turned on each end. Use six threads to the inch or larger. Two L-shaped bearings are



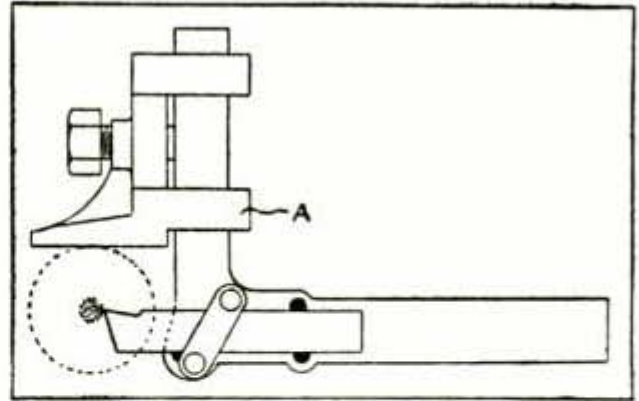
The Threaded Roller Cuts the Stone

fastened to an iron plate, and this plate has two long slots cut in it, one on each side. Lag screws put through the slots and turned into the frame of the grindstone hold the plate and roller close to the face of the grindstone. A sharp blow of a hammer will push the plate and roll up to the grindstone for a second or third cut or as many cuts as are necessary to make the stone true. The steel roll should be a little longer than the width of the grindstone.

Steady Rest for Cutting-Off Tools

This toolholder and steady rest is very simple to construct and can be made from a steel casting or a forging, says the Model Engineer. The holder

is of the ordinary cutting-off tool pattern, with the addition of an L-piece which stands vertically above the knife.

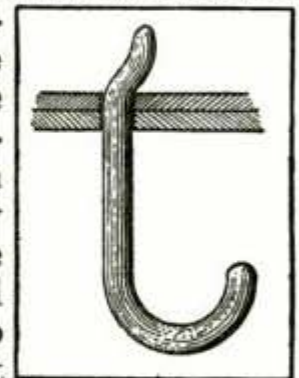


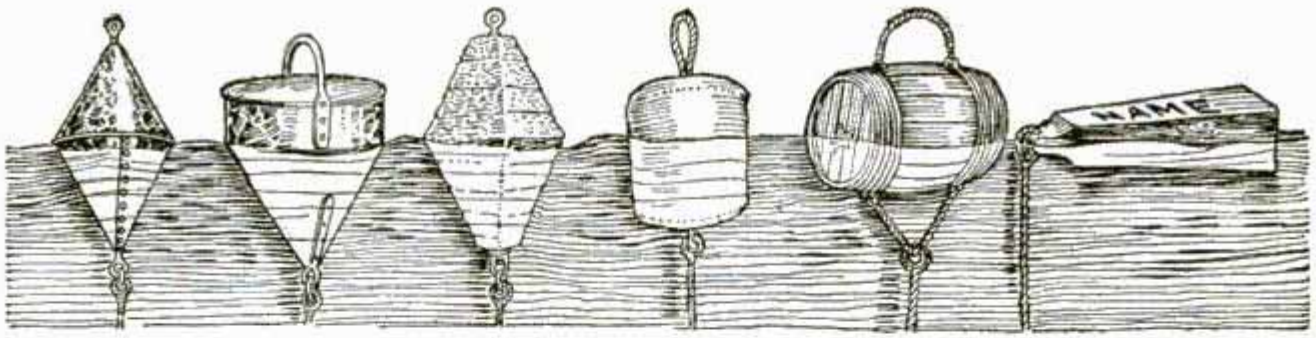
The Steady Rest in Position

Sliding on this vertical piece is another angle piece, A, which is clamped in position after it is lowered so as to come in firm contact with the rod which is being cut off. In place of the usual slot for the blade to rest in, three steel pins are screwed into the flank of the toolholder, and flat places are filed on these pins for the blades to rest upon. The rest of the toolholder is of the usual construction and clearly shown in the drawing.

A Boiler-Maker's Holding-On Hook

Undoubtedly many boiler-makers have had a great deal of trouble in using a hook to support a holding-on sledge where it is necessary to place a nut on the end of the hook to hold it in place, says a correspondent of the Boiler-Maker. The sketch shows a simple device which makes it unnecessary to use a nut on the end of the hook. All that is necessary is to offset the upper part of the hook the thickness of the rivet, provided the hook is made the same diameter as the rivet. The use of this hook will result in a great saving of time and trouble, for the holder-on can easily move it from one hole to another, and thus get the best position for holding on the rivet.





SAFE MOORINGS FOR MOTORBOATS

Condensed from Article by C. G. Davis in Motor Boat

Automobiles have done away with the old-time horseblock and hitching post; motorboats, on the contrary, have increased the demand for moorings to which to tie boats in harbors, bays and rivers. An auto will stand still, but a motorboat requires a rope or chain which gives her freedom to swing back and forth and to rise and fall with the tide and to hold her in any particular place.

In tidal waters boats are kept out from the shore tied to permanent heavy anchors securely hooked or sunk into the bottom of the bay or river. In very narrow channels two stakes are driven into the mud parallel with the shore, far enough apart to give slack rope enough to permit the launch to rise and fall with the tide and yet not be able to rub her paint off against either stake. A framework of wood forming a triangle about the stake sufficiently buoyant to rise and fall with the tide is often bolted together, and to this the mooring lines are tied, either two separate ones or one line from stake to stake with slack enough to allow its being hitched about the mooring cleats or posts. This is handy for the reason that when you get hold of this line at any place, you have both ends at once;

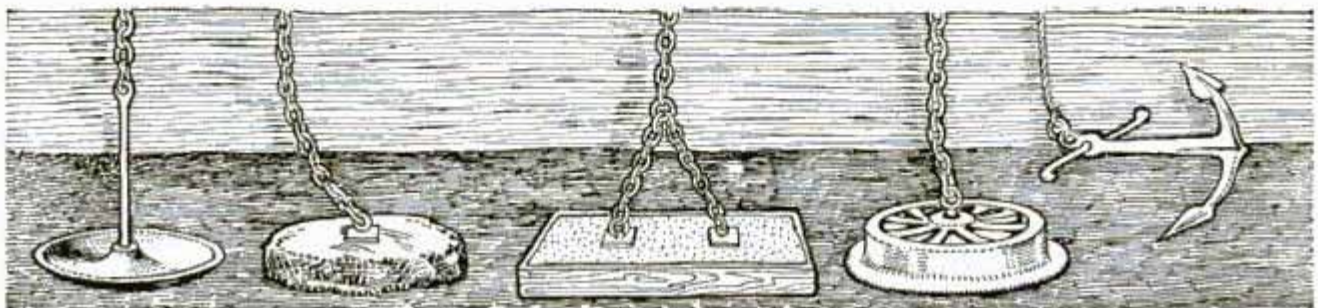
the same is effected by tying the ends of two separate lines (bow and stern lines) together before casting off for a sail.

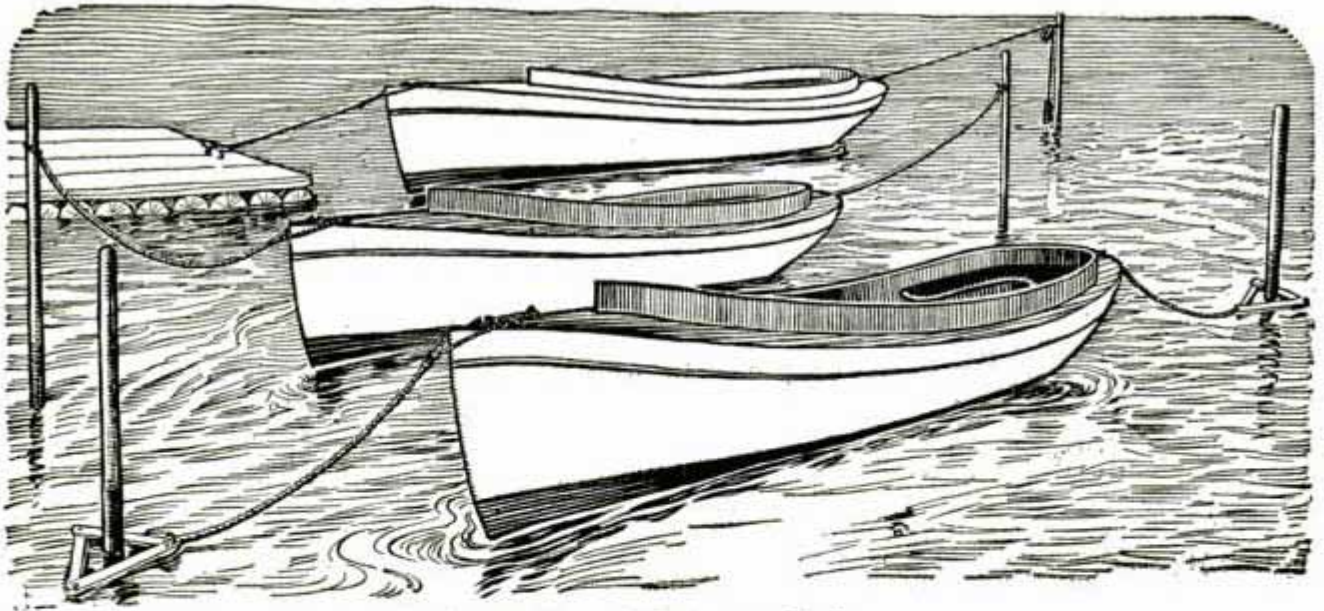
Another handy way, where there is a float to which a bow line can be tied, is to have a stake driven in the mud about twice the boat's length from the float with a pulley made fast to this stake. By making the bow line fast to the float with about 4 ft. of slack line the launch can be kept that distance away from the float by having a heavy weight hanging on the end of the stern line that is rove through this pulley.

An ordinary anchor will hold a boat for a short time, but one takes some chances in so leaving his boat. The variable winds and the twice-a-day shift of the tides may cause the cable to twist around the fluke that is standing up, and if that happens, the anchor is nearly sure to be pulled out of the mud and drag, letting the boat go afoul of some other craft, or ashore, doing many dollars' worth of damage.

It is to eliminate this danger that moorings are purposely made so that they cannot foul and are put down for the permanent anchorage of a yacht in her home port.

There are all kinds of anchors used,





Boats Moored Between Stakes

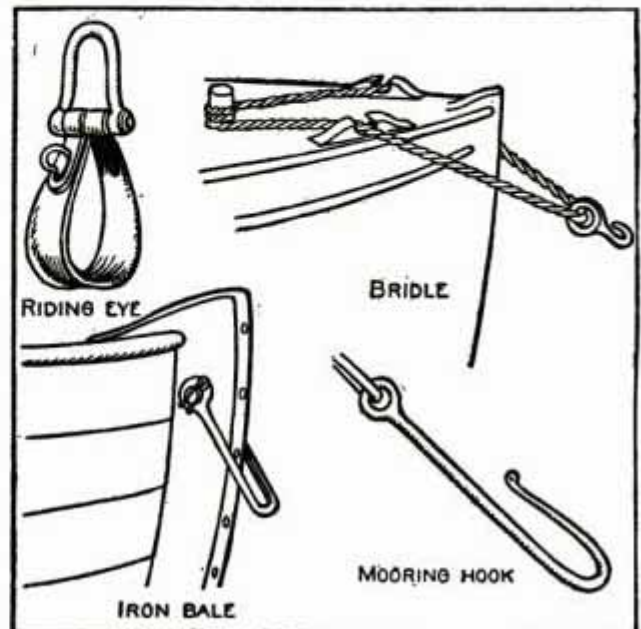
according to the nature of the bottom. No one cares to anchor on a rock bottom, and no sailor would. Mud holds an anchor best of all, as it allows the anchor to dig deep down and not only holds firm by hooking onto the mud, but by the suction as well. Some people cannot understand how mud bottom forms a good anchorage; but if these will take off their shoes and stockings some day and walk through shallow water and mud where they sink 6 in. or so into that mud, the principle will be satisfactorily explained. It is all one can do to pull his foot out of the sticky mud owing to the suction of it, and it is this suction that does the holding, and for this reason the anchors used for permanent moorings are of the mushroom variety.

Let the saucer-shaped body of a mushroom anchor once get bedded under the mud and it will soon bury itself, owing to its weight, continually sinking as the action of the tide about it washes the mud loose and over it, and it is well nigh impossible to drag it up out of the mud. It settles down and down through all the soft mud till it comes to the hard caked mud below and even cuts down into this as the boat pulls on its cable, so that the flanged edge is teetered up and dragged into the mud.

A mushroom anchor by its weight alone would never hold a boat, and even bedded in sand a few inches it would

not hold much. What causes it to hold is the fact that it keeps working down all the time, until it is securely embedded, then the suction will do the holding. Try to pull your foot out of thick mud and you will soon realize the strength of the suction that is holding the mushroom fast. A large flat stone makes a good mooring anchor for this same reason; an old car wheel makes a good one, or a strong box with two stout iron eyebolts embedded in it, filled with broken stone and scrap iron, and then poured full of concrete, the box forming a mould to make a large stone. Such moorings are put out for permanent anchorages at yacht clubs.

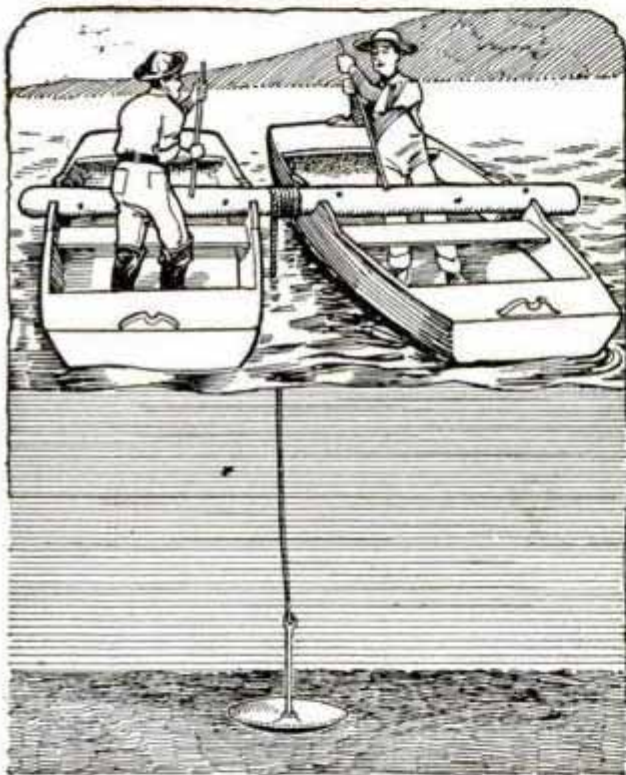
To raise a mooring of this sort get two large square-end scows, lay a spar,



Boat Fastenings

such as a piece of old 8-in. mast, across the two scows, resting in chocks of wood on each gunwale to prevent the spar rolling along the gunwale as it turns. Holes are bored through this spar into which the ends of crowbars can be inserted as heavers turn on the spar. By heaving tight on the chain of a mooring at low tide the anchor is lifted up out of the mud as the tide rises.

The mooring line is hooked to the boat by various means. Small boats sometimes have an iron bale, or staple, bolted through the stem on which to hook the mooring line. Another way is to have a bridle of small rope made fast to the bits, one passed through each



Raising a Mushroom Anchor

bow chock and fastened to a split hook for the mooring cable. A riding eye placed under a bowsprit will lead the cable through and prevent chafing the hull.

While some boat owners advocate swivels the one best thing to take the turns out of a rope is to use a floating buoy.

For floats, to hold up the light mooring line, there are a number of kinds in use, as shown in the accompanying diagram, made of galvanized sheet iron in various shapes, of cork cut in slabs or covered with canvas, and there are

wooden buoys of various shapes and small wooden casks.

When slipping an anchor the yacht's life preservers are often tied to the end of the cable to act as a buoy, but such a float is a temptation to thieves and is a bad practice. It is a good idea to have the yacht's name painted in plain black or white letters on the float or buoy, as it is more apt to be left alone than one not designated as personal property.

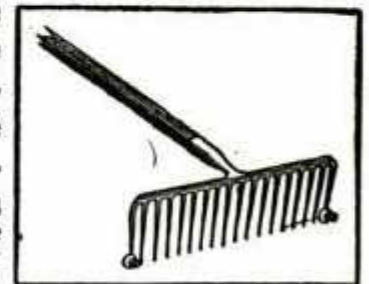
The length of the mooring chain should be three or four times the depth of the water and the cable four or five times the same depth. The end of the cable is not attached direct to the buoy, but has a small line that connects them both, so as to keep the heavy drag of the big rope off from the buoy.

Hardening of Steam Hose

The sulphur contained in rubber will cause steam hose to harden as vulcanization goes on with the heat from the steam. If an exact proportion of sulphur could be had this vulcanization would not be carried so far. The exact amount of sulphur is difficult to obtain. The crude rubber is gathered by natives all the world over, and is taken from trees varying from 7 to 10 years old, and if 10 tons of rubber were bought there might be 10 different qualities.

Iron Rake Teeth Kept from Digging a Lawn

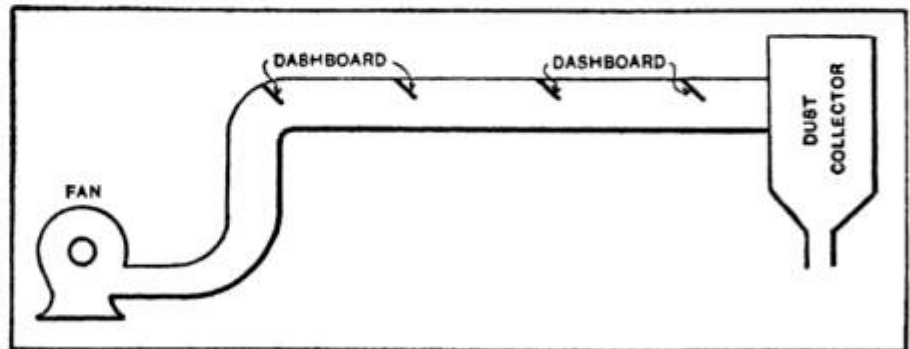
A wood rake is used to pick up the grass after cutting a lawn. If a wood rake is not at hand and you have an iron garden rake the teeth may be kept from digging into the ground by attaching a brass ball to each of the outer teeth



as shown in the sketch. The brass balls are fastened to the teeth with set screws.—Contributed by L. W. Hickman, Harrison, N. J.

Preventing Stoppage in a Shavings Conduit

The accompanying sketch shows how the stopping up of a blowpipe system, which would pack up and close the main pipe from the fan to the shavings collector, was prevented. The conduit had a double inlet fan sucking wet shavings, sawdust and bark from the two sides. The shavings would start packing at the first elbow leading to the collector and keep packing higher and getting longer, until the pipe would be stopped up, says the Metal-Worker. A larger elbow and pipe were put in and a dashboard made of heavy No. 16 galvanized iron was placed in the top part of the elbow so that the force of the air striking the dashboard deflected to the place where the packing first occurred. Dashboards were placed at 8-ft. intervals. The size of the pipe was made large enough so that there was still the number of square inches area below the dashboards as there was in the outlet of the fan.



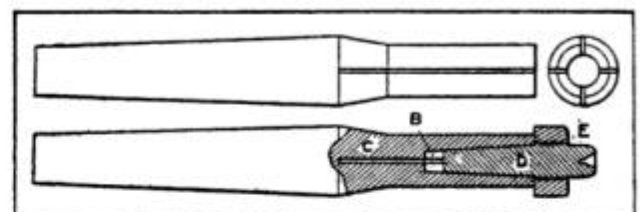
The Dashboards Deflect the Air

or for threading and a notch is filed in one end to admit the edge of the head on an adjusting screw. A hole is bored parallel with the slot for the tool, tapped and the adjusting screw turned into the threads.

In slipping curtains over small brass rods place a thimble over the end to prevent the curtain from being torn by the sharp edges of the brass rod.

Expanding Mandrel for Small Work

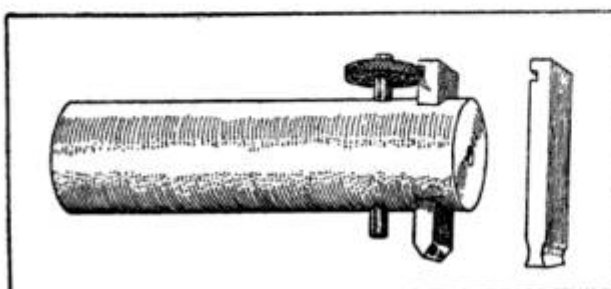
A mandrel adapted for quick work on brass goods that are too thin to hold in a lathe chuck is shown in the sketch. One end of the mandrel is turned to fit the taper in the lathe spindle to make it possible to leave the mandrel



Hold the Work by Expanding

Boring Tool for Irregular Work

The tool as shown in the accompanying sketch is used in a chuck on a lathe for boring or threading a piece of work that is too large or of such a size that it cannot be swung in a lathe. The holder for the cutting tool is made from a bar of soft steel with a slot cut in one end to receive a piece of tool steel. The steel is either ground for a cutting tool



Used In a Chuck

in place while removing the work. The other end is turned to fit the work easily but not loosely and this end is slotted with a hack saw far enough to allow the mandrel to expand freely, says Southern Machinery. Before cutting the slots, the hole B is drilled and reamed with a taper reamer, then the expansion pin, D, is made to fit the taper hole, allowing a small space between the threads on the pin and the end of the mandrel, so the releasing nut, E, can easily withdraw the pin.

The mandrel is placed in the lathe spindle the same as a center, then the

work is placed in position and the expansion pin inserted. Strike the pin one or two sharp blows with a hammer or press it in with the tail stock center. The work is removed by withdrawing the pin with the releasing nut and slipping the piece from the mandrel.

How to Remove Broken Cap Screws

Grind the twist drill so the cutting edge will be on the back side and to cut when the drill is turned backward. Drilling in this way will often remove the broken screw long before the drill will cut its way through. This saves the necessity of chipping out the shell that is left when drilling in the ordinary way.

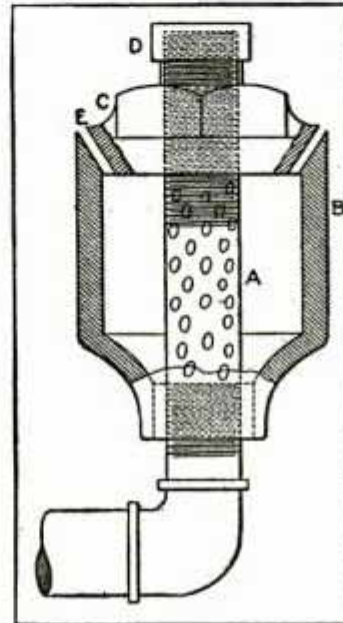
Roller Coaster for Handling Lumber

An owner of a small lumber yard in a western city uses a roller coaster to carry boards when unloading cars. The coaster is made by using rollers placed between pieces of 2- by 6-in. pine set at the proper distance apart to take the widest boards. This device can be made in sections so one or more can be used as necessity demands. The sections are supported by timbers so they can be inclined from the unloading place to the pile of lumber in the yard. Two persons can unload a car of lumber and pile it at the same time with this device,

where, if done by the usual method, a team and wagon would be required as well as extra help.

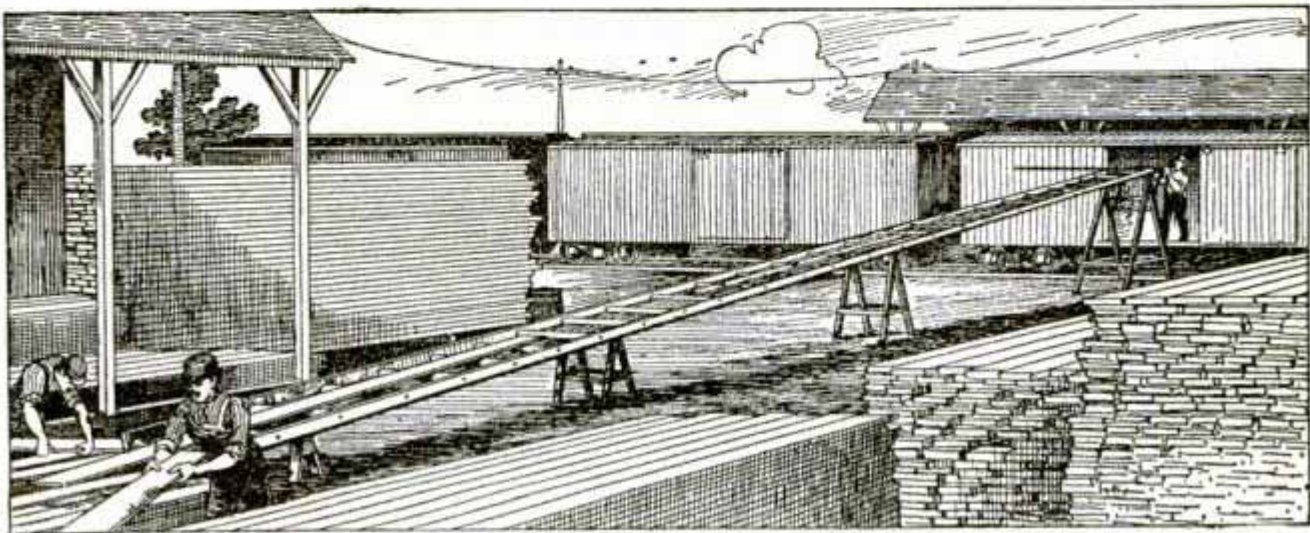
Home-Made Blower Head

Pipe and pipe fittings are used in the construction of this blower head as illustrated. A $\frac{3}{4}$ - by 2-in. reducing coupling is turned out as shown at B. A short piece of $\frac{3}{4}$ -in. pipe, A, is so



threaded as to reach entirely through and extending $1\frac{1}{2}$ in. above the end of the coupling. A reducing bushing is turned down to a cone-shape, as shown at C, and a $\frac{3}{4}$ -in. pipe cap turned on the top end of the pipe, says Power and Engineer.

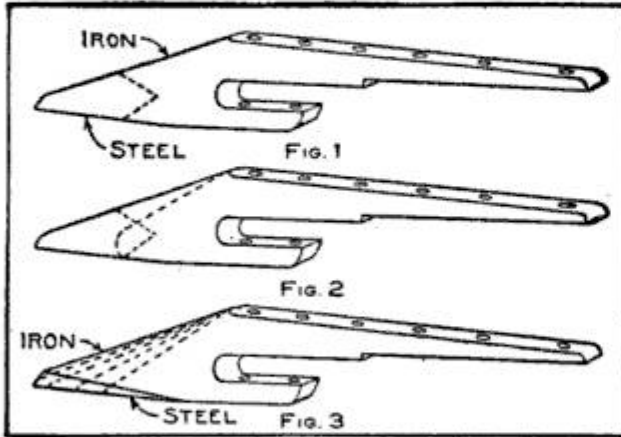
Drill twenty $\frac{1}{4}$ -in. holes in the $\frac{3}{4}$ -in. pipe through which the steam will pass to the body part of the coupling. The reducing bushing is screwed on until the space E is 1-32 in. wide. The steam coming out in a funnel-shape will catch the entire column of air inside the stack and force it out, where a single piece of pipe would only set a core of air in motion in the center of the stack.



Coasting the Boards Down on Rollers

Repointing Worn Dipper Teeth on a Steam Shovel

There is nothing that hinders the operation of a steam shovel, especially in hard digging, so much as dipper teeth that have become so worn that it is almost impossible to keep them in



Method of Applying the Steel

the bank, says Steam Shovel News. In forcing blunt teeth into a bank of hard material there is a continual tax on the capacity of the crowding engines with the result that during the operation there is a constant abnormal strain on the engines, boom, gears, and on all members directly concerned with the operation of the dipper, which in time will leave its marks on any shovel, no matter how well taken care of otherwise. Every steam shovel plant should be equipped with an extra set of dipper teeth, so that when one set gets worn to a degree where it is no longer economy to use them, the extra set can be substituted and the old ones re-pointed.

The old method of placing steel on a tooth is shown in Fig. 1 and the wear on such a tooth will be as shown by the dotted line in Fig. 2. The steel should be placed on the tooth as shown in Fig. 3 and the wear will be in the successive shapes indicated by the dotted lines. The tool may be used longer and still have a sharp cutting edge. The iron will wear away faster than the steel and so leave the cutting edge sharper for a longer time.



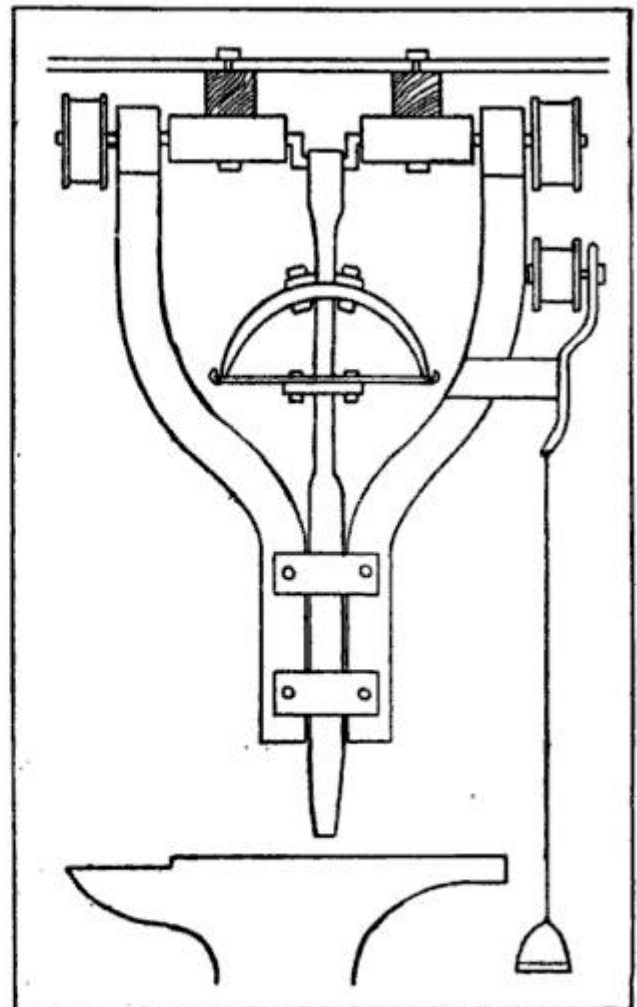
Add a little shellac to demar varnish to make it harder.

How to Make a Light Forging Hammer

The accompanying illustration shows the construction of a simple, durable and light forging hammer. This hammer takes up no extra room in the shop, as it may be hung over any anvil and can be swung up out of the way when not in use.

The hammer consists of two hangers or bearings of wood babbitted for a $1\frac{1}{8}$ -in. crankshaft. These hangers should be 8 in. long, 4 in. wide and 4 in. thick, with two $\frac{5}{8}$ -in. bolts in each piece to hold them to the timbers overhead. The crankshaft is made of $1\frac{1}{2}$ -in. cold rolled steel. If this crank is made with a core no lathe work will be required on it. On one end of this shaft is a 12-in. flywheel and on the other end a 10-in. driving pulley. Both of these should be fitted with a key, as there is considerable strain on this shaft.

The two side pieces are of 3-in. channel iron with the flat on the inside to



The Hammer Swings Above the Anvil

form, at the lower part, the guides for the ram head. Two pieces on each side, $\frac{1}{2}$ by 2 in., hold the frame in place and form guides for the ram. Bearings on the upper ends of the channel irons can be made of wood or iron and babbitted, says American Blacksmith. The channel pieces can be made of any length to suit the height of the room in which the hammer is located. Two $\frac{3}{4}$ -in. rods with turn buckles are used to hold the frame in position over the anvil. Make the connecting rod in two pieces with $\frac{5}{8}$ -in. bolts each side of crank. The ram head is of iron 2 by 3 in. with a steel face drawn small at upper end and bolted to spring, which can be made of an old carriage spring with strap to connect at lower end. This hammer is run with a loose belt and tightener which can be worked by foot or hand. There are no obstructions in working this hammer from any side and the stroke should be 4 in. with a speed of about 250 revolutions per minute.

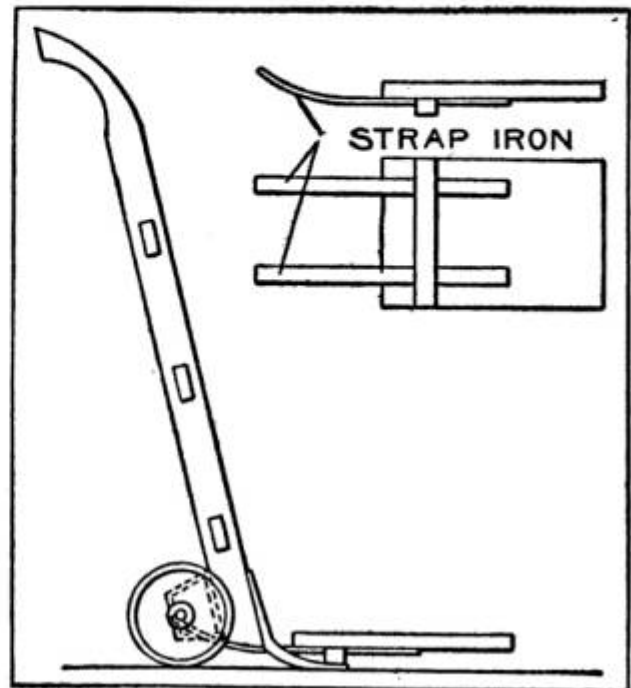
How to Plate on Wood

Wood may be electroplated by first protecting the surface with a coat of shellac prepared by dissolving 2 oz. of shellac in 1 pt. of wood or denatured alcohol. The shellac coating protects the wood from the action of the solutions used in the plating process. After the shellac has thoroughly dried, a very thin coat of copal varnish, turpentine or hard oil varnish is applied. When the surface gets "tacky," dust it over with pure copper bronze powder, using a camel's hair brush for this operation. The wood must be completely covered with the bronze powder. A second application should be made with a stiffer brush, so that the coat becomes perfectly smooth.

When the surface is perfectly dry the wood is ready for the plating process. The plating is done in the ordinary way with an electric current, using a solution made up from 2 lb. sulphate of copper, 4 oz. sulphuric acid and 1 gal. hot water. Anodes of pure copper are used.

Enlarging the Capacity of a Mill Truck

Where it is necessary to move flour from the mill to the warehouse or from the warehouse to a car, a board fixed to a common bag truck, as shown in the cut, will be a big help, says the Ameri-

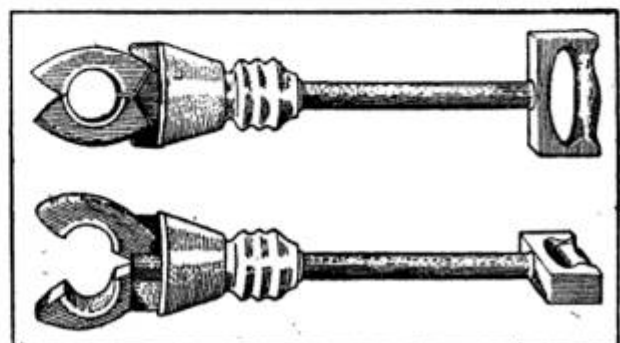


Extra Large Mill Truck

can Miller. One and a half to two barrels of flour can be carried on a truck of this kind at one load. The sketch shows the side and end views of the board and how it is attached to the truck.

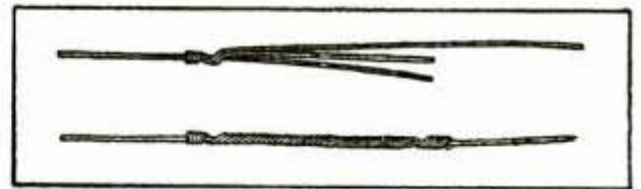
High Voltage Fuse Tongs

When inserting and removing fuses on high voltage circuits there is considerable danger. The Australasian Hardware states that tongs have been devised to handle fuses on mains carrying 40,000 volts with safety. These tongs can be manipulated with one



Heavy Insulation Used on Handles

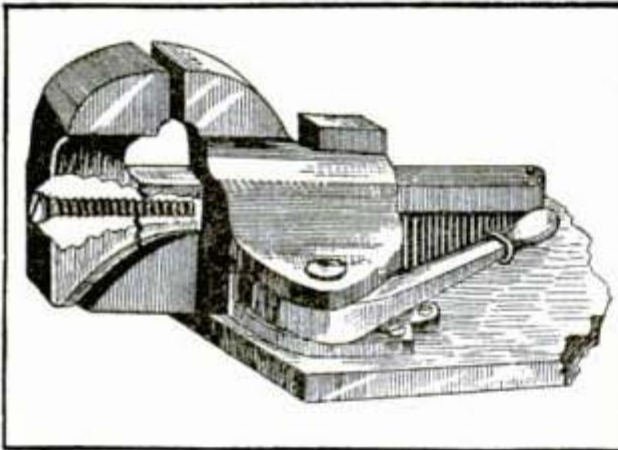
hand. The illustration shows the tongs closed and open. The handle is of wood and is insulated from the tongs by a corrugated insulator which has been tested up to 40,000 volts. As soon as the tongs are placed against the fuse they open automatically, embrace the fuse tube, and close again. The handle is then turned slightly, and this locks the tongs so that the fuse may be withdrawn. On inserting the fuse the reverse action takes place.



An Extra Piece of Wire Is Added

Repairing a Broken Vise

The adjustable jaw of a lever vise was broken from the sliding arm and I repaired it as shown in the sketch. I drilled a hole through the jaw and into the arm and tapped this hole to



A Screw Holds the Parts Together

receive a machine screw. A round-headed screw with a slot for a screw driver held the parts tightly together and the vise was used the same as before it was broken.—Contributed by W. L. Johnston, Hamilton, Ont.

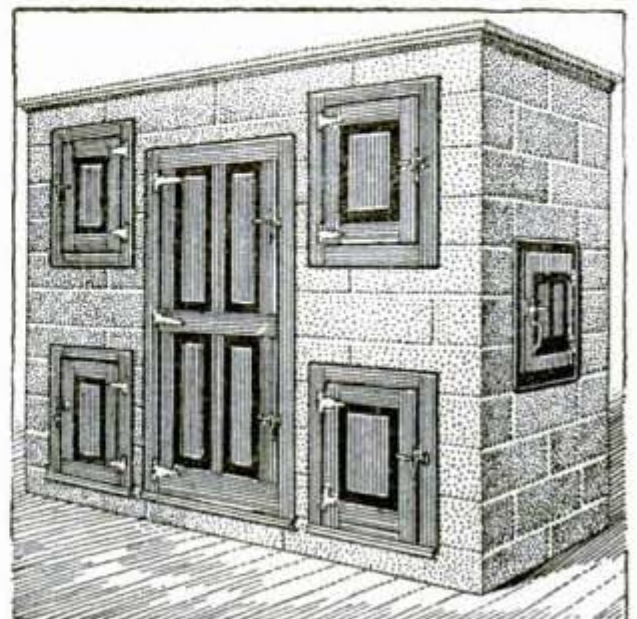
How to Make a Three-Wire Splice

A three-wire splice on telephone wires is much better than the two-wire splice, says Telephony. A three-wire splice is made by cutting an extra piece of wire 12 in. long and placing it alongside of the other two ends, then placing connectors about 3 in. from either end and then wrapping both free ends around the line wire. The connectors are then placed at the other end

of the splice and the other two free ends wrapped around the line wire. The connectors are then placed on the wrapped ends and with a pair of cutters placed lengthwise with the splice at the opposite end, and taking hold of one of the free ends, the splice is twisted firmly together. The space between the wrapped ends is about 5 in., but this space is tightly wrapped together, making a perfect joint in every way. Soldering improves the joint if properly done.

Refrigerator Built of Concrete Blocks

Concrete is one of the poorest known conductors of heat and cold, yet very little practical use has been made of this knowledge, particularly in the manufacture of articles requiring the use of small quantities of cement, says Concrete. The sketch shows an ice chest built of concrete blocks which was built four years ago, and in the four years' use the chest has given entire satisfaction. This chest was built with two compartments, but concrete

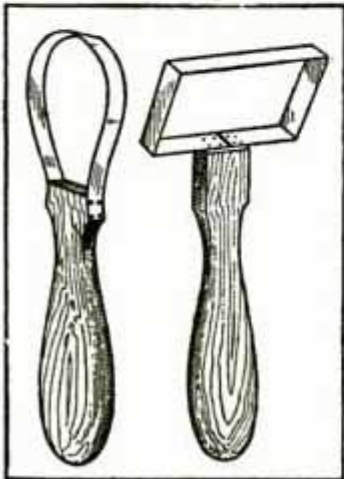


The Walls Are Made of Concrete Blocks

can be made for shelves and any divisions constructed as required. The chest need not be built of concrete blocks, as concrete is an ideal material with which to build an ice chest of monolithic construction.

Home-Made Weeders

Two excellent weeders for the garden that any boy ought to take pleasure in making are shown together. One is the loop of stiff hoop iron that is nailed

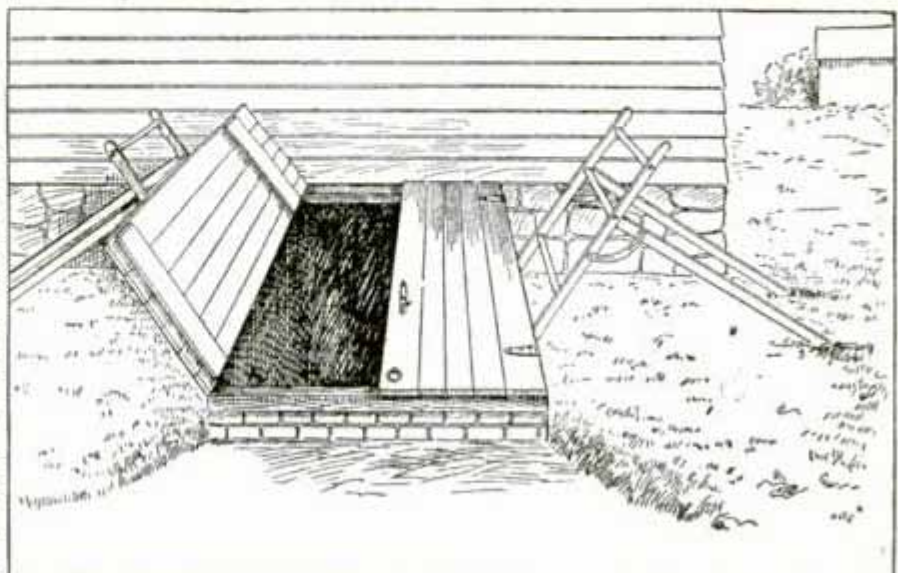


to the sides of a sound stick of wood $1\frac{1}{2}$ in. thick and 2 in. wide, says American Thresherman. It is smoothed and rounded by the aid of a knife to form a nice handle. The other is a similar handle with its end cut on a bevel.

To this is fastened a strap of band saw or hoop iron that has been made into a square and its ends brought together so they will just touch. This should be held to the wood by nails that are at least 3 in. long, as it has a severe strain. But it is a most useful and rapid implement for clearing away the soil and weeds from onions, beets, carrots, etc.

A New Use for Old Cots

There may be found stored away in almost any attic an old thrown away cot. Make two parts of the cot by sawing the two side rails off in the middle. Place one part on each side of the cellarway with the ends of the rails stuck in the ground in such a way as to cause the end of the cot to slope in the proper position to hold the cellar door when open. A small hook at-

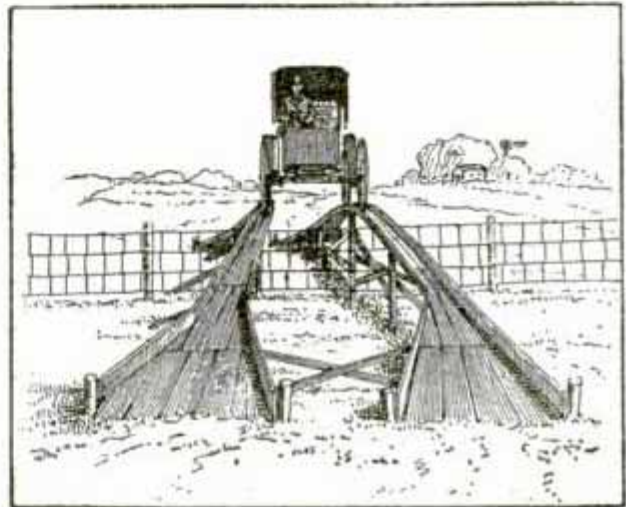


Props for Cellar Doors

tached to each door and placed so it will engage in an eye put on the cot frame will hold the door open against a strong wind.—Contributed by Oliver Wells, St. Louis, Mo.

Bridging a Fence for an Automobile

An Indiana farmer solved the problem of passing in and out of his yard with his automobile without using a gate. The illustration shows how he goes over the fence instead of through a gate. The main channels for the wheels of the automobile are 6 in. wide

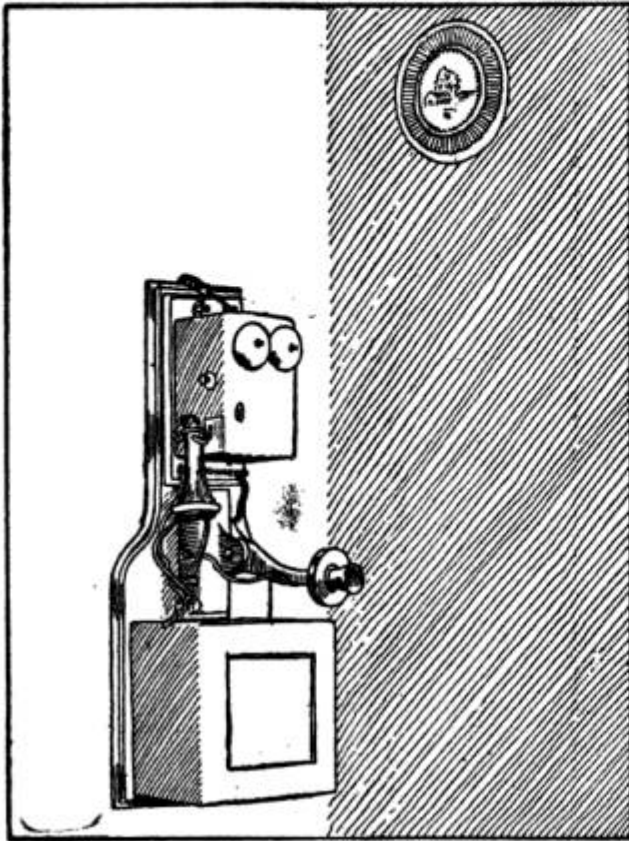


Roadway Over a Fence

at the top and broaden out at the foot on each side of the fence. The wide part of the channels resting on the ground guides the wheels as the approach is made. The channels are supported by timbers of sufficient size to carry the weight of the automobile.

An Unusual Telephone Buzzing

The subscriber of a telephone had the instrument situated in his place of business as shown, and he complained of a buzzing sound when the telephone was



The Chimney Hole Cover Caused the Buzzing

not in use. Inspectors were sent to clear the trouble, but the real trouble could not be found for several weeks. Each inspector was sure he had not found a trouble like this one before. The noise was finally located in the cap that covered the stovepipe hole in the flue just above and at the right of the telephone. This cover was in no-wise connected with the instrument. The cap was drawn in and pushed out by the suction of the air with great rapidity, causing the buzzing sound.

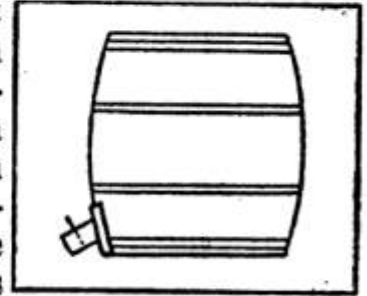
How to Make Black Wax

When putting a wax finish on oak or any open-grained wood, the wax will often show white streaks in the pores of the wood. These streaks cannot be removed by rubbing or brushing. Prepared black wax can be purchased, but if you do not have any on hand, ordinary floor wax can be colored black.

Melt the floor wax in a can placed in a bucket of hot water. When the wax has become liquid mix thoroughly into it a little drop black or lampblack. Allow the wax to cool and harden. This wax will not streak, but will give a smooth, glossy finish.

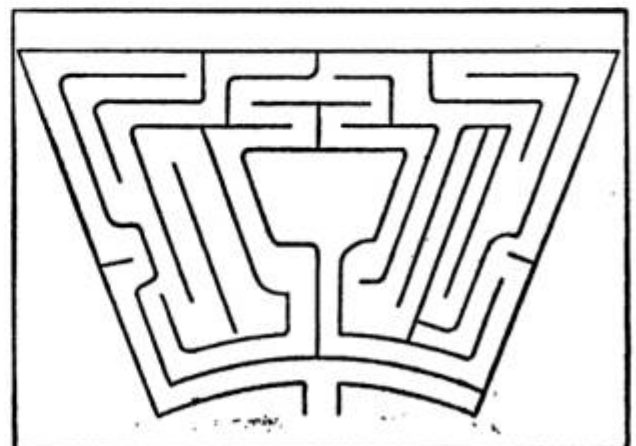
Handy Sack Filler

When purchasing flour from custom mills, the farmers often receive their flour in sacks, emptying it into a chest when they get home. In such cases, it is convenient to have a barrel with a sack spout fastened on one side for filling sacks at the packer without changing tube on packer, says a correspondent of American Miller. As indicated in the sketch, the sack spout should have a cut-off slide.



Design of a Growing Maze

There is located in the grounds of a hotel at Monterey, Cal., one of the largest and oldest mazes in this country. The hedge was planted 24 years ago and was modeled after the famous Hampton Court maze in England. The general design is shown in the sketch. The hedges are composed of cypress trees and these are worked into different designs such as castles, knights, chessmen and other figures.



Layout for the Growing Hedge



Amateur Mechanics

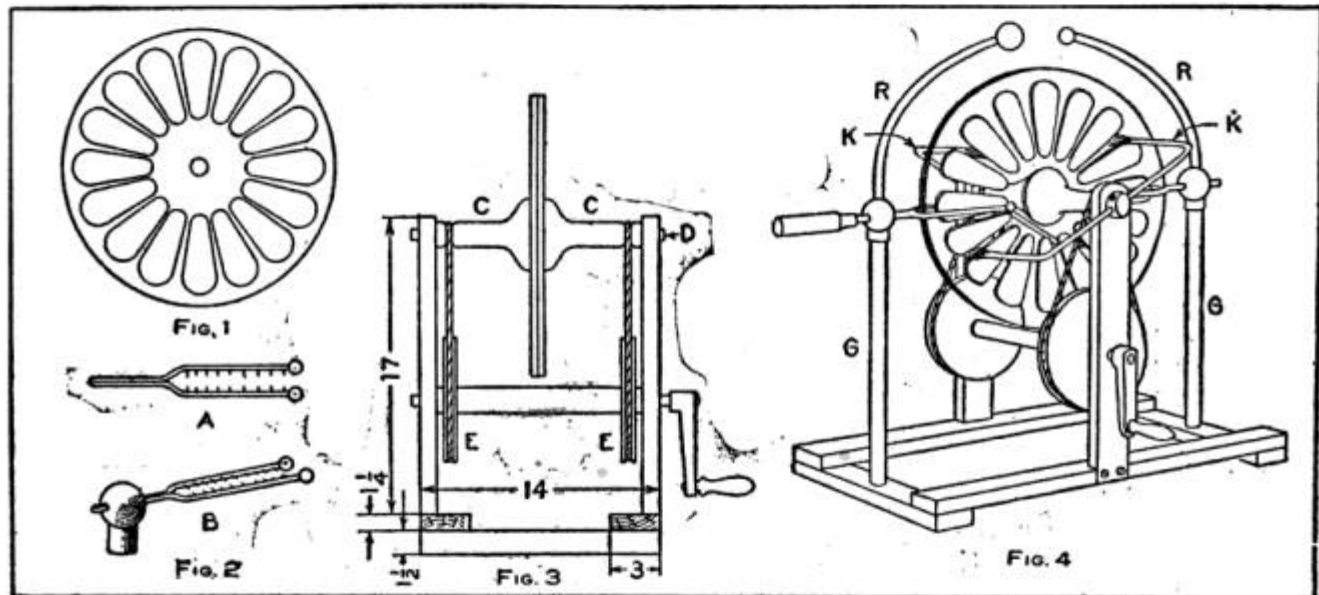


How to Make a Static Machine

Static electricity is produced by revolving glass plates upon which a number of sectors are cemented, these sectors passing through neutralizing brushes distribute electric discharges to collecting combs attached to discharging rods. The glass selected for the plates must be clear white glass, free from wrinkles, and have a uniform thickness. Two plates are necessary to make this machine, and the glass

and 4 in. long. A thin coat of shellac varnish is applied to both sides of the plates and 16 sectors put on one side of each plate as shown in Fig. 1. The divisions can be marked on the opposite side of the plate and a circle drawn as a guide to place the sectors at proper intervals.

The collectors are made, as shown in Fig. 2, from about $\frac{1}{4}$ -in. copper wire with two brass balls soldered to the ends. The fork part is 6 in. long and the shank 4 in. Holes are drilled on



Details of a Home-Made Static Machine

should be of sufficient size to cut a circular plate 16 in. in diameter. A hole must be made exactly in the center of each plate, and this should be done before cutting the circle. One of the best ways to make the hole is to drill the glass with a very hard tempered drill, and while drilling keep the cutting edge moistened with 2 parts turpentine and 1 part sweet oil. The hole is to be made $\frac{3}{4}$ in. in diameter. The circle is then marked on each plate and cut with a glass-cutter. The plates are trued up after they are mounted by holding a piece of emery wheel to the edges while they are turning. Water should be applied to the edges while doing the work.

The sectors are cut from tinfoil $1\frac{1}{2}$ in. wide at one end, $\frac{3}{4}$ in. at the other,

the inside of the forks and pins inserted and soldered. These pins or teeth should be long enough to be very close to the sectors and yet not scratch them when the plates are turning.

The frame of the machine is made from any kind of finished wood with dimensions as shown in Fig. 3, the side pieces being 24 in. long and the standards 3 in. wide. The two pieces CC, Fig. 3, are made from solid, close-grained wood turned in the shape shown, with the face that rests against the plate 4 in. in diameter and the outer end $1\frac{1}{2}$ in. in diameter, the smaller end being turned with a groove for a round belt. Before turning the pieces a hole is bored through each piece for the center, and this hole must be of such a size as to take a brass tube

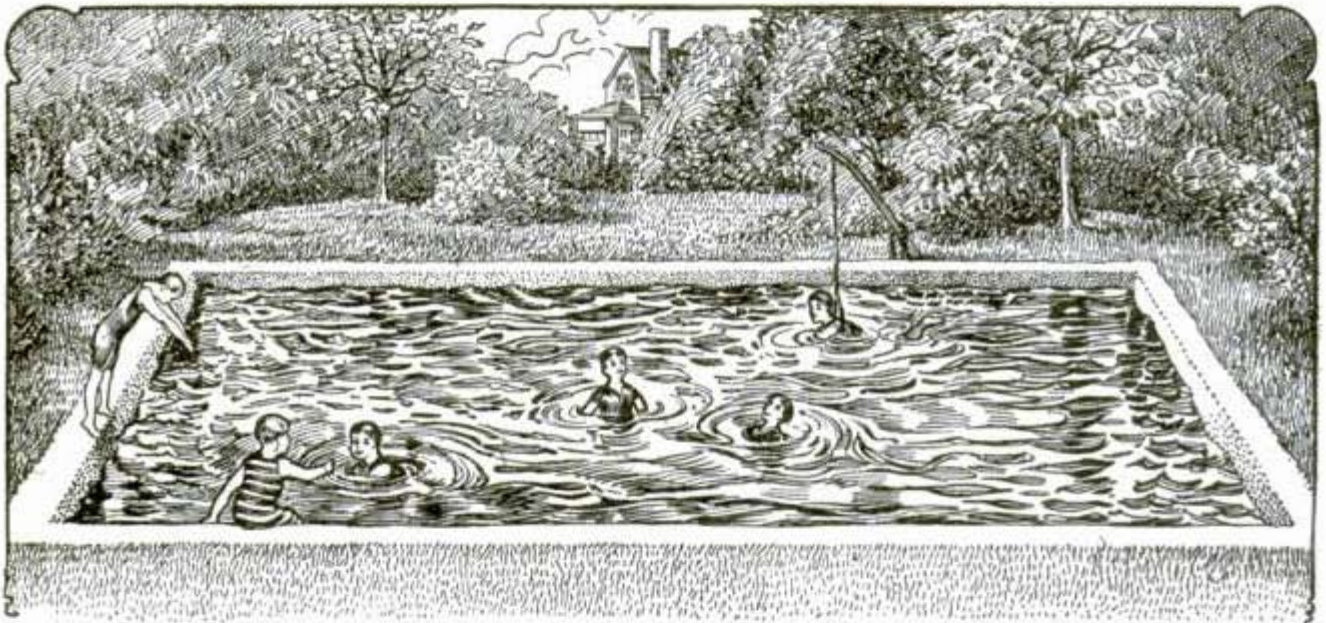
that has an internal diameter of $\frac{3}{4}$ in. The turned pieces are glued to the glass plates over the center holes and on the same side on which the sectors are fastened. Several hours' time will be required for the glue to set. A fiber washer is then put between the plates and a brass tube axle placed through the hole. The plates, turned wood pieces, and brass axle turn on a stationary axle, D.

The drive wheels, EE, are made from $\frac{7}{8}$ -in. material 7 in. in diameter, and are fastened on a round axle cut from a broom handle. This wood axle is centrally bored to admit a metal rod tightly, and extends through the standards with a crank attached to one end.

KK, which are bent as shown. Tinsel or fine wire such as contained in flexible electric wire are soldered to the ends of these rods, and the brushes thus made must be adjusted so they will just touch the plates. The caps are fitted with screws for adjusting the brushes. These rods and brushes are called the neutralizers. A little experimenting will enable one to properly locate the position of the neutralizers for best results.—Contributed by C. Lloyd Enos, Colorado City, Colo.

A Concrete Swimming Pool

Several boys from a neighborhood in the suburbs of a large city concluded to



Home-Made Swimming Pool

Two solid glass rods, GG, Fig. 4, 1 in. in diameter and 15 in. long, are fitted in holes bored into the end pieces of the frame. Two pieces of 1-in. brass tubing and the discharging rods, RR, are soldered into two hollow brass balls 2 or $2\frac{1}{2}$ in. in diameter. The shanks of the collectors are fitted in these brass balls with the ends extending, to which insulating handles are attached. Brass balls are soldered to the upper ends of the discharging rods, one having a 2-in. ball and the other one $\frac{3}{4}$ in. in diameter.

Caps made from brass are fitted tightly on the ends of the stationary shaft, D, and drilled through their diameter to admit heavy copper rods,

make for themselves a swimming tank of concrete. The money was raised by various means to purchase the cement, and the work was done by themselves. The ground was selected in a secluded spot in a neighbor's back yard and a hole dug to a depth of 4 ft., 12 ft. wide and 22 ft. long. The concrete was made by mixing 1 part cement, 4 parts sand and 10 parts gravel together and the bulk moistened with water. The bottom was made the same as laying a sidewalk, and forms were only used for the inside of the surrounding wall. The tank may be hidden with shrubbery or vines planted to grow over a poultry wire fence.

Old-Time Magic—Part III

Disappearing Coin

While this is purely a sleight-of-hand trick, it will take very little practice to cause the coin to disappear instantly. Take a quarter of a dollar between the thumb and finger, as shown, and by a



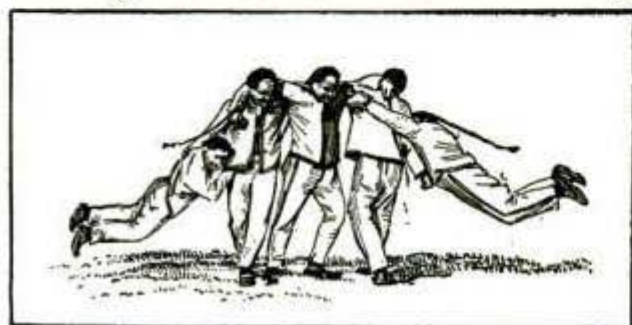
rapid twist of the fingers whirl the coin and at the same time close the hand, and the coin will disappear up your coat sleeve. On opening the hand the coin will not be seen. Take three quarters and hold one in the palm of the left hand, place the other two, one between the thumb and finger of each hand, then give the coin in the right hand a whirl, as described, closing both hands quickly. The coin in the right hand will disappear up your sleeve, and the left hand on being unclosed will contain two quarters, while the one in the right shall have disappeared.

Sticking a Coin Against the Wall

Cut a small notch in a coin—ten-cent piece or quarter will do—so a small point will project. When this is pressed firmly against a wood casing or partition the coin will stick tightly.

A Chinese Outdoor Game

The accompanying illustration shows the "grand whirl," or the Chinese students' favorite game. This game is played by five persons, four of them turning around the fifth or central fig-



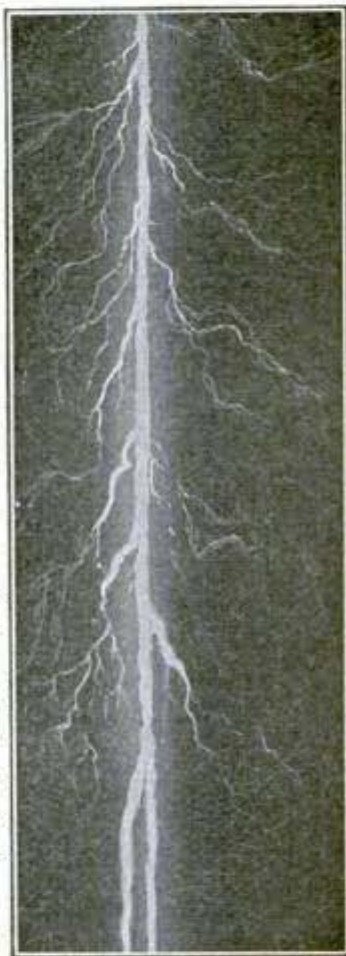
Chinese Doing the Grand Whirl

ure with their arms locked about each other and the two outside persons swinging in midair with their bodies almost horizontal.

Home-Made Photograph of a Lightning Flash

How many times has each amateur photographer tried to photograph the lightning's flash? Some good pictures have been obtained by a ceaseless effort on the part of the operator. Here is a

method by which you can make a picture of a streak of lightning on a clear night in your own house. Paste two strips of black paper on a piece of glass that is 10 in. square so as to leave a clear space through the center 2 in. or more in width. Smoke this uncovered space over a candle's flame until the soot is thick enough to prevent light passing through. Take a sharp lead pencil and



outline a flash of lightning upon the smoked surface, using a fine needle to make the smaller lines, and then set the glass up against the back of two boxes which are set to have a space between them of 4 or 5 in.

A lighted candle is held behind the glass so the light will shine through for focusing the camera. After darkening the room set your camera ready for the exposure and burn a small quantity of flash light powder in the same place in which the candle was held. This will make an impression upon the plate of the flash drawn on the smoked glass.

HOW TO MAKE COPPER TRAYS

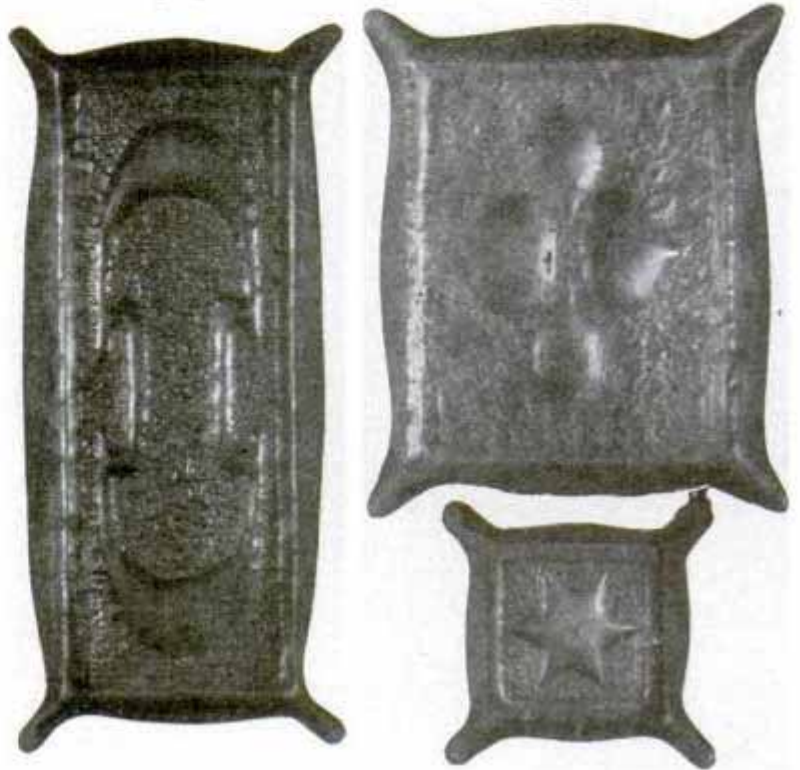
Copper trays such as are shown in the accompanying illustration are very useful as well as ornamental about the house. They can be used to keep pins and needles, pens and pencils, or cigar ashes, etc. They are easily made, require no equipment in the way of tools except what are usually found about the house, unless it would be the metal shears, and when the decorations are well designed and the metal nicely colored, they make attractive little pieces to have about.

The first thing to do in preparation for making them is to prepare the design. Simple designs work out better than fussy ones and are more likely to be within the ability of the amateur. Having determined the size of the tray, draw on paper an oblong to represent it. Inside this oblong draw another one to represent the lines along which the metal is to be bent up to form the sides. Inside this there should be drawn still another oblong to represent the margin up to which the background is to be worked. The trays shown are $5\frac{3}{4}$ by $6\frac{3}{4}$ in., the small ash tray 4 by 4 in., the long pen and pencil tray $4\frac{3}{4}$ by $9\frac{1}{2}$ in. The second oblong was $\frac{3}{4}$ in. inside the first on all, and the third one $\frac{1}{4}$ in. inside the second on all.

If the decoration is to have two parts alike—symmetrical—divide the space with a line down the middle. Draw one-half the design free hand, then fold along this line and trace the second half from this one. If the lines have been drawn with soft pencil, rubbing the back of the paper with a knife handle will force enough of the lead to the second side so that the outline can be determined. Four-part symmetry will require two lines and two foldings, etc.

For the metal working there will be needed a pair of tin shears, two spikes, file, flat and round-nosed pliers, screw-

driver and sheet copper of No. 23 gauge. Proceed as follows: 1. Cut off a piece of copper so that it shall have $\frac{1}{2}$ in. extra metal on each of the four sides. 2. With a piece of carbon paper trace upon the copper lines that



Articles Made from Copper

shall represent the margin of the tray proper and the lines along which the upturned sides of the tray are to be bent; also trace the decorative design. 3. With a nail make a series of holes in the extra margin, about $\frac{3}{4}$ in. apart and large enough to take in a $\frac{3}{4}$ -in. slim screw. 4. Fasten the metal to a thick board by inserting screws in these holes. 5. With a 20-penny wire nail that has the sharpness of its point filed off, stamp the background promiscuously. By holding the nail about $\frac{1}{4}$ in. above the work and striking it with the hammer, at the same time striving to keep it at $\frac{1}{4}$ in. above the metal, very rapid progress can be made. This stamping lowers the background and at the same time raises the design. 6. Chase or stamp along the border of the design and background, using a nail filed to chisel edge. This is to make a clean, sharp division between background and design. 7. When the

Finger Mathematics

By Charles C. Bradley

stamping is completed, remove the screws and the metal from the board and cut off the extra margin with the metal shears. File the edges until they are smooth to the touch. 8. With the flat pliers "raise" one side of the tray, then the other side. 9. Raise the ends, adjusting the corners as shown in the illustration. Use the round-nosed pliers for this purpose.

Copper is frequently treated chemically to give it color. Very pretty effects may be obtained by covering the tray with turpentine, then moving it about over a flame such as a bunsen burner until the turpentine burns off. The copper will "take on" almost all the colors of a rainbow, and the effect will be most pleasing.

Photograph of a Clown Face

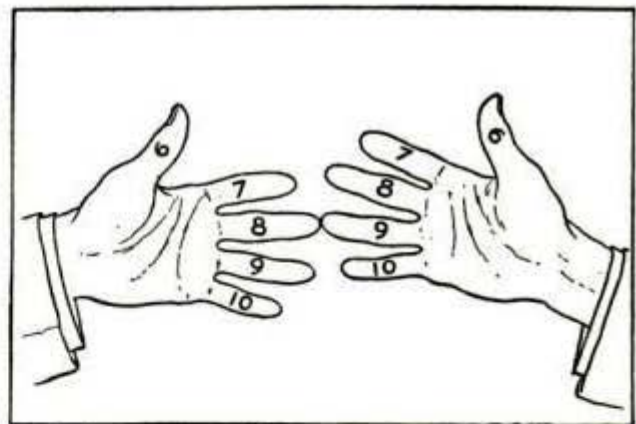
At first glance the accompanying photograph will appear as if the person photographed is wearing a false face or has his face painted like a clown. On close observation you will notice that the face is made on the bald head of the person sitting behind the table. The eyes, nose and mouth are cut from black paper and pasted on the bald spot. The subject's face is horizontal and resting upon his hands.



A Bald Head Photographed

All machinists use mathematics. Ask a machinist what would be the product of 9 times 8 and his ready reply would be 72, but change the figures a little and say 49 times 48 and the chances are that instead of replying at once he will have to figure it out with a pencil. By using the following method it is just as easy to tell at a glance what 99 times 99 are as 9 times 9. You will be able to multiply far beyond your most sanguine expectations.

In the first numbering, begin by holding your hands with the palms toward the body and make imaginary numbers on the thumbs and fingers as follows: Thumbs, 6; first fingers, 7; second fingers, 8; third fingers, 9, and fourth fingers, 10. Suppose you desire to multiply 8 by 9, put the eighth finger on one hand against the ninth finger of the other hand as shown.

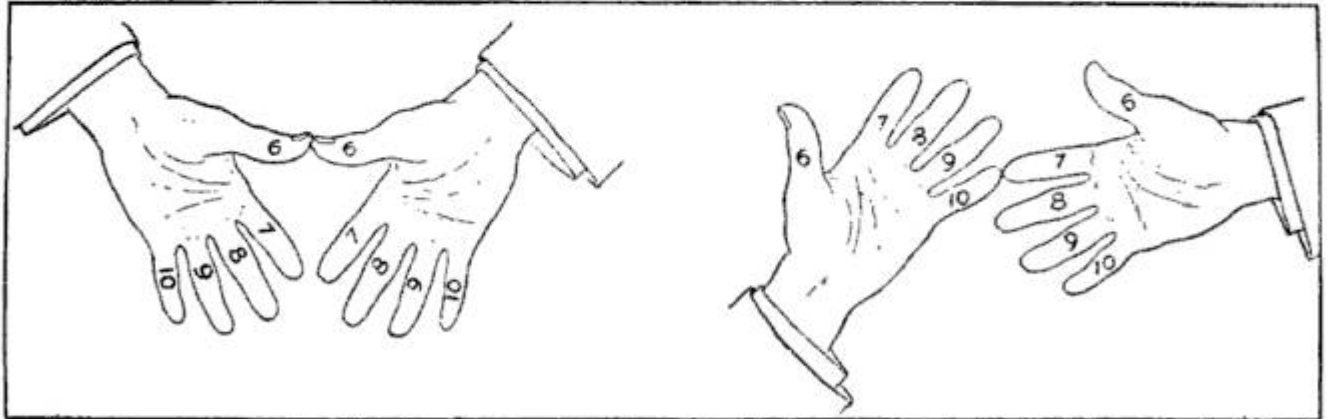


"8 Times 9"

The two joined fingers and all the fingers above them (calling the thumbs fingers) are called the upper fingers and each has a value of ten, which tens are added. All the fingers below the joined fingers are termed the lower fingers, and each of the lower fingers represents a unit value of one. The sum of the units on one hand should be multiplied by the sum of the units on the other hand. The total tens added to this last named sum will give the product desired. Thus: Referring to above picture or to your hands we find three tens on the left hand and four tens on the right, which would be 70. We also

find two units on the left hand and one on the right. Two times one are two, and 70 plus 2 equals 72, or the product of 8 times 9.

Supposing 6 times 6 were the figures. Put your thumbs together; there are no fingers above, so the two thumbs represent two tens or 20; below the thumbs are four units on each hand, which would be 16, and 20 plus 16 equals 36, or the product of 6 times 6.



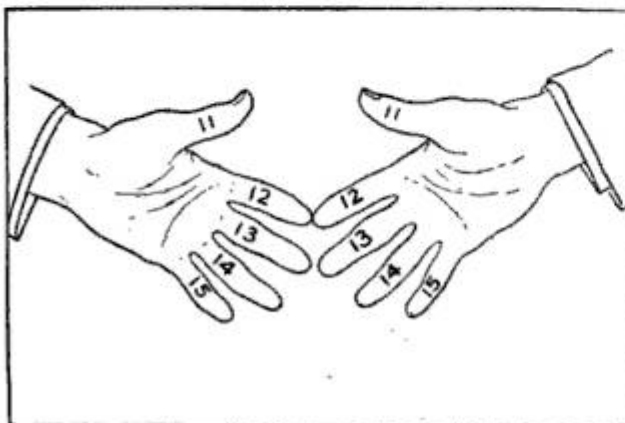
"6 Times 6"

"10 Times 7"

Supposing 10 times 7 is desired. Put the little finger of the left hand against the first finger of the right hand. At a glance you see seven tens or 70. On the right hand you have three units and on the left nothing. Three times nothing gives you nothing and 70 plus nothing is 70.

In the second numbering, or numbers above 10, renumber your fingers; thumbs, 11; first fingers, 12, etc. Let us multiply 12 by 12.

Put together the tips of the fingers labeled 12. At a glance you see four tens or 40. At this point we leave the method explained in Case 1 and ignore the units (lower fingers) altogether. We go back to the upper fingers again



"12 Times 12"

and multiply the number of upper fingers used on the one hand by the number of upper fingers used on the other hand, viz., 2 times 2 equals 4. Adding 4 to 40 gives us 44. We now add 100 (because anything over 10 times 10 would make over 100) and we have 144, the product of 12 times 12.

The addition of 100 is arbitrary, but being simple it saves time and trouble. Still, if we wish, we might regard the

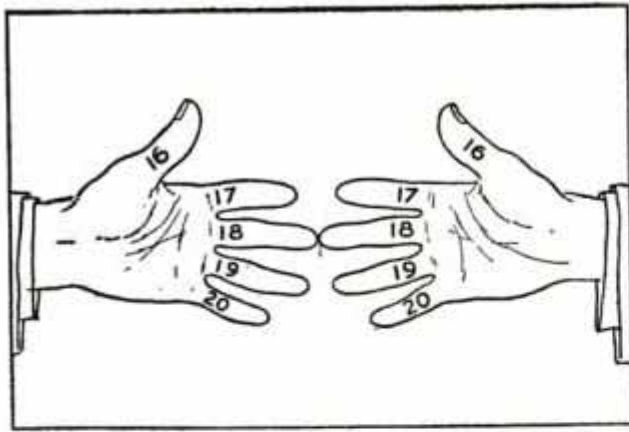
four upper fingers in the above example as four twenties, or 80, and the six lower fingers as six tens, or 60; then returning to the upper fingers and multiplying the two on the right hand by the two on the left we would have 4; hence 80 plus 60 plus 4 equals 144; therefore the rule of adding the lump sum is much the quicker and easier method.

Above 10 times 10 the lump sum to add is 100; above 15 times 15 it is 200; above 20 times 20, 400; 25 times 25, 600, etc., etc., as high as you want to go.

In the third numbering to multiply above 15 renumber your fingers, beginning the thumbs with 16, first finger 17, and so on. Oppose the proper finger tips as before, the upper fingers representing a value of 20. Proceed as in the first numbering and add 200. Take for example 18 times 18.

At a glance we see six twenties plus 2 units on left hand times 2 units on right hand plus 200 equals 324.

In the fourth numbering the fingers are marked, thumbs, 21, first fingers 22, etc., the value of the upper fingers being 20. Proceed as in the second numbering, adding 400 instead of 100.



"18 Times 18"

Above 25 times 25 the upper fingers represent a value of 30 each and after proceeding as in the third numbering you add 600 instead of 200.

This system can be carried as high as you want to go, but you must remember that for figures ending in 1, 2, 3, 4 and 5 proceed as in the second numbering. For figures ending in 6, 7, 8, 9 and 10 the third numbering applies.

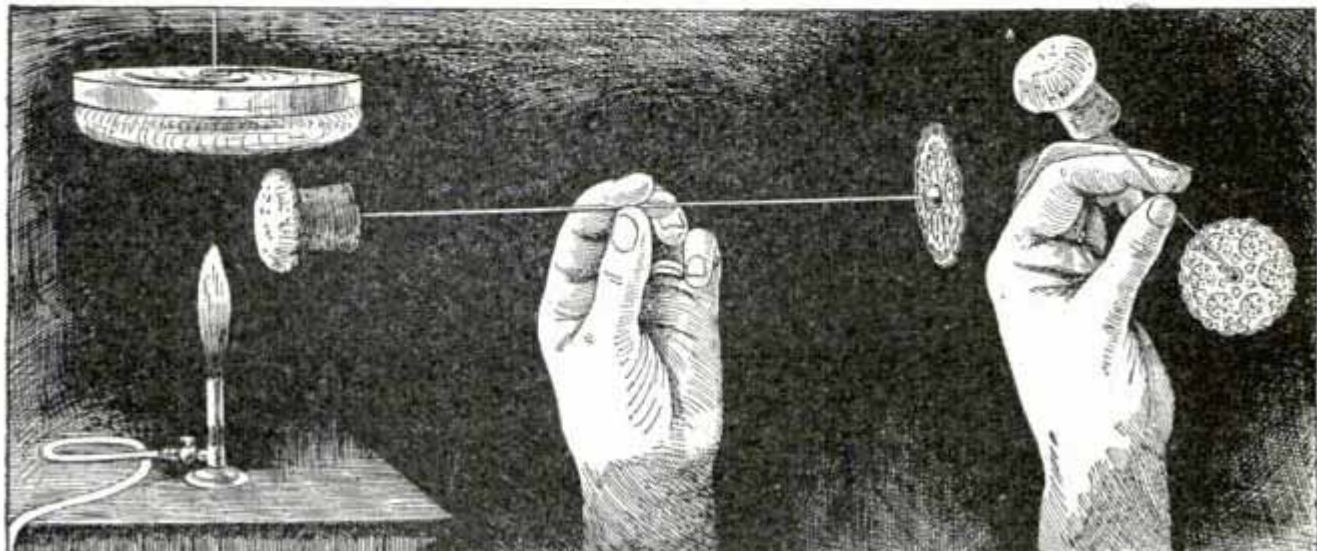
Determine the value of the upper fingers whether they represent tens, twenties, thirties, forties, or what. For example, any two figures between 45 and 55, the value of the upper fingers would be 50, which is the half-way point between the two fives. In 82 times 84 the value of the upper fingers would be 80 (the half-way point between the two fives, 75 and 85, being 80). And the lump sum to add.

Just three things to remember: Which numbering is to follow, whether the one described in second or third numbering; the value which the upper

fingers have; and, lastly, the lump sum to add, and you will be able to multiply faster and more accurately than you ever dreamed of before.

Optical Illusions

If a person observes fixedly for some time two balls hanging on the end of cords which are in rapid revolution, not rotation, about a vertical axis, the direction of revolution will seem to reverse. In some experiments two incandescent "pills" of platinum sponge, such as are used for lighting gas-burners, were hung in tiny aluminum bells from a mica vane wheel which was turned constantly and rapidly in one direction by hot air from a gas flame to keep the platinum in a glow. The inversion and reversion did not take place, as one might suppose, at the will of the observer, but was compulsory and followed regular rules. If the observer watches the rotating objects from the side, or from above or from below, the inversion takes place against his will; the condition being that the image on the retina shall be eccentric. It takes place also, however, with a change in the convergence of the optical axes, whether they are parallel to each other or more convergent. Also when the image on the retina is made less distinct by the use of a convex or concave lens, the revolution seems to reverse; further, in the case of a nearsighted person, when he removes his spectacles, inver-



Illusions Shown by Revolving Platinum Sponge "Pills" and Hat Pins

sion results every time that the image on the retina is not sharp. But even a change in the degree of indistinctness causes inversion.

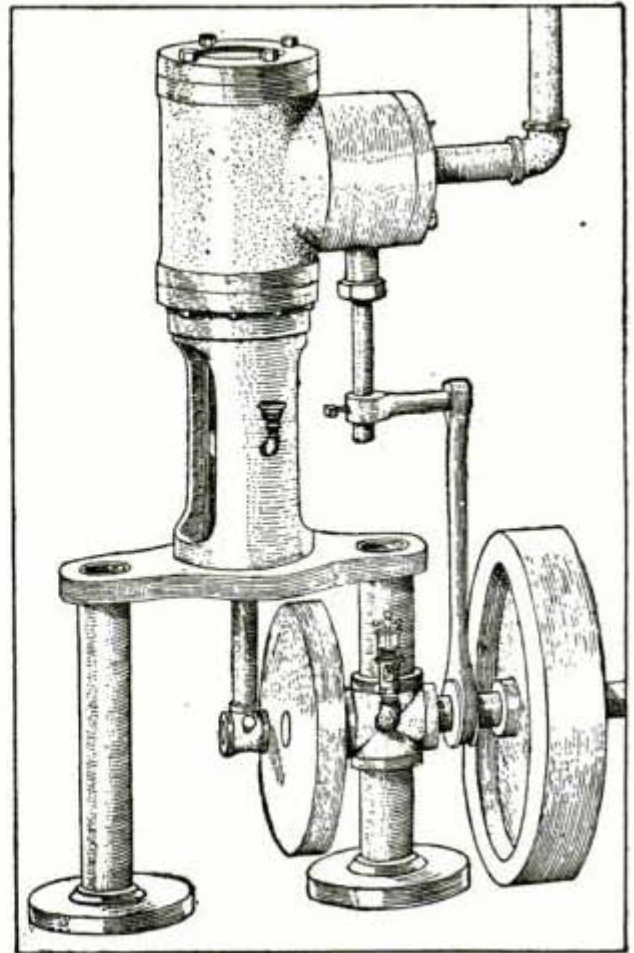
The cause of this optical illusion is the same where the wings of windmills are observed in the twilight as a silhouette. It is then not a question of which is the front or the back of the wheel, but whether one of the wings or the other comes towards the observer. The experiment is made more simple by taking a hat pin with a conspicuous head, holding it firmly in a horizontal position, and putting a cork on the point. Looking at it in semi-darkness, one seems to see sometimes the head of the pin, sometimes the point towards him, when he knows which direction is right. The inversion will be continued as soon as one observes fixedly a point at the side. Here it is a question of the perception of depth or distance; and this is the same in the case of the rotating balls; the direction of seeming revolution depends on which one of them one considers to be the front one and which the rear one.

From the foregoing the following conclusion may be reached: When, in the case of a perception remitting two appearances, one fixedly observes one of these and then permits or causes change in the sharpness of the image on the retina, the other appearance asserts itself.

Steam Engine Made from Gas Pipe and Fittings

Almost all the material used in the construction of the parts for the small steam engine illustrated herewith was made from gas pipe and fittings. The cylinder consists of a 3-in. tee, the third opening being threaded and filled with a cast-iron plug turned to such a depth that when the interior was bored out on a lathe the bottom of the plug bored to the same radius as the other part of the tee. The outside end of the plug extended about $\frac{1}{4}$ -in. and the surface was made smooth for the valve seat. A flat slide valve was used.

The ports were not easy to make, as



The Engine Is About 20 Inches High

they had to be drilled and chipped out. The steam chest is round, as it had to be made to fit the round tee connection. The crosshead runs in guides made from a piece of gas pipe with the sides cut out and threads cut on both ends. One end is screwed into a rim turned on the cylinder head and the other is fitted into an oblong plate. Both ends of this plate were drilled and tapped to receive $1\frac{1}{2}$ -in. pipe.

The main frame consists of one $1\frac{1}{2}$ -in. pipe 10 in. long and one made up from two pieces of pipe and a cross to make the whole length 10 in. These pipes were then screwed into pipe flanges that served as a base. The open part of the cross was babbitted to receive the main shaft. The end of the shaft has a pillow block to take a part of the strain from the main bearing. The eccentric is constructed of washers. While this engine does not give much power, it is easily built, inexpensive, and any one with a little mechanical ability can make one by closely following out the construction as shown in the illustration.—Contributed by W. H. Kutscher, Springfield, Ill.

FOLDING POCKET LANTERN.—Fig. 1 shows a folding lantern, consisting of two side plates hinged together, and top and bottom triangular bodies, each consisting of two similar triangular plates hinged together in pairs and fastened by hinges to the side plates. By folding the top and bottom bodies together and bringing the side plates into parallel planes the lantern has the appearance shown in the illustration.

PROTECTION FOR CONCRETE CURB CORNERS.—Fig. 2 is a soft steel, round-head "T" bar used as a protection for the exposed corners of concrete curbing. The dovetailed web, projecting into the concrete, holds it so solidly in place that the inevitable blows it receives cannot dislodge it. The bar is galvanized to protect it from rusting.

COLLAPSIBLE TUBULAR FIRE ESCAPE.—This tubular fire escape with the projecting steel coil to support it is collapsible, and when not in use is held compressed in a box which swings into a window opening. It is designed for school buildings. Should the building catch fire the person in charge of the room having such an apparatus throws open the window and swings the box into position. The doors of the box are then released and the tube and projecting coil shoot to the ground, where they are held in position, shown in Fig. 3.

NEW TYPE OF CORE OVEN.—A Massachusetts firm has placed on the market the new type of core oven shown in Fig. 4. The cores are placed on a set of swinging shelves, each shelf in the form of a quadrant and operating independently of the other, enabling the operator to remove the contents of a single shelf without lowering the temperature of the oven or hindering in any way the baking process on the other shelves. Each shelf has two doors, one at each radial edge, the rear door closing the opening when the shelf is swung open, thereby retaining the heat in the oven.

FOLDING HAT RACK AND KNEELING STOOL.—The problem of disposing of hats while in church is solved by one inventor in the combination hat rack and kneeling stool illustrated in Fig. 5. The hat-rack portion is automatically carried under the seat or drawn out by dropping the kneeling stool into position under the seat when the pew is entered and swinging it up under the seat when the service is over.

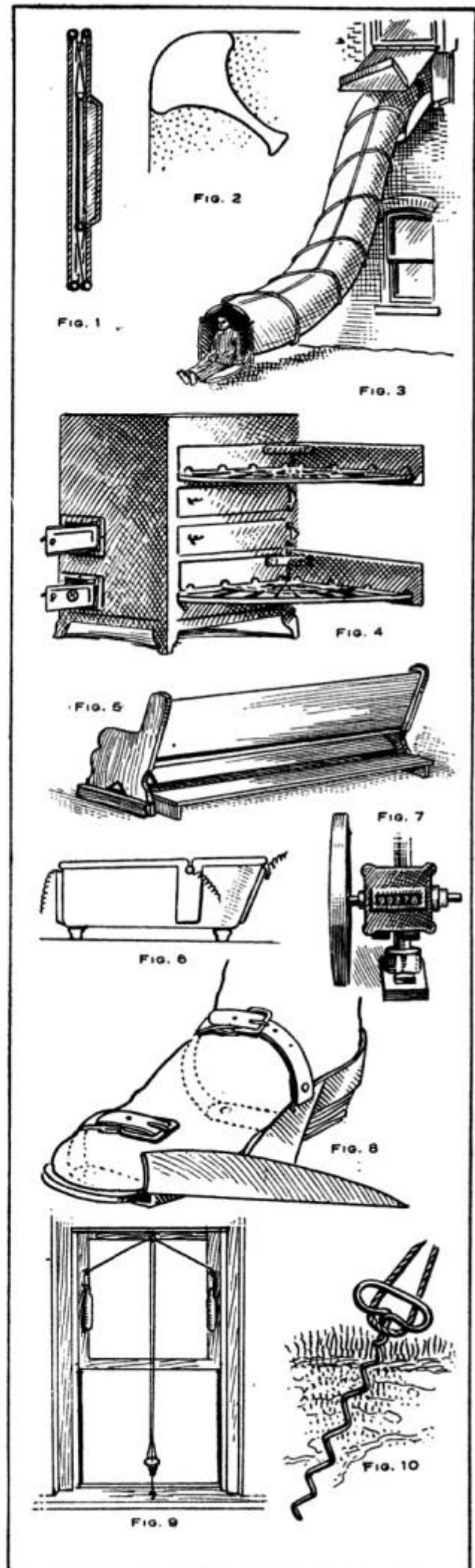
AN ELECTRIC CURRENT BATH TUB.—The tub illustrated in Fig. 6 is designed for electric bathing. A partition of insulating material extends across the tub from side to side, separating it into two compartments. The partition also serves as a support under the knees of the bather. He lies with his body in one compartment and his feet in the other. Electrodes are attached at the ends of the tub.

LUMBER MEASURING DEVICE.—The device reproduced in Fig. 7 is known as a tally-meter, and is used to measure lumber as it passes through rip saws, planers, matchers and other saw-mill machinery. It is so arranged that the wheel rides on the upper side of the lumber and is rotated by it as it passes through the machine. The mechanism in the case records the linear feet that passes under the wheel. The head to which the wheel is attached yields to accommodate different thicknesses of lumber.

CORN-CUTTER ATTACHMENT FOR SHOE.—Fig. 8 illustrates a foot device to be used in cutting down corn stalks in the fields. It consists of a knife harnessed to the shoe in such position that by kicking the foot backward the stalk is caught between the sharp edge of the knife and a plate of steel attached to the shoe just forward of the heel.

AUTOMATIC WINDOW-CLOSING DEVICE.—The fear of a sudden rain storm often makes necessary the closing of all windows when the home is left unoccupied for a few hours on hot summer days. With such an attachment as the one shown in Fig. 9 the probability of rain spoiling the furnishings of the room need not be feared. At the end of the cord holding the weights, shown in the center of the drawing, is a ring which is held by a bulb attached to a cord fastened to the bottom of the window sill. Under normal conditions the ring is too small to pass over the bulb, but the bulb is of such nature that it will reduce itself under the influence of moisture. Therefore, when it commences to rain the ring slips over the bulb and the window closes.

A PATENT TENT PEG.—Ordinary wooden tent pegs usually are torn free from the ground when a wind storm arises, and the tent is carried away at just the moment its protection is needed the most. This tent peg (Fig. 10), formed of heavy wire, is so shaped that it literally twines itself around stones and dead-wood in the ground, making it almost impossible to drag it out by a direct pull.





The Object Lesson of the Great Rush

By A. O. Brookside, in Railway and Locomotive Engineering

Sam Sanderson was a great rusher. That was his characteristic, but he was employed as an engineer on the Rock Ballast & No Dust Railway, and he pulled passenger. Sam had all kinds of good luck coming his way last week. He had been told to take the "push" over the road, which was the way he spoke of the annual inspection trip of the high officials of the railway, and he had had a chance to speak face to face with the president while they all waited in a siding for something to go by on the main line. Sam had briefly explained to the president all the hard things he had to put up with on the road and had casually referred to the permanent way as a one-horse creation of the road department.

The best piece of luck happened on Saturday afternoon. Sam's engine was wanted at the other end of the division and visions of a light run back on a glorious summer afternoon and a Sunday at home floated through his mind, for he meant to book rest when he got back and be sick if necessary, and so have the Sabbath to himself. The dispatcher, however, did not care for glorious summer afternoons and hated light runs very bitterly, so he arranged that Sam should take a train of coal cars down, and, so to speak, work his passage home.

Sam generally covered the division in three hours and a half on passenger, and he figured that if he could get home early he could attend to some private business, so at the appointed time he started with the coal train. Sam forgot he had a lot of rickety, pot-bellied old gondolas bulging at the sides and loaded ten per cent above capacity, which is putting it very mildly, and he admired the rich coloring of the trees alongside of the one-horse creation of the maintenance of way department so much that he flew along at passenger speed and the bulgy old coal cars rattled and swayed behind him.

Sam felt happy, but the coal cars resented a passenger train schedule and journals began to get hot, and by the time he reached the Halfway House station he had a hot box train of the best and most complete description, for he had covered the distance in almost passenger train time. At Halfway House there was one lone solitary car repairer, as this was a junction point. The R. B. & N. D. Railway paid half the car repairer's wages and the junction road paid the other half, but Wilkinson, the car repairer, preferred to say he was half paid by both companies.

When Sam arrived with the hot box extra, Wilkinson saw his work was cut out for him and as he surveyed the clouds of smoke arising silently in the calm, clear air from the hot boxes, he asked Sam why he required a helper engine with a train like that. Sam ignored the sarcasm and asked Wilkinson to get busy. Wilkinson became very busy and soon used up his small stock of oil and waste and all his spare brasses. Sam offered to lend him a can of oil and a brass or two, but Wilkinson told him that as the company had now put it up to him to oil all the cars in America he was so much obliged to them for bringing the hot ones to him and not asking him to walk all over the continent to do his business, but he guessed he would worry along somehow. He said further that he did not like to take Sam's offer and that no self-respecting car repairer could bring himself to accept a can of lubricant from an engineer; he felt that it must be full of tainted oil.

Sam felt deeply wounded at being classed with the captains of industry by a mere hot box menial, so he proceeded to oil several boxes which Wilkinson had already fixed up and Wilkinson warned him about the sin of wilful waste. Sam catching the last word shouted that he had some waste, but Wilkinson thought that must be tainted too. When Wilkinson said he would worry along he had his own ideas of what he would do, but the worrying came later.

Wilkinson still had quite a number of boxes to repack and he proceeded to help himself to oily waste and some brasses from the cars belonging to the junction road, and after he had robbed Peter to pay Paul to a considerable extent he thought Sam ought to be able to arrange to think about starting again. In the meantime the dispatcher had asked what was keeping the coal train and Sam gave a splendid explanation, which cast a deep shadow all over the whole car department of the road and particularly on the honesty, integrity, ability and fidelity of the oilers at the terminus, which he intimated had sent out a very heavy coal train without oil, waste, brasses, wedges, or indeed anything that a very heavy coal train ought to have.

Sam had been about two hours on the road and Wilkinson's work had taken about two hours, so that the train's starting time from Halfway House was something over four hours after he had made the start from the terminus. Sam ran slower on the homestretch, but still fast enough to keep up the honor of the hot box extra, as he had some

(Continued on advertising page 104.)

HOW THE PRESIDENT SAVES AN HOUR EVERY DAY

BY W. W. GRIFFITH

A New System which Economizes the Time of the Officers of the Company as well as the Managers and Clerks

Like most other men with Hurry as their tag-fly, I sometimes hear of astonishing things that I mean to look into, but which "business" drives out of my mind before I have the opportunity to investigate. But when I was told at luncheon the other day

that the active President of a great corporation had installed a system whereby he could instantly and directly issue a general order to all the heads of departments throughout the building, at one time, without leaving his room, I remembered to have heard about that wizard-like performance before, and determined to follow the lead at once, before I could lose it again. Fortunately

I was acquainted with the President, and I found him not only willing but rather pleased to show me the operation of the wonderful saver of time and annoyance.

Just under the pigeonholes of his desk, out of the way of everything and almost out of sight, was set an innocent-looking box not more than 11 inches long and 6 inches high; a row of small levers ran along the lower part of it, above which were two orifices that might remind one of a pair of exaggerated eyes.

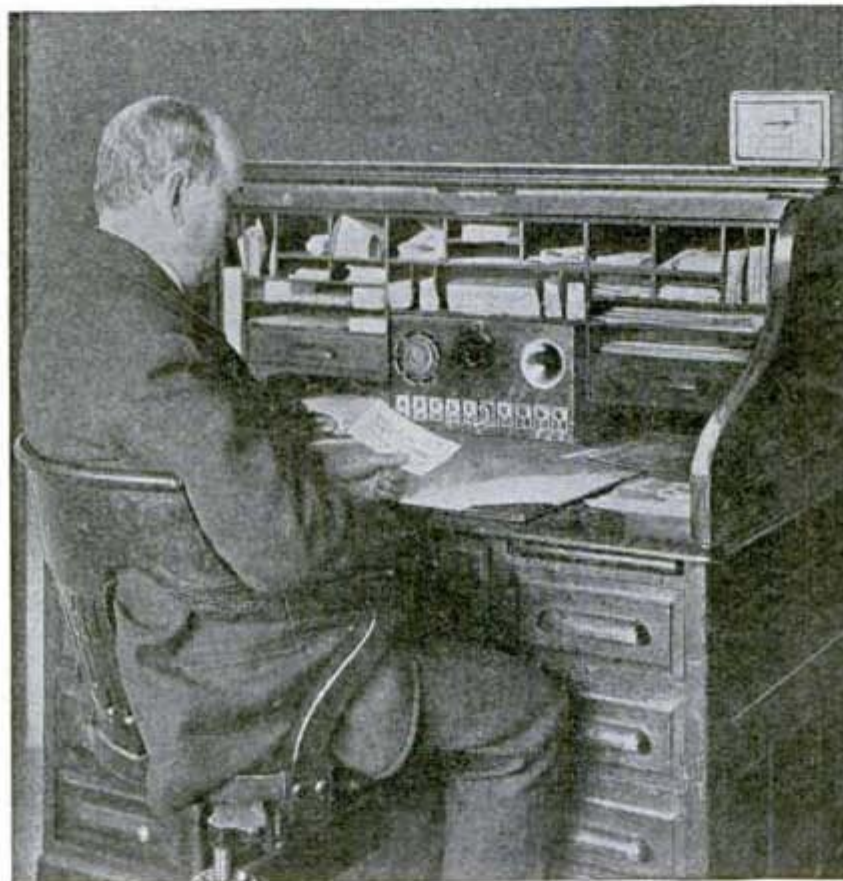
"Demonstration number one," said the President, and reaching over he pulled down several levers; "Buzz" went the instrument and several "Buzzes" answered — "Now I know," said he, "that my heads of departments are at their end of the wire and I'm

going to issue a general order about deliveries," which he did in a low tone of voice at a distance of at least 6 feet from the box, and rather away from it than toward it. "Is that understood, Mr. Evans, Mr. White, etc.," and he went down the line of names. Imagine my astonishment when "Yes, sir, O. K." came from the box, as each name was called, in tones clearly audible in every part

of the private office (about 15 feet square). It was almost uncanny.

"You see," he said, "instead of sending a boy and bringing them to my office from distances of 100 to 700 feet and on different floors, I can issue a general order and have it acknowledged in 10 seconds.

"Demonstration number two will show you how the Private office can be secluded even from my stenographer who used to be its most consistent invader," continued the President as he pressed another lever; instantly the box said "Yes, sir, ready"—



PRESIDENT OF COMPANY DICTATING TO STENOGRAPHER THROUGH DICTOGRAPH.

walking to the extreme end of the office he dictated a letter in a tone of voice scarcely above a whisper and, mind you, without connection with or apparent regard for the location of the box—talking into the air—“Read that back, please,” and out of the instrument came the text of the letter word for word clearly understandable and distinct to both of us.

“This feature is particularly desirable,” he said, “when I have a number of gentlemen in the office and want to dictate an agreement or a letter. It saves the time for them and for me which would be required for her to come to the office and depart; I get her instantly and when through dictating I shut off and we are immediately ready to resume our conference.

“The third demonstration will show you how secret communication is assured. We will assume that you are a salesman and have quoted me a price on a large quantity of oil. I press my bookkeeper’s lever,” suiting the action to the word, “and ask ‘What did we pay for that last supply of oil?’ Now I take this receiver off the hook; that automatically causes the instrument to act like an ordinary telephone—I get the information and you have heard nothing. Further and entire secrecy is assured by the fact that no matter how many lines are opened on the other end (or sub-stations), nothing can be heard unless I switch them on here (at the master-station). No control is necessary—the inter-communicating and cutting-out system is evidently perfect in its arrangement and is entirely governed by my pressing the lever.

“Here is also an interesting test that I have tried. We will suppose that clerk No. 1 has laid the blame for an error on clerk No. 2. I connect up both clerks without either knowing that the other is on the wire; then I say to clerk No. 2, ‘Clerk No. 1 says that you are at fault in this case’ and state the reason. Clerk No. 2 gives his side and if it is not correct Clerk No. 1 breaks in and tells him so. They then argue it and I hear

both sides without taking them away from their desks or having them invade my office for the discussion.

“It is quite a detective in its way and beside giving me much inside information I figure that it saves me perhaps as much as one to two hours a day, which is obviously a great consideration.

“Our Secretary, Treasurer, General Manager and Superintendent all have master stations and we communicate with each other constantly without leaving our desks and without the bother of either talking into a mouth-piece or holding a receiver to the ear.”

“Does it ever get out of order?” I asked

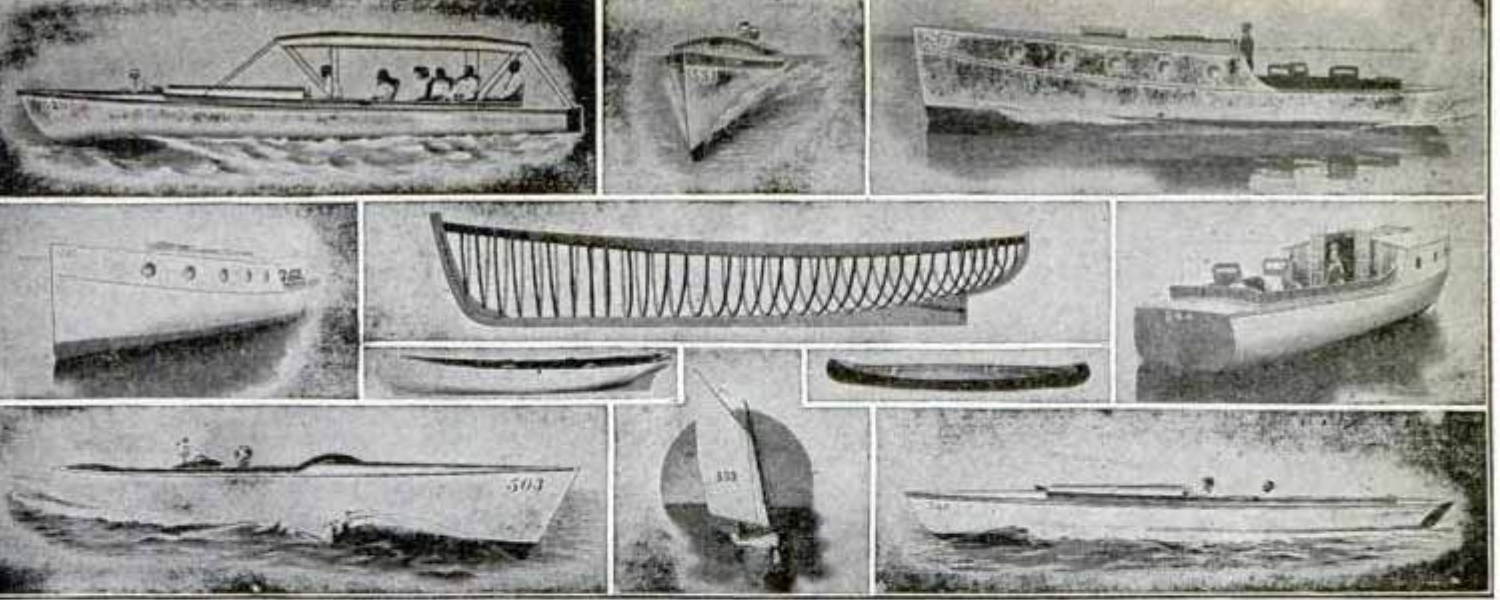
“Ours has not as yet, and it has been installed six months,” was the reply. “It is put in on a rental basis and the National Dictograph Company guarantees all maintenance and perfect working order.”

By the way, the name of this little wizard of modern business is the Dictograph, but that name hardly expresses its capabilities as demonstrated to me, and in fact it would be hard to find a name that would.

Further investigation gives me the information that while the National Dictograph Company is a young concern, its instruments are now installed in some of the largest and most conservative Banks, Trusts and Life Insurance Companies, and Industrial Corporations in New York and Chicago.

The purpose of the company having satisfactorily proved the practicability and usefulness of the Dictograph by actual rental to great corporations, is to take immediate steps toward making it universally known and used.

It would seem that every business man would conserve his best interests by writing to the Sterling Debenture Corporation, 22 Fifth Ave., New York, for Booklet No. “N.356” which gives full information about the Dictograph, its purposes, its rentals, installations and plans for the future



Build Your Own Boat and Save Two-Thirds

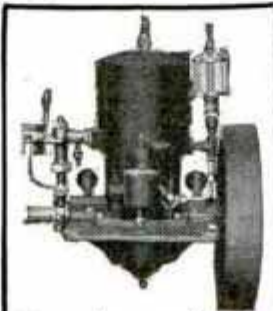
Anyone can put together my knock-down boats or build a boat from rough lumber, by using my exact size printed paper patterns and illustrated instruction sheets. I can sell you a boat for about one-third what a factory would charge. If you want to know how it can be done,

Send for my new 1909 catalog No. 22 today, showing 100 new models.

Each one embracing all the requirements of the thoroughly up-to-date pleasure boat—the result of twenty-three years' experience in building and sailing boats—from a paddling canoe to a large cruiser.

Eight years ago I originated the pattern and knock-down system of boat-building. It has revolutionized the boat-building business. Boats built by my system are now found in every civilized corner of the earth, and they have been built by amateurs at a saving of just two-thirds of what they would have cost if bought from a boat builder or factory. Right today there are more boats built by my system than all the boat factories put together, and mostly by inexperienced men and boys.

Knock-down frames with patterns and instructions from \$5.00 up.



My engines are best described in catalog No. 22 which also gives a combination discount when your order includes engine and K.-D. frame.

My new catalog quotes prices on knock-down frames, patterns, complete knock-down boats, motors, hardware and fittings, knock-down boathouses and completed boats ready to run.

In addition to our former lines, it shows speed, semi-speed, and family launches, of the "V-in," "V-out" and "V-plumb" stern types. Also a line of sea-going cruisers and light draught tunnel sterns, up to 45 feet in length, beams up to 9 feet.

I can supply you with the frame-work for your boat, shaped and machined, every piece fitted ready to put together, for less money than most lumber dealers would charge you for suitable rough lumber.

I can save you (1), the boat builder's profit; (2), labor expense; (3) big selling expense; (4), $\frac{7}{8}$ the freight. **Figure it out yourself.**



MY GUARANTEE. —You Take No Risk

I absolutely guarantee that you will be perfectly satisfied with everything you purchase of me, or your money will be instantly refunded.

C. C. BROOKS.

Put the "Knock-Down" Sections Together Yourself and Save $\frac{2}{3}$

I can also save you two-thirds on high grade Mission furniture shipped in sections—not in pieces. Easy to put together. No tool work necessary. No skill required. Simply fit the assembled sections together in the grooves provided, apply stain furnished and the piece is finished.

Every piece is of selected solid oak, massive, simple, and always in good taste, increasing in value with age, of a style that never changes. You save in dealer's profits, freight rates, finishing, crating, packing and factory costs.



As you receive it, with cushions made ready to drop in place. Just six joints to put together.

If interested in furniture only, send for Catalogue No. 8

C. C. BROOKS, President

BROOKS MANUFACTURING COMPANY

SAGINAW, MICHIGAN, U. S. A.

Originators of Knock-Down System of Boat Building and Home Furnishing





Training Helps

Besides giving you the great advantage of being able to *compel* opportunity, training *will help you pay the bills* by bringing a salary that will put the comforts of life within your easy reach.

To raise your salary, to help you pay the bills—*that* is the great mission of the International Correspondence Schools of Scranton, the world's mightiest factor in the success of poorly paid but ambitious men and women. And when you remember that an I. C. S. training doesn't mean leaving home, giving up work, or making any outlay for books, it is all the more evident that the I. C. S. can raise *your* salary—can help you pay *your* bills.

No obligation or expense is incurred in marking the attached coupon which will bring you full particulars regarding the special I. C. S. Course for YOU. Mark the coupon NOW. Don't delay.

Read These

I started my I. C. S. Training when employed passing coal in a power house. The instruction of my Course enabled me to advance from one position to another, and I am now Salesman in the New England Territory for the Westinghouse Machine Co. My salary has been increased many times since enrolling.

J. N. NICHOLSON,
Board of Trade Bldg., Boston, Mass.

The benefits I have received from my I. C. S. Course of Training have been inestimable. I enrolled when employed as a machinist; I am now a member of the firm of the Southern Manufacturing and Supply Co.

D. S. COOP, Albany, Ga.

A few years ago I was a bookkeeper at a salary of \$60 per month. I. C. S. Training has made it possible for me to steadily advance my position and I am now in charge of a sales office; my salary has been increased 600 per cent. since I enrolled.

G. E. DEMING,
154 Nassau St., New York, N. Y.

I enrolled for an I. C. S. Course of Training when employed as a messenger. At that time I had very little knowledge of telephony. My Course advanced me to a position as Telephone Engineer with the Bell Telephone Co. with an increase of over 700 per cent. in my salary.

E. L. SMITH,
Care Engineering Dept., Bell Tel. Co., Dallas, Tex.

I was formerly employed as a clerk in a meat market. I am now Chief Draftsman for a Steel Co. in Philadelphia, and my salary has been increased 400 per cent. I credit the largest portion of this advancement to my I. C. S. Course.

M. S. GRAWL, 1803 Erie Ave., Philadelphia, Pa.

I am glad to recommend I. C. S. Training to an ambitious man. My Course has been of great assistance in advancing me from an office clerk to a position as Patent Office Draftsman with Charles E. Gaylord. My salary has been increased 500 per cent. since enrolling.

C. H. BUELL, 1505 Marquette Bldg., Chicago, Ill.



to Pay the Bills

There's no side-stepping the issue: to advance you *must* have the necessary training. You *must* be an expert. Your work *must* be congenial—it must be that of your own choice. How are you going to meet these conditions? *Let the I. C. S. tell you how.* With the information in your possession you'll be sorry you didn't act before. Mark the coupon. **NOT** marking it will *not* bring success.

You'll find men everywhere who owe their success in life to the I. C. S. Some could only read and write when they enrolled. Yet, in spite of this, and of the fact that many lived thousands of miles away, and that others filled positions where the work was hard and the hours long, *the I. C. S. went to them* and fitted them for promotion and larger salaries. Mark the coupon.

On an average 300 students every month **VOLUNTARILY** report advancement in salary and position as the *direct result* of I. C. S. training. During the number was .

Mark the coupon. It means a larger salary—a salary that will PAY THE BILLS.

Letters

I. C. S. Training has been one of the chief means by which I have advanced from a position as 4th assistant in a laboratory to Chief Chemist for the American Steel Foundries Co., at a very large increase in salary.

E. H. OEHLER,
1609 St. Louis Ave., East St. Louis, Ill.

When I started my I. C. S. Course of Training, I was earning a salary of \$2.50 per day. Since finishing my Course I have been able to hold a position as Superintendent of Construction at a salary ranging from \$60 to \$70 per week.

M. P. MORTENSEN,
Care Strehlow, Freese & Petersen, Seattle, Wash.

When employed as an apprentice in a machine shop, I started my Course of I. C. S. Training. I am now Draftsman for the Dillon Iron Works. My salary has been increased 375 per cent.

W. A. GALLAND,
3225 Marvin St., Denver, Col.

SALARY-RAISING COUPON

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 872, Scranton, Pa.

Please explain, without further obligation on my part, how I can qualify for employment or advancement in the position before which I have marked X

Bookkeeper
Stenographer
Advertisement Writer
Show Card Writer
Window Trimmer
Commercial Law
Illustrator
Civil Service
Chemist
Textile Mill Supt.
Electrician
Elec. Engineer

Mechan. Draughtsman
Telephone Engineer
Elec. Lighting Supt.
Mech. Engineer
Plumber & Steam Fitter
Stationary Engineer
Civil Engineer
Building Contractor
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Architect
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Name _____

Street and No. _____

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Everything for Furnace Work



No 45
"Leader" Steel Furnace
Price \$49 Pipes and Registers Extra
Delivered any station east of Omaha and north of the Ohio River.

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Until Jan. 1st, 1910

Our story is quickly told. We will send you a Hess Steel Furnace and complete heating outfit, including pipes, registers, fittings and everything needed, for from \$25 to \$100 less than you can buy from dealers, and deliver it at your station, freight prepaid. You may place the purchase price in the hands of your local banker who will hold the money until Jan., 1st, 1910, while you test the heater.

If the test is not satisfactory to you in every way, you may return the goods at our expense and have your money back, we to pay cost of removal and freight charges both ways. Ask us more about it. There's money in it for you. Our great co-operative plan makes you a partner in our success. We explain this with every estimate. This offer also applies to heating equipments for all buildings. We manufacture and sell from our Factory direct to you.

Heating Plans Free! Write for Booklets!

Send us a rough sketch of any building that you wish to heat and—without any charge or obligation on your part, we will have our experts prepare a simple, clear plan, which you can easily understand, showing every detail of the furnace, pipes, registers, etc., in their proper places, with the exact cost to you of the complete equipment.

The Hess Furnace will burn any fuel. Besides any kind of coal, or wood,—chips, twisted straw, corn cobs or any other waste fuel can be utilized and money saved.

Our free booklets, "Modern Furnace Heating" and "These Bear Witness," give valuable information about heating any building perfectly and economically. Write today for these booklets.

Hess Warming & Ventilating Co.,
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BISHOP FURNITURE CO. GRAND RAPIDS, MICHIGAN

Ship Anywhere "On Approval," allowing furniture in your home five days to be returned at our expense and your money refunded if not perfectly satisfactory and all you expected. We Prepay Freight to all points east of the Mississippi River and north of the Tennessee line, allowing freight that far toward all points beyond.

We furnish Homes, Hotels, Clubs, Y.M.C.A.'s, Hospitals and other Public Buildings at wholesale prices.



\$29.75 buys this large, luxurious High Grade Genuine Leather Turkish Rocker No. 1268. In style, comfort and durability it equals most \$50 Rockers. Our LARGE catalogue illustrates Turkish Rockers and Couches from \$12.75 to \$76.



\$34.75 buys this large, handsome, high-grade Combination China Closet and Buffet, No. 576 (worth \$50). You save \$15.25 by ordering direct. Made of select Quartered Oak, any finish. French Bevel Mirror 24x18 in. Length 56 in. Sixty styles of Buffets and Sideboards from \$15 to \$135 in our large catalog.

Catalog

If you are interested and want to save one-third on high grade furniture, send ten cents in stamps to cover cost of mailing our 176-page Catalog of Home and Office Furniture and our "Art Book" of Mission Furniture.



\$24.50 buys this beautiful Colonial style Brass Bed No. 990 (worth \$40.00). Massive 2-inch continuous Pillars (6 up-rights). Made in Double or Single widths and bright or Satin finish at same price. Our LARGE catalogue shows Iron and Brass Beds from \$2.25 to \$60.00.

(Continued from page 492)

idea that Wilkinson's time ought to be made up. The upshot of it all was that he took the train in over the home plate hotter than a caboose stove and in about the same total time that he might have consumed running at a decent kind of speed on the beautiful summer day aforesaid. The company had not gained anything in time and were out a lot of brasses, oil, waste, etc., and Sam did not get home early enough to look after his private business.

Wilkinson's requisition for oil, waste and brasses next day cast a gloom over the stores department, and the M. C. B.'s letter of the "please-explain" quality cast gloom over the Halfway House for a few minutes, but Wilkinson's reply caused a dark, sunset shadow to fall over Sam, and the train dispatcher deepened the gloom by his remarks, and the maintenance of way department blackened it into night when they told of the great and many stray lumps of coal to be found along what the called the track, and when Sam said he was sick at the roundhouse everybody told him he looked it, and he eventually got some rest without the trouble of book-keeping it.

Moral: It is better to be a humble railroad man than a great rusher, and it is always wise to study the habits and ways of old-fashioned coal cars. Do not refer to even a poor, neglected siding as a one-horse creation when speaking to the president, and above all things never try to get home quickly for private ends, or a deep and dark gloom will surely overtake you, and the one which you have helped yourself to when a car repairer's back was turned may rise up against you and make you even as one of the captains of industry.

WATER SUPPLY for COUNTRY HOUSES

THE PROBLEM SOLVED

No elevated tank to freeze or leak. Tank located in cellar. Any pressure up to 60 lbs. The ideal fire protection. Send for Illustrated Catalogue 39.

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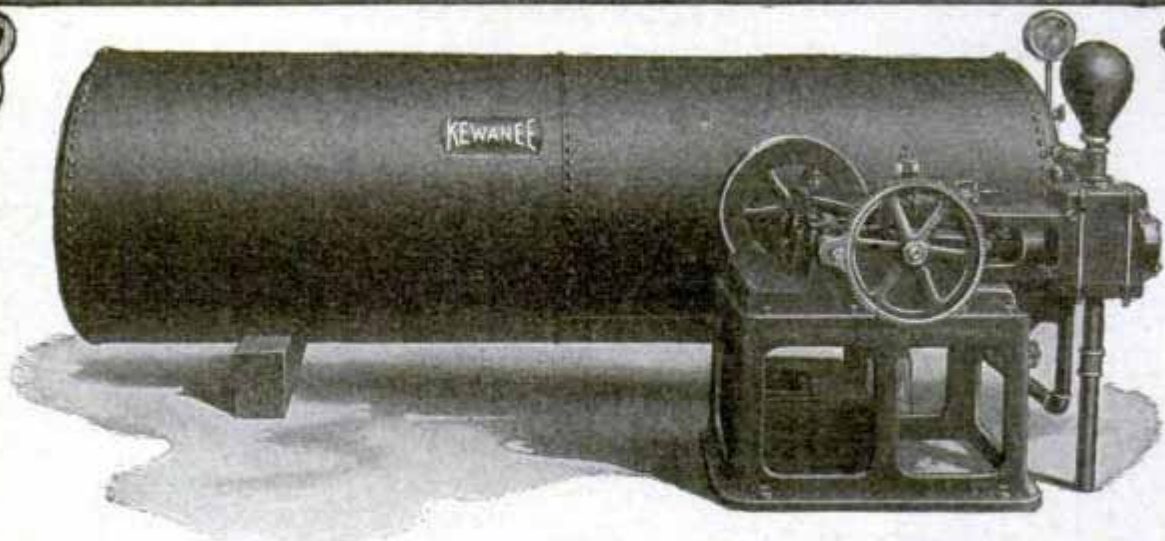
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THE KEWANEE SYSTEM OF WATER SUPPLY



This is a Complete Private Water Works Plant

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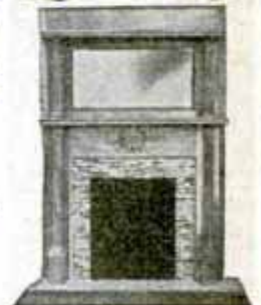
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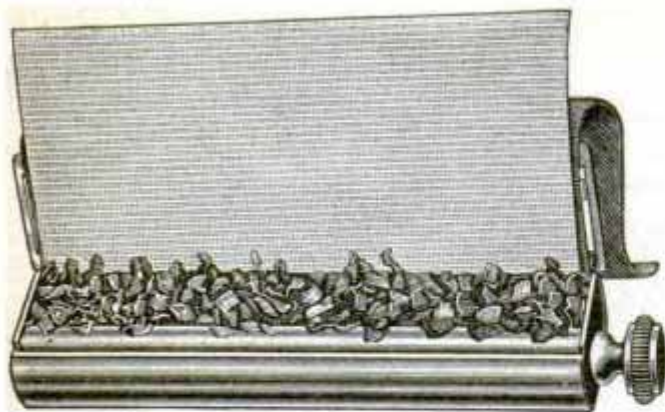
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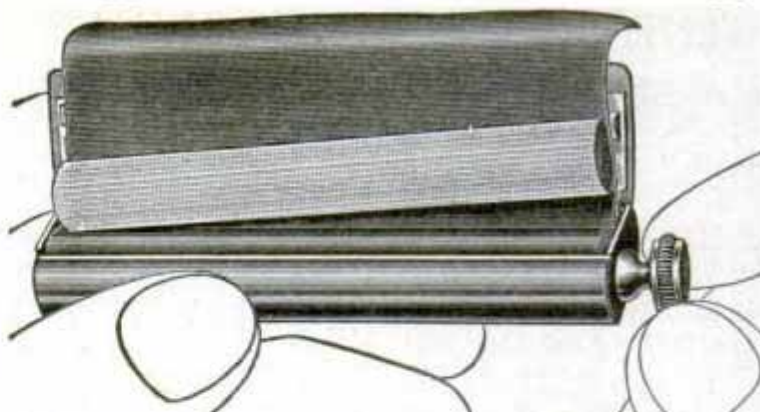
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shaves better than any other razor made, regardless of price—we know because we've tested them all. It is simple in construction, having only two parts—a handsome silver plated handle and a keen, finely tempered blade that gives a delightful, smooth, clean, velvety shave. It's easy to use—easy to clean, sanitary, and soon pays for itself many times over. Send us your order—try it 30 days—if not satisfied, you can have your money back.



UNIVERSAL STROPPER Sharpens Any Safety Razor Blade

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The Strubler Computing Scale Co., Elkhart, Indiana, have special territory open for experienced scale men only. Address, STRUBLER COMPUTING SCALE CO. SALES DEPARTMENT, ELKHART, IND.

THE INTERNATIONAL BALLOON RACE IN SWITZERLAND.—The fourth international balloon race for the Bennett trophy will start from Zurich, Switzerland, next October, it having finally been decided that the race last year was won by a Swiss balloon. The Aero Club of America is entitled to three entries.

MAKES SAUSAGE 103 FT. LONG.—For several months butchers in the vicinity of Canal Dover, Ohio, have been attempting to outdo each other in making long sausages. The first made was 39 ft., but the latest, made by a New Philadelphia butcher, measures 103 ft. This great sausage is continuous, having not a single splice.

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We can furnish you with press, type and all material so you can start a small printing office in your own home and make money printing circulars, cards, envelopes and bills for your friends and the store-keepers in your town. We have all kinds of outfits at all prices. We have been in business for many years and thousands of successful business men today got their start by buying one of our outfits. Please write us asking for our catalogue and we will send you pictures of our different presses, samples, type, and all the things we sell. You can start in business for yourself for a few dollars and make a lot of money at odd hours.



Here is a splendid chance for boys and young men who can spare a few hours each week.

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"F" first and finest grade—diamonds of the rarest beauty—are shipped prepaid on approval; no money down.

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Without any obligations please send me at once, free your Marshall Catalog and Special Discounts Sheet, with full explanation of your no-money-down approval offer.

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annual income from the Cosmopolitan Magazine is about \$1,500,000. The property is now owned by William Randolph Hearst, who bought it from John Brisben Walker. Mr. Walker had made several fortunes from the magazine. The profits of Everybody's Magazine are estimated as being as high as \$800,000 a year. Other American magazines are all large profit earners. A well known English author about ten years ago accepted \$2,000 worth of McClure's stock in payment for a story; recently he sold this stock for \$20,000. During the time when he held the stock it paid him dividends of \$14,000, making a total of \$34,000 cash for the \$2,000 worth of fiction manuscript. If you had been able to secure an investment of only \$100 in Munsey's magazine, that investment would now be paying an income of \$1,000 every year, and would be worth at least \$10,000 in cash. Those who had the opportunity to become interested with magazines when they first offered their stock to the public have become wealthy.

REFERENCES.

Numerous references of the most substantial character will be furnished on request.

It is decidedly worth your while to look into this without delay. There are only 10,000 shares at \$10 each. They are offered for sale in the columns of our own monthly magazine, "Home Life," having a circulation of 900,000 copies per issue, and through the columns of several other standard publications with a combined circulation of over a million, it is therefore expected that the entire issue will be promptly subscribed.

The capitalization of the Company is extremely low, the proceeds from the sale of the 10,000 Preferred Shares are to be used for the purpose of improving the magazine to the extent of making it the highest grade mail-order publication in the country.

While dividends of only 10% are guaranteed, the Preferred Stock participates in all earnings the same as the Common Stock and may be confidently expected to pay from 25% to 100% per annum. Any increase in the rate of dividends will effect a proportionate increase in the value of the shares.

Considering every phase, we believe that no sounder or more profitable investment was ever offered to the public through the columns of the press. It is as safe and more profitable than keeping money in the best bank. The business is successfully established and the entire proposition rests upon the firm foundation of "what it has done" and "is doing now," not upon "what it proposes or expects to do."

The April issue of Popular Mechanics contained on pages 95 to 99 complete particulars upon Home Life and the Balch Publishing Co.
The entire information is embodied in a booklet which will be mailed on receipt of the attached application or coupon.

Fill out and mail the attached application or coupon to

BALCH PUBLISHING COMPANY
43 DEARBORN AVENUE, CHICAGO, ILL.

COUPON

Balch Publishing Co.,
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 Please mail me free a copy of Home Life and our booklet containing references and complete information upon the 10% Guaranteed Shares.

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Balch Publishing Co., 43 Dearborn Avenue, Chicago, Ill.
 Subject to your guarantee I herewith apply for _____ shares of your 10% Guaranteed Stock on Plan _____ at \$10 per share and enclose herewith \$ _____ as required under the said Plan, and agree to pay the balance, if any, according to your terms. Certificate to be issued me as soon as I make full payment.
 Please acknowledge receipt and send copy of Home Life and Booklet.

Name _____
 Address _____
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10,000 shares of the 10% participating preferred stock of the Balch Publishing Company, guaranteed as to principal and dividends, are herewith offered for subscription at \$10 per share, par value, subject to following

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No subscription for less than 5 shares will be accepted. Make Checks and Money Orders payable to Balch Publishing Company.

DIVIDENDS

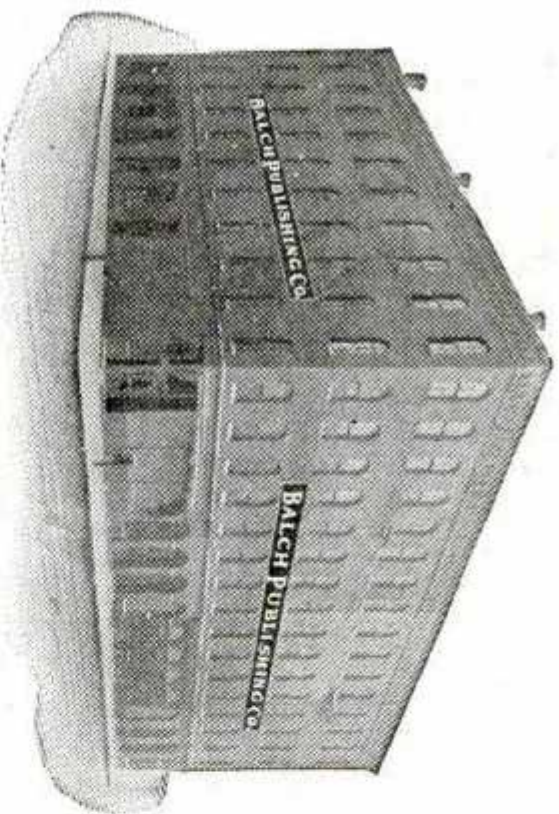
Commence from the date on which the stock is paid in full, and will be paid by check semi-annually on March 1 and September 1 of each year.

GUARANTEE.

The Preferred annual dividend of 10% is guaranteed for 3 years, and the repayment of the principal with a premium of 5% is guaranteed on demand at the end of 3 years. In the event of Mr. Balch's decease prior to the expiration of the 3 years, the full amount due under the guarantee becomes payable in cash, a special fund having been provided for that purpose by insurance on Mr. Balch's life. The Guarantee appears on every stock certificate.

Profits in Magazine Publishing.

Frank A. Munsey started in the magazine business with a capital of \$40; his business now pays a profit of \$1,000,000 a year. The stock of the S. S. McClure Company is worth \$1,000 a share. The income of the Curtis Company from the Ladies' Home Journal and the Saturday Evening Post is nearly \$6,000,000 a year. The



Building at Kinzie Street and Dearborn Avenue, occupied by Balch Publishing Company.

GENERAL INFORMATION.

The Balch Publishing Company is an Illinois Corporation, doing business in Chicago and highly regarded locally. The entire capital is \$150,000, of which \$50,000 is common stock owned by Mr. Frank O. Balch. There are no bonds, mortgages or prior liens of any kind.

The Company owns and publishes "Home Life," a mail-order monthly magazine with a circulation of 900,000 copies per issue and an advertising patronage approximating \$25,000 per month. The magazine is known to every advertising agency in the United States and is considered one of the best paying mediums for advertisers.

The business has been established a number of years and is now paying at the rate of about \$65,000 per annum.

RIGHT AT HOME

A brief list of Chicago subscribers to the "Home Life" shares, thoroughly acquainted with the condition and standing of the Balch Publishing Co.

- T. C. FREDERICK—Treasurer Bedford Quarries Co.
- GEO. GILLETTE—Attorney.
- D. W. GAYLORD—Adv. Manager Balch Publishing Co.
- H. A. BINGHAM—Sales Manager Pilcher-Hamilton Paper Co.
- H. A. BOWMAN—President Bowman Auto Advs. Co.
- JOHN ARTHUR DIXON—Associate Editor Chgo. Record-Herald.
- WM. E. DUFP—Circulation Mgr. Balch Publishing Co.
- ALFRED BERSBACH—Treasurer Manz Engraving Co.
- J. E. DUNNING—Sup't. Printing Dept. Balch Publishing Co.
- JOHN HINDMAN—President Colonial Mercantile Co.
- RIGHT REV. SAMUEL FALLOWS—M. E. Bishop, Chgo. Diocese.
- ARTHUR E. SWETT—Sweet Adv. Agency.
- E. C. BODE—Advertising Mgr. Chicago Examiner.
- LEON F. TITTS—Banker.
- H. E. GROTH—Treasurer Mahin Advertising Co.
- S. F. MARGANT—Treasurer Pilcher-Hamilton Paper Co.
- J. B. ORT—President Ort Printing Co.
- RICHARD C. HAREL—President Steamfitters Supply Co.
- W. A. C. SMITH—Manager The Ohio Quarries Co.
- M. ROTHSCHILD—Manager Chicago House Wrecking Co.
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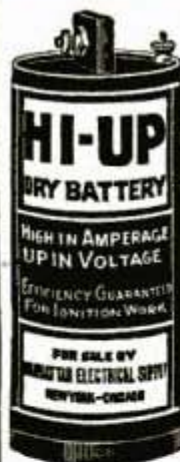
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Write for our **no money down offer**—how we will ship a suit or overcoat nothing down—not C. O. D. to us either. You take the garment **to your home**, try it on then and there; if satisfactory send us our rock-bottom price. **And** if you don't want to send all cash at once you can send **a few dollars now, balance during the next month or two**—we give you time to pay just as the local tailor gives time to the business men in town. So get your suit now; not necessary to wait until it is convenient to send all the cash.

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Write like this: "Gentlemen: Send me your free clothing samples."

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SANITARY HORSE CLEANING DEVICE

CONRAD HAMMER, Patentee

GREATEST MONEY, TIME AND LABOR SAVER. The only Apparatus which removes all dirt instantly and thoroughly, and does not allow it to fly all over the stables. Requires about $3\frac{1}{2}$ horse power Steam or Gas Engine or Electric Motor to run this Machine.



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ADVANTAGES

This apparatus possesses the following unique advantages:

It removes all the dirt on the animal's skin, cleansing both the surface and the pores and creating a perfectly clean and sanitary condition.

It improves the animal's health by opening and thoroughly cleaning the pores of its

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It is thoroughly hygienic and sanitary.

Not only is the animal's coat cleaned more perfectly than by any means heretofore known, but the particles removed are conveyed to a closed receptacle instead of being scattered and disseminated around the stable. Produces a perfectly sanitary and healthful condition in the surroundings.

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A horse can be thoroughly cleaned in from three to five minutes by this improved apparatus while with the present currycomb and brush it takes from twenty minutes to an hour of vigorous rubbing and then it is not thoroughly cleaned and if the workman is lazy or tired the horse is only superficially brushed and curried to brighten up his skin.

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Tubing can be led to any part of the stable.

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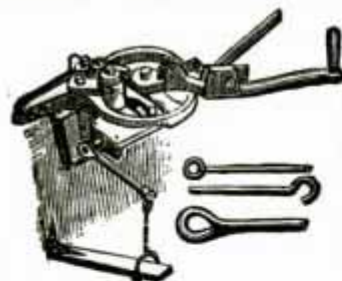


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CONGRESS COMMITTEE PRAISES PANAMA CANAL WORK.—The committee on interstate and foreign commerce of the house of representatives, which visited the Isthmus of Panama during the holiday recess, is reported by Representative Esch, of Wisconsin, a member of the committee, as having found a great transformation to have taken place since the previous visit of the committee four years earlier. In an account of the inspection printed in the New York Evening Post, Representative Esch speaks in the highest terms of the work accomplished by the United States government. With regard to the Gatun dam, about which there has been so much controversy, Esch says that full hearings were given by the committee.

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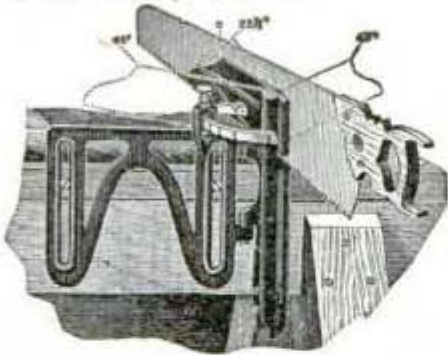
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at which Col. Goethals, chief engineer and chairman of the canal commission; Col. Sibert; Major Gaillard; Col. Hodges, assistant chief engineer, and Admiral Rousseau, all commissioners, testified as to their absolute faith in the present plans for the locks and dam at Gatun, and their ability to construct them so that they would be permanent and safe and meet all requirements.

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Fig. 1.



Fig. 2.



Fig. 3.

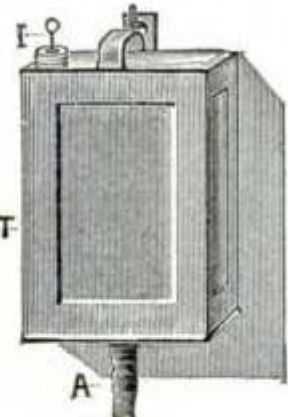
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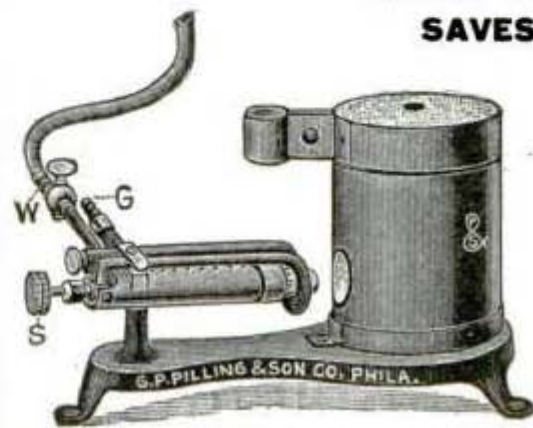
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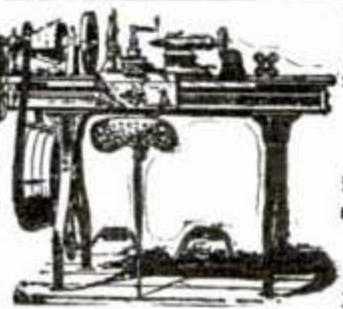


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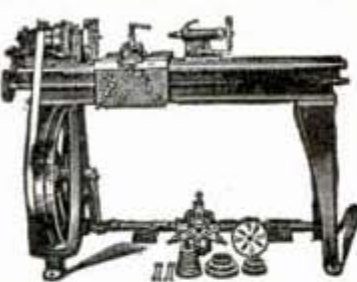
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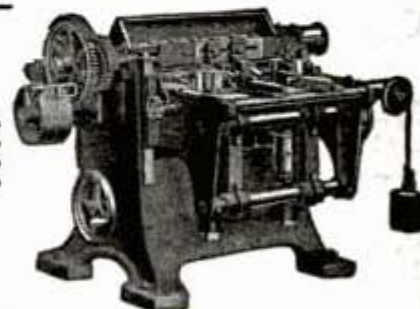
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LEARNING A BAGPIPE MUSIC LESSON OVER TELEPHONE.—According to the St. Paul Pioneer Press a music lesson on bagpipes was given over the telephone between Minneapolis and St. Paul a few weeks ago:

"The feat was performed by Capt. George Sinclair, of Minneapolis, formerly in the service of the late Queen Victoria as piper in the Scotch guards, and William Wallace Robert Bruce, a well-known piper of St. Paul.

"Captain Sinclair sat in his chair in the Mill City police headquarters, while Mr. Bruce was at his home, puzzled over a new hornpipe composed by William McKay, of Ayrshire, Scotland. He appealed to his brother Scot in Minneapolis.

"According to the captain the piece is a very difficult one and if your fingers are not pretty limber you are apt to get caught on it. There are crochet (not the kind worked with a needle), grace notes, several varieties of hemi, demi and semi quivers, and also six distinct brands of quavers in it. Therefore when Mr. Bruce appealed to the captain for assistance the latter was 'up against it' for a minute.



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"Placing his lips to the telephone transmitter he puckered them into a whistle and went through the knotty piece, note by note, getting in each and every grace note, crochet, hemi, demi and semi-quaver, and also all the quavers. He stopped for breath and then repeated the air. "There was an anxious silence and then from the St. Paul end of the line came the tunes of a bagpipe playing the McKay hornpipe just right. Next came a cheery voice saying, 'Hoot, awa, mon,' which ought to mean in Gaelic, 'Well done, George, Scotland forever,' and the music lesson, the first of the kind on record to be given over the telephone, was over."

LOGGED-OFF LAND PROPERTY IN WASHINGTON.—According to the report of an expert who made an investigation of the logged-off land in western Washington, there are 8,700,000 acres of land, 5,000,000 of which are still covered with marketable timber. The area in cultivation is only 429,000 acres. The report also shows that there are 2,352,000 acres of logged-off land, which could probably be put under cultivation if economical means of clearing could be found. According to experiments already made the cost per acre of clearance varies from \$35 to \$200, the average being about \$100. A number of systems of clearing logged-off lands are being experimented with, and it is believed that some of these may be the means of rendering this land available for homesteaders.

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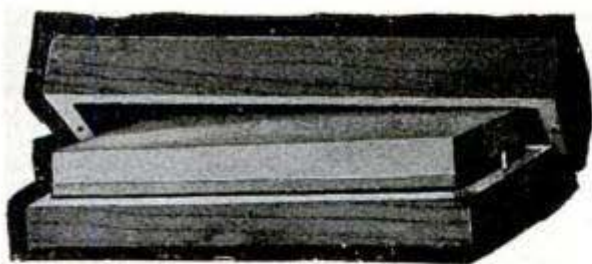
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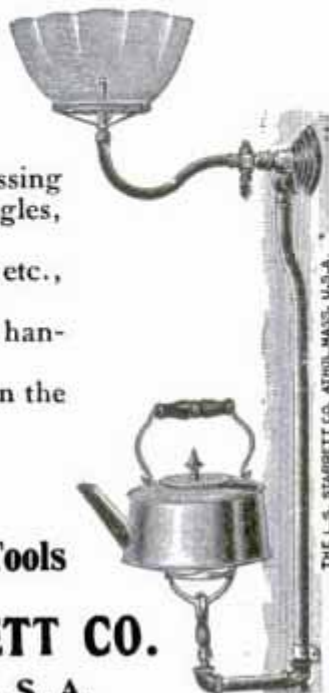
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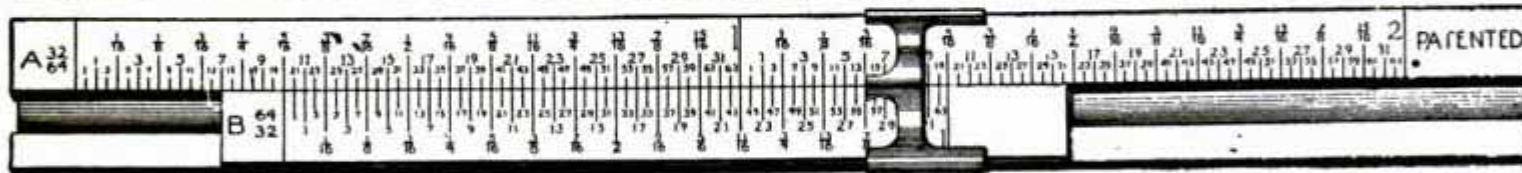
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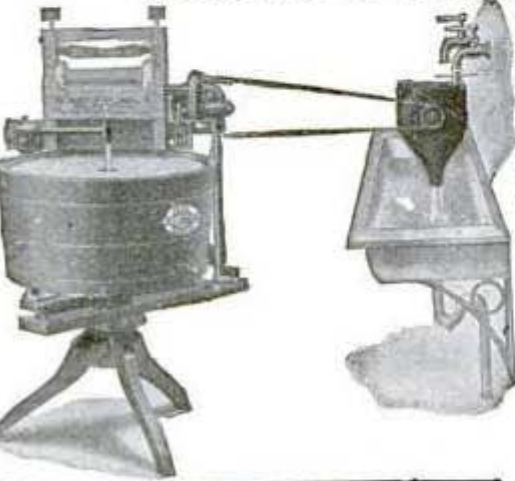
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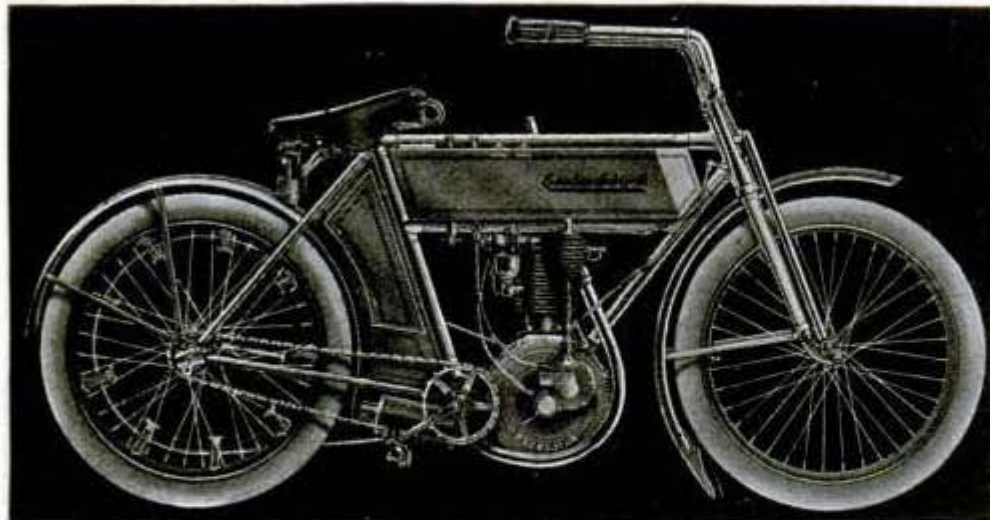
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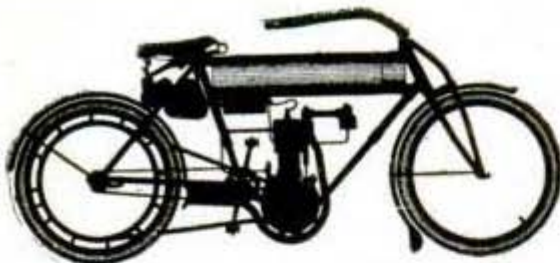
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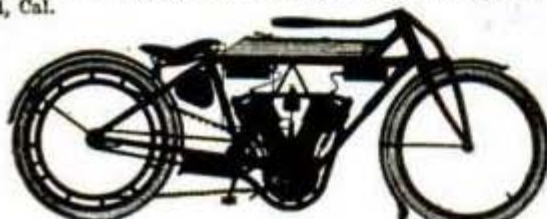


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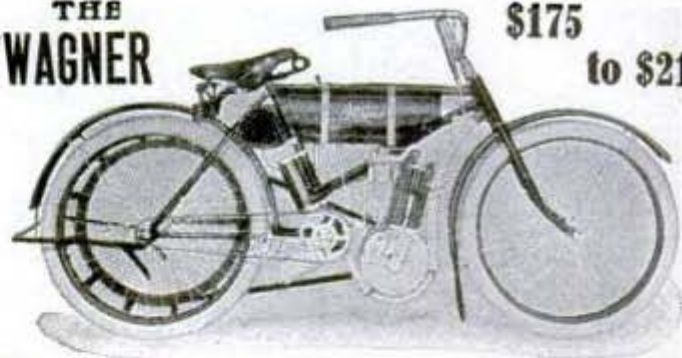
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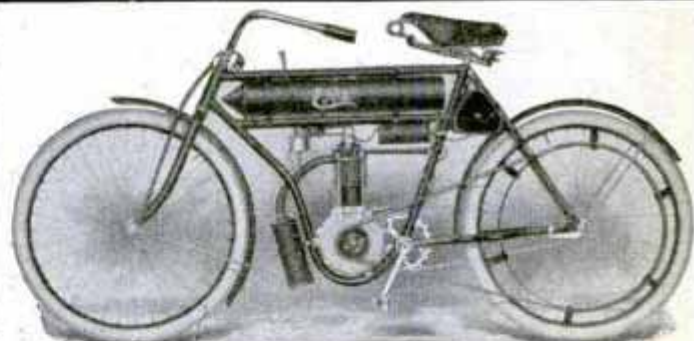
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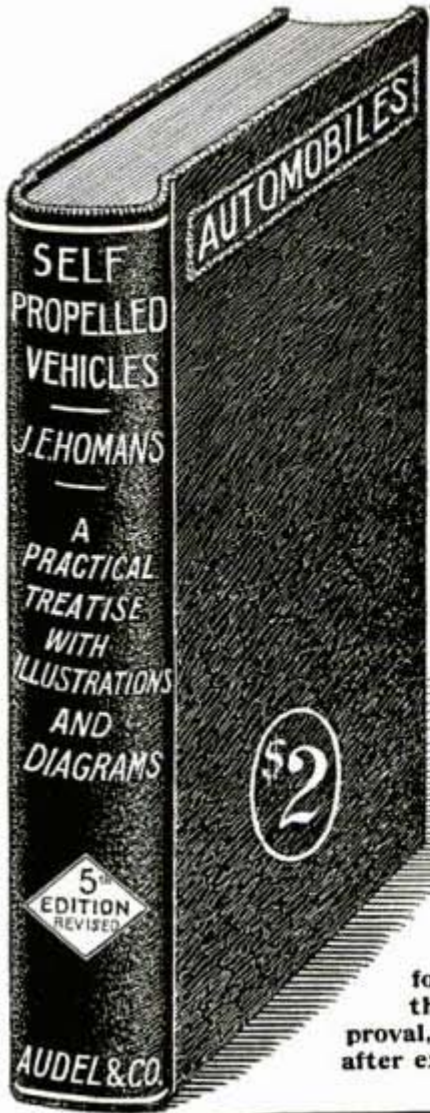
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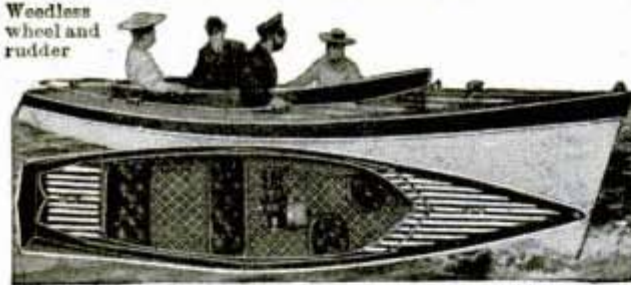
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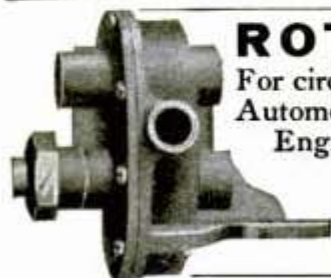
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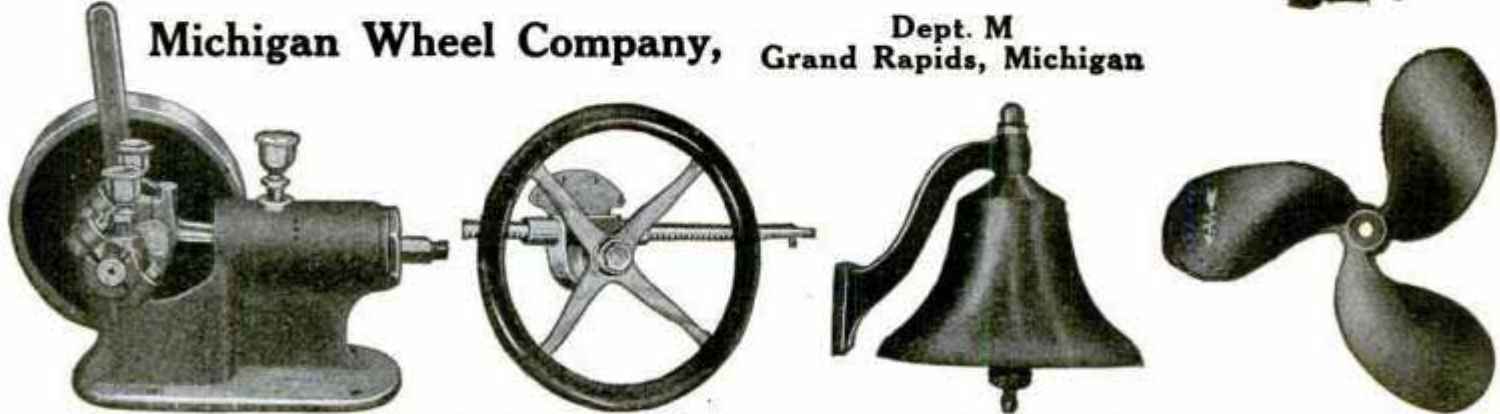
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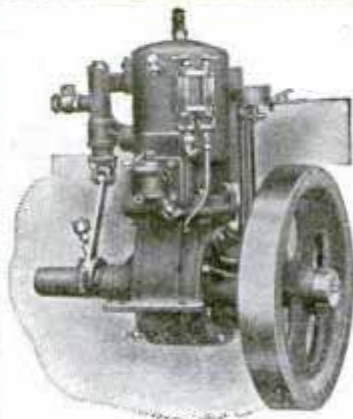
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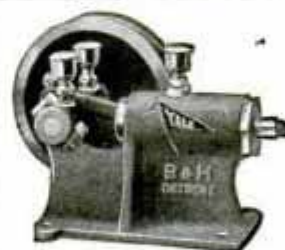
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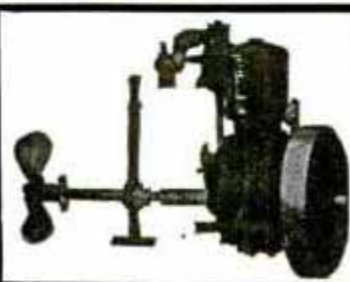
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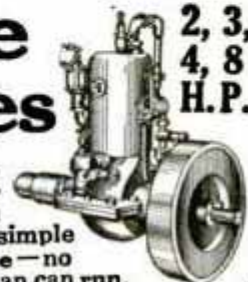
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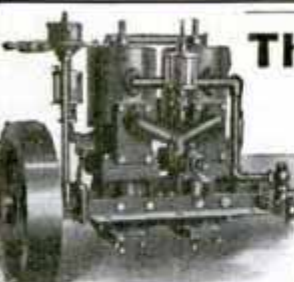
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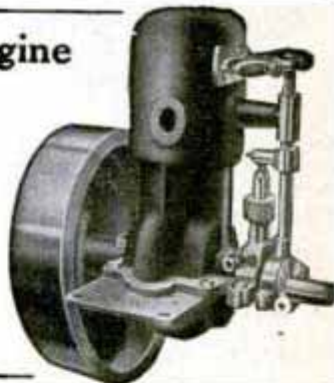
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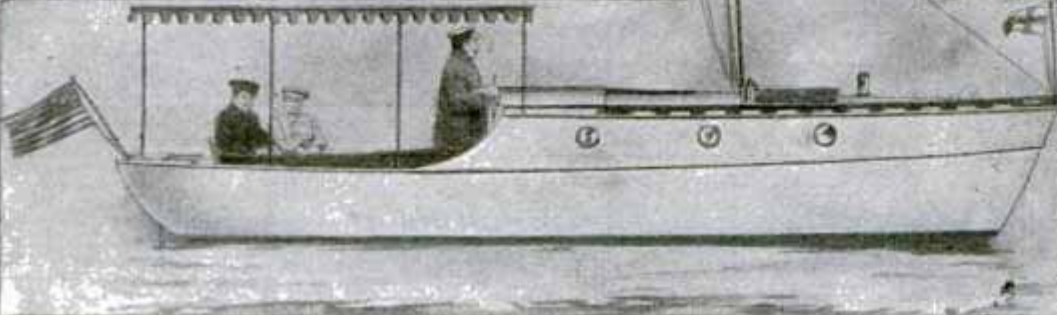
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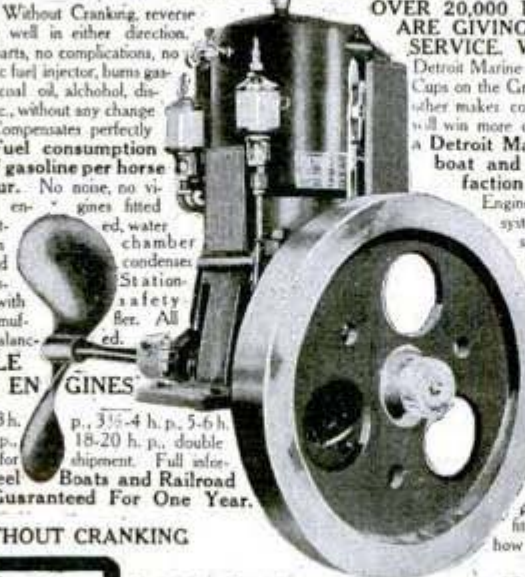


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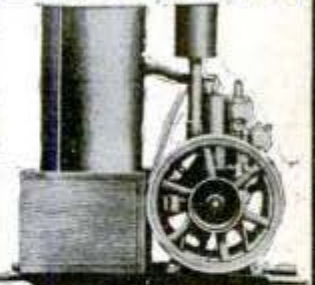
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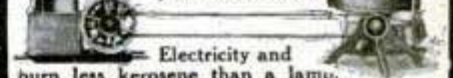
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GENERAL LECTURES ON ELECTRICAL ENGINEERING. By Charles Proteus Steinmetz. Cloth: 284 pp.; illus. Price, \$2.00 postpaid. Deals with problems of generation, control, transmission, distribution and utilization of electric energy; that is, with the operation of electric systems and apparatus under normal and abnormal conditions, and with the design of such systems. Robson and Adee, Schenectady, N. Y.

KRAFT. By Prof. Dr. E. Reyer. Paper covers: 380 pp. Okonomische, technische und kulturgeschichtliche Studien über die Machtenfaltung der Staaten. Wm. Engelmann, Leipzig.

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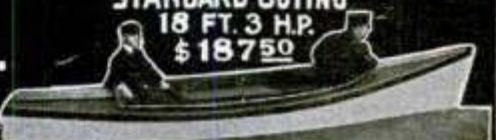
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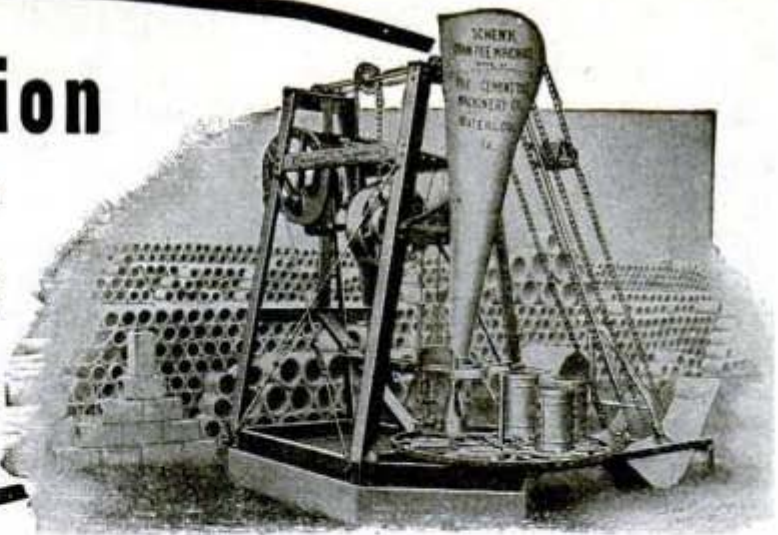
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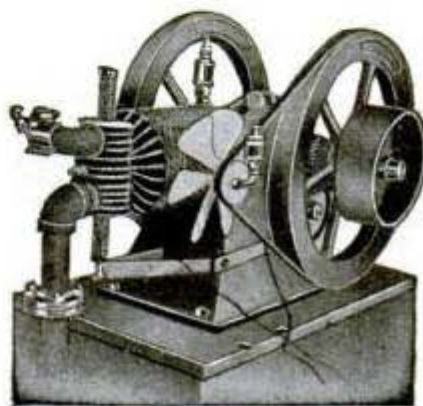


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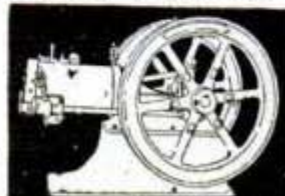
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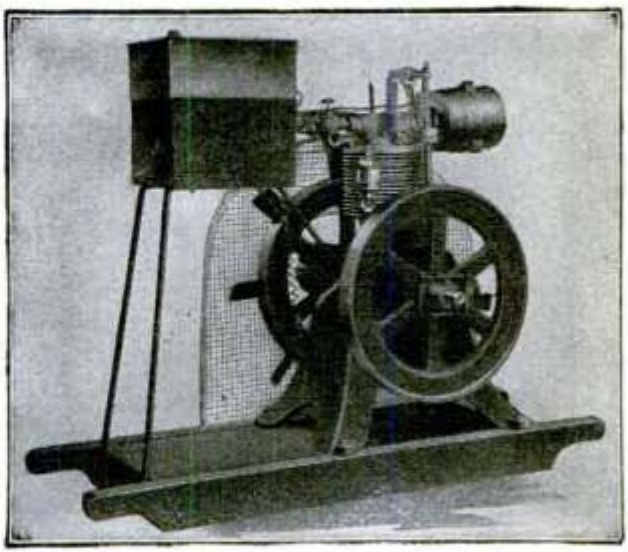
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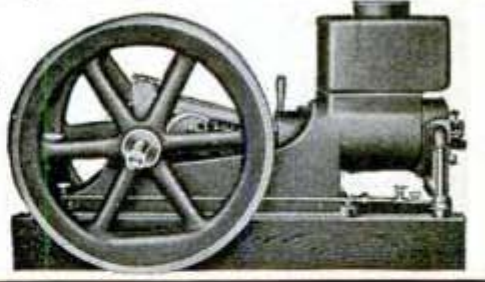
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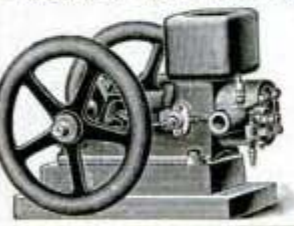
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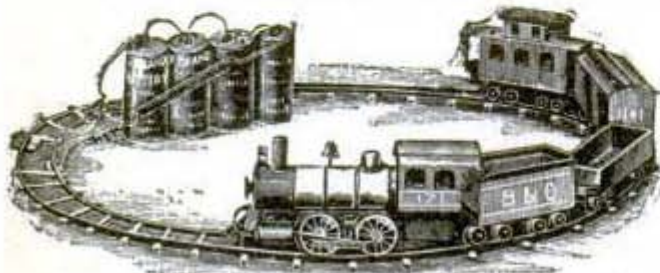


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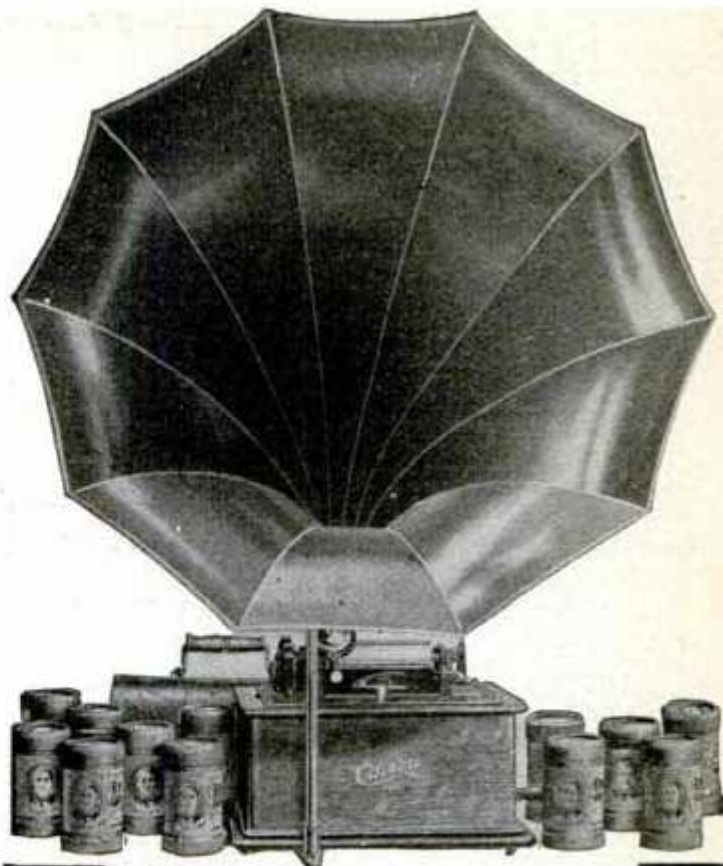
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\$10.00 to \$65.00. Many of these machines have been in use less than sixty days, are as good as new, and we guarantee them to give exactly the same service. Write us before you buy, stating make of machine you prefer. We will give you the best typewriter bargains ever offered, shipped subject to examination.

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ALL MAKES REBUILT at 1/4 to 1/2 manufacturers' prices. Rented anywhere or sold on 3 months' approval. Write for our money back guarantee, also Catalogue and special Price List.

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All the Standard Machines SOLD or RENTED ANYWHERE at 1/4 to 1/2 MFR'S PRICES, allowing RENTAL TO APPLY ON PRICE. Shipped with privilege of



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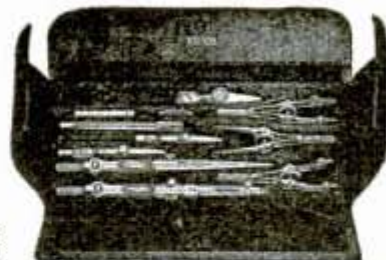
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Most convenient and practical low-priced Typewriter Stand on the market. Made of selected seasoned Oak, fine Golden finish, 44 in. long, 24 in. wide. Typewriter Table is 27 in. long, 26 in. high; Pedestal 30 in. high; has three drawers and extension slide; Paper Cabinet has Roll Curtain Front and Copy Holder. Shipped K. D.; put together with screws. Price \$12.00 at factory.

Ask for our big Catalog 211—(new)—with money saving prices on Office Desks, Chairs, etc., etc.
We make School, Church and Opera Seats, Lodge and Bank Furniture.
E. H. STAFFORD MFG. CO., 248 Adams St., CHICAGO, ILL.

CLEVELAND WILL HAVE INDUSTRIAL EXPOSITION. —Cleveland's Industrial Exposition, which will be held June 7th to 19th, promises to be unique in the history of home-product expositions in the diversity of manufactures shown. It is estimated that 125,000 different articles come out of the city's 3,500 shops. The percentage of these displays will give unusual variety and range to the exhibits and will add greatly to the spectacular as well as to the educational value of the exposition. Cleveland is noted for the production of steel ships, heavy machinery, hardware, twist drills and small tools, wire and wire nails, bolts and nuts, vapor stoves, electric carbons, malleable castings, telescopes, gasoline, steam and electric automobiles, and takes high rank in the manufacture of paints and oils, women's clothing, chewing gum and various other products. In many cases the demonstration of the method of manufacture will be made by running machinery, and the active use of the manufactured articles will be shown.

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ENGRAVED BY ALL PROCESSES TO ILLUSTRATE ADS, CATALOGS, ETC. IT COSTS NO MORE TO PRINT A GOOD CUT THAN A POOR ONE. WE MAKE CUTS THAT PRINT CLEAN AND SHARP ON ANY PAPER. NO CUTS IN STOCK - ALL WORK DONE TO ORDER - ASK FOR SAMPLES. ACME ENGRAVING CO., 155 WASHINGTON STREET, CHICAGO.



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Bright, sparkling, beautiful. For brilliancy they equal the genuine, standing all test and puzzle experts. One twentieth the expense. Sent free with privilege of examination. For particulars, prices, etc., address

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for June Brides and Sweet Girl Graduates

Give that beloved one now what you want to—no need to wait till you have the money. We'll sell you a watch, brooch or diamond at cash prices on terms you can well afford. Just say about what priced article you'd like to see. We'll send it at once at our own expense. You've nothing to pay until you've seen and carefully examined

what we offer. When you've made up your mind that it's a bargain—and you want it—send us, say, a fifth of its price, and pay the balance in small monthly payments. Our Diamonds are first water gems only—pure white stones of marvelous brilliancy that increase in value from year to year. Write today for

Free Catalogue of Diamonds, Watches, etc.

You will find our prices will save money for you on every purchase.

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CANNON BALL PEN

There are only three things to a pen—Material, Shape, Workmanship. Like all the ALUMINOID pens, "Cannon Ball" is made of a remarkable aluminum alloy that gives the Spring of steel and the Smoothness of gold. "Cannon Ball" is a speed pen that writes on anything. A pen for men whose time and annoyance are worth saving.

For sale by Stationers.
Samples sent for 2 cent postage.

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Buy Your Tobacco Direct from Factory

That's the only way to know how fragrant, rich and smooth French's Mixture is. Descriptive adjectives have all been used by inferior tobaccos ere this. We can give you no new words, but we can give you a new and better smoking tobacco direct from the makers.

To make it easy for you to try

FRENCH'S MIXTURE

We have the standing offer printed at the left. Take advantage of it and you will have reason to congratulate yourself. You will obtain a perfect blend of pure North Carolina Golden Leaf Tobacco, made almost entirely by hand. It is

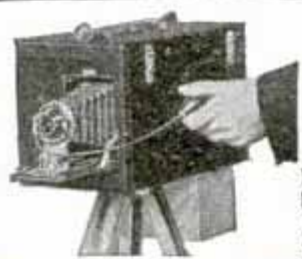
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Send 10 Cents in silver or stamps for a large sample pouch and booklet; both will be a delight to you.

Make a Good Income!



operating a **Daydark Photo Post Card Machine**. 3 Photo Postal Cards of any object made and delivered on the spot in 10 minutes. No experience required—no dark room necessary. All work done in the machine in open day. Establish a profitable business at home by opening a Daydark Postal Parlor and big money maker on the street, at fairs, etc.

Make Good Money.

Send at once for free catalog and sample post card showing fine work the machine does. **DAYDARK SPECIALTY COMPANY** 1000 St. Ange Avenue, St. Louis, Mo.

WANTS SOMEBODY THAT OWNS SOMETHING.—The "When you want anything and don't know where to find it, write Popular Mechanics" notice brings the magazine a large amount of correspondence. Some of the letters are unique. Here is one from a boy who evidently has ambitions worth while:

Dear Sir: I received your answer and was glad to get it, but it will do me no good. There are no shops in this town and hardly any works and nothing doing.

Do you know of any place in Chicago where they would like to have a boy to work, or do you know of anyone that would like to have a boy work with them in a shop or any place? I will have to hike after awhile, as I have no home. I am just staying with a family and cannot get any work, and I would like very much to get in with somebody that owns something and be right with them and learn a trade. There ought to be someone, for Chicago is a big place. If you can satisfy my wants I will live to pay you for it some day. Hoping to hear from you with a good interesting letter. I remain, yours truly, Myles Johnson, 704, 3rd St., Moundsville, W. Va.

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Double value service **THE FOUNCIL**. Instant use ink or lead. Indispensable to the business world, the school and home. Traveling salesmen take note.

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One less article to carry. Gives new and practical features never before possessed by any single writing instrument; warranted 14-K gold best iridium points. Pencil part go'd mounted clutch device, holding varying diameter leads. Guaranteed. With each Founcil a box of four 2-lead leads and an ink filler. No. 2 Founcil, plain, \$2. No 4 Founcil, chased, \$2.50. Sent direct, postpaid.

Ore Specimens

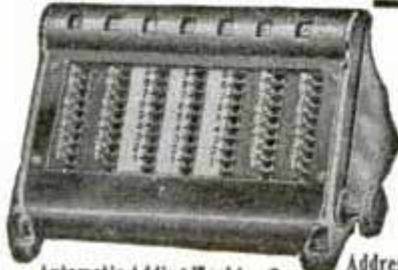
How many of the following ores could you recognize if you saw them?—Gold, silver, copper, iron, lead, zinc, tin, nickel, graphite, sulphur. Very few, if any. Let me send you these 10 specimens boxed, named and where found. Price 50 cts. (no stamps.)

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INVENTIONS—How to Protect, Sell and Buy Them

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\$15 "GEM" Adding Machine

Free 10 Day Trial at Our Expense Has an *Automatic Carrier* and a *Resetting Device* that clears the dial to zero. Does the work of high-priced machines, 2 years' *Written Guarantee*. Special offer to agents.

Automatic Adding Machine Co., Address E. GANGHER, 332 Broadway, N.Y.

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Tells at a glance postage in cents on all mail matter. Capacity, 1 pound by half ounces, 3 inches high. Cuts down the stamp bill. We make several styles for the office, store and large business houses, as well as the individual desk. Catalogue \$ free, showing 12 styles.

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"WONDER CANNON"

Automatic Photo Button Machine, this season.

ONLY \$30.00

cash required to start you in this profitable business.

Our \$30.00 outfit is complete and includes Wonder Cannon, Tripod, 1000 Plates, 1 gross Gilt Frames and enough Developing Powders for one month's work.

Our Cannon takes, develops and finishes Photo Button in 30 seconds, ready to wear.

No experience required. Can be set up in 20 seconds, ready to operate. A big money maker at Fairs, Carnivals, Picnics, or Celebrations. Sent upon receipt of \$5.00, balance C. O. D. Write for Free Circular.

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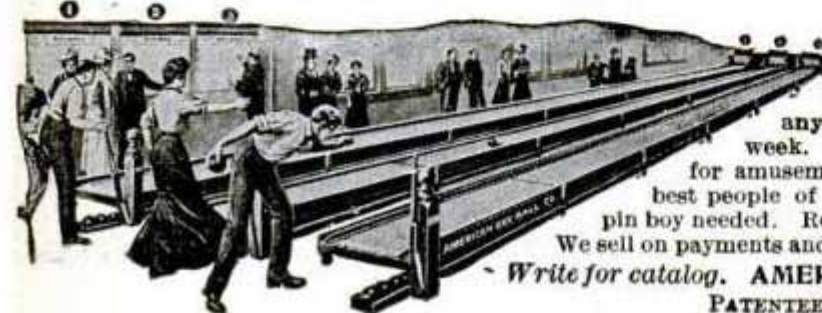
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START A MAIL ORDER BUSINESS AT HOME. Devote whole or spare time. We tell you how. Very good profit. Everything furnished. No catalog. outfit proposition. Write at once for our "Starter" and free particulars. P. M. KRUEGER CO., 155 Washington St., Chicago, Ill.

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Let us tell you all about this marvelous CIRCLING WAVE, and its wonderful money-making power. Address,

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A NEW FIRE BRICK.—An asbestos fire brick is now manufactured from asbestos rock which is to be found in the state of Idaho. The brick is sawed to the desired dimensions from the large rocks. Bricks cut from these rocks have been subjected to a heat of 4,000 deg. and then plunged in cold water, with the result that the brick has been made harder by the process.

Plant PENNIES and Grow DOLLARS

Pennies spent in common, ordinary, corner store sugar are stretched into dollars and lots of them, in a few minutes, if you have an

EMPIRE CANDY FLOSS MACHINE

The wonder of a wonderful century. For the past five years this EMPIRE has been the cynosure of all eyes—the magnet that has pulled the nickels, dimes and dollars from the crowds at fairs, race courses, court days, picnics, or anywhere a crowd has collected. And Profit? You can't help but make 3,000 per cent on every pound of sugar used. The record of a large number of users show as high as \$50 to \$60 a day profits. Ask for catalog 13.

EMPIRE CANDY FLOSS MACHINE CO.
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Ask also for special book describing Pop Corn, Peanut and Ice Cream Cone Machines. All Winners

Is the result from the operation of one American

Box Ball Alley in Sullivan, Ind. Why not go into this business yourself? It is the most practical and popular bowling game in existence. It will make big money in any town. These alleys pay from \$25.00 to \$65.00 each, per week. This is no gambling device, but a splendid bowling game for amusement and physical exercise. Liberally patronized by the best people of both sexes. Quickly installed, conveniently portable. No pin boy needed. Receipts are nearly all profit. Nearly 5,000 sold to date.

We sell on payments and our catalog is free.

Write for catalog. **AMERICAN BOX BALL COMPANY,**
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GEM JUNIOR Safety Razor

WITH
NEW
BAR

Bar and Blade

Two Great Features

The NEW BAR (Pat. No. 686,143) gives the GEM Junior Safety Razor a big advantage over all other shaving devices. Without it no safety razor of any make, at any price, can possibly do what it makes practical.

Almost any razor can shave on the level, but the face isn't level. With the NEW BAR the razor edge doesn't have to dig down into ruts after short, stiff hairs, but the skin is smoothed and the hairs raised to meet the coming blade. It makes a clean sweep of the bristles, and leaves the face smooth and comfortable.

We have been 30 years making the finest steel cutlery. The GEM Junior BLADE is one of the results of that experience. The steel is the finest known, and the rolling, tempering, polishing, and sharpening have been reduced to a science. The keen edge lasts, and when dulled can be renewed by stropping.

The NEW BAR and GEM Junior BLADE combined make this razor indispensable to men who shave.

The Complete One Dollar GEM Junior Outfit includes a handsomely finished silver-nickel-plated frame, extension and stropping handles, 7 selected blades of the finest steel, and a substantial case.

SET
COMPLETE
\$ **1⁰⁰**



If you don't care to strop, we will.
New Blades for Old, 7 exchanged for 25c.
EXTRA SET, 7 BLADES, 50c

See that you get a sealed package.

Don't take a substitute. If your dealer is behind the times, send us One Dollar and we will mail the complete GEM Junior outfit, postpaid, to your address.

Booklet "Shaveology" free on request.

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We are the original Modern Safety Razor Makers.

A Heating Plant For Your Home

SOLD DIRECT TO YOU AT MANUFACTURER'S PRICE

Don't say you can't afford a heating plant for your home until you GET OUR PRICES. They will surprise you—and we furnish plants in such convenient form that you CAN INSTALL THEM YOURSELF if you want to—or have a handy man to do it at day laborer's wages. It costs you nothing to have us make an estimate for you—and we not only save you about 50 per cent in the cost, but we **GUARANTEE SATISFACTION**. You take no chances. We write it in the contract that our plant will supply the temperature required in each and every room, and hold ourselves in readiness to supply, free of all cost, all materials, should it be needed to bring the plant up to our guarantee. Should the plant at any time within one year prove a failure, or unsatisfactory to you, we will refund the entire purchase price upon the return of the plant to us. We will make you (free) complete working drawings, showing the size of pipes to use at every part of the plant and how to place the fittings, so that you can't go wrong. We will cut all large sized pipe for the mains and will lend you an entire outfit of tools to do the work. You cannot get a better plant, even if you pay twice as much. It will pay you to write for our Information Blank. Then give us a sketch showing the arrangement of your rooms, or furnish us with the architect's plans, and we will figure out the exact amount of material needed, and our prices.



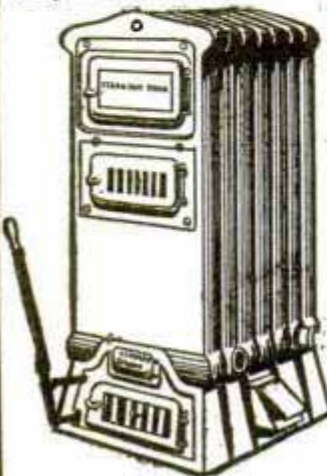
\$135 Is all it costs for a hot water heating plant for this 5-room cottage. 6 radiators. A total of 215 feet of radiation and a 400 foot, cast iron, sectional heater, together with all the necessary pipe and fittings; radiator valves, gold bronze, covering, and, in fact, every bit of material needed.



\$180 A first-class hot water heating plant, for this 8-room house for \$180. 8 radiators, a total of 300 feet of radiation, a 500 foot, cast iron, sectional heater, gold bronze, all the necessary pipe and pipe fittings, radiator valves, covering, and everything needed.



\$247 This large 11-room house supplied with all the material for a hot water heating plant for \$247. 475 feet of radiation in 11 radiators and a 700 foot, cast iron, sectional heater, gold bronze, and all the necessary pipe and pipe fittings, radiator valves, and covering; in fact, every bit of material needed.



weather. I expect to purchase quite a few plants from you this year to install in other houses. I also bought a pneumatic water supply system and bath room outfit with the necessary piping to connect it all up. I did all the work myself and the entire outfit works perfectly. Five to ten minutes' pumping twice a week supplies us all the running water we want. I think almost any man would be able to follow your plans and do the work.

WILLIAM GESSERT, Menominee Falls, Wis.

CENTRAL M. & S. CO., CHICAGO.

I am much pleased with the hot water heating plant, the pneumatic water supply system, the bath room outfit and kitchen sink that I purchased from you for my home. Every part of this plant is thoroughly satisfactory. We have extremely cold winters here but the heating plant heats the house perfectly. In purchasing this from you, I saved about \$400.00.

Very truly yours,
JOHN GASMAN, Bark River, Mich.

CATALOG No. 101 BARGAIN BUILDING MATERIAL, including bath room and plumbing supplies, heating apparatus, pipe and fittings, poultry netting, wire fencing, roofing material, etc.. **FREE.**

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Guarantee: The key note of our business is EVERY ARTICLE GUARANTEED AS REPRESENTED AND TO BE SATISFACTORY. Your money will be cheerfully refunded for any article not entirely satisfactory.



\$39.00 For this Complete Set of High-Grade Bath Room Fixtures
We Sell Direct to the Consumer

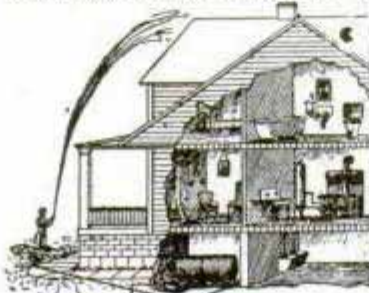
This is our No. 5 bath room combination, regularly listed in our catalog for \$45. We are making a special offer to readers of the Popular Mechanics on this of \$39. The Bath Tub is 5 ft. long, 30 inches wide, white porcelain enameled inside and over the rim, and is trimmed complete with full nickel trimmings. The Lavatory is cast iron, heavy white porcelain enameled and trimmed complete with full nickel trimmings. The Closet is high-grade, sanitary, vitreous syphon wash down bowl with polished oak copper lined tank and seat and cover to match. All parts high-grade.

This offer is for a limited time only!
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DON'T BE HELD UP for an exorbitant sum in order to possess these conveniences, for we will sell you the material at lowest wholesale prices. There is no mystery about the pipe work for plumbing.



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We will furnish you with a complete pneumatic or air pressure water supply outfit that will furnish you running water the same as city water works. Prices range from \$40 upward. We will furnish you complete house plumbing outfit like shown in this picture, including the pneumatic water supply system, the bath room outfit, the kitchen sink and range boiler and all the pipe and pipe fittings to install from \$125 upward.

It makes no difference—whether in a city, where you have running water and sewerage, or in the country, where you have to provide your own water system and dispose of your own sewerage, you can have these improvements. We will sell you all the material of all kinds needed, make you working drawings, and tell you how to do the work.

JUST SEND US A PLAN

of your house for our free estimate of all the material required to put in these modern conveniences.

READY ROOFING STEEL ROOFING

95 Cents per Square

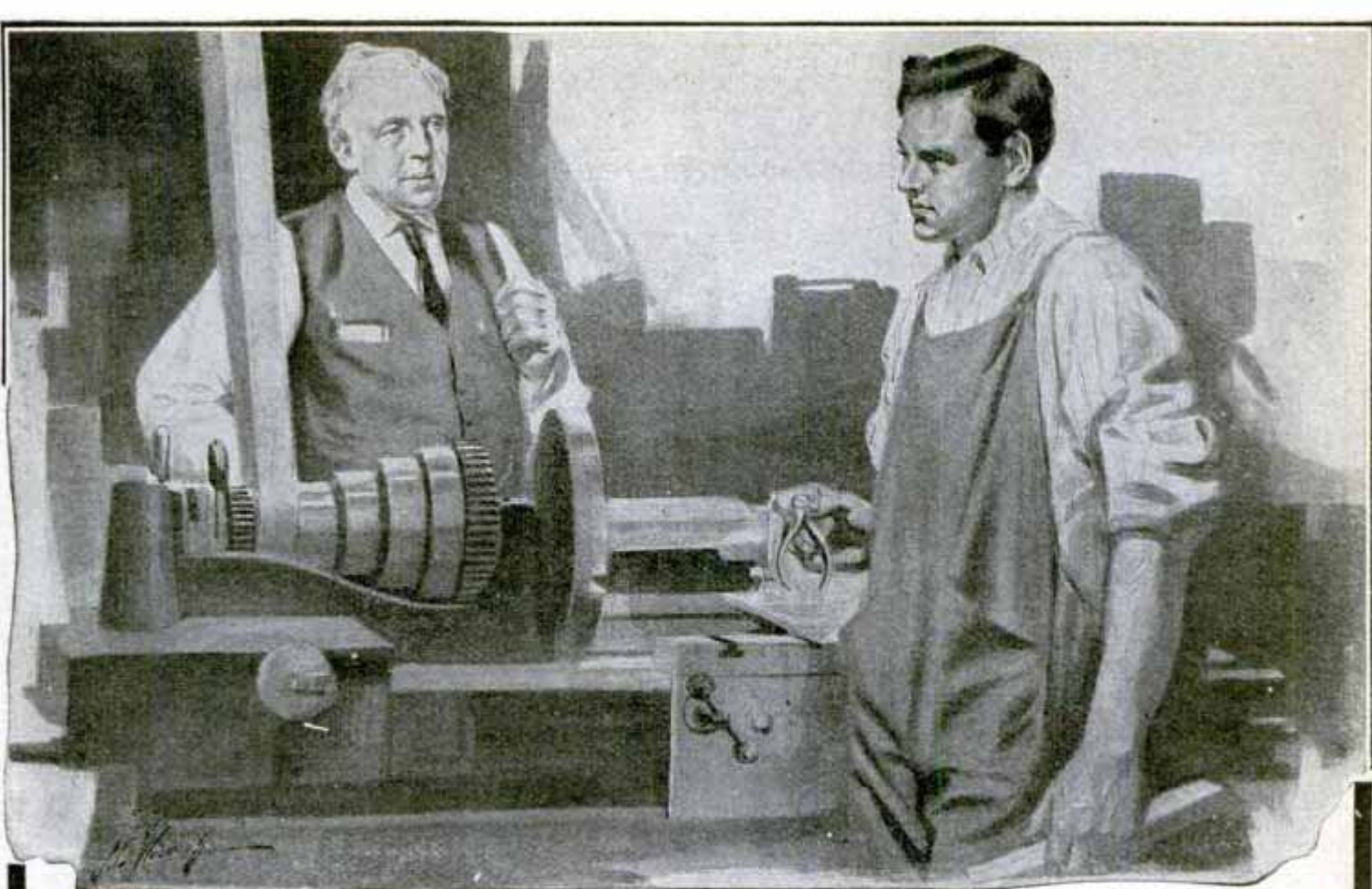
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We offer the entire lot of factory mill ends of prepared roofing strictly high grade, brand new, at less than cost of manufacture. There are from two to four pieces of galvanized rubber or asphalt roofing to each roll of 108 sq. ft. This is \$2 and \$3 grades of roofing.

Only \$1.50 per 100 sq. ft. Fifty thousand squares of steel roofing, size 2 feet 6 inches wide by 5 feet 6 inches long (30"x66 in.)

These sheets were used about 30 days in connection with the manufacture of soap. This material was never exposed to the weather and was never nailed. Every sheet is clean and free from nail holes and practically as good as new. **EXTRA HEAVY.** From 24 to 28 gauge.

PRICE FLAT, FOR 100 SQ. FT., . . . \$1.50
CORRUGATED, PER 100 SQ. FT., . . . 1.75



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If you are a little better than the other man — if you know more about your work than he does, do you suppose the boss will pass you by and promote the other fellow?

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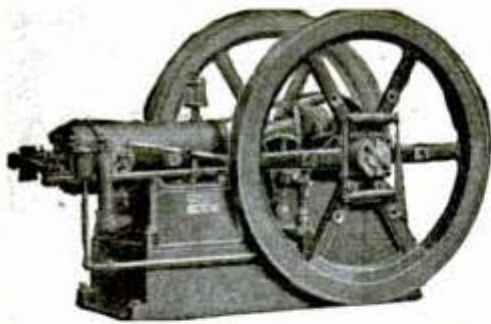
Please send me free Bulletin of engineering information and advise me how I can qualify for position marked "X."

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Before you buy an engine you should be satisfied that it can be depended upon in every way.

An engine that is frequently out of order when most needed,

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Save yourself time and money by installing a power plant built by a company that cannot afford to send out engines that fail to give perfect satisfaction.

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are built on such simple lines that an inexperienced person has no trouble in mastering their management. Thousands of them are at work today, their years of service telling of thorough efficiency.

Vertical in 2, 3 and 25 horsepower.

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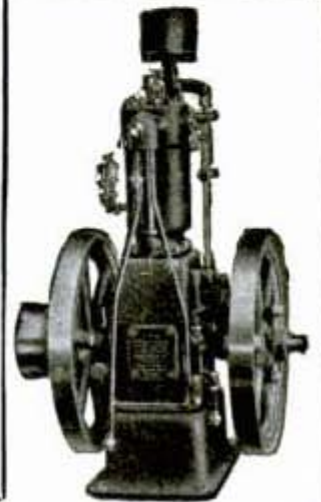
Also a complete line of Famous engines mounted on skids or ready for mounting by the purchaser.

Sawing, spraying and pumping outfits, and jacks.

Call on the International local agent for catalog and particulars, or write the home office. Valuable book, "300 Years of Power Development," sent on request.

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This book gives you the opportunity to study motors for all kinds of boats—the kind you have or want to own. It shows 1, 2 and 3 cylinder engines from 3 to 25 HP. It gives you the opportunity to investigate before you buy, not after you have found you have made a mistake.

Ferro motors are used the world over—more were sold last year than any other 2-cycle engine. We want to show you what cannot be told in a magazine advertisement—the many advantages of the Ferro

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Besides our regular line we are building 5,000 special 3-HP. motors to sell at a low price, \$60 the lowest ever made on a good motor. Latest design, best material and workmanship. Just the motor for launch, dingey, canoe or auxiliary yacht. Quantity brings down the cost.

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SINTZ-WALLIN CO.

Grand Rapids, Mich.

THE LATEST WRINKLE.—Anglers are a conservative lot, and very slow to avail themselves of the latest developments of science, says the Fishing Gazette. The mechanical live bait which swam round and round like a submarine was a dead failure, and the numerous inventions for giving fish an electric shock the moment they seize the bait never seem to have come into general use. Now, Le Pecheur tells a story of a man who was found sitting by the waterside with a swagger rod and the latest thing in landing nets. The rod was held in the usual fashion adopted by float fishermen, but of line there was no vestige to be seen. Someone came up and asked him what he was doing. "Fishing!" was the answer. "But you haven't got a line." "Well, what of it? I suppose you've heard of wireless telegraphy? Well, this is the same principle applied to fishing. In fact, lineless angling." "Yes, I see. But how do you find it answers? Do you catch more fish than you did in the old way?" "Well—not exactly more—but quite as many!"

DETROIT MARINE BATTERY

NO. 2 DOUBLE SET \$7.00

NO. 1 SIZE \$3.75



Hot sharp spark at all speeds. Not effected by moisture. Increases the power of the engine. Packed in water tight steel case. No short circuits. Thoroughly insulated. No chemical leaks. Runs in any position. Most reliable and cheapest battery on the market for all gas or gasoline engines. Write for descriptive circular and catalog of supplies.

DETROIT ENGINE WORKS.

Special Accident-Health Insurance

SEND NO MONEY

CLIP THIS COUPON ATTACH TO LETTER PAPER • FILL OUT • AND MAIL WITH YOUR PHOTOGRAPH

Protect Yourself—accidents will happen—sickness occurs—your income stops—yet living expenses and doctor's bills must be paid. Would your family need money if you were killed, injured or taken sick today? Every man or woman between the ages of 16 and 70 years, regardless of occupation, can be protected by the best limited Accident-Health Insurance policy in the world—**\$2000.00 for Accidental Death—\$15.00 Indemnity (5 weeks) for Accidents—\$15.00 Indemnity for Sickness (5 weeks for 30 Common Diseases)—\$100.00 Emergency Fund for Hospitals, Doctors' Bills, Railroad and Sleeping Car Fares, etc.**

We Are the Exclusive Sales Agents for the Above Contract.

All policies are issued and losses paid by the following old line Accident Insurance Corporations;

North American Accident Insurance Co., Chicago, Ill.
\$629,069.47 Assets. \$460,323.13 Surplus.

German Commercial Accident Insurance Co., Philadelphia, Pa.
\$215,709.51 Assets. \$192,374.92 Surplus.

All losses paid direct—no divided responsibility.

We also issue to each policy holder, without extra charge, one perfect

"Identification-Credential-Pocketbook" Patent No. 467460

which displays owner's signature, personal description and photograph. Accepted and endorsed by Banks, Hotels, Telegraph, Express, Post Office as an aid in cashing checks, drafts and money orders.

Our Offer In order that you can read the \$2,000 Accident-Health Insurance policy and inspect the fine leather pocketbook and identification-credential, we will send the contract complete to any bank, where you can call and examine the same and if satisfactory pay the annual premium which is only **\$5.00 per year (no dues—no assessments)**. If not satisfactory the bank will return the contract to us and at our expense.

All that is necessary is to clip out the coupon, attach it to a sheet of paper, write the answers to the questions and mail it to us with your photograph (cabinet or postal photo preferred) but **send no money**.

IDENTIFICATION COMPANY OF AMERICA (Incor. 1900) 131 La Salle Street, Chicago

1. Name?
2. Address?
3. Occupation?
4. Age?
5. Height?
6. Weight?
7. Color of hair?
8. Color of eyes?
9. Scars or marks?
10. Name of Fraternal Order or Lodges to which you belong?
11. Name and address of beneficiary?
12. Name and address of Bank to whom this contract is to be sent for examination?

Notice.

No medical examination required. Write your name and address on back of photograph; it will be returned to you promptly in good condition.

10 Years of Successful Business.

Make a Motor Boat of Any Boat in Five Minutes



You can do it with the Waterman Outboard Motor, which you can quickly attach (and detach) to the stern of any skiff, row boat, dinghy, punt, sail boat, and have a good motor boat. It is not a toy, but a reliable 2 H. P. Marine Motor that will drive an 18-foot row boat 7 miles an hour, 4 hours on gallon gasoline. Simplest motor made. Weight 40 lbs. Equipped with Schebler Carburetor. Four years' successful results behind it. Send for Catalog C.

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Waterman Marine Motor Co.
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Exceptional Business Opportunity

\$5.00 to \$15.00 Per Day

has been made printing business and calling cards, etc. Drug and department stores, shop windows, parks and fairs offer good locations.



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CASH required. Start a business of your own. No experience required.



The original Automatic Card Printing Press. Size 12 x 21 x 24 inches. Prints 120 cards a minute. \$75.00 cash and \$25.00 per month for 8 months, buys the greatest modern money maker, including automatic self-feeding and inking card press, 14 fonts standard type, ten drawer type cabinet, 10,000 blank cards and full assortment of tools, etc. FREE—Our new catalog. Tells what others have done. **AUTOMATIC PRINTING PRESS CO., Originators and Manufacturers. 177 Dearborn Street, Chicago.**

DUBRIE MARINE MOTORS

Use Kerosene, Distillate or Gasoline

Gasoline Motors

Thousands of these are in use in Speed Models, Livery and Fishing Boats. They start easily, are always ready. Wonderful economy of fuel, dependability, bulldog persistence and a reasonable price for a strictly high-grade product, have made these motors intensely popular with those who know values. Made in ten sizes—2½ to 27 horsepower—one, two and three cylinders.

Ask for descriptive catalog.

Kerosene Distillate or Gasoline Motors

Because of our vaporizing device, kerosene and distillate may be used in the Dubrie kerosene motor. A pint of kerosene per horsepower keeps you going full speed for an hour. There's more power in kerosene or distillate. It's

vastly cheaper. None of the fuel can escape to cause odor or fuss. These engines always start easily and run smoothly and persistently. They cost but little more than the gasoline motor, and far less than other kerosene motors.

Made in all sizes from 4 to 27 horsepower—one, two and three cylinders. Our catalog gives all details. Ask for it.



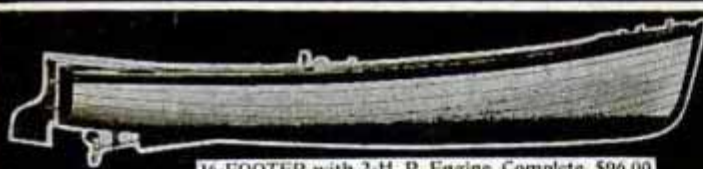
Big Introductory Boat Bargain

The hull alone is worth more than we charge for this speedy boat, fully equipped and ready to run. It is 18 ft. long; seats 10 passengers comfortably; has Dubrie 6 horsepower gasoline engine; 16-in. propeller with reverse gear. Speed (actual) 9½ to 10 miles per hour.

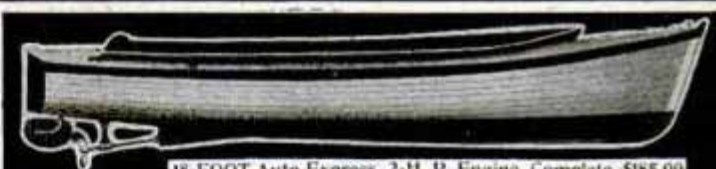
Write quick, if you are interested, for the number of these boats is limited.

\$225 Complete—Ready to Run

DUBRIE MOTOR CO., 425 Guoin Street, Detroit, Mich.

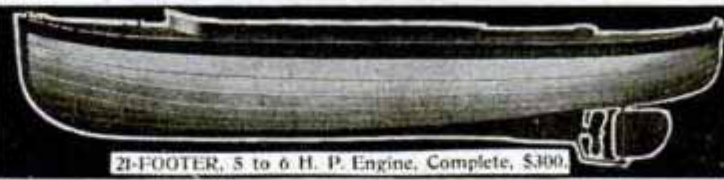


16-FOOTER with 2-H. P. Engine, Complete, \$96.00



18-FOOT Auto Express, 2-H. P. Engine, Complete, \$185.00

WE are the sole owners of patents for the manufacture of rolled steel, locked framed, concealed rivetted steel boats. Don't confound these boats with cheap stamped steel boats with exposed rivets and lapped seams. If you are in doubt as to the strength of Michigan Steel Boats, write us for testimonials received unaltered from lively men who have used our boats, and sample of our luck seams which will speedily convince you that we have the staunchest boat made.



21-FOOTER, 5 to 6 H. P. Engine, Complete, \$300.

L. S. CASPHELL, of Tampa, Fla., writes: "In the summer of 1914 I got a 21-foot boat built from you in the shape of the old Union and became an avid motor boat and the very next month, in a race with another boat, I would like to say that the boat has been an all right one since I received her. She proved well in every way and she was a great asset at one place, that the boat was built in any way made the slightest mark on her, they are built the best. There is no boat here in my knowledge built like the Michigan Steel Boat and engine in the power output to me the boat, I would like to know if there is any boat and person that has not run on my boat, if not." All boats fitted with water-tight arrangements, to prevent sink. Look up my boat when you are in the water, you will see it in the water, and it is a great asset at one place, that the boat was built in any way made the slightest mark on her, they are built the best. There is no boat here in my knowledge built like the Michigan Steel Boat and engine in the power output to me the boat, I would like to know if there is any boat and person that has not run on my boat, if not. Write them from the company from the office of all of us from water.



14 FOOT "B" ROW BOAT, 1 PR. OARS, Complete, \$28.80



12 FOOT "F" ROW BOAT, 1 PR. OARS, Complete, \$20.00

16-foot Launch \$96.00
18, 21 and 25-Foot at Proportionate Prices

All Launches fitted with Detroit Two-Cycle Reversible Engine. Starts without cranking--has positive speed control, only three moving parts piston, connecting rod and crank shaft. White bronze bearings,



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Over 40 Different Styles to choose from.
ON HAND AND READY TO SHIP

ROWBOATS, \$20.00 AND UPWARDS

We are the largest manufacturers of Pleasure Boats in the world and carry in stock several thousands of each style boats so that orders can be filled the day they are received if necessary. Every boat and engine guaranteed and thoroughly tested before shipment, insuring a perfect working outfit. MICHIGAN STEEL BOATS need no boat house, can be left out on the beach for months at a time and when put back in the water are perfectly water-tight, as they don't crack, check or rot and are impervious to the effects of the weather. One Boat Livery has 125 of our Special Livery B 14-foot square stern rowboats in use. They are money makers and a source of comfort and pleasure to all who use them. They propel with one-third less power than other boats of the same size, are lighter and more buoyant, more seaworthy, longer lived and better in every respect. Send for FREE CATALOG and description of the trip taken in a Michigan Steel Boat through the Canyons of Colorado and Arizona. The only boat that ever successfully completed this trip.

WRITE US FOR LIST OF USERS OF OUR PATENT STEEL BOATS

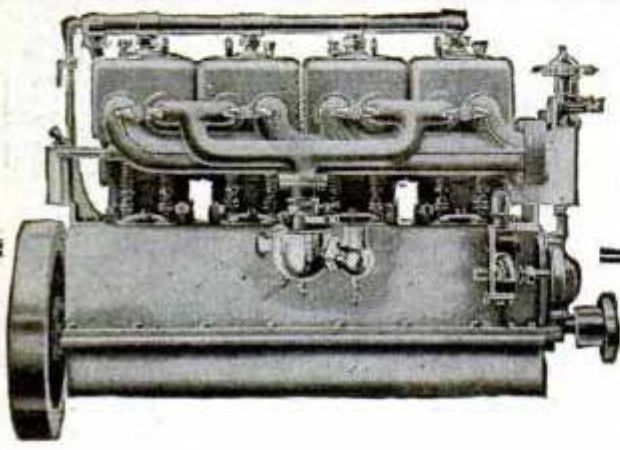
MICHIGAN STEEL BOAT COMPANY, 1271 Jefferson Ave. Detroit, Michigan, U.S.A.

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SCRIPPS MOTORS have proven their superiority over and over again in races and contests, but their popularity is not due to their wonderful possibilities in speed contests, but on account of their reliability and smoothness of running in every day service.

SCRIPPS MOTORS are equal in workmanship and material to the finest automobile engines made. They are all of the four-cycle type, which in automobile and marine practice has proven its superiority. SCRIPPS MOTORS can be had in any desired size and power, from 4 to 100 H. P., one to six cylinders. Our handsome catalog sent on request, tells what SCRIPPS MOTORS are and what they have done. SCRIPPS MOTOR CO., 650 Lincoln Ave., DETROIT, MICH. New York Agents, Neptune Marine Construction Co., 1133 Broadway



The Strelinger

4 CYCLE 1-6 CYLINDER

For over 12 years the name "Strelinger" has stood as the best in marine gasoline engines. A distinct success. First quality from flywheel to propeller. Strong, sturdy, RELIABLE, speedy, troubleless. The engine that **ALWAYS Makes Good** because built right. Famous for endurance, fuel economy, power. Pulls steady, smoothly, quietly, minimum vibration. From 4 to 100 H. P. Our Free Catalog lists engines from \$35. up to \$2500. Write for a copy.

Enclose 10c for nickel-plated pocket marine compass.



STRELINGER MARINE ENGINE CO.
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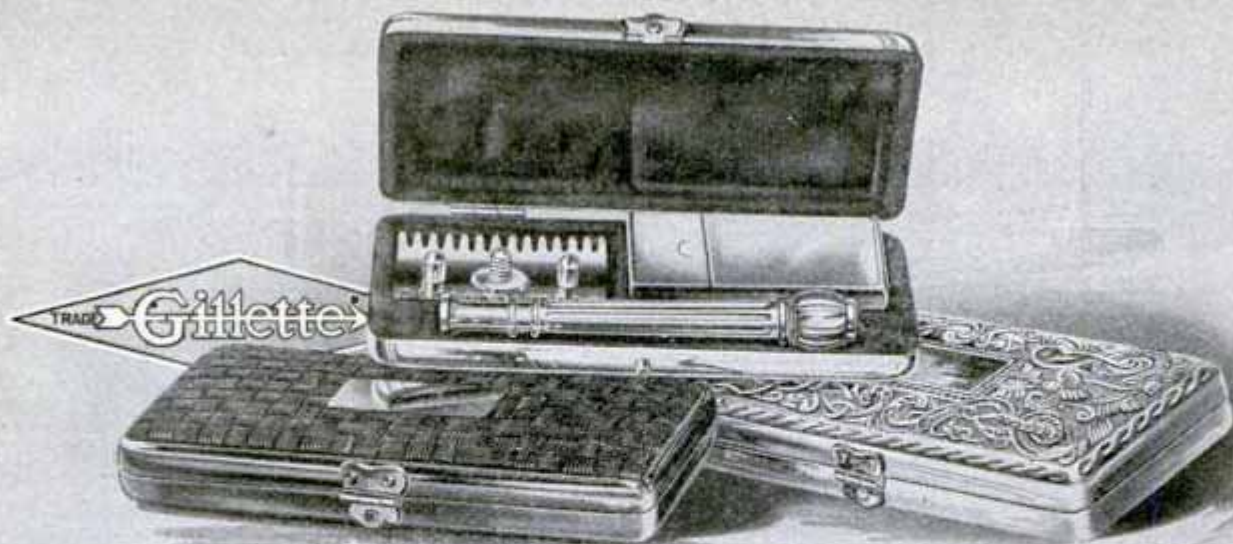
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GASOLINE MOTORS

Pushes your boat like a giant--takes up room of a dwarf. Most powerful engine of its size built. Simple, speedy and sturdy. Two-cycle--two and three port; equipped with our patented force feed lubricating system. 2 TO 16 H. P. **\$40 UP** Catalog FREE. Send 10 cents stamps for "Ignition and Vaporization," the handiest booklet ever issued for the benefit of gasoline engine users.

UNITED MFG. CO.
175 W. Woodbridge St., Detroit





Gillette Safety Razor

New Pocket Edition

HERE is news indeed—for the two million men who shave themselves every morning with the Gillette Safety Razor.

Our first announcement of the latest GILLETTE achievement—the *New Pocket Edition*—the GILLETTE Safety Razor in such compact form that it can be carried like a card case in the waistcoat pocket, or slipped into the side of a traveling bag.

Same size blade as before, same principle; but neater, more workmanlike, the most perfect shaving imple-

ment in the world—as compact and as beautifully finished as a piece of jewelry—and the blades are fine.

If you are a GILLETTE user call on some progressive dealer at once and examine this new razor.

If you have never used the GILLETTE now is the time to get acquainted.

You can shave yourself in from two to five minutes with the GILLETTE—a clean, satisfying shave. *No stropping, no honing.*

The pocket-case is of gold, silver or gun metal. Plain polished or richly engraved in floral and Empire designs. Inside the pocket-case are *handle and blade box*—triple silver-plated or 14K. gold plated. Prices, \$5 to \$7.50, on sale everywhere.

You should know GILLETTE Shaving Brush—a new brush of GILLETTE quality—bristles gripped in hard rubber; and GILLETTE Shaving Stick—a shaving soap worthy of the GILLETTE Safety Razor.

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Chicago, Stock Exch. Bldg.
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Gillette Safety Razor
NO STROPPING NO HONING

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IT'S FREE—ASK FOR IT

A new method of laying roofs without cement and large headed nails. No more trouble with leaks or dauby cement and unsightly roofs. The wonderful merit of "Green Flag Roofing," combined with the only perfect system of laying ever discovered, is a fact you cannot afford to miss in arranging the roof of your building. Don't let your dealer talk you out of this. Insist on the "Kleet" device. It costs you nothing to have it with your roofing if you use "Green Flag" brand. In this way you get the best roof and the one perfect method of laying at a price so reasonable it will astonish you. It was our good fortune to give the public "GREEN FLAG ROOFING," the best Ready Roof ever manufactured. There never was invented a method for laying a roof that insured the seams against leaks nor against the destruction of wind and weather.

until now. **WE CONTROL THIS INVENTION AND OFFER IT TO YOU WITHOUT COST.**

The builder has always been confronted with this problem which has baffled the ablest experts. Before you make any arrangements for your roof, let us tell you all about this discovery. We will also mail you free, a sample of "Green Flag Roofing." It is adapted to any kind of a roof, from a henhouse to a mansion. Don't wait—don't do anything until you know about this. Write today. It won't cost you a penny nor obligate you in any way.

Ask for Free Samples of "Green Flag Spar" Roofing—Fire, Acid, Fume Proof, Needs no coating at time of laying or afterwards. Has the new "Kleet" device for laying.

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Pulley Covering Machine



The only perfect one in the market! Adjustable to any size pulley. Does the work quickly and neatly. Covering is riveted at one end, drawn around pulley and secured in clamp. Pressure on lever turns pulley, tightening and stretching covering, which is then riveted without removing pulley and a perfect joint made. Practical, simple and durable. Patentees desire to arrange for manufacture of same upon royalty or will sell patent. Write for prospectus and full particulars.

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Very Easy Terms

SIGN WRITER PRESS COMPLETE.

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Including three sizes metal type, 500 blank cards size 5x6 to 10x18 in., 2 inking rolls and plates, 2 tubes best ink, black and red. A practical machine size, 20x20x8. Weight 68 lbs. Shipping weight with complete outfit 150 lbs. Every merchant daily needs attractive display signs, cards, and price tickets for store and window advertising. Press prints any size card to 18x28 inches. Two or more colors printed at one time. No experience necessary. Easy payment terms, \$25 cash, \$10 per month for three months. Free catalog.

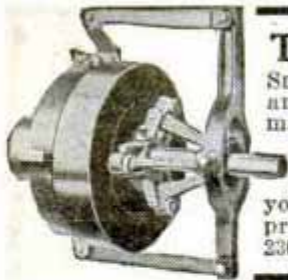
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Magic Lanterns with the Alco-Radiant Light



The Alco-Radiant is the only practical, brilliant light for Lantern use where electricity is not available. It burns alcohol, costs little to use and but a trifle to buy; weighs 3 lbs; adaptable to any lantern. We also make electric and calcium lanterns, cinematographs and Reflectoscopes for showing post cards, engravings and cuts. We rent specially arranged Lantern Slide Entertainments and carry over 40,000 Lantern Slides for sale or rent. Send for lists stating your requirements.

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Triumph Reverse Gear

Small, compact and light, yet strong and powerful. Highest grade workmanship and material. A gear that is perfectly balanced and gives instantaneous action. So simple in design, that you can install it yourself. Write for "1909" catalog and prices. **TRIUMPH GEAR CO., 230 Abbott Street, Detroit, Michigan.**

W. B. Bennett

A RUBBER STAMP of your own signature just as you write it. Material does not exceed 5c per stamp. 30-day offer: For this ad. and 25c. full instructions will be sent how to make. Answer at once, and start to work. Address

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WATKINS' SPECIAL MOTOR

3 HORSE POWER—30 Lbs.

Aluminum base, copper water jacket, steel shaft, bronze bearings, special carburetor.

IN A CLASS BY ITSELF HAS NO COMPETITION

Made in large quantities, therefore price right. Especially adapted for Canoe or Light Boat.

THE WATKINS MOTOR CO.

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Reduces Gas Bills

Our Gas Controller stops that Blowing and Breaking Mantles and will actually save you 15% to 30% on every gas bill. We guarantee it.

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AGENTS WANTED

WRITE TODAY

Lasts a lifetime and needs no attention. No expense after attached. Drop a postal and let us send prices. References, any bank in Chicago.

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4 PANEL SCENES 50c

Reproductions of Water Colors, consisting of Woodland, Landscapes, River and Ocean Views. Sizes 4x14—6x14, on brown mounts. 4 colored reproductions of Archie Dunn's American Girl, 50c. With each order of \$1.00 includes a colored picture of the Composite American Girl. **LAKE ART CO., (Not Inc.), 925 Sherwin Avenue, CHICAGO, ILLINOIS**



Will you accept \$5⁰⁰ a day for your services?

Whatever your present employment may be—whether you are a man or or woman—this offer is open to you.

You can establish yourself in a **pleasant, profitable and permanent** business that will pay you more than \$5.00 a day at the start—and will pay you as much more as you care to make.

You can learn this business in **less than a week**—and make **good money** while you are learning it. You will have practically no competition.

You Take no Risk Whatever

You will invest no money in this business until you are **absolutely sure** you can earn the money at it. You therefore **run no risk** of losing money. You are paid well for all you do.

You know the principle of the vacuum cleaner. It sucks up dirt and dust from floors, carpets, rugs, furniture, walls, woodwork, etc., and takes all the dirt and dust out of the house—quickly, easily, economically.

It makes housecleaning the work of hours instead of the work of days—and it does the work ten times as thoroughly as any other method.

How The Business Increases

Every housewife who has a rug, a room or a house cleaned by this process, is so thoroughly satisfied that she tells her friends about it.

You get their orders. They tell their friends—and you get more orders.

You get the work month after month, season after season, year after year. The more customers you get—the more they get for you.

Duntley Standard Vacuum Cleaners

embody every principle and every improvement known in the vacuum cleaner business—and combine all these advantages in a portable machine, weighing about 50 pounds, that can be easily carried from room to room, or house to house.

You can take one of these machines into a residence and remove every particle of dust and dirt, from every room, without taking up carpets or rugs—without removing furniture—without taking down curtains or portieres—and do it in one-tenth time it could be done otherwise.

What This Invention Means

Before the invention of the Duntley Portable Standard Vacuum Cleaner, this work could only be done with a big, cumbersome, costly wagon apparatus—yet these wagon outfits earned for their owners immense profits.

The Duntley Portable Standard Vacuum Cleaner does the same work that the big wagon outfits do, and costs only a fraction as much originally and much less to operate. It will therefore, pay you far larger profits.

My Pay From Profit Plan

I want one good, earnest, honest, active man or woman in every city or town—no matter how small—where residences are lighted by electricity, to engage in the Duntley Vacuum Cleaner business, on the "Pay from Profit Plan."

I will establish you in business—show you how it is done—enable you to make good money while you are learning it—and assure you an income of at least \$5.00 a day.

Or, should you want a Duntley Standard Vacuum Cleaner for use in your own home, I will prove its value, its economy, and its necessity to you—and give you an opportunity to use it, at my expense.

Let me Prove These Truths

I do not ask you to invest one dollar. All I ask is that you fill out the coupon below, and let me prove to you the truth of every statement here made.

This offer is made to you—now—today—it is your great opportunity to start in a new business—in a coming business—in a profitable business—in a business of your own, that will grow bigger each year. Fill out and mail the coupon right now.

J. W. Duntley, President

Duntley Mfg. Co., 303 Dearborn St., Chicago

Fill out and mail this coupon today

J. W. Duntley, Pres., 303 Dearborn St., Chicago. P.M.

Dear Sir:—Tell me how I can earn \$5.00 or more a day with a Duntley Standard Vacuum Cleaner, on your "Pay from Profit Plan."

Name

Street and No.....

Town.....State.....

Occupation

Will you engage in business yourself?.....

Or, are you interested for use in your home?.....

Price

\$1.00 Each



CHANDLER'S ADDING AND SUBTRACTING SCALE

FOR MECHANICAL ENGINEERS, DRAUGHTSMEN, STUDENTS, ELECTRICAL ENGINEERS, CIVIL ENGINEERS, MACHINISTS, BOOKKEEPERS.

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The most efficient and simple calculator on the market. Made of celluloid, printed in plain figures and enclosed in handsome leather case and will fit the vest pocket. It is indispensable to the professional and business man who wishes to save time. The answers in addition and subtraction are given in fractions and their decimal equivalents insuring absolute accuracy. All chances of mistakes eliminated. Saves time—money—work. Sent prepaid with full instructions upon receipt of \$1.00. Satisfaction guaranteed.

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WHITE AS
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WITH A
DAMP
CLOTH

STYLE
ECONOMY



What Wears out the Collar?

The weekly soaking, soaping, boiling, rubbing, starching, ironing—all for one day's use. Cut this out, with the worry and expense.

Litholin Waterproofed Linen Collars and Cuffs

make you independent, and you can bank what you save. You look neat and stylish always, for LITHOLIN Goods follow the fashions closely. The same collar you have always worn, only waterproofed. Book of styles free on request.

Collars 25c.

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Always sold from a RED box.

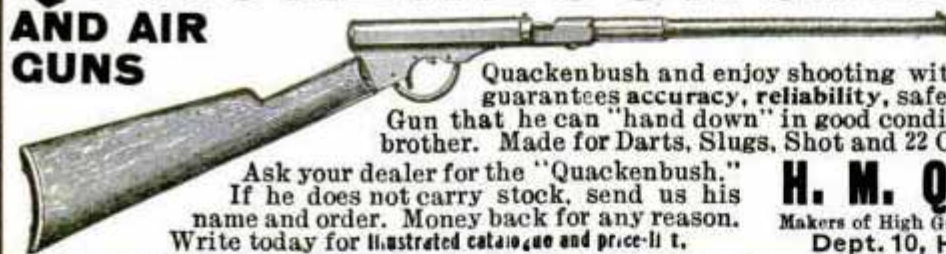
Avoid substitutions.

If not at your dealer's send, giving style, size, how many, with remittance, and we will mail, post paid.

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QUACKENBUSH SAFETY RIFLES

AND AIR GUNS



Quackenbush and enjoy shooting with him. The name guarantees accuracy, reliability, safety and a rifle or Air Gun that he can "hand down" in good condition to his younger brother. Made for Darts, Slugs, Shot and 22 Cal. Cart.

Ask your dealer for the "Quackenbush." If he does not carry stock, send us his name and order. Money back for any reason. Write today for illustrated catalog and price list.

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Makers of High Grade Air Guns for 85 Years
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\$8.50 COMPLETE OUTFIT

will start you in the ICE CREAM CONE BUSINESS anywhere. Fascinating, profitable, permanent work. Hundreds started with this \$8.50 outfit, now own factories. Make a small fortune in a single season. Machines with your own brand or name, no extra charge. Send for my free book—tells all about it, or send \$8.50 for machine and complete outfit.

A. T. Dietz, 100 Michigan, Toledo, O.



Just Turn The Faucet



and have the week's wash done in 1/2 the time, by water pressure.

No backaches or wash women! The "Simplex" works perfectly on pressure of 20 lbs. or more. A trial convinces. Sold complete—or separate motor to be attached to your hand machine for \$12.50.

AGENTS This motor sells because it WASHES cloths. New proposition, nothing like it. Women want it. Send for booklet and state territory desired. Now's the time, SIMPLEX WASHER CO., Milwaukee, Wis.

BEAVER BOARD

The Modern Wall and Ceiling Material. Made of pure wood fibre in panels. Uniform thickness—33 sizes. Nails direct to studding.

TAKES PLACE OF BOTH LATH AND PLASTER

Eliminates unsanitary wall paper. Susceptible to finest decoration. Descriptive booklet and sample free. Write today.

THE BEAVER MANUFACTURING CO., Perry St., BUFFALO, N. Y.



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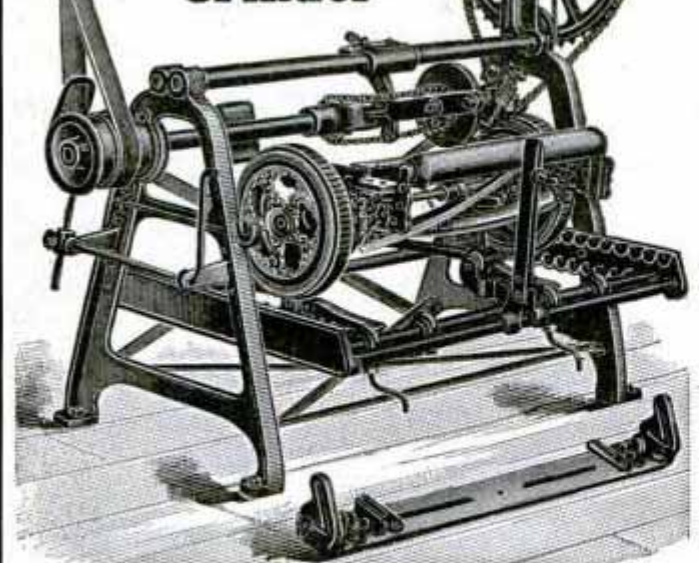
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LOBEE PUMP

Write for Catalog.

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Lawn-Mower
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Grinds the reel knife to fit either a crooked or straight lower blade—something never done before. Nothing like it on the market. Sharpens a mower perfectly in 15 minutes. The biggest money-maker you can have in your shop. Write for circular and price TODAY.

THE HEATH FOUNDRY & MFG. CO.
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CONCRETE

Sewer Pipe and Drain Tile
is the **BIGGEST MONEY MAKING** business for small capital and limited experience necessary to make a success that we know of.

We will prove it to you FREE

Just the business for the young man of push—as every community buys sewer pipe—and tile is used by progressive farmers everywhere. It pays for itself first year.

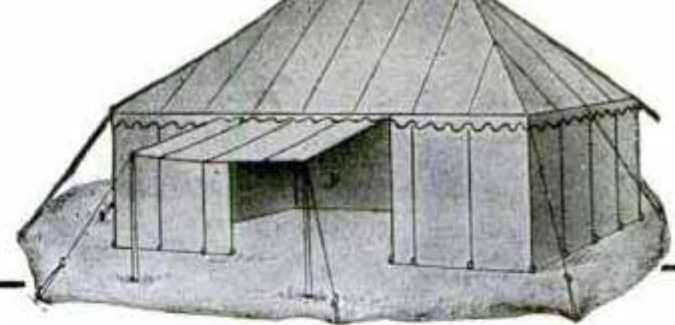
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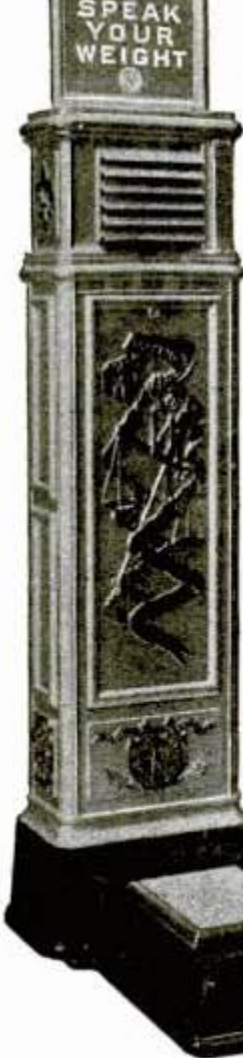
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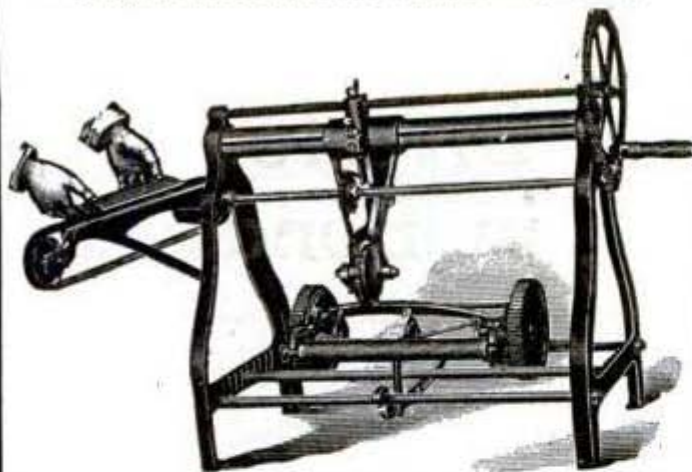
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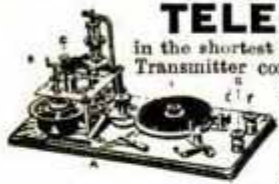
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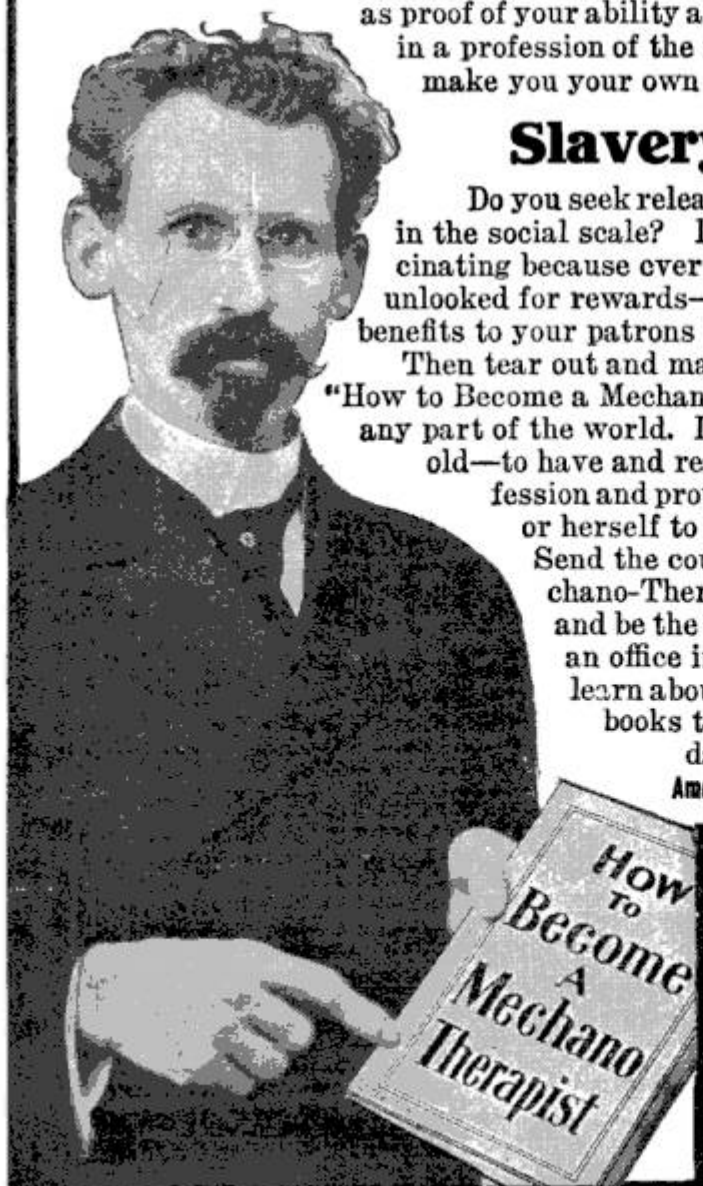
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Dear Sir: It gives me great pleasure to testify to the perfect cure I have gained by using your wonderful Shields. After suffering fifteen years with stomach troubles, although doctoring the greater part of the time, I kept getting worse, until I was the victim of a severe complication of stomach and kidney trouble, which a year and a half ago all seemed to go to my lungs. Had dreadful pains, lost my appetite, could not sleep, became so very weak I could hardly walk across the floor, and not able to do my work. At times, when my pains were not so severe, I would try to read, but could not for more than five minutes at a time, as I was very nervous. My family and friends thought I could not live another month. I was getting tired of taking medicine. Nothing helped me. I happened to see your advertisement in the paper, which read, "Magnetism Cures Without Medicine." I thought, "While there is life there is hope." So just one year ago today I put on your wonderful Magnetic Vest, Leggings and Insoles. The result was a miracle, for in two days I felt relieved; in a week, very much better; in three weeks, entirely cured.

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Here are a few of the hundreds of unsolicited testimonials from people who have used the White Cross Electric Vibrator and know what it has done. It will do the same for you.

PARALYSIS TREATED BY VIBRATION

Upon the request of my sister, who urged me to use her great Electric Vibrator on my son when I was thoroughly hopeless of his cure from physicians' treatment, I write you this recommendation. My son is 16 years old, and eight months ago became paralyzed from the after-effects of diphtheria. He was so badly afflicted that his arms and limbs were twisted out of shape and was confined, all doubled up, in his bed. Medicine and attention did no good, and I had become discouraged in all ways. After treating first his spine at the base and then his limbs with your vibrator he felt such relief that I kept up the treatment regularly, with the result that we soon had him around in a wheel chair. Next he was going around on crutches, and now, after three months' treatment, he is going around with a cane and will soon be entirely cured.

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Get this valuable free book at once. No matter how healthy you may be now, the time will come when you will need this book **badly**. It may save your life or the life of some of your loved ones. Learn all about our offer—the most astounding and generous offer ever made. Don't wait. Don't delay. Sign the coupon **NOW!**

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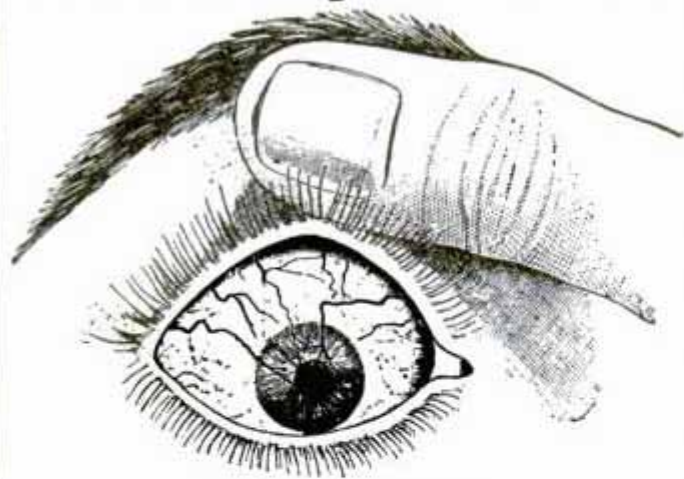
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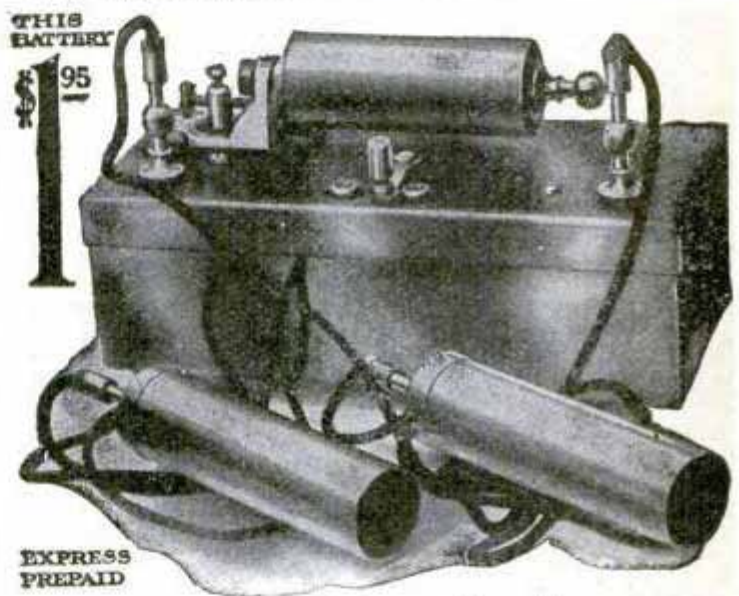
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