

JUNE

THIS ISSUE 141,000

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POPULAR MECHANICS

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PUBLISHED IN CHICAGO

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Artificial Production of Real Diamonds

Courts to Decide Whether Claim is Fake or Fortune

Strange Diving Machine to Harvest Sponges

Operates on Ocean Bottom Where Divers Cannot Work

Cannon to Shoot from London to Paris

Startling Claim of English Inventor Being Investigated by War Department

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Second Article on "How to Build Airships and Flying Machines"



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H. H. WINDSOR, Editor

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CONTENTS FOR JUNE, 1908

Sponge-Gathering Diving Machine.....	349	Blacksmith's Blower as Air Pump.....	375
A Wicker-Work Lifeboat.....	350	Egyptian Temples Submerged.....	376
Traction Machinery Livery Stable.....	350	Silage from Cured Corn Fodder.....	376
Photograph of a Steel Rail.....	350	Engine for Hauling Purposes Only.....	377
Elevated Train Wreck.....	351	Hanging Water Mains.....	377
From Rail Fences to Pencils.....	351	Cement Used for Mine Supports.....	378
Automobile Cab with Luggage Rack.....	351	The World's Finest Apartment Building.....	378
Ruins of the Chelsea Fire.....	353	Concrete Loggia on Side of Mountain.....	379
Lawn Cleaner.....	353	Repairing a Concrete Arch.....	379
Electrically Heated Bathrobe.....	353	An Improved Umbrella.....	379
Bleaching Negroes White.....	354	Street Car Crashes into Store.....	380
Across the Continent by Goat Team.....	354	Exact Time to Ships by Wireless.....	380
The Artificial Production of Real Diamonds.....	355	Building Airships and Flying Machines—	
New German Battleship.....	356	Part II.....	381
Hoisting a Mule Ten Stories.....	357	Cot Covered with Mosquito Netting.....	383
Huge Tibetan Trumpets.....	358	Street Baskets for Waste.....	383
"Battle Fleet" Kills Whale in Target		Steam-Driven Omnibus.....	384
Practice.....	358	Crossing-Bells Ring Only for Certain Trains	
Wrecking Windmills a New Industry.....	358	Motor Sleigh for Polar Expeditions.....	384
An Electric Lamp Socket that Locks.....	358	Puncture-Proof Ball-Bearing Tires.....	385
World's Challenge Cup for Aeroplanes.....	359	Signaling a Prisoner's Escape.....	385
Aerial Railway in Strawberry Field.....	359	Sash Retainers for Passenger Cars.....	385
Hat Pins from Genuine Rosebuds.....	359	Metals in a Battleship.....	386
Asbestos Shingles.....	359	Gasoline-Electric Railway Car.....	386
Path of the Full Moon.....	360	Widening the Suez Canal.....	386
Opium Secreted in Donkey Boiler.....	360	Gasoline Fishing Boat Equipped with Wire-	
Huge American Dredge for Egypt.....	360	less.....	387
Oil Motors for Small Boats.....	360	Weather Bureau Kiosk.....	387
The Death Roll of Industry.....	360	House Built of Bottles.....	387
Ice Gorge in Maumee River.....	361	Suspended Railway Projected for Berlin.....	387
Spring Automobile Wheel.....	361	New German Electric Automobile.....	388
Diving Suit with Laced-up Legs.....	362	Gas Lamp for Illuminating Roll Top Desks	
Extinguishing an Oil-Tank Fire.....	362	and Pianos.....	388
Indian Recruits Descending 18-Ft. Wall.....	362	Federal Bureau of Mines Demanded.....	388
Street Gas Lamps Lighted Automatically.....	362	A Portable Electric Elevator.....	388
Photographing the Discharge of Electricity		Largest Tea Warehouse in the World.....	389
from Human Body.....	363	Huge Screwdriver for Spiking Rails.....	389
Pasteboard Railway Engine as Fancy Dress.....	363	Frame of New Liner.....	390
The "Comet" Clock.....	363	Cuts and Sews at Same Time.....	390
Consumption of Cross Ties.....	363	Electric Fire Engines in Berlin.....	390
Concrete Dairy Building.....	364	Combustion Indicator for Firemen.....	390
Unloading Ocean-Going Vessels.....	364	Inventions of Man Imitate Nature.....	391
Windmill Signaling in the Netherlands.....	365	New Method of Embalming the Dead.....	391
The Aquatic Tournament.....	365	Vertically Folding Doors.....	392
Acetylene Lights Aid Fire Fighters.....	365	Niagara Lights Syracuse.....	392
Explosion at Natchez, Miss.....	366	Electric Campaign Cane.....	392
Where Anthracite First Was Burned.....	366	Camping Out on Top of a Skyscraper.....	392
Farman Makes Two-Mile Flight.....	367	Water Pumped by the Gas it Contains.....	393
A Grand Duke's "Gipsy" Wagon.....	367	Elevator Saved by a Terrier.....	393
Work on Panama Canal Stupendous.....	368	Cultivating Pearls in Mexico.....	394
Wireless Telegraphy Displaces Carrier		Bombay Platform Clocks.....	394
Pigeons.....	368	Illicit Distilling in Ireland.....	418
Handling Huge Slabs in Egypt.....	369	Inexpensive Concrete Bridge.....	418
Huge Single Casting.....	369	New Non-Inflammable Roofing Material.....	418
Giant Railway-Car Elevator.....	369		
Vast City Reservoirs Under Roof.....	370		
Huge Plants for the Storage of Coal.....	371		
Bamboo Suspension Bridge.....	372		
Heavy "Former" on Iron and Concrete Piers.....	372		
Boiler with Curved Water Tubes.....	373		
Electric Cannon to Shoot from London to			
Paris.....	373		
German Lightship "Fehmarnbelt".....	373		
Wooden Pipe Line.....	373		
The Workshop of a Great Hotel.....	374		
New Quick-Firing Gun.....	375		
French Method of Measuring Wind Pressure.....	375		

(Continued on Page 6.)

SHOP NOTES.

How to Make a Shop Gas Heater.....	395
A Handy Spout Runner.....	395
How to Turn Thin Tubes Fitted with	
Threads.....	395
Another Way to Make a Soldered Joint.....	395
How to Put a Line Over a Stack.....	396
Blown-Out Shots in Mines.....	396
A Handy Shellac Barrel.....	396
How to Transplant Plants.....	397

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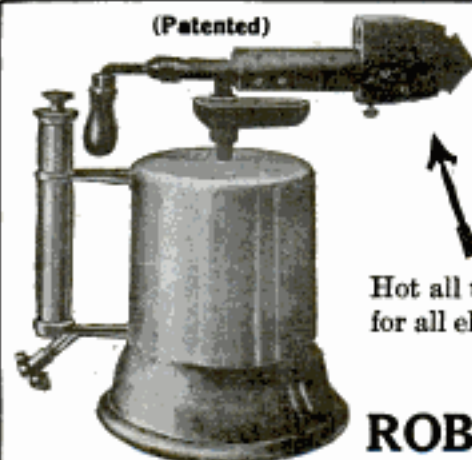
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CONTENTS—Continued

A Goose Hunting Boat.....	397	New Way to Store Gasoline.....	405
A Substitute for a Level.....	398	Quickly Made Oil Separator.....	406
How to Make a Socket Wrench.....	398	Things to Know About Wall Paper.....	406
Where the Heat Goes in a Gasoline Engine.....	398	A Home-Made Brazing Clamp for Band Saws.....	406
How to Clean Sediment from an Oil Can.....	398	Panel Designs.....	407
Etching on Steel.....	398	Substitute for a Hack-Saw.....	408
One-Pipe Radiator for a Bathroom.....	399	Lining Up a Generator and Water Wheel.....	408
Pattern-Makers Varnish Can.....	399	How to Make a Cold Dumb Waiter.....	409
How to Make a Belt Punch Gauge.....	399	How to Make an Ink Bottle Stand.....	409
A Handle for Corks.....	400	How to Repair a Moving Picture Film.....	410
How to Cast Wax in Plaster Molds.....	400	How to Paint Over Cement.....	410
Split Cotter Pins Used as Sliver Tweezers.....	400	Home-Made Power Windmill.....	411
Gas Engine's Speed Retarded by Improper Ignition.....	401	How to Drill Tapered Holes in Marble Slabs.....	412
Alarm Clock Switch for Window Lights.....	401	Home-Made Saw Set.....	412
Changing a Plain Gunstock into a Pistol Grip.....	401	A Measure on a Shingling Hatchet.....	412
Electric Signs on Automobiles.....	402		
A Soldering Iron Kink.....	402	AMATEUR MECHANICS.	
Unjointing and Removing Cast-Iron Pipe.....	402	Home-Made Workbench.....	413
How to Heat Turpentine.....	403	Forming Coils to Make Flexible Wire Connections.....	414
Pipe Coll Radiator Without Threads.....	403	Photographing the North Star.....	414
How to Handle Coils of Rope.....	403	How to Relight a Match.....	415
How to Make an Electric Wire Splice.....	403	Home-Made Hand Drill.....	415
How to Drive a Small Wire into the Ground.....	404	How to Make a Stationary Windmill.....	416
Measuring the Horsepower of Marine Steam Turbines.....	404	Electric Anaesthesia.....	416
How to Clean Engine Paint.....	404	A Simple Battery Rheostat.....	416
A Combined Window Shade and Awning.....	405	A Frame for Drying Films.....	417
How to Make a Temporary Stencil.....	405	A Home-Made Novelty Clock.....	417



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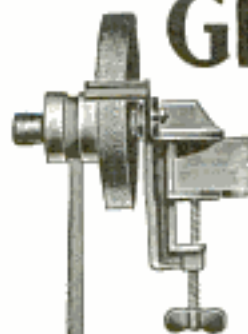
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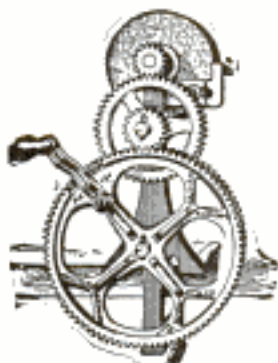
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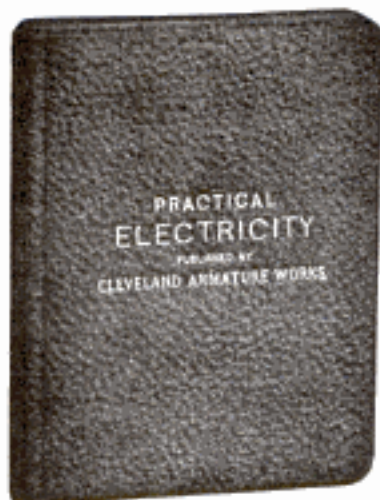
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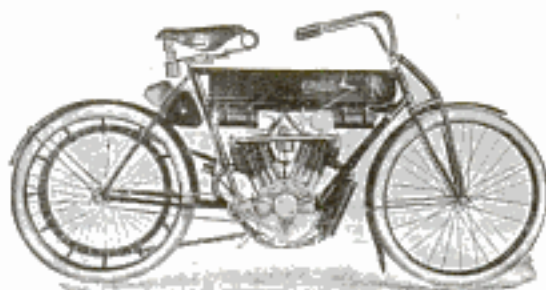
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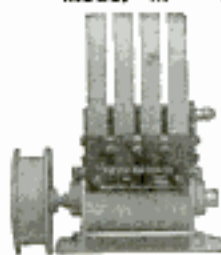
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The Earning Power of Money Invested in Kornit

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HERE is a Financial Opportunity to make an investment in an up-to-date, energetic, money-making, industrial manufacturing company, which owns its own factory, all the United States patents, processes and exclusive rights for producing Kornit, a product never before manufactured nor sold in this country. The demand for Kornit is great and the profit of manufacturing and selling is ENORMOUS. Read every word of this announcement and ACT AT ONCE.



CHARLES E. ELLIS.

THE STORY OF KORNIT

By President CHARLES E. ELLIS

KORNIT was invented by JOHANN GUSTAV BIERICH, a subject of the Czar of Russia, residing at Menkenhof, near Lievenhof, Russia, and is a homogeneous Horn or Hoof substance. Kornit is produced by grinding horn and hoof shavings and waste into a palpable powder and then pressing under heavy hydraulic pressure with heat into a homogeneous slab. This slab produces a substance which can be sawed or turned the same as ordinary wood. It is of a beautiful black consistency and is EXTREMELY VALUABLE as a NON-CONDUCTOR FOR ELECTRICAL SUPPLIES. It is a matter of record that the electrical industry in this country AT THIS TIME DOES NOT HAVE a satisfactory material for heavy or high insulating purposes. A slab of Kornit one inch thick was tested in Trenton, New Jersey, by the Imperial Porcelain Works and was FOUND TO HAVE RESISTED 96,000 VOLTS OF ELECTRICITY. It may be interesting to note here that the heaviest voltage which is transmitted in this country is between Niagara, Buffalo and Lockport, New York. The voltage transmitted by this com-

pany is between 40,000 and 50,000 volts. Kornit is equally as good as a non-conductor for electrical purposes and supplies as is hard rubber.

The average price of hard vulcanized rubber for electrical purposes is today considerably over one dollar per pound—at the present writing something like \$1.25 per pound. KORNIT CAN BE SOLD AT TWENTY-FIVE CENTS PER POUND, and AN ENORMOUS profit can be made at this price, so that it CAN EASILY BE SEEN that where Kornit is EQUALLY AS GOOD and AS A MATTER OF FACT, in many instances, a BETTER non-conductor than hard rubber, it can compete in every case where it can be used with great success on account of its price. For electrical panel boards, switchboards, fuse boxes, cutouts, etc., there are other materials used, such as vulcanized paper fibre, slate, marble, etc. A piece of vulcanized paper fibre 3x4x1 inch in lots of 1,000 brings 20 cents per piece. A piece of KORNIT of the SAME DIMENSIONS could be sold with the ENORMOUS PROFIT OF OVER 100 PER CENT at ten cents. The absorptive qualities of Kornit render it such that IT IS FAR PREFERABLE to that of vulcanized fibre. It will not maintain a flame. Of all the materials which are now in the electrical market for supplies and insulators there is, as we

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have stated above, none that are satisfactory. Kornit will fill this place. Its tensile strength per square inch averages from 1,358 pounds to 1,811 pounds, which the reader can readily see IS MORE THAN SATISFACTORY. This test was made by a well-known electrical engineer, who is now acting in that capacity for the United States Government, with a Standard Reible Bros. Testing Machine.

Waste horn and whole hoofs are being sold by the ton today principally only for fertilizing purposes. There is one town alone, Leominster, Mass., where they have an average of eight tons of horn shavings every day. These waste horn shavings are now only being sold for fertilizing material. These eight tons of horn shavings manufactured into Kornit and sold for electrical purposes would easily bring \$3,000. At this price it would be



MR. JOHANN GUSTAV BIERICH, THE INVENTOR OF KORNIT, IN HIS SUMMER GARDEN AT MENKENHOF, RUSSIA.

selling for less than one-fifth of what hard rubber would cost, and about one-half what other competitive materials would sell for, even though they would not be as satisfactory as Kornit.

Kornit has been in use in Russia about five years. In Riga, Russia, which is the largest seaport town of Western Russia, the Electrical Unions there are using Kornit with the greatest satisfaction, finding it preferable to any other insulating material.

The expense of manufacturing Kornit from the horn shavings is not large, as the patentee, Mr. Bierich, has invented an economical and satisfactory process which produces an article that in the near future will be used in the construction of almost every building in this country.

Besides electrical insulators, Kornit can be used for the manufacturing of furniture, but-

tons, door handles, umbrella, cane, knife and fork handles, brush and sword handles, revolver handles, mirror backs, picture frames, toilet accessories, such as fancy glove boxes, jewel cases, glove stretchers, shoe lifts, etc.; office utensils such as paper knives and penholders, ink stands, pen racks, medical instruments such as syringes, ear trumpets, etc., etc.; pieces for games, such as draughts, chessmen, dominoes, checkers, counters, chips, cribbage boards, etc.; telephone ear pieces, stands, etc.; piano keys, typewriter keys, adding machine and cash register keys, tea trays, ash trays, scoops, mustard and other spoons, salad sets, cigar and cigarette cases, cigar and cigarette holders, match boxes, automobile supplies and hundreds of other useful and ornamental articles, all at a large and remunerative profit.

The Great Demand for Kornit in this Country

THERE is one manufacturer ALONE here in New York that uses 60,000 square feet of insulating material for panel boards every year. He is now using slate and marble, but IT IS NOT SATISFACTORY, for the reason that in boring and transportation IT BREAKS SO EASILY. KORNIT WILL ANSWER THE PURPOSE OF MANUFACTURING PANEL BOARDS VERY MUCH MORE SATISFACTORILY. On 60,000 square feet of Kornit there would be a net profit of over \$30,000, or 50 cents for every square foot used. THIS ONE EXAMPLE is cited to show you THE ENORMOUS PROFITS which can be made. There are a great many other panel and switchboard manufacturers in this country. You may be interested to know that a panel board is a small switchboard. There is one or more on every floor of all large buildings where electricity is used. They each have a number of switches mounted on them, so that those in charge can turn certain lights on or off, and by these panel boards all the electrical power in the building is controlled. They must be of a reliable non-conducting material. Kornit can be used for this purpose almost exclusively. The largest electrical manufacturing concerns in Riga, Russia, ARE USING KORNIT FOR THIS PURPOSE, after having tried all other so-called non-conducting compositions. The electrical trades alone can consume a great many tons of Kornit every day in the year. If only two tons of Kornit is manufactured and sold every working day in the year IT WILL ENABLE THE KORNIT MANUFACTURING COMPANY TO PAY 16 PER CENT. DIVIDENDS EVERY YEAR. Of course, if four tons a day are sold the dividends would be 32 per cent, per year. THIS IS NOT IMPROBABLE. AN EXPERT ELECTRICAL ENGINEER who holds one of the most responsible positions here in New York City made the statement, after thoroughly examining and testing Kornit for electrical purposes, that in his most conservative estimation there can be ten tons of manufactured Kornit sold every working day in the

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first year. This would mean that the Kornit Manufacturing Company would pay a dividend out of its earnings the first year of over seventy-five per cent (75%). This is probably more than will be paid the first year. But there certainly seems to be a good prospect of paying a large dividend within one year from today.

THERE WILL BE SUCH AN ENORMOUS DEMAND FOR KORNIT AFTER IT BECOMES INTRODUCED THAT FROM YEAR TO YEAR THE DIVIDENDS EARNED WILL BECOME LARGER AND LARGER. THIS IS THE BEST OPPORTUNITY TO MAKE AN INVESTMENT THAT YOU HAVE EVER HAD.

It is a well-known fact that **THE MOST LEGITIMATE and PROFITABLE way to MAKE MONEY** is by manufacturing some product that is "NECESSARY" and **ONE THAT CAN**

A New Factory Just Completed

ON March 1, 1907, our Factory, which had just been thoroughly equipped and completed, was burned to the ground!

Since that time we have purchased the Real-Estate and have completed **OUR OWN** Factory. It was finished and in complete working order on the 15th of last month (May). We have purchased the land and erected the building for which we paid cash. All of the machinery is paid for. Money is now needed to establish sales depots. After this money is obtained there will not be any shares sold at the present price.

A few shares obtained now may be the foundation for a fortune of the much-desired income for support in the unknown years that



NEW KORNIT FACTORY, NEWARK (BELLEVILLE STATION), N. J.

BE FULLY CONTROLLED so that nobody else can manufacture the same article. Look at Sugar (which is protected by a high tariff); at Standard Oil, the Telephone, the Telegraph, and we might go on and enumerate many more monopolies. **THEY ARE THE BIG MONEY MAKERS OF TODAY. KORNIT CANNOT BE MANUFACTURED BY ANYBODY IN THIS COUNTRY EXCEPT OURSELVES OR OUR AGENTS.** We own all the patents issued by the UNITED STATES GOVERNMENT to the inventor, MR. JOHANN GUSTAV BIERICH, IN RUSSIA. These patents **HAVE BEEN BOUGHT** from Mr. Bierich, and, **ARE DULY TRANSFERRED TO THE KORNIT MANUFACTURING COMPANY** and the same is **DULY RECORDED IN THE PATENT OFFICE OF THE UNITED STATES.**

are to come. We leave it to you if it would not seem good judgment to take immediate advantage of this opportunity. Anyway, please write me at once and let me know just what you will do. If it is not possible for you to take shares now, write me and tell me how many you would like and how soon it will be convenient for you to do so, provided I will reserve them for you. As soon as I receive your letter I will answer it **WITH A PERSONAL LETTER AND WILL ARRANGE MATTERS AS YOU WISH TO THE BEST OF MY ABILITY.**

REMEMBER, I HAVE A GREAT MANY THOUSAND DOLLARS INVESTED IN THE KORNIT MANUFACTURING COMPANY, and the minute you buy a share or more in this Company we become **CO-PARTNERS as CO-SHAREHOLDERS.** It is for our mutual bene-

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fit to watch and guard each other's interests. I WILL BE GRATEFUL IF YOU WILL WRITE ME TODAY, so that I may know just what you will do.

I know you will agree with me that you have never had presented to your notice a better opportunity to make an investment where such large profits can be made because of the exclusiveness of control and the great demand and the low cost of the raw material, which is now almost practically thrown away. Join me in this investment, and I assure you that it is my sincere belief that in the near future you will say, "That is the day I made the most successful move in my whole life."

My Offer to You While It Lasts

THE KORNIET MANUFACTURING COMPANY is incorporated under the laws of New Jersey, and is capitalized with 50,000 fully paid non-assessable shares at \$10 each. It is my intention at this time to sell only a limited number of these shares at the par value of \$10 each. We have paid cash for our Factory and all of the machinery, which was in the majority of cases built to our special order. It is now necessary for us to establish sales depots all over this country. This will take quite a considerable sum of money. And this is the reason I am willing to sell these shares at their par value. In my opinion they are worth much more and just as soon as our sales departments are in good working order not a share will be sold at this price. Now is the time to get into this concern, which has already spent thousands of dollars in Land, Factory Building and Machinery. You will get quick results. Every dollar which the Kornit Manufacturing Company receives from the sales of these shares will be put into the treasury of the company and used for development purposes. Ten dollars will buy one share. Twenty dollars will buy two shares. Fifty dollars will buy five shares. One hundred dollars will buy ten shares. One thousand dollars will buy one hundred shares, and so on. After you have bought one or more shares in the Kornit Manufacturing Company you may feel, as I do, that you have placed your savings where they will draw regular and satisfactory large dividends.

I should not be a bit surprised if these shares paid dividends as high as one hundred per cent in the not far distant future. Consequently, a few dollars invested now in the shares of the Kornit Manufacturing Company will enable you in the future to draw a regular income from the large profits of the Company as they are earned. The dividends will be paid semi-annually, every six months, the first of May and November of each year. This is one of the best opportunities you will ever have presented to you in your whole lifetime. I have invested a great many thousand dollars in the Kornit Manufacturing Company, and I feel sure it is one of the best investments I have ever made. I can truthfully say to you

that I fully believe that you will be more than pleased with your investment and that you will never be sorry. Remember, that you have here an opportunity to become interested in a large industrial manufacturing concern manufacturing a product with an exclusive monopoly, which has never before been manufactured or sold in this country.

Remember, that it is by no means an experiment, as it has been successfully manufactured and sold for over four years in Russia at a large profit, and the manufacturer and inventor recently wrote that the demand is increasing every day beyond the capacity of their manufacturing facilities.

Now is the time for you to take advantage of this magnificent opportunity to make an investment in these shares. I EARNESTLY BELIEVE that in a few years THESE SHARES WILL BE WORTH FROM FIFTY DOLLARS TO ONE HUNDRED DOLLARS each on account of THE LARGE DIVIDENDS which the company will earn and regularly pay each and every six months. It is a well-known fact that shares that pay fifty (50) to one hundred (100) per cent dividends will readily sell in the open market for \$50 to \$100. THE OUTLOOK FOR THE KORNIET MANUFACTURING COMPANY is such that it seems impossible for the earnings to fall far short of these figures. If the company only makes and sells two tons of Kornit a day for the first year and made a profit of only \$200 per ton it would mean a profit of over sixteen per cent (16%) the first year. If this business were doubled the second year, of course the earning capacity would double and the dividends would be over thirty-two per cent (32%). Prominent and well-known Electrical Engineers assure me that this product cannot help and is bound to make enormous profits. I would recommend that you send for as many shares as you wish at once. You, in my conservative opinion, can safely count on the large earning capacity of these shares. I will at once write you a personal letter with full information, and send you our illustrated book, "A Financial-Opportunity," containing a score of photographs of the Kornit industry, taken in Russia. Please let me hear from you.

Yours very truly,

CHARLES E. ELLIS

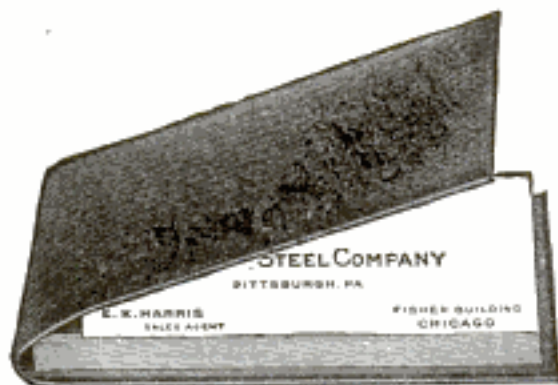
607A West 43rd St., New York City, N. Y.

Mr. Ellis, besides being President of this company, is also President of two other large and successful companies, owning shares therein valued conservatively at over \$250,000. Mr. Ellis has other investments in New York City real estate, bonds, stocks and mortgages to the amount of hundreds of thousands of dollars. Any bank or mercantile agency will tell you his guarantee is as good as gold. This is the successful man who wishes you for a Co-partner as a Shareholder and Dividend Receiver in his company. Remember, you will do business personally with Mr. Ellis in this matter.

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THE things most in evidence in any home are the woodwork, furniture and floors.

If these things look old, shabby or out-of-date, the home cannot be modern.

Are you perfectly satisfied with the appearance of your furniture, woodwork and floors?

If you are not, you can easily remedy matters yourself—you can do the work in your spare time—it's interesting, fascinating—the expense is trifling.

You can make a pine floor almost as beautiful as hardwood—you change old discarded furniture, making it handsome and modern in finish—you can change the shiny, harsh, always-marred varnish finish on any wood to the proper dull waxed finish.

The "Johnson Way" is the only way that is absolutely satisfactory and really simple and practical.

Wood stains dry so quickly that it is very difficult to apply them evenly—they show laps, light and dark spots and rub off—spirit stains and water stains raise the grain of the wood.

As for "varnish stains,"

stain and varnish, they produce a coarse, out-of-date, shiny finish and anyway varnishing requires expert handling—such preparations hide the beauty of the wood because they are too "thick" to penetrate the pores and they are a constant source of care and expense—they cannot wear well because every scratch and scrape takes them off the surface.

Anyone can secure the best results with Johnson's Wood Dyes and Johnson's Prepared Wax.

Johnson's Wood Dyes (in 14 shades) are really dyes—they do not coat over the wood—they color it because they are so prepared that they penetrate the pores—thus they accentuate the beautiful grain of the wood and give an unequalled richness and depth of permanent tone—a perfectly even texture which will not rub off.

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But don't expect to be able to do this with any other wax because Johnson's contains 20 per cent more of the hard, expensive polishing wax than any other similar preparation—so it covers a fifth more space—does not get soft and sticky—does not catch dust and dirt—does not show re-waxed spots and can be brought to the most beautiful and lasting polish with the least labor and expense.

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PATENTS—The Popular Mechanics Patent Bureau renders efficient service. Following letter is dated May 25, 1907:

Dear Sirs: Please allow me to acknowledge the receipt of yours of the 13th, the official notice of the allowance of my application for patent on Paper Clips. I wish to say I am highly gratified with the efficient manner in which you have attended to my interest in this matter, and that the drawings and specifications were far ahead of my expectations, and that if I ever have any other work, I wish you to do it. I beg to remain, respectfully yours, John H. Atter, 439 Main St., Conneaut, O.

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FOR SALE CHEAP—Complete equipment of large machine shop. Millers, lathes, planers, grinders, screw machines, radial drills, drill presses, etc. Also 18x42 Corliss engine and a lot of others, different sizes. Boilers, pumps, compressors, etc. The Adams Machinery Co., 401 Ashland Block, Chicago, Ill.

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FOR SALE—New, No. 2 Porter motor, \$4. Model electric car motor, \$2.75. D. Lackey, Avalon, Pa.

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NEW 6-INCH BENCH SPEED LATHES. Easily rigged for footpower. Strong construction. \$9 each. Charles Schaffner, Box 124, Maywood, Ill.

I HAVE a 7-horsepower Peerless Marine gasoline engine with full equipment, including coil, batteries, spark plug, oilers, dope cups, water pump, carburetor, coupling, stuffing box, shaft and propeller wheel; also reverse gear. This outfit is brand new and has never been used and cost about \$200 two months ago. At present I am not in a position to fit up a boat and will sell the outfit as above described for \$102, or without the reverse gear for \$90. W. J. Bird, 11 Raynor St., Detroit, Mich.

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FOR SALE—1 1/2, 2 1/2, 7 and 35-hp. gasoline engines, three air compressors, a lot of Gould pumps for belt drive, lot of tool steel, all sizes of pulleys, chisels, hammers, drills, air drills, pneumatic hammers. I. V. Schulz, Box 176, North Chicago, Ill.

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FOR SALE

FOR SALE or exchange, one 10-hp. gas engine, cost \$450; one 80-light 110-volt dynamo, cost \$200; one automobile running gear, cost \$300. American Publishing Co., Columbus, Ohio.

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FOR SALE—A perfect dish-washing machine for hotels and restaurants; patented March 6, 1906, No. 814329 U. S. patent; \$1,200 cash. Address A. Dow, Wooster, Ohio.

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FOR SALE—Moseley Watch Lathe, including countershaft, ten chucks and lathe wheels; \$25; 1 1/2-hp. motorcycle engine, \$15; 2-inch spark coil, \$12. All in good condition. Emil Henry, Peru, Ill.

FOR SALE—The Doane Telephone Exchange with its farm lines and phones; two position board. The stock is S. & C. manufacture. See the plant or write. Geo. M. Doane, Perry, Ill.

FOR SALE—One new 4-cylinder, 4-cycle Auto Engine; 20-hp., aluminum crank chamber, with timer, float feed carburetor and pump attached. Price, \$240. C. F. Sparks Machine Co., Alton, Ill.

FOR SALE—One new D. C. 110-V. Fan. Box 108, Dayton, Ohio.

FOR SALE—Fisher Hydraulic Press, complete with trucks, track and all attachments; size of block, 32x5x4 1/2 inches. Machine has been used less than a year; cost \$1,500; will be sold for \$500. John M. Greene, Drexel Bldg., Philadelphia, Pa.

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FOR SALE—CHEAP—Extraordinarily Fine Phonograph Outfit, concert size, using 5-inch diameter wax records costing \$1 to \$3 each; outfit cost nearly \$400; will sell for best offer. Also for sale, almost new Upright Piano, Three Stereopticons and Moving Picture Machine and complete outfit; Twenty Salted Peanut Machines; Steam Boiler and Engine; Nickel Plating Outfit; three corner building lots at Tuckerton, N. J. Write for full particulars of any of above, Arthur N. Boothroyd, Newburgh, N. Y.

FOR SALE—A 4x5 Hawkeye film camera with dry plate attachment; good R. K. lens; price, \$10. Automatic developing tank and portrait lens, \$1.50 extra. C. E. Mears, Grove City, Pa.

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FOR SALE—Steam automobile in good order, \$125. Casale, 131 Cedar St., New Haven, Conn.

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FOR SALE—Cheap—Camera, Premo St., good as new, 4x5; made by Rochester Optical Co. H. Clyde Parrish, Gt. Barrington, Mass.

FOR SALE—Laundry Machinery; one 6-hp. boiler, two 32x32 washing machines, 24-inch extractor, one combination collar, cuff and bosom ironer, one body ironer. All in first-class shape. Bargain. Schuck, 4110 Olive St., St. Louis, Missouri.

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FOR SALE—Gent's watch, never used; cost \$30; price, \$15. Chas. C. Nunn, 2136 St. Michael St., Cincinnati, Ohio.

FOR SALE—Lady and gent's tandem, in excellent condition; new two-speed coaster brake; wheels and tires new. The first check for \$25 takes it. Ohmer Evans, 414 Haynes St., Dayton, Ohio.

FOR SALE—Five-passenger auto, without engine; cheap. Arthur K. Ballentine, Somerville, N. J.

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FOR SALE—3¼x4¼ Anasco film pocket camera, with leather carrying case; telescope metal tripod, with leather case; Alhista panorama, 3½x9, with leather carrying case. Address C. F. S., Lock Box 148, Maywood, Ill.

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WILL EXCHANGE an Edison Standard Phonograph, 130 records, beautiful violet horn and crane, guaranteed new and first-class, for a second-hand motorcycle; a loud, clear machine. For further details address Richard Van Fleet, Bartow, Fla.

SNAP SALE—Set (4) Artillery wood wheels, 28x3", with rims, front and rear axle ball-bearing, chain 8 ft. ½x1¼" Diamond, all new, for light tearing car or heavy runabout; \$60 cash. Otto L. Schaefer, 922 24th St., Milwaukee, Wis.

FOR SALE OR TRADE—1 motor, \$5; 1 Brownie camera No. 2, \$2; 2 rolls film, 40c; 1 New Departure motor, \$1; 1 countershaft, \$1.60. I will trade entire outfit for a No. 6 Folding Pocket Kodak or sell for \$6. E. O. Gardner, 925 Oak St., Rochester, N. Y.

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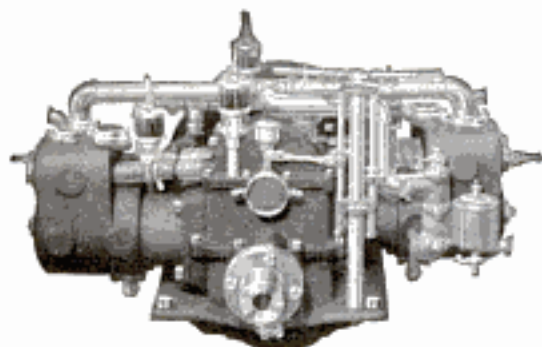
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Commercial Law	Stationary Engineer
Illustrator	Civil Engineer
Civil Service	Building Contractor
Chemist	Architect's Draftsman
Textile Mill Supt.	Architect
Electrician	Structural Engineer
Elec. Engineer	Banking
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Street and No. _____

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POPULAR MECHANICS

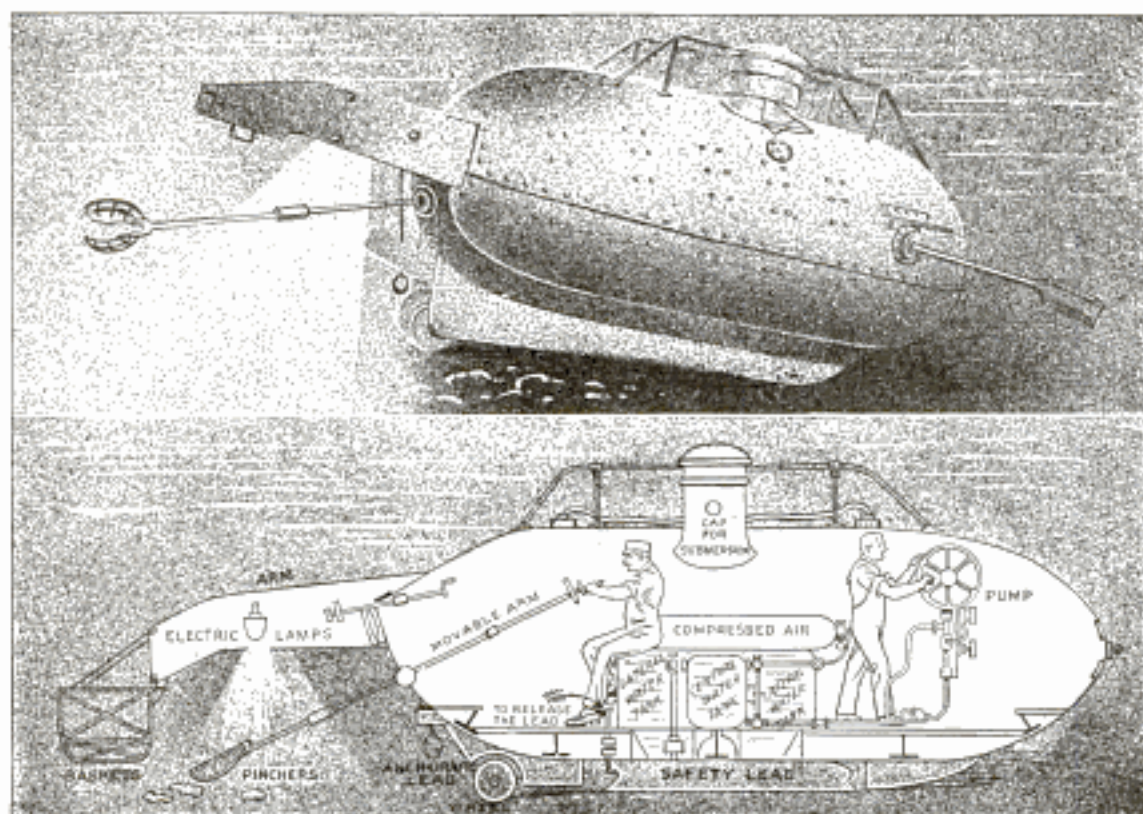
Vol. 10.

JUNE, 1908.

No. 6.

SPONGE-GATHERING DIVING-MACHINE

The Dream of Jules Verne a Twentieth Century Accomplishment



Machine for Harvesting Sponges on Ocean Bottom

The curious submarine diving-machine shown in these illustrations was invented by Abbe Raoul, the Vicar-General of Carthage, for the purpose of revolutionizing the task of gathering sponges from the bed of the sea off Tunis. The usual method is for native divers to swim to the bottom, grasp a sponge and rise to the surface as rapidly as possible for another long breath of air, or for white divers to go down in the regulation diving outfit.

The vessel is 17 ft. long and 7 ft. in diameter, and carries two men. It has no engines and is propelled by means of two oars. It is raised and sunk by means of water-tanks. At the bottom is fixed a safety-lead weighing 1,625 lb., which can be released if the raising apparatus refuses to work. This so lightens the vessel that it can rise of its own accord. The sponges are gathered by means of a movable arm with a device on the end which

pinches the sponges from their bed. A stationary arm or standard holds the basket into which the sponges are dropped; an electric lamp illuminates the sea-bottom.

A WICKER-WORK LIFEBOAT

A wicker-work lifeboat, considered absolutely practical by foreign marine experts, has been constructed by a Rot-



By Courtesy of the Shipping World

Will Not Crush Easily

terdam inventor who is well known in Holland for his marine patents.

The hull is made of cane or plaited wicker-work, and its most important advantage is its practically unbreakable character. This has already been put to a severe test in a collision which occurred between a Belgian sailing yacht and a Dutch motor boat. The wicker lifeboat was caught between the two craft and acted as a buffer, sustaining no other damage than the breaking of the mast and stays. Among its other advantages is the fact that it is unsinkable, has no rusting materials, is not liable to leakage although squeezed almost out of shape, and has more room for storage of provisions and water than ordinary wooden lifeboats, in addition to being much lighter.

For life-saving work in narrow waterways, where there is danger of collision with floating wreckage or of being crushed, this type of boat seems desirable. Whether a craft so constructed is the best to make headway against an unusually heavy sea or not is another question.

TRACTION MACHINERY LIVERY STABLE

An entirely new proposition by which an Englishman has made a big fortune is a livery stable filled with all kinds of power-propelled farm and road machinery. In his stables he has for hire by day, week or month nearly 50 steam road rollers, varying in weight from 6 to 17 tons; 33 traction engines, 7 sets of steam-plowing tackle, 14 sets of engines and threshers, and 2 gasoline tractors, over 100 in all.

To keep these machines in order he has a complete machine shop, which he also uses for outside repairing. Each outfit has a mounted house in which the men live. His whole system of paying his men is based on a fixed wage, with a small bonus for each piece of work accomplished. In all cases the hirer has to furnish fuel and water and deliver it to the machines. A large map of England and Scotland hangs in his office and red numbered flags pinned to this give the location of each machine. The foremen report every 24 hours.

PHOTOGRAPH OF A STEEL RAIL

This seemingly fine automobile road is nothing more nor less than a line of steel rails. The amateur photographer who took the photograph held his cam-



A Rail, Not a Street

era on the shining surface of the rail while taking the exposure. The other rail can be seen at the right.



Wreck on South Side Elevated Ry., Chicago. Twenty-one persons injured seriously, but no one killed

FROM RAIL FENCES TO PENCILS

The famous cedar rail fences of the time when, as a boy, many a president of the United States barked his shins climbing over them and plowed the fields they encompassed, are fast disappearing, and those still left in some sections of the country are coveted by pencil and penholder manufacturers.

It would be hard to make many people believe that the wood in the pencil or penholder they daily use has served for 50 and perhaps 100 years as part of a rail fence, but to a great extent this is true. When split open the most aged and dry-rot eaten cedar rail divulges an interior of as white and well



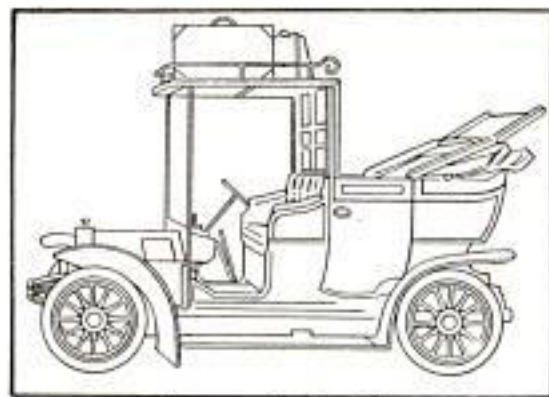
A Valuable Fence

seasoned wood as can possibly be procured by long and careful seasoning.

The Alabama rail fence shown in this illustration is no less than 75 years old and would sell for more than enough to pay for a new wire fence.

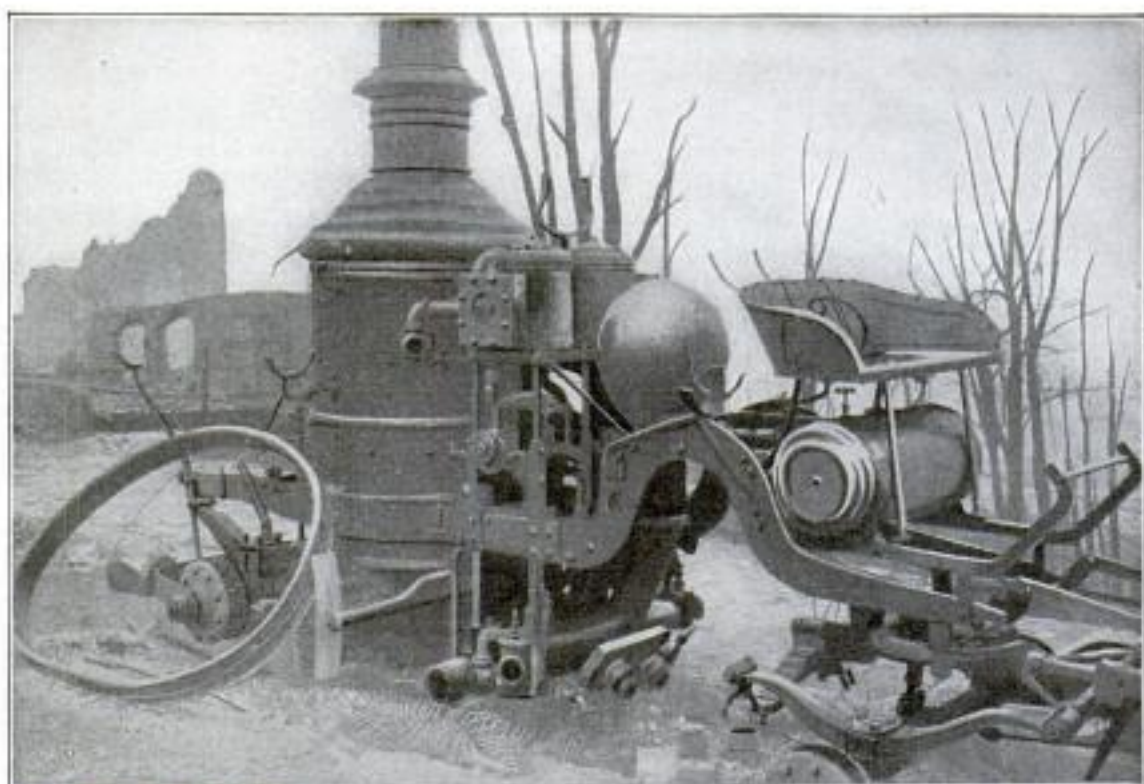
AUTOMOBILE CAB WITH LUGGAGE RACK

A new and advanced type of automobile cab, which has as a distinct feature an adequate rack for the accom-



Luggage Rack on Top

modation of luggage, is now being operated in London. This is provided for by a fixed canopy over the driver's seat, supported at the rear by the framing around the front windows and over the dashboard by two steel rods.



RUINS OF THE CHELSEA FIRE



Wreck of B. & A. Bridge—Militia Patrolling Ruins

On the opposite page are shown three views of the ruins of Chelsea, Mass., after its destruction by the devastating fire which razed to the ground over \$10,000,000 worth of property. Out of a population of nearly 40,000 people only 13 met death.

The first illustration shows the wreck of a fire engine which was abandoned when the flames surrounded it. The second illustration is the ruins of the city hall and the third is a view of Everett avenue, swept almost clear by the flames. The illustration on this page is the wreck of the B. & A. railroad bridge.

LAWN CLEANER

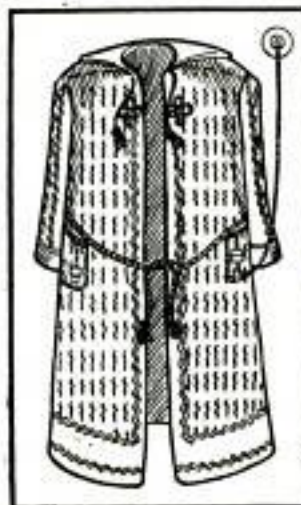
A recent addition to the many tools which make the gardener's work a little less difficult is a lawn cleaning machine that picks up papers, leaves and similar rubbish and deposits it in a galvanized receptacle. In construction and



mode of operation it resembles a lawn mower. On the axle of the wheels is a drum, the surface of which is composed of rows of points. As the machine is rolled over the lawn these points pick up every loose object.

ELECTRICALLY HEATED BATH-ROBE

Among the most curious of the recent electrical inventions is a bathrobe heated by electricity. The outer surface is made of heat-retaining material, and between this and the lining is a mesh of wires. These wires all run together at one of the pockets into a common lamp socket. This is connected with a regular electric current by plug and cord. Another pocket holds a snap-switch which enables the wearer to quickly turn the



current off or on. The garment, which is used as an ordinary lounging robe when the current is off, is practically fireproof.

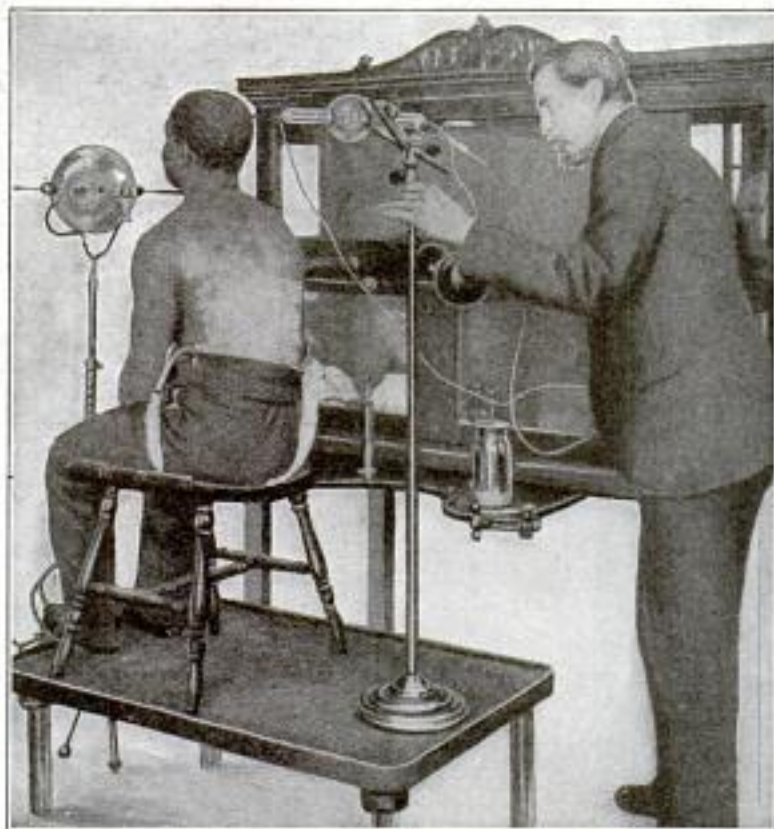
BLEACHING NEGROES WHITE

Working upon the well known fact that the X-ray machine possesses the property of destroying the coloring matter of the skin, a Philadelphia doctor is, with more or less success, using such a machine to bleach the skin of negroes to as near white as possible.

In one instance he has succeeded in discoloring a negro's face after 30 treatments, and other cases of "black skin" now being treated are progressing satisfactorily. After the tenth treatment the complexion of a very black negro turned to a light chestnut color, and by pro-

longing the treatment an olive tint was obtained. With negroes of a lighter color he has obtained creole tints.

The speed record for United States armored cruisers is now held by the "North Carolina."



ACROSS THE CONTINENT BY GOAT TEAM

Probably one of the most unique methods ever used for crossing the American continent is this little conveyance, drawn by four Angora goats, which recently started from San Diego, Cal., to make the trip to New York. Only three weeks prior to the start across the continent the outfit completed a 4,000-mile overland trip from Hastings, Neb., via Portland, Ore., to San Diego, commenced in May, 1907. The little animals plod steadily along over the ground, and,

while they do not cover nearly as much territory in a day as would a team of horses, they can make a daily average



Average 15 Miles Daily

of 15 miles. The owner and driver is Vivian Edwards.

THE ARTIFICIAL PRODUCTION OF REAL DIAMONDS

**Diamond Controversy Agitates Europe—M. Lemoine Either Genius or Fraud—
No Doubt as to the Possibility of Making Diamonds Artificially—African
Diamond Mine Owners at First Frightened—Now Cry "Fraud"**

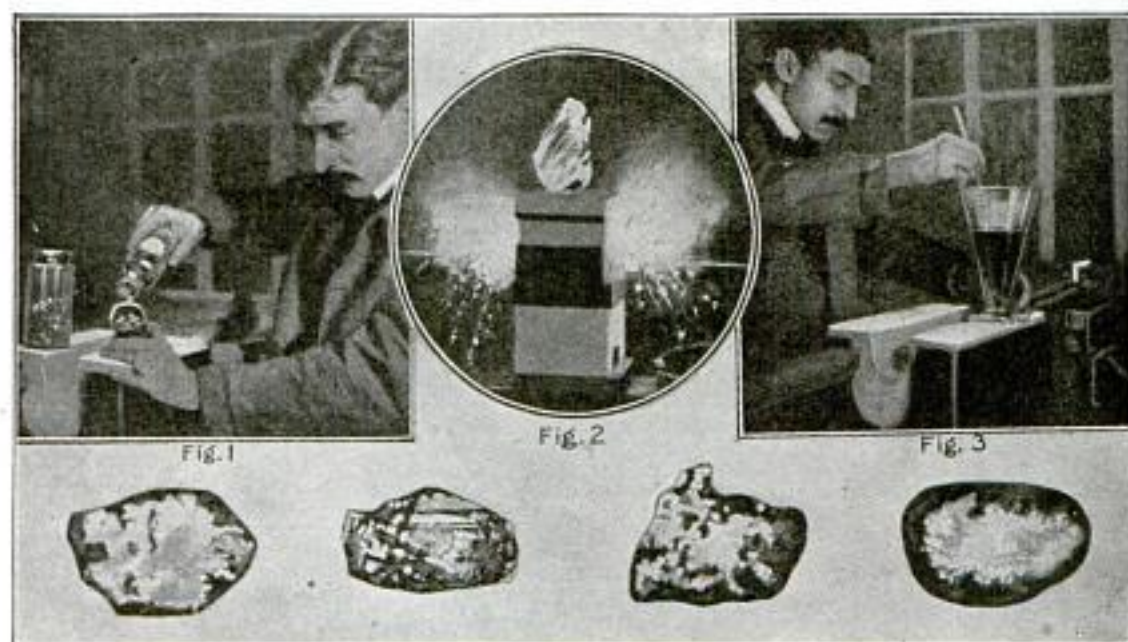


Fig. 1.—Loading the Crucible with Iron Filings and Carbon of Sugar. Fig. 2.—Furnace in Full Blast. Fig. 3.—Washing Diamonds from the Waste Matter

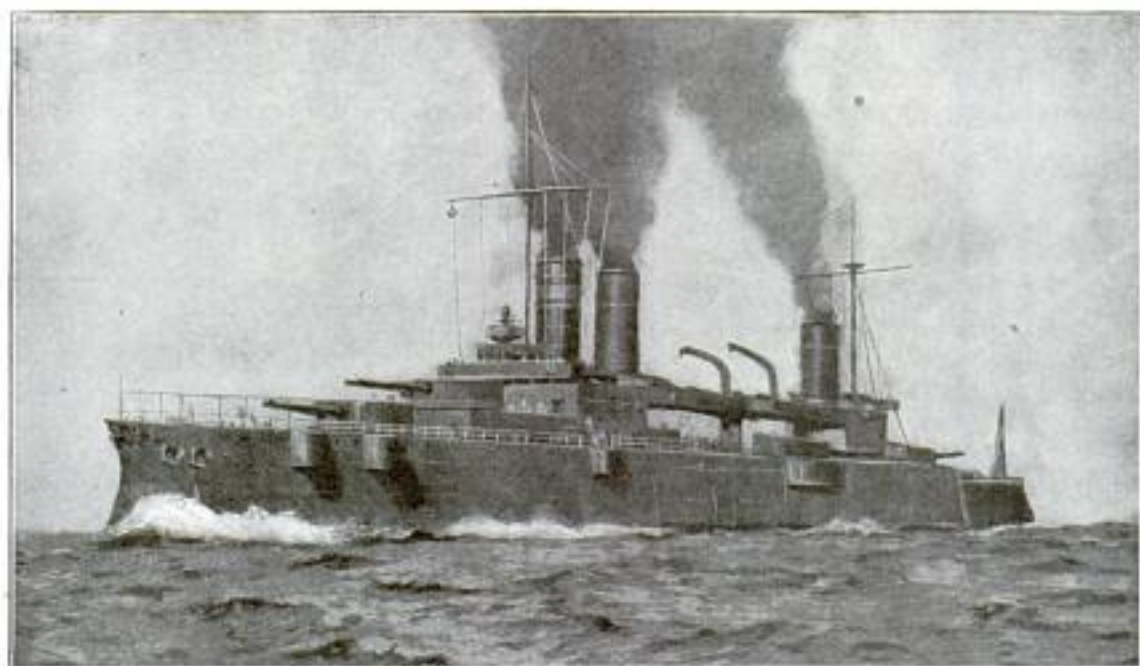
M. Lemoine, a French scientist, claims he can manufacture diamonds. Sir Julius Wernher, president of the De Beers South African Diamond Mining Company, and not exactly a simpleton, was present with his experts at two experiments. He became convinced and associated himself with the inventor to the extent of \$65,000. Then quite suddenly he exclaimed that he had been deceived, and on his simple affirmation M. Lemoine was arrested.

Now M. Lemoine is in prison, the secret formula of his process is safely locked away in a London bank, Lord Armstrong has publicly proclaimed his belief in M. Lemoine, the whole of Europe is agitated, and the scientists of France are drawn up in battle array to defend or accuse.

The majority say that the French diamond maker is a fraud, but others just as stoutly affirm that he is a genius and that for reasons apparent to

every thinking person, those who have everything at stake are endeavoring to discredit his claims and drive him into a prison. It is natural to be skeptical under the circumstances, and the chances are that M. Lemoine is a fraud, but there is at least one chance that he is a genius.

It is freely admitted that, if it is possible, as M. Lemoine claims, to manufacture diamonds and sell them for a song, as compared to the price asked for diamonds gathered from the store houses of nature, the great diamond syndicate would be ruined and the diamond mines of Africa have to close down. It is therefore quite natural that the syndicate would try to protect its own. This, and the fact that Henri Moissan, who was one of the greatest scientists in France, actually manufactured diamonds, although of minute size, make the one chance in a hundred that M. Lemoine is a genius. The



The great German battleship "Ersatz Bayern" was launched at Wilhelmshaven on March 5. The big ship's displacement is 17,960 tons, she will carry ten 11-in. guns, have a crew of 866 men, and her speed will be 21½ miles an hour.

When placed side by side with the English "Dreadnaught" type of warships, and the big fighting ships of the American navy, it is noticeable how the German, and also the French ships, loom above them. This difference in marine architecture, however, is considered as vastly in favor of the American and English ships, as the vessels of the former nations present a larger mark to the enemy's fire and are not believed to be as seaworthy.

By Courtesy of London Illustrated News.

improbability that he has succeeded where other and greater scientists have failed, and his attitude in the face of the charges made, constitute the ninety-nine chances that he is a fraud.

According to the French magazine, *L'Illustration*, the men who believe M. Lemoine has found a simple means of obtaining the result vainly sought for by great scientists are honorable above any suspicion, but although men of some affairs, are considered not familiar enough with the elementary mysteries of chemistry to be completely relied upon. This, however, does not apply to Sir Julius Wernher and his experts. They knew the elementary principles of the method from studying the experiments of Henri Moissan.

The tests made before Sir Julius and his experts were at the time considered conclusive. In their presence Lemoine placed the chemicals in a crucible—watched closely to see that he put no diamonds in as well—then placed the sealed crucible in the electric furnace. The current was turned on, the ex-

perts saw the crucible grow hot, then white hot and continue so until the inventor announced that the requisite temperature had been reached.

The utmost precautions were taken by M. Lemoine to assure Sir Julius that no real diamonds could be substituted for the contents of the crucible. He stripped himself to the skin, and removing the white-hot crucible from the furnace on a shovel, plunged it into a pan of water. When the crucible was sufficiently cooled the De Beers experts opened it and found 25 diamonds of sufficient size to satisfy them of the value of the process. However, to make doubly sure, they asked for a second test, which was conducted in the same manner and with practically the same result.

Whether the stones were truly made, or whether the manufacture was a feat of jugglery will not be proven until M. Lemoine gives a test before a commission presenting the necessary guarantees of competence and honor. So far M. Lemoine has offered, in return for

his provisional release, to satisfy any six experts Sir Julius may select by further tests, but the magnate thought best to keep Lemoine where he can be easily found if badly wanted. He offered, however, to give the inventor \$80,000 additional for the surrender of the formula in the London bank, which offer was rejected on the advice of his attorney, M. Labori, the famous French lawyer who defended Dreyfus. Prior to Lemoine's arrest Sir Julius started suit to compel the inventor to hand over the formula, but was defeated by M. Labori on the ground that he had not lived up to his part of the contract. This formula, so M. Lemoine modestly states, is worth \$25,000,000.

Sooner or later the public will know what Lemoine's claims are worth, but at present the formula is supposed to run something like this: "Take carbon of sugar, place it in a crucible, and heat to the requisite temperature in an electric furnace. The result will be diamonds." Whether this is the secret or not, it is a fairly accurate description of what was actually accomplished in Henri Moissan's laboratory, although the stones were infinitesimally small.

It has been absolutely proved that a diamond is pure carbon crystallized by heating it to a great temperature in oxygen and burning it to a cinder. The problem of the diamond-maker is to transform carbon—preferably carbon of sugar—into the diamond crystal. An inferior form of diamond is graphite, which is produced by the cooling of fused iron. The diamonds of Africa are found in blue clay, in a volcanic formation rich in peridot and granite, and are believed to have been formed under great pressure at an intense heat.

HOISTING A MULE TEN STORIES

As a little publicity event the constructors of a 10-story bank building in Knoxville, Tenn., hoisted a mule named "Maud" to the top story as soon as the steel work was in place. The event had been heralded in advance,



and when Maud started skyward 3,000 voices cheered in unison with the blowing of the whistles.

HUGE TIBETAN TRUMPETS

During the solemn festivals of the Lamaistic ritual, the Tibetan priests blow these huge brass trumpets at fre-



Trumpets 16 Ft. Long

quent intervals. The trumpets are 16 ft. long and emit a note like thunder. The standing figures are two lamas or priests of one of the Tibet monasteries.

"BATTLE FLEET" KILLS WHALE IN TARGET PRACTICE

A few days after the completion of the target practice of the "battle fleet" in Magdalena bay, a huge whale, 60 ft. long, apparently wounded by big gun shots, came ashore at a point on the extreme southern coast of California.

Two deep holes in its carcass, midway between head and tail, were proof of the cause of its death. During the early part of the practice a large whale was frequently seen in the vicinity. It disappeared suddenly and later was seen some 100 miles distant, apparent-

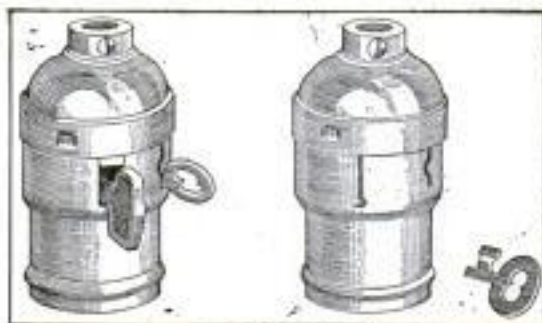
ly in great distress. It was in the last throes of a death struggle when stranded.

WRECKING WINDMILLS A NEW INDUSTRY

The passing of the windmill in England, antiquated by such recent power producers as the gas engine and electric motor, has given life to a new industry—windmill wrecking. The old windmill builders understood their business, and meant their handiwork to last, and so the demolishing of such structures is no simple task. Many of the old mills stood 100 ft. high and had eight or nine floors, fitted with four run of stones, and contained tons upon tons of brick. Often these huge mills stand close to other buildings and accidents would be inevitable if the wreckers did not have experience in their tasks.

AN ELECTRIC LAMP SOCKET THAT LOCKS

The accompanying illustration shows two styles of lamp sockets that are now being fitted with locks and keys to prevent the globes from being removed by sneak thieves. In this new locking socket the shell turns freely, making it impossible to remove the lamp by unscrewing until the shell is locked with the key. The general appearance of the sockets is the same and the security for the lamps will be appreciated by many, and especially those using the new tungsten, tantalum or other high-priced globes.



Lights that Lock

WORLD'S CHALLENGE CUP FOR AEROPLANES

M. Michelin, one of the best known aeronautics enthusiasts in France, has founded a world's challenge cup of the value of \$20,000, to be competed for annually by aeroplanes. After the first race the aviators will be compelled each year to fly double the distance made by the winner of the trophy the preceding year. The cup will be held by the aero club of the country of which the winner is a native, and he will receive in addition to the cup \$5,000.

M. Michelin has also offered a special prize of \$20,000 to the aviator who, between now and 1918, travels in an aeroplane from Paris to Puy-de-Dome, a distance of 250 miles.

AERIAL RAILWAY IN STRAWBERRY FIELD

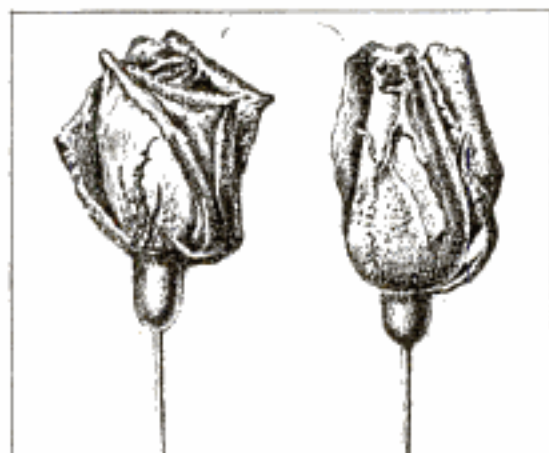
An ingenious Japanese small-fruit grower in California has rigged up an aerial railway in his strawberry fields on which the trays of fruit are carried to the little packing house. It consists simply of a row of posts, a $\frac{1}{4}$ -in. wire, two barn door hangers and a frame for carrying a dozen trays. The shadows cast by the posts over the growing plants are too immaterial to retard growth.



A Strawberry Trolley

HAT PINS FROM GENUINE ROSEBUDS

The manufacturer takes fresh rosebuds of different varieties, ranging in



Gold Plated Rosebuds

price from 50 cents to \$2 per dozen, and places them in an electro bath which deposits metal on the bud. The metallic surface retains the forms and outlines of the buds and shows the veins and delicate tracings. As in nature, no two are alike. Gold, copper and silver may be used.

A less pleasing, though more realistic, demonstration of this process may be seen in a cigar store in Los Angeles. The proprietor secured a snake about 2 ft. in length, which he coiled around a cigar lighting pedestal, and had his snakeship plated with a nice heavy coat of copper. The form is perfect, even to minute details such as the eyes.

ASBESTOS SHINGLES

An asbestos shingle roof, when properly made, will outlast the life of the building itself. The simple exposure to the elements causes the cement covering of the asbestos fiber to crystallize and it becomes more and more serviceable as time rolls on, steadily toughening and hardening with exposure. The fact that the elements take better care of these shingles than the best paint or dressing does away with this expense.

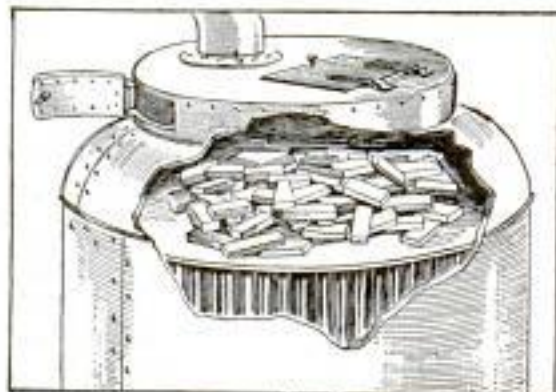


This interesting picture is from a photograph taken with an exposure of one hour and a half, with the full opening of the lens. The white line is the path of the full moon. The night was clear. Photo by H. W. Belteridge, Fresno, Cal.

Being fireproof and not affected by continuous moisture or frost, it is obvious that asbestos shingles and asbestos lumber can be used in a great many places where ordinary lumber has failed.

OPIUM SECRETED IN DONKEY BOILER

More than \$11,000 worth of opium was recently found secreted in the boiler of a donkey engine on the steamer "City of Puebla" when she arrived at San Francisco from Victoria, British Columbia. Nine sacks of the



Smugglin' Steam Boiler

drug were taken out of the space above the tubing in which the steam is generated. Opium is worth about \$14 a pound in this country, the duty being \$6 a pound. The seizure was the largest in years.

HUGE AMERICAN DREDGE FOR EGYPT

Orders have been received by the Richmond branch of the American Locomotive Works for the building of a mammoth dredge for work on the upper Nile, Egypt. The scoop will cut 10 yd. each way and will be the largest in the world. The dredge will be taken apart again after construction, for shipment, and each package or part will not weigh more than 600 lb., as it will be necessary to transport it on the backs of donkeys to the point on the Nile where it is to be used.

OIL MOTORS FOR SMALL BOATS

A large 140-hp. motor using kerosene instead of gasoline has just been suc-



By courtesy of Shipping World

Oil Motor on Trial

cessfully tried by the British Admiralty in a 40-ft. pinnace. In one of the tests the motor ran without the slightest hitch for 6 hours at full speed. To start the motor a small auxiliary motor driving the air compressor is used.

THE DEATH ROLL OF INDUSTRY

At least one death or injury every minute of every week day of 24 hours is the annual toll labor pays to industry in the United States. Of the 19,000,000 industrial workers of the

country, 500,000 men, women and children are killed or maimed every year.

Among the most dangerous occupations are the manufacture of dynamite and gunpowder, submarine tunneling, mining, skyscraper construction, railroading, and steel manufacturing. New York and Chicago, being the largest cities in the United States, naturally have a large accidental death and injury roll, but the most appalling list comes from Allegheny county, Pennsylvania. This county, in which Pittsburg is located, combines steel, iron and coal industries, mills, mines, railroads and building operations. Over 17,000 deaths and injuries a year in all industries is its record.

ICE GORGE IN MAUMEE RIVER

Went Out with Irresistible Force, Wrecking a Bridge and Steamer

These illustrations show an ice gorge in the Maumee river at Toledo and the damage it was responsible for when the spring freshets occurred. The big whale-back steamer "Yuma," loaded with 150,000 bu. of flaxseed, was tied to a dock just above the Cherry street bridge when the ice floe started. The big 3-in. hawsers were snapped like whiplashes, and in the recoil one of them struck and killed a bystander. The vessel was driven against the bridge and carried away one of the spans. The Toledo harbor master was on the span at the time and narrowly escaped drowning in the cold water. He was carried nearly half a mile with the ice before being rescued.

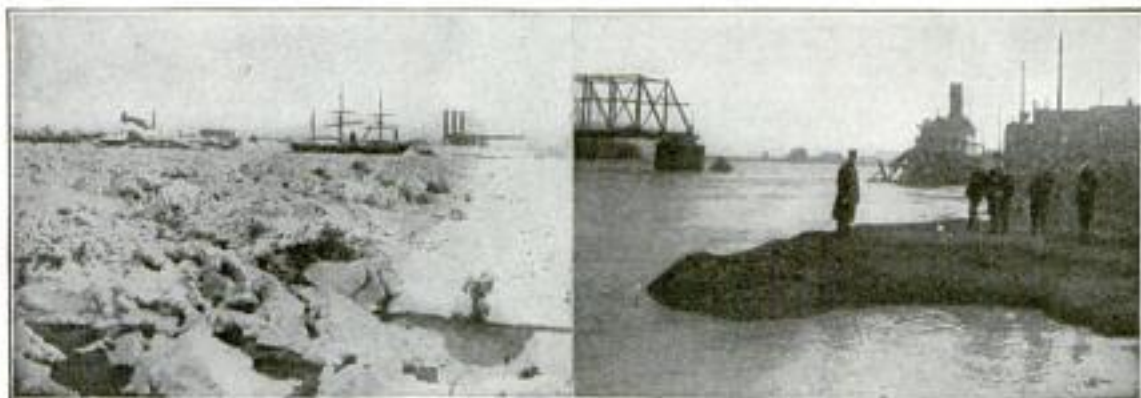
SPRING AUTOMOBILE WHEEL

One of the latest designs of spring automobile wheels is the invention of a California engineer. It is simple in design and is claimed to have stood practical demonstrations. The cushions of



New Auto Wheel

the wheels are of hard rubber, and the spring and smooth running of the standard pneumatic tire is made possible by the flat steel springs that form the lower part of each spoke. The upper parts of the spokes are fastened to the hub by a socket joint, and the lower parts or springs, connecting with each other by elbow joints, are solidly riveted to the inside of the wheel rim. The spokes cross each other near the hub and are tangent to it under all conditions.



Ice Gorge at Toledo, O.

Wrecked Bridge and Steamer

DIVING SUIT WITH LACED-UP LEGS

"Blowing up" is one of the accidents to which deep-water divers are the most liable. When a diver is crawling on the bottom with his head down, air may accumulate in the back of his suit, and, gaining access to the legs, cause him to turn turtle and shoot helplessly upward, with the risk of coming into contact with a ship's or boat's



bottom. To make such accidents impossible, the diving committee of the English Admiralty has recommended that all new diving suits be provided with an arrangement for lacing up the legs and thighs.

EXTINGUISHING OIL-TANK FIRE

The fire in this 30,000-gal. fuel-oil tank, caused by an explosion following the attempt of a man with a lantern to measure the depth of oil, was extinguished by tunneling under the tank and drilling a hole through the bottom. A pipe was fitted into this hole and the oil was drawn off into a hurriedly excavated pit in the ground. The tank was repaired as soon as sufficiently cooled and the oil pumped back into it again.

The Anthracite coal production of the United States is confined to Pennsylvania, Colorado, Rhode Island and New Mexico.

INDIAN RECRUITS DESCENDING 18-FT. WALL

The training the recruits of the native British Indian army are put



A Difficult Jump

through is strenuous. One of the methods of hardening them for soldiering is the obstacle race, in which they make difficult jumps and hurdles and scale high walls. The illustration shows a number of them descending an 18-ft. concrete wall.

STREET GAS LAMPS LIGHTED AUTOMATICALLY

An English inventor has devised an



Quenching a Burning Oil Tank

automatic appliance for lighting and extinguishing street gas lamps by varying the pressure in the mains. The appliance consists of two chambers, the one a high-pressure and the other a low-pressure chamber, both provided

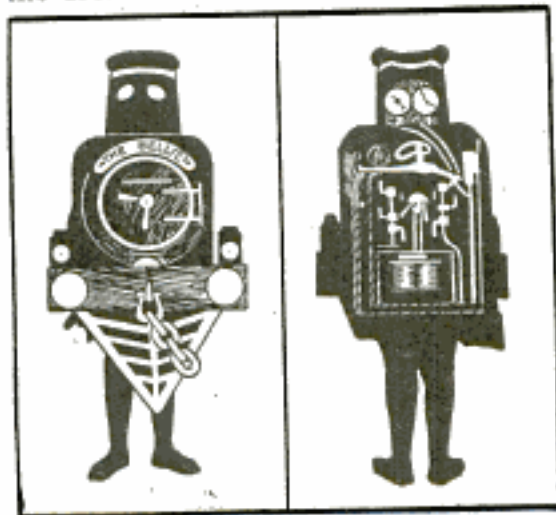
with sliding domes. The high-pressure dome is weighted to suit the night pressure and the low-pressure dome to suit the day pressure. To light the lamps the pressure of gas is increased slightly over the normal night pressure. This causes the high-pressure dome to rise and open a port, thus allowing the gas to pass into the low-pressure dome, which in its turn rises, and, by means of a small pilot light, lights the lamps.

PHOTOGRAPHING THE DISCHARGE OF ELECTRICITY FROM HUMAN BODY

That electricity, heat and ether are one and the same fluid, is the assertion of Frederick Hovendon, of London, who also claims that every person exhales electricity from the finger-tips and that he can take moving pictures of the process. To do this he fills a square glass box with cigarette smoke, mixed with air. The experimenter thrusts a finger through a hole in the bottom of the glass box and a powerful arc lamp is turned on. The ether or electricity is immediately seen issuing from the finger tips and photographed.

PASTEBOARD RAILWAY ENGINE AS FANCY DRESS

The illustrations show an ingenious adaptation of a pasteboard outline of the front and rear of a locomotive as



Odd Masquerade Dress

a fancy dress costume. The costume appeared at a railway men's dress ball and, needless to say, won first prize.

THE "COMET" CLOCK

An ingenious as well as a remarkably artistic clock has just been added to the many horological curios which have been devised by French craftsmen ever since the dark ages.

A sun is supported by a small statue of graceful form. In this sun is concealed a clock movement, to which is adjusted a large hand in the form of the tail of a comet. This hand makes a revolution of the sun every 12 hours. It has, in the starred circle, a figure symbolizing "Father Time," mounted on an absolutely free axis. The point of the scythe, which is Father Time's chief incumbrance, always points downward, thus designating the exact time as the hand revolves around the sun. As shown in the illustration the time is 7 o'clock. At mid-day the hand will be at its highest point and the figure 12 will be under the point of the scythe.



CONSUMPTION OF CROSS TIES

The consumption of cross ties by steam and electric railways in the United States during the year 1906 amounted to 102,834,042, valued at \$48,819,124, an average of 47 cents per tie. Of this number nine-tenths were purchased by the steam roads.

The total number of treated ties purchased was 5,289,437, to which were added 6,390,203 treated by the companies themselves.

CONCRETE DAIRY BUILDING

The buildings of one of the most complete and up-to-date dairy farms in Michigan are constructed entirely of reinforced concrete, roofs and all. The milk house is of as neat a design as could possibly be conceived, and has continuous hollow walls. The milk is carried from the barns to the tower room and poured into a pipe which carries it to an air cooler. From the air cooler it is drawn off into receiving cans and placed in ice tanks.

The other illustration shows the silo and barns while under construction. The silo has an inside diameter of 20 ft. and is 40 ft. high. The wall is 8 in. thick for the first 7 ft. above the foundation and 6 in. thick for the remaining distance. It was reinforced with $\frac{1}{4}$ -in. round iron. The form or model, which can be seen near the top, was made of a sheet of 20-gauge iron, 30 in. wide. All the work was done from an inside scaffold. The silo has a capacity of 325 tons of ensilage. The first story walls of the cow barns are also constructed with continuous hollow walls.

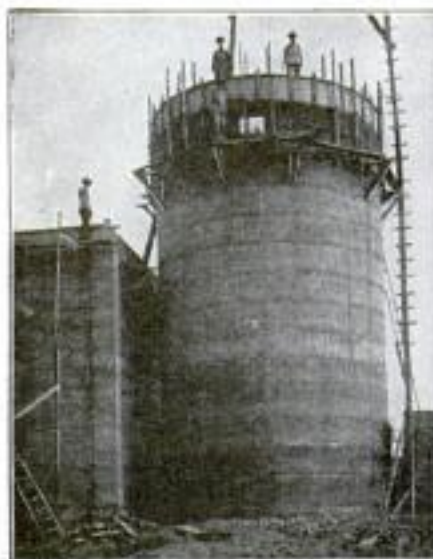
UNLOADING OCEAN-GOING VESSELS

The lumber cargo of this ocean-going vessel is being unloaded with two double

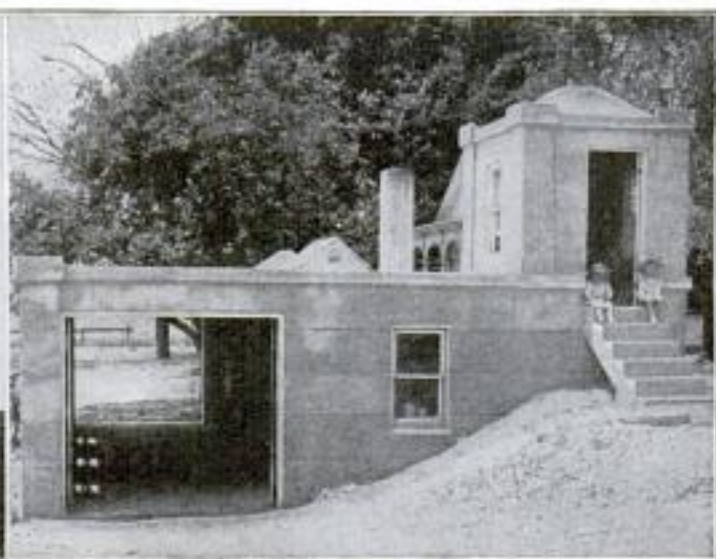


Unloading with Donkey Engines

engines and two stationary booms. The engineer stands between the two engines directly in front of the main mast. At the moment this photograph was taken he was operating the two engines in opposite directions, thus swinging the load from the vessel to the dock. A cable from each engine runs over each boom to the chain carrying the load.



Silo



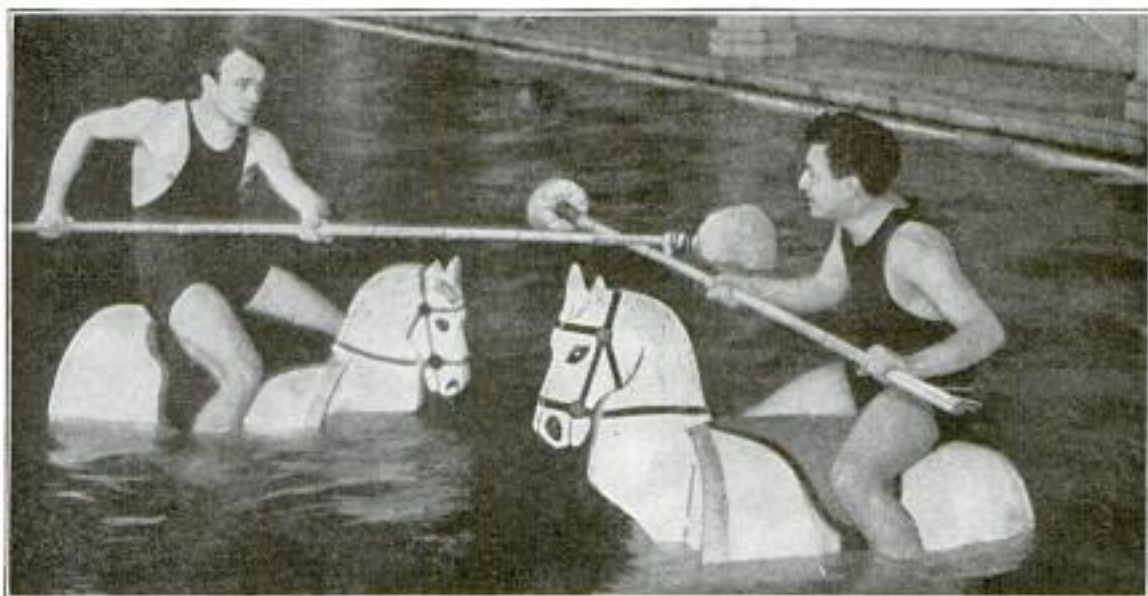
Milk House

WINDMILL SIGNALING IN THE NETHERLANDS

Quite recently the Dutch government carried on a series of experiments in order to ascertain the value of windmill signaling for military purposes, and proved that communication could easily be established with far-distant centers by sending messages from one mill to another some miles distant, and so forwarding them throughout the length and breadth of Holland in an incredibly short time. Holland is an intensely patriotic land, and by secret codes, only known by the millers themselves, confidential messages could be

two lances tipped with padded end pieces are the outfit required. The combatants are placed opposite each other on the horses, the word is given, and they make the best time possible forward, wielding the lances in an effort to upset each other.

The horses are so ballasted that the slightest thrust with the lance will unhorse an opponent unless he is skilled enough to offset the push with a quick balancing manœuvre. As it is impossible for the combatants, encumbered with the unwieldy lances, to retain their seats when the right thrust is received, the unhorsing process is not difficult to a skilled man, but when two op-



"The Slightest Thrust Will Unseat an Opponent"

sent in times of strife. Codes are now in use which have been handed down from generation to generation of millers and jealously guarded from outsiders with all the intense conservatism for which the provincial Dutch are proverbial. What need has Holland for wireless telegraphy?

THE AQUATIC TOURNAMENT

Tilting tournaments in the water have become the feature of aquatics at the University of Pennsylvania, and the students, under the direction of the swimming instructor, are practicing industriously. Two floating horses and

ponents of equal cleverness meet the contest is exciting.

ACETYLENE LIGHTS AID FIRE FIGHTERS

Every fire truck in Philadelphia is provided with a portable acetylene searchlight for use in lighting dark cellars and smoke-filled rooms while fighting a fire.

In appearance the searchlight is a round, squat can about 12 in. high and 6 in. in diameter, filled with acetylene carbide. In using it a hole is knocked in the top and water poured in. A brilliant white light immediately flares



This building at Natchez, Miss., occupied by a drug company, was destroyed by fire following an explosion of gas. Eleven lives were lost. The first body was being removed when the photograph was taken.

up, and by the use of reflectors the rays are thrown in any desired direction. No match is necessary and combustion takes place as soon as the gas generated by the water comes in contact with the air. Each can holds 3 lb. of the mixture and will burn an hour. The Philadelphia fire chief says it doesn't seem right to make a light by pouring water on it, but the larger the quantity used the brighter the light.



WHERE ANTHRACITE FIRST WAS BURNED

Interest, during the recent celebration at Wilkes-Barre, Pa., of the one hundredth anniversary of the first use of anthracite coal for fuel, centered about the fireplace in which William Fell, proprietor of a country tavern in that city, on February 11, 1808, found that "stone coal," as it was termed in those days, could be burned. His discovery made, he called in his friends to "make a night of it," and

no one went home while the good cheer lasted.

The news spread rapidly, and Fell's tavern was the mecca of travelers in Eastern Pennsylvania for several years. Persons came hundreds of miles to see the "show," went home and told their friends of the wonder, and it was necessary to keep the coal fire going summer and winter, to the great profit of the tavern keeper.

About 50 years ago the tavern was in such a tottering condition that it



The Original Grate

was necessary to demolish it, but the fireplace and chimney were left standing, and around them was erected the

building of the Wilkes-Barre Historical Society, where have been gathered hundreds of relics of the birth and growth of an industry now producing over 70,000,000 tons of fuel per year.

FARMAN MAKES 2-MILE FLIGHT

All previous official records for aeroplane flights were beaten at Issy-les-Moulineaux on March 21 by Henry Farman, and, further, for the first time an aeroplane with two persons on board made a short flight.

In the presence of officials of the French Aero Club and an enormous crowd of spectators, the French machine made two and one-half turns around two stakes fixed in the ground about 1,600 ft. apart, remaining in the air 3 min. 29 sec., and covering a distance of 2 miles. Had not the motor become heated the flight would have been much longer. The problem of sustained aerial flight seems now to depend only on the building of a motor which, while sufficiently light and speedy, can be adequately cooled without adding materially to the weight of the apparatus.

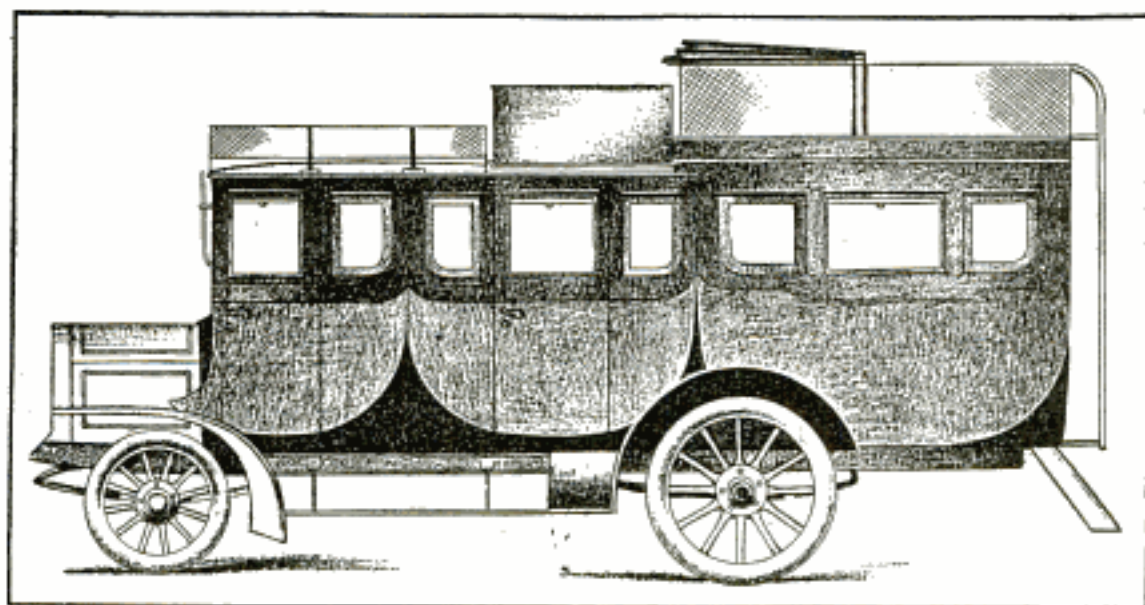
After housing his own machine, Mr. Farman accepted the invitation of M. Delagrande to accompany him on a

trip across the field in his aeroplane. The Delagrande aeroplane ran along the ground with the two men on board and, rising to a considerable height, flew a distance of 100 ft. This is the first time an aeroplane has been known to leave the ground with two persons on board.

A GRAND DUKE'S GIPSY WAGON

This illustration is of an interesting and original automobile made to order from the design of a Russian grand duke, who evidently cherishes the intention of playing the amateur gipsy without much sacrifice of the comfort or the elegance of town life.

The first compartment contains a fixed seat for two and a folding seat for a third person. The second compartment has been built wide enough to allow of cross seats to serve as bunks. When the grand ducal party wishes to turn in, the cushions are removed and the seat-backs, matted on the rear side, are flapped down. Generally speaking, this compartment resembles a section in a first-class Pullman sleeper, with lockers under the seats for bedding and other accessories. The rear compartment or saloon is handsomely fitted up in red plush.



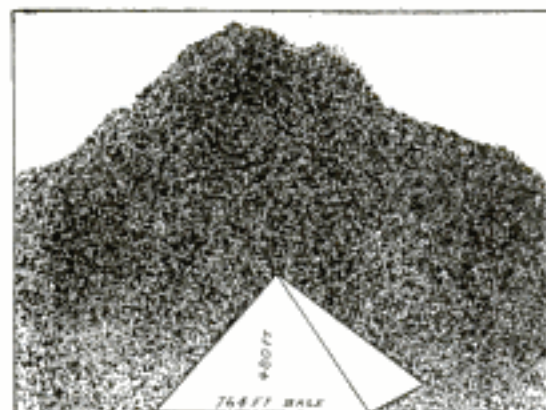
Russian Duke's Gipsy Wagon

Redrawn from London Motor

WORK ON PANAMA CANAL STUPENDOUS

Every Working Day the Yankees and Their Machines Accomplish as Much as 100,000 Egyptian Pyramid Builders in 125 Days

Every 50 working days the toilers who are digging the Panama canal



One Year's Excavation on Panama Canal Compared to the Great Pyramid

are removing an amount of material equal to the great Pyramid of Cheops, which consumed the labor of 100,000 men for 20 years in the building, and the services of the same number for 10 years in constructing the road connecting the work with the quarries.

"Spread in any city of the Union the earth which was taken from the canal during a single month would have buried 10 solid city blocks under 40 solid feet of earth," says the Philadelphia North American.

Truly, the work accomplished since the army engineers took charge is stupendous and awe-inspiring, but the fore-runners who prepared the way under overwhelming obstacles and drove the mosquito and the yellow fever from the canal zone must not be forgotten. Because of their work the whole force can now put its shoulders to the wheel and defy the climate, which 10 years ago was death to the white man.

The high water mark was reached during February, when a daily average of 122,741 cu. yd. of material was excavated. February had but 24 work-

ing days of 8 hours each, but all records were broken by a total excavation of 2,945,880 cu. yd. For this work 64 steam shovels were used. Thirty-five more immense steam shovels are now being used, or are en route for the canal zone. In the month of January, 1908, there were approximately 43,000 employes on the rolls of the commission and of the Panama Railroad, about 6,000 of whom were Americans.

The real work of excavation began in 1906, and in the two years ended since then 21,600,565 cu. yd. were removed. During 1907 the record went up in bounds from 815,270 cu. yd. in March to 1,868,729 in October, but even the latter figure, which so amazed the American public when reported, has been dwarfed to insignificance by the 2,709,290 cu. yd. of January and the 2,945,880 cu. yd. of February, 1908.

With fully 80 per cent of the entire plant needed for construction purchased or contracted for, machine shops erected and organization perfected, this year will see every record almost doubly broken and completion near enough to determine with a fair amount of accuracy the date on which the great American fleet, if desired, could pass into the Pacific without such a cruise as has just been accomplished.

The illustration shows the amount of material excavated from the Panama canal in a year, as compared with the amount of material in the Pyramid of Cheops.

WIRELESS TELEGRAPH DIS- PLACES CARRIER PIGEONS

The British naval homing pigeon service is being abolished and wireless telegraphy has taken its place. Not many years ago people were filled with wonder at the endurance of the homing pigeon, which could fly at the rate of 100 miles an hour and reach its destination with safety. To-day wireless messages are being sent hundreds of miles in a few seconds.



A gang of native workmen, employed by the German Oriental Society, are here shown removing a great slab from the fallen columns of the great temple at Abusir, Egypt, where antiquities are being searched for. The pyramids in the background have nearly lost their shape through centuries of exposure to the elements.
Courtesy of The Sphere.

HUGE SINGLE CASTING

This monster casting is claimed to be the largest ever turned out in the history of the iron and steel trade of the United States. It is of one piece of iron, 26 ft. 6 in. long, 8 ft. wide, and 12 ft. high. Its total weight is 235,000 lb., or 117 tons, and it took months to prepare.

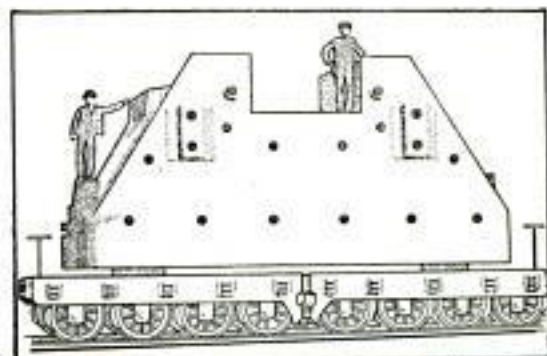
The question of transportation from the shops in Pittsburg to the big steel plant at Monessen, Pa., where it will

form part of a rolling mill, was a problem, as there were no cars strong enough to bear its enormous weight. Two 8-wheel gun trucks, such as are used for the transportation of the heavy ordnance of the United States government, were at last decided upon to bear the burden. During the short trip from the shops to the main line the enormous weight of the load caused the rails of the yard tracks to spread, derailing the trucks twice.

GIANT RAILWAY-CAR ELEVATOR

To raise and lower the heavy cars in and out of the Hudson river tunnel, the Hudson & Manhattan Railway Company has constructed an elevator having a lifting capacity of 100,000 lb., with a platform 50 ft. long and 12 ft. wide.

A wellway, having reinforced concrete walls from the ground level to the tunnel, was provided as a shaft



Big Rolling Mill Casting

for the elevator. Upon the side walls of this structure are placed 6 steel columns, which support a girder-framing directly over the hoistway. Upon these girders is placed the machine which operates the elevator platform. The

entire system of drum shafts, worm gears and worm shafts is driven by a 100-hp. motor.

The Hudson tunnel cars are 46 ft. long, 9 ft. wide and weigh 64,000 lb. when empty.

VAST CITY RESERVOIRS UNDER ROOF

Unusual Construction for Los Angeles Water Supply



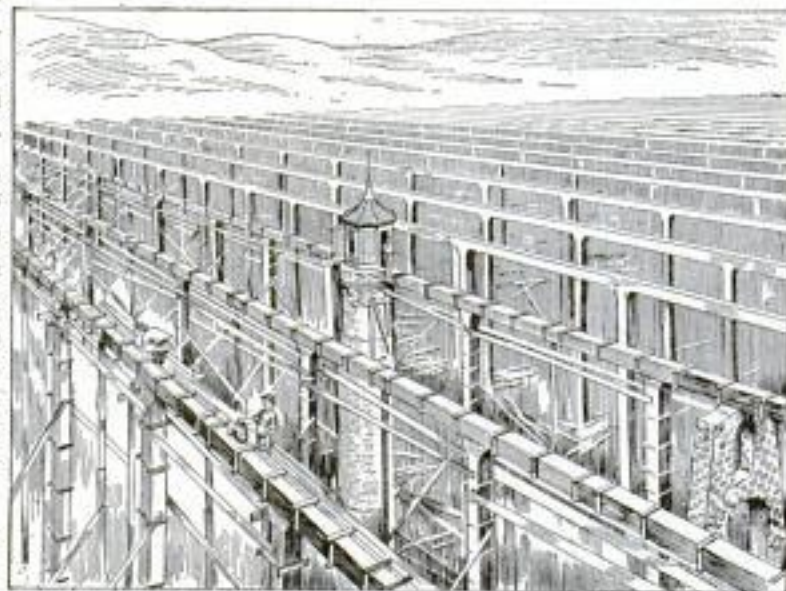
These Roofs Cover 16 Acres of Reservoirs

Two of the largest roofs in the world, covering approximately 16 acres, and embodying building methods and material never before adapted to such a purpose, are in course of construction at Los Angeles, Cal. Each is being placed on a city reservoir, one 10 acres in extent and the other 6, and reinforced concrete piers are used as supports. In the Bellevue, the smaller of the two reservoirs, these piers are 47 ft. long, and will be submerged over 40 ft., and on the other, the Ivanhoe, 27 ft. The unique work has progressed so far that the finishing touches will soon be put on.

The immense Bellevue basin, cleared of water pending roofing, with the towering piers and network of scaffolding, resembles more a drydock than a reservoir. Workmen on the miles of scaffolding resemble spiders in a great web. They take a good many

chances on the narrow board pathways high above the bed of the basin. A 3-story building could be dropped in at almost any point on the 6 acres and still there would be room at the top.

There is a veritable forest of piers—



Construction for Supporting the Roofs

330 of them—in this reservoir. Each rests on a 30-in. base, running thence to 16 by 16 in., and finally to 12 by 12 in. at the top. The girders that span

the huge "well on a hill," as this reservoir is often called because of its commanding location several hundred feet above the surrounding country, are 8 by 14 in. at the ends, 304 ft. long at the widest part of the tank, and 115 ft. at its narrowest—and all of reinforced concrete. The roof now being placed upon them will, it is declared by the engineers in charge, last practically forever. It will be painted green, to harmonize with the landscape.

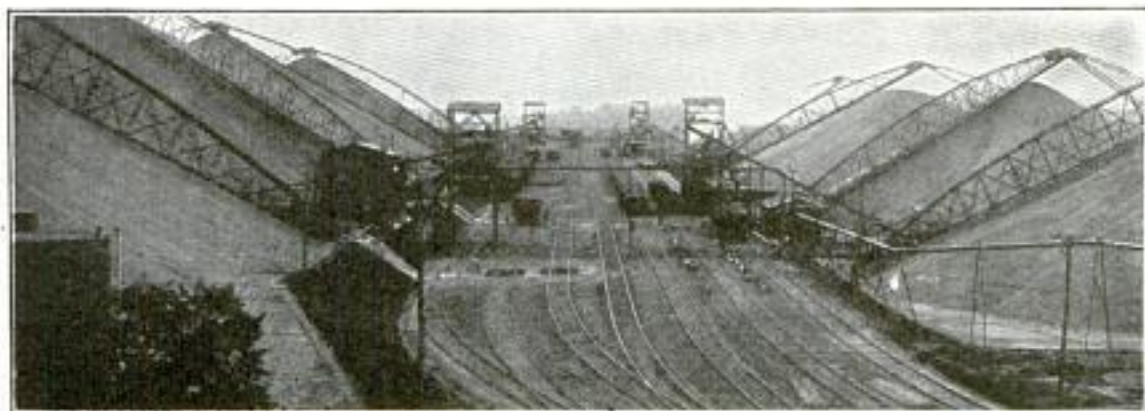
Roofing the 10-acre Ivanhoe reservoir is a stupendous task, costing approximately \$27,000, and requiring

1,000,000 ft. of lumber and 2,000 bbl. of cement for the 630 reinforced concrete pillars that support the roof; 200 kegs of nails were required to fasten the timbers together, and a gang of 50 men has been at work more than two months fastening on the boards. The roof is of truss construction, and 1,280 trusses are used. From either end of the reservoir the appearance is that of a row of 19 house roofs of great length, the base of each truss frame being 40 ft.

Waterworks Superintendent William Mulholland directed the construction work, with Robert Neisse as foreman.

HUGE PLANTS FOR THE STORAGE OF COAL

"Rainy Day" Departments of the Anthracite Coal Companies Represent an Immense Expenditure



480,000 Tons Piled in this Storage Yard

For the purpose of keeping the anthracite coal supply steady and to prevent sudden fluctuations in the market, caused by strikes and other perverse conditions, the anthracite coal companies have expended a vast outlay of money in the building of up-to-date, mechanically operated storage plants along the Atlantic seaboard, in the coal regions, and on the Great Lakes.

The storage of coal has become a special science, having its own peculiar conditions, its experts, and its inventions. Coal is no longer dumped from a car by the crude, old-fashioned methods, and loaded into a car in the same

crude way. Electricity and steam take their part here as everywhere, and the day's work is measured in thousands of tons; the year's work in millions.

Anthracite and bituminous coal differ in chemical composition and in the manner of their mining, and therefore must necessarily be differently stored. As a rule, bituminous coal is stored by the consumer or by some middle man. Anthracite has to be stored by the producing company, due in part to the fluctuation in the demand for the several sizes. Bituminous coal being uniform, not divisible in sizes, the supply can be adapted to the demand with a fair



In Hindustan, near the Indian frontier, the country is rugged and improvements are of a very primitive though often ingenious character. The illustration shows a suspension bridge built by the natives by splicing bamboo. The construction closely resembles the inverted frame of a dirigible airship.—Courtesy London Graphic.

degree of accuracy. The sizes of anthracite rank as separate commodities, and if the demand for one variety falls off, that variety has to be stored to await a better market.

Bituminous coal must be stored in piles not more than 35 ft. high, owing to the danger of spontaneous combustion. Anthracite is stored in much deeper piles, and can be handled with bucket conveyers and other similar implements, but as carefully as possible, as breakage is a most important consideration, and the smaller the coal the smaller the price.

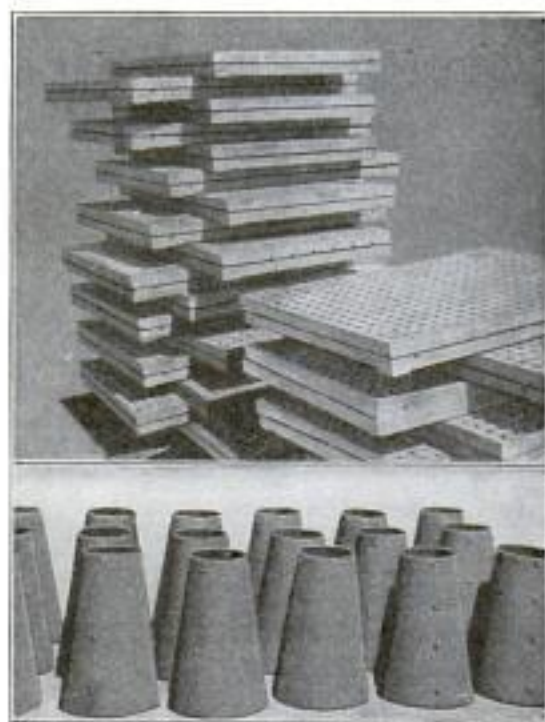
An immense slanting truss, with a chain conveyer, constituting what is known as a "trimmer," is the most important feature of an outdoor storage plant. By this conveyer the coal is delivered upon the ground and then carried to the apex of the pile. Gradually the mass of coal grows higher and higher, until it forms a bulky cone against the sky. The movable trough-bottom of the conveyer, kept a little in advance of the apex of the cone so that a gentle fall is effected and breakage reduced to a minimum, makes it easy to change the point at which the load

is emptied. A reloading conveyer, often running in a tunnel beneath the level of a pile, carries the coal to the reloading tower, where it is screened before being chuted into the cars for shipment. The mechanism through which the coal is sent into the reloading conveyer is capable of reaching any part of the entire storage area.

Elaborate provisions have to be made for melting out anthracite during cold spells. If snow falls and melts, and the mercury drops below freezing, the coal, either in cars or on the pile on the ground, becomes a solid mass. Boiler plants have been built on nearly all the storage grounds and when the coal freezes the steam is piped to the piles and forced into the coal. This thaws the ice sufficiently to make it possible to move the coal through the chutes.

HEAVY "FORMER" ON IRON AND CONCRETE PIERS

These heavy cast-iron former plates, weighing several tons each, will be placed on concrete piers which will be formed in the iron molds shown at the right. The "former" floor will be 18



Plates and Molds

in. above the ground. In the perforations are placed iron plugs or stakes around which steel beams, heated red hot, are shaped.

BOILER WITH CURVED WATER TUBES

This water tube marine boiler has 1,080 tubes, 7 ft. in length. The 1½-in. tubes in the center of each nest are straight, but the outside tubes, re-



New Type Marine Boiler

ceiving more intense heat, are curved. The flue sheets are 1 in. thick. Any tube can be removed for repairs.

ELECTRIC CANNON TO SHOOT FROM LONDON TO PARIS

A gun that if set up in London could bombard Paris is the latest European war invention announced to the public. The inventor is a Scotchman who claims that by the application of electricity he can impart a velocity of 30,000 ft. per second to projectiles of any dimension now in use on board ships or in land defenses.

Col. F. W. Maude, of the English army, who has seen the model work, says that the results claimed are certain to be realized. The inventor states that the greatest experts of England have seen, examined and witnessed the working of the model and expressed their entire satisfaction of its practicability. It is claimed that the gun can impart the above velocity to a shell

weighing 2,000 lb. without smoke, flash or recoil.

GERMAN LIGHTSHIP "FEHMARNBELT"

The new German lightship "Fehmarnbelt," just completed at the Bremen shipyards, is one of the finest of



Power Lightship

that class of vessels which, anchored over a dangerous shoal in calm and stormy weather, warns ships to beware of the peril so close at hand. The lightship's length is 135 ft.; breadth, 24 ft., and depth, 12½ ft. She has a tonnage of 300 tons.

A fine quality of rock suitable for grindstones has been uncovered in large quantities in Colorado. The stones, cut to factory sizes, will be put on the market at once.

WOODEN PIPE LINE

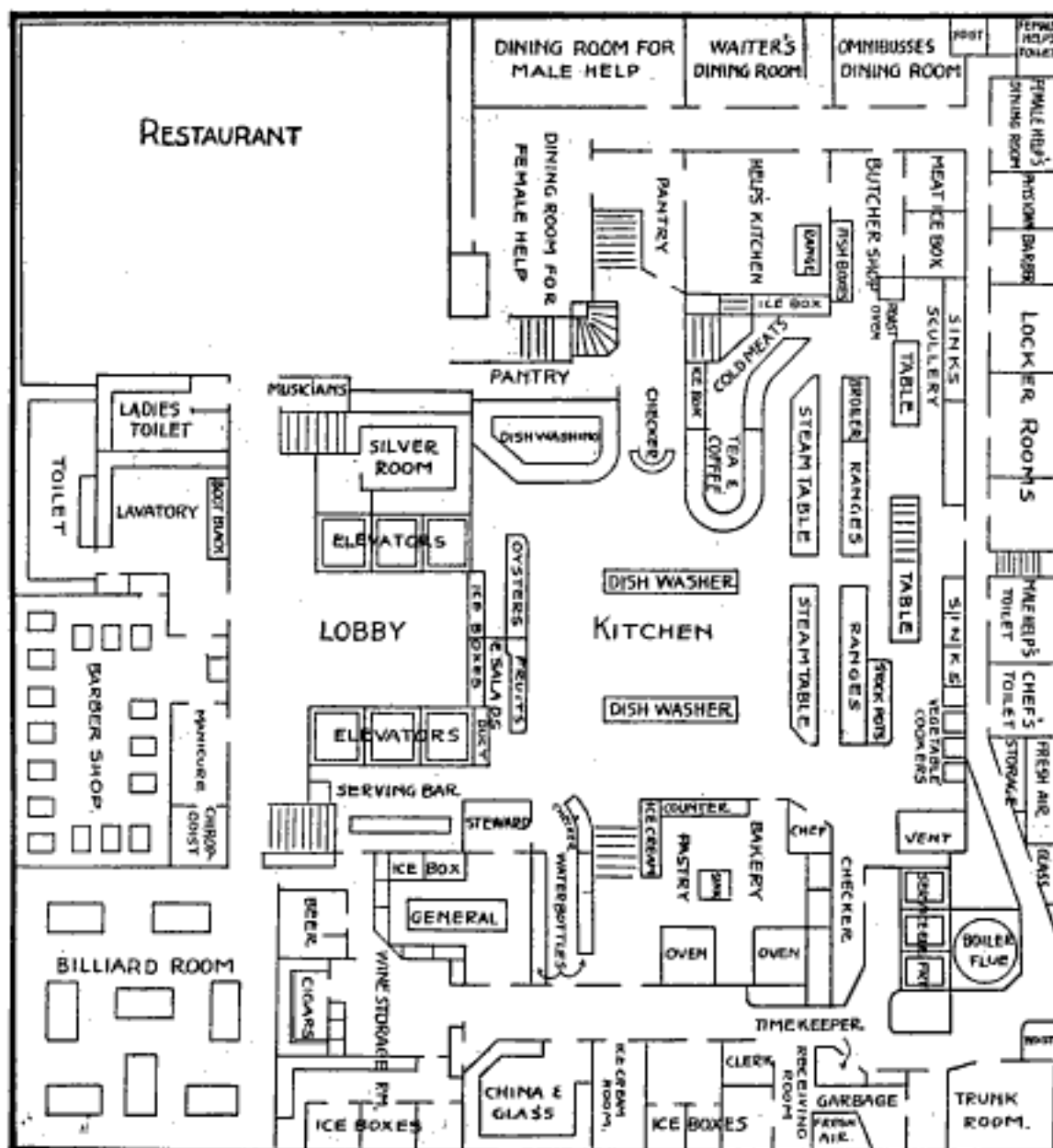
These 24-in. wooden pipes are joined together with wooden couplings and are used for the discharge of sand and water from a hydraulic dredge.



The Joints Are Wood

POPULAR MECHANICS

THE WORKSHOP OF A GREAT HOTEL



The receiving, storing, preparing and serving of food in a great hotel requires facilities little dreamed of by the patron whose acquaintance does not go beyond the dining-room. Not only must there be ample facilities in this workshop, but everything must be planned with a view to convenience and a saving of time and labor.

The diagram shows the basement plan of a million-dollar hotel now being built to occupy a space about 175 ft. square.

On the railway in Wales the brakeman has to announce such stations as: Ffestiniog, Bettws-y-coed, Llandegai and Penmaenmawr. As in this country, tourists occasionally fail to understand what the man says.

In a collision between the British cruiser "Burwick" and the torpedo boat "Tiger," off the Isle of Wight, the latter was cut completely in two, and 36 men, including the commander, were drowned.



This new quick-firing gun, intended for the use of the British territorial army, was recently taken from Woolwich to Westminster to give the members of Parliament the opportunity of examining it.

FRENCH METHOD OF MEASURING WIND PRESSURE

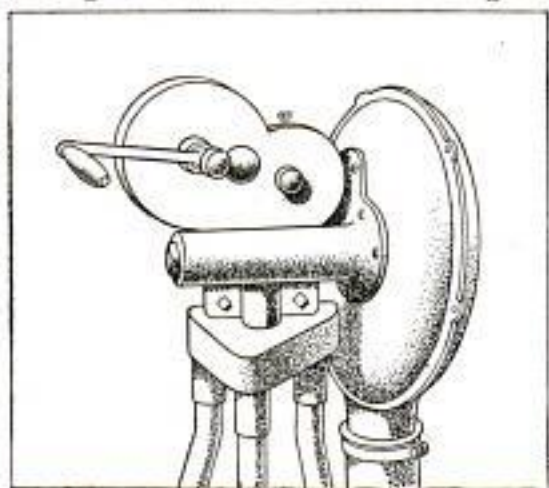
M. Eiffel, the French construction engineer, has just completed a number of unique tests for the purpose of obtaining precise data on the subject of wind pressure. To do this he had recourse to the novel method of letting the plates or wind boards, offering the surfaces to be tested, fall vertically from a height of 400 ft. in the Eiffel tower. Above the wind board and attached thereto by springs was a cylindrical case containing suitable dynametric and recording apparatus. Through the axis of this case was a hole, through which a cable passed, and it was this that guided the assemblage in its fall. The cable was a loose fit until about 60 ft. from the ground was reached, then it gradually enlarged, bringing the apparatus to a rest without shock about 20 ft. above ground.

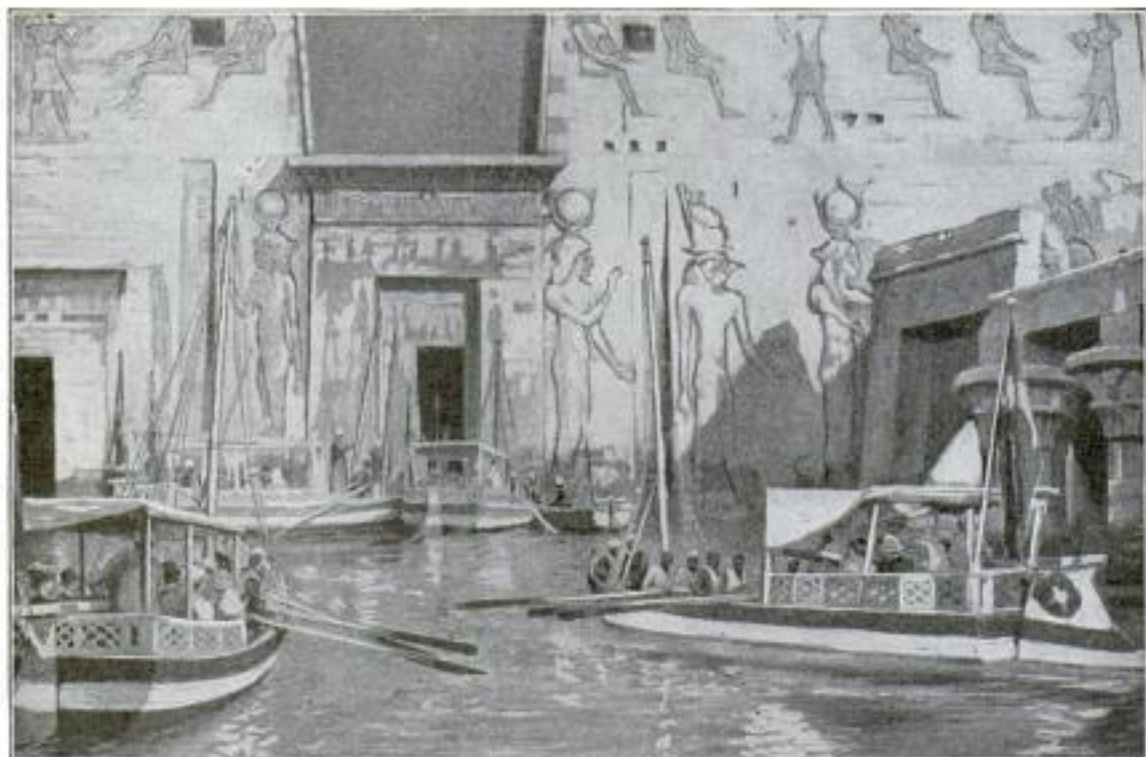
The experiments proved that for velocities of from 60 to 130 ft. per second the resistance by air to a moving surface is practically proportional to the square of the velocity. He also

found that the resistance of an inclined surface is practically the same as that of a normal one when the perpendicular to the surface makes an angle less than 30 degrees with the direction of the motion.

BLACKSMITH'S BLOWER AS AIR PUMP

To avoid danger of gas explosion in the manholes, a common blacksmith's blower is being used to force air to a workman fixing telephone wires in an underground conduit in Los Angeles.





When the great Assouan dam was constructed the rise in the waters of the Nile partially submerged the wonderful old temples on the island of Philae, and the further raising of the dam, which is now taking place, will mean the final destruction of some of the most beautiful relics of the land of the Pharaohs. The island is now covered with water during more than half of the year.

It is only between August and December, when the water of the river is allowed to flow through the gates of the dam, that the whole island stands high enough above water so that access may be had to all the temples. The oldest temple buildings date from 350 B. C. The illustration shows the flooded outer court of the Temple of Isis, where emperors feasted and tourists have trodden for 2,000 years.

SILAGE FROM CURED CORN FODDER

At the Delaware Experiment Station of the United States Department of Agriculture, A. T. Neale has studied the possibility of making silage from cured corn fodder, being led to undertake the work by the fact that formerly good results were obtained locally by feeding cut corn fodder, which was packed into boxes, moistened with hot water and allowed to stand for 24 hours. Concentrated feeds, such as cottonseed meal, could be mixed with the mass and such a mixture used in the place of bran. The method is too inconvenient for general use, but it suggested the possibility of making silage from dried corn fodder by addition of water and subsequent fermentation. When the experiment was tried a rise of temperature was noted in the silo and the development of an aromatic odor, as in



To Show Size of Columns

the case of green silage. It was found that young and old stock ate such silage practically without waste and the cows preferred it to dried shredded fodder.

ENGINE FOR HAULING PURPOSES ONLY

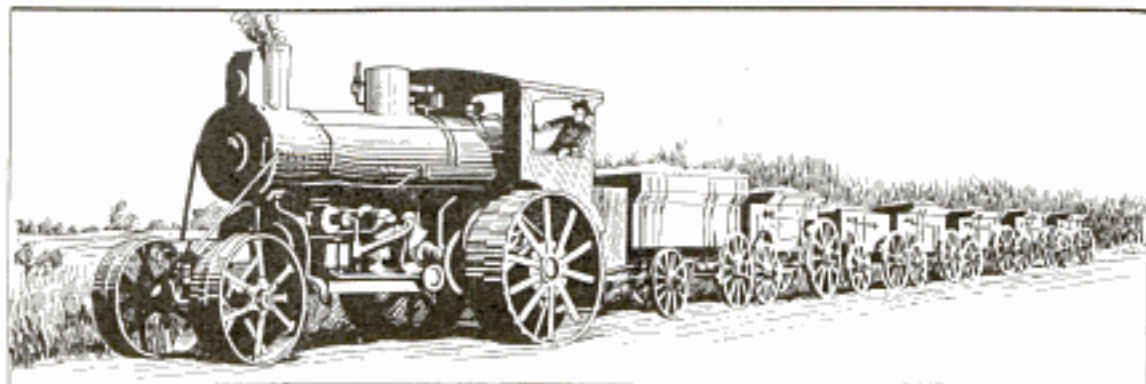
Among the latest inventions is a hauling engine, designed primarily for

object sought is to transmit the power to the driving wheel and develop the draw-bar pull.

The engine shown in this illustration is drawing 35 tons of crushed rock for road improvement.

HANGING WATER MAINS

A plan for a hanging high-pressure water system for fighting fires in Chi-



Engine Drawing 35 Tons of Crushed Rock

drawing loads. This is where it differs from the ordinary traction engine, which is generally built to furnish power through belt connection to run other machinery, while its traveling power is a secondary consideration. In this hauling engine the flywheel becomes of minor importance and the

cago has been presented to the fire chief of that city and approved. The idea is to hang the pipes under the tracks of the Union elevated loop and, by making a connection with the fire boats in the Chicago river, force water through them at the rate of 100,000 gal. per minute.

FLYING OVER ICE

The recent short flight of the aeroplane "Red Wing," so called because its planes are constructed of red silk, was one of the most interesting public exhibitions of heavier-than-air flying machines ever made in this country, although the distance flown was under 400 ft. After flying 318 ft., at a height of 10 ft.,



the horizontal rear surface gave way and the machine described a circle, landing safely. The two principal features of the flight were that it was accomplished at the first trial, and that it was made from the ice-covered surface of a lake. The aeroplane was supported on steel runners instead of on bicycle wheels, and it was the first time such a flight had ever been attempted.

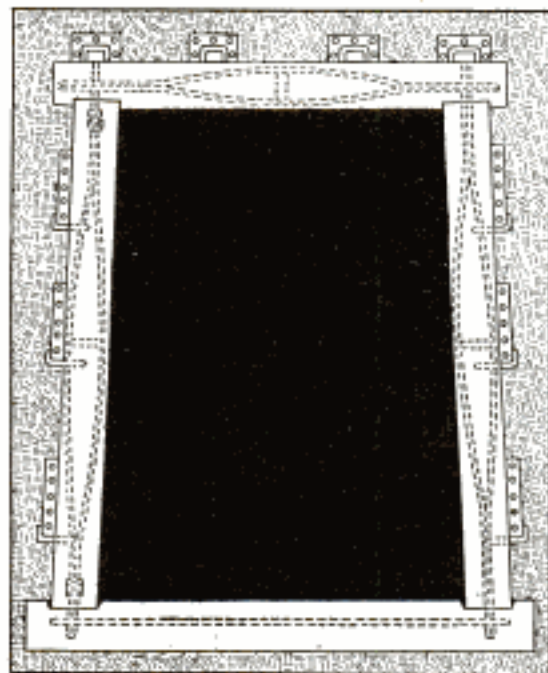
The experiment was held at Lake Keuka, near Hammondsport, N. Y., under the operation of G. H. Curtiss. The "Red Wing" was designed by Lieut. Selfridge, of the United States army, and is composed of two superposed surfaces, made with a double curve and bowing laterally. The ribs which form the curve are made of thin layers or plates of wood and the struts are vertical pieces of spruce, carefully formed to give the least possible resistance in the air. The width of the machine is 42 ft., and the surface has an average depth of 4 ft. 3 in., being 4 ft. wide at the outer edge, and 6 ft. 6 in. wide at the center. It is driven by an 8-cylinder, air-cooled engine, which develops 40 hp. at 1,600 revolutions, and weighs 145 lb. A steel propeller, 6 ft. 2 in. in diameter, with a 4-ft. pitch, is attached to the engine shaft.

CEMENT USED FOR MINE SUPPORTS

The increased use of cement for various branches of construction has directed the attention of mining engineers toward this material as a possible substitute for mine timbers. The accompanying illustration shows a method of using cement in the place of timbers. The reinforcing rods are made in the form of a simple truss, and so placed that the pressure will be directed against the apex. These rods are not large in section, as the surrounding body of concrete supports them against lateral bending.

The cost of construction is from 10 to 15 per cent less than that of timbers,

says Mining Science. In an ordinary drift the posts are made 4 by 5 in. in size and the caps are 4 by 7 in. Reinforcing loops made of $\frac{1}{2}$ -in. iron rods are



Cement Instead of Timber

embedded in the cement. The advantage in favor of the cement is that there is less liability of fire and that the cement gains strength with age, while timbers will rot and weaken. The forms for making these posts and caps in various ways are patented.

THE WORLD'S FINEST APARTMENT BUILDING

The apartment building now under construction at the corner of Park Lane and Piccadilly, London, will be the finest in the world and will cost about \$1,500,000. There are only 7 floors to the building and each floor constitutes an apartment, fully equipped with every modern luxury. Each apartment has large drawing, music, dining and billiard rooms, a library, 11 bed and dressing rooms, 3 bathrooms, and kitchens and domestic offices. Every apartment will command a rental of \$15,000 a year, in addition to rates and taxes.

AN IMPROVED UMBRELLA

Owing to the fact that the handle or stick of the ordinary umbrella is centrally located, a single person can occupy only one-half of the space beneath, with the result that his outer shoulder is exposed to the drip and rain. An umbrella has been designed to remedy



Will Shelter Two

this defect, and it is so made that when raised the handle will be at one side of the center, leaving the central portion of the sheltered part unobstructed. This umbrella when closed has the same appearance as the ordinary article, says the *Scientific American*. The handle is provided with the usual runner, but the stretchers are attached to a carrier which is connected with the runner by means of links. The ribs close tightly against the handle when closed,

but when raised they are tilted slightly to one side.



CONCRETE LOGGIA ON SIDE OF MOUNTAIN

The loggia shown in this illustration is constructed of reinforced concrete and is built out from the side of a rocky bluff overlooking a road in Geneva, Switzerland.

REPAIRING A CONCRETE ARCH

The central span of this concrete bridge was too heavy for its supporting piers and cracked on both sides. Holes were cut through the floor of the bridge in the center and a symmetrical center pier cast. The cracks at the ends of the span were enlarged and refilled with concrete.





In this illustration is shown the contrast between a modern ocean steamship and a "dugout" boat paddled by three Ceylon boys. It was constructed from an old log, the lines of which were far from perfect in the first place. Photo contributed by K. McBratney.

STREET CAR CRASHES INTO STORE

The illustration shows all that was left of the fronts of two stores and the big interurban electric car which crashed into them. Loaded with nearly 50 passengers, 37 of whom were injured, the forward trucks of the car, which runs on the Detroit, Ypsilanti, Ann Arbor and Jackson interurban line, left the tracks on Michigan avenue in Detroit, and swinging around crashed into the stores and turned over. Four of the passengers were fatally injured. In the center of the chaos hangs a skirt torn from one of the women passengers.

EXACT TIME TO SHIPS BY WIRELESS

A proposal has been made to the French Academy of Sciences by the French inventor, de la Grye, to equip the Eiffel tower with a wireless apparatus powerful enough to send Hertzian waves completely around the world, for the express purpose of sending to every ship, no matter in what part of the world, the exact time, according to the meridian of either Greenwich or Paris.

If this scheme is possible, and it is being given serious thought, it is believed that wrecks through miscalculation of longitude would be few and far between, as every ship equipped with a wireless instrument would be able to correctly regulate its own chronometer and learn the exact longitude without taking observations by the sun. Noon or midnight would be indicated by a prearranged signal.

— • • • —

An alarm of fire was recently turned in from a lumber yard in a submerged section of Battle Creek, Mich. Flat boats were brought into service and the fire-fighting apparatus poled to the scene. Hydrant connection was made under water.



BUILDING AIRSHIPS AND FLYING-MACHINES

PART II—By Carl Shelley Miner, The Miner Laboratories

HOW TO MAKE A HYDROGEN GAS GENERATOR**Simple But Practical Apparatus for Inflating Balloons**

Notwithstanding recent promising developments of the aeroplane, especially the work of Farman, it is still true that the bulk of the really satisfactory results in aerial navigation have been secured by the use of the power-driven gas bag. While in many directions there have been great improvements on the balloons of former times, hydrogen gas generated by means of iron and sulphuric acid is still used to fill them, as it has been almost from the beginning of ballooning. A few attempts to use hot air have been made, but it is so inferior to the hydrogen that its use has never become general. The hydrogen gas, because of its extremely low gravity, the ease with which it can be produced and its cheapness, stands without a rival. It is so absolutely without competition in this field that there seems not the slightest probability of its ever being displaced. The efforts of those who are working on the problems of aerial navigation have been directed therefore not to discovering a substitute for it, but to evolving cheaper and more convenient methods for its production.

The method commonly employed consists in treating iron shavings with sulphuric acid. The increasing use of hydrogen in airships and, even more, its use in certain industrial processes, such as welding, have drawn the attention of various investigators to the problem of improving this process, and several excellent methods, some of them new, have recently come into use.

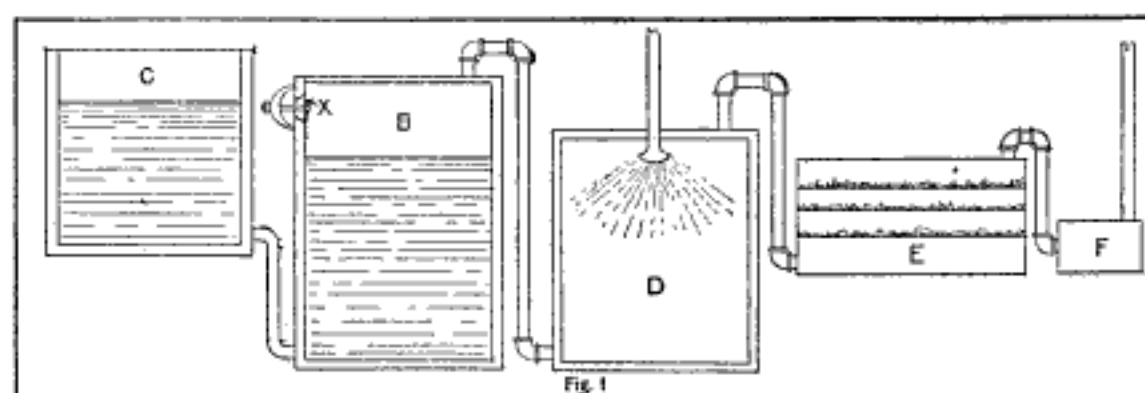
In the Russian-Japanese war the Russians produced gas for their balloons by treating aluminum with an alkali. This is a more expensive method than the use of iron and sulphuric acid, but has the advantage that

the aluminum is lighter than the iron and that the alkali may be obtained in solid form, and so can be transported and handled much more easily than sulphuric acid. Recently metallic silicon has been substituted for aluminum in this process.

The French transport the hydrogen for their war balloons compressed under a pressure of 185 atmospheres in metal cylinders and have found this plan very satisfactory.

Two new methods make use of solids which, when brought in contact with water, generate hydrogen gas. One of these, manufactured in this country, is an alloy of lead and sodium. The reaction of metallic sodium when brought into contact with water is well known to even the most superficial student of chemistry. Hydrogen is evolved and caustic soda is formed. The object of using the lead sodium alloy is to obtain a material which is less violently reactive than the sodium alone, for even a small amount of moisture may cause it to react with explosive violence. The lead sodium alloy may be more easily and safely handled and is a convenient means of generating hydrogen.

Another material which is used in somewhat the same way is calcium hydride. This compound is formed by passing hydrogen over heated metallic calcium and is a solid similar in nature to calcium carbide. By treating it with water hydrogen may be generated just as acetylene is generated from calcium carbide. One pound of calcium hydride is capable of producing 17 cu. ft. of hydrogen gas, and when it is realized that 1 lb. of iron and 2 lb. of ordinary commercial sulphuric acid produce only 6½ cu. ft. of gas, the immense superiority of calcium hydride will be apparent at once. The product is, however, so high priced that it is not practical for the ordinary investigator of the problems of aerial navigation. The old iron and sulphuric acid method is still the



Details of Apparatus for Generating Gas

best available, and it behooves him to understand it thoroughly.

Since hydrogen is the lightest of all gases, it follows that the purer the hydrogen, the more suitable it is for filling balloons. Air is 13 times as heavy as hydrogen; carbon dioxide, 22 times as heavy; hydrogen sulphide, 16 times; sulphur dioxide, 32 times. All these gases may occur in the hydrogen produced by the use of iron and sulphuric acid. When a very pure hydrogen is required, as in the case of André's balloon or Wellman's airship, great precautions are taken to remove all these impurities as well as the water and sulphuric acid which may be carried along with the gas mechanically. The accompanying sketch shows an apparatus which was designed for André:

C, (Fig. 1) is a lead lined mixing tank, where the 60 degree Bé acid is added to sufficient water to reduce the gravity to 16 degree Bé. The acid is then run into the generator, B, into which the iron is introduced through the valve X. A stop cock should be attached to the base of the generator, B, for the purpose of removing the sludge. The gas passes from the generator to the washing chamber, D, where it is thoroughly washed by fine sprays of water. It then passes through the chamber, E, which contains trays of chemicals for removing the residual impurities. Finally it goes to the testing chamber, F, where its actual purity is tested before it is passed on into the balloon.

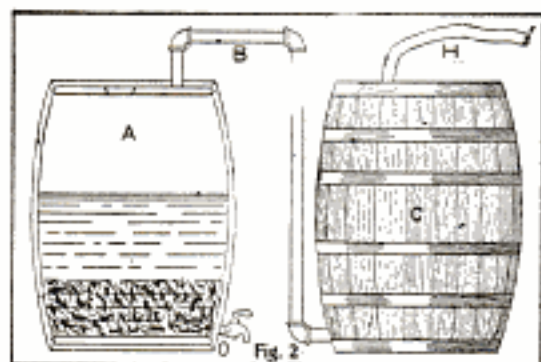
The apparatus used by Wellman is

similar. The gas is thoroughly washed and is passed through a cylinder filled with caustic soda, which removes acid and carbon dioxide. It is afterwards dried, tested and perfumed, the latter being an important precaution to aid in the prompt discovery of leaks, since hydrogen itself is odorless.

For filling ordinary balloons or airships such precautions are unnecessary. A simple apparatus such as is shown in the accompanying sketch (Fig. 2) will produce a gas quite satisfactory for the purpose. A is an ordinary 50-gal. barrel, having a pipe, B, connecting it with the lime tank, C. A should have an opening in the head through which the iron and acid may be introduced and which admits of being tightly closed by a bung or valve. It also has an outlet, O, near the bottom, for the removal of sludge and exhausted acid liquor. C is another barrel partially filled with milk of lime. This will remove acid and carbon dioxide. The removal of the acid from the gas is very important, as otherwise it may injure the envelope of the balloon. C has a flexible connection, H, which may be ordinary hose, through which the purified gas passes to the bag. The iron should be scraps or shavings, not large chunks nor fine powder. The ordinary 60 degree commercial sulphuric acid may be used, but should be diluted to 16 degree. This may be done by adding it to about $3\frac{1}{2}$ times its own weight of water. Add the acid to the water slowly, with constant stirring. *Do not add the water to the acid*, as that pro-

cedure has a tendency to reduce the surplus population.

For a bag of a capacity of 5,000 cu. ft., approximately 900 lb. of iron and 1,800 lb. of 60 per cent acid will be required. The actual operation of generating the gas is quite simple. It consists merely in filling the generator barrel about one-third full of iron, adding dilute acid to within about 1 ft. of the top and immediately closing the opening tightly; the gas then passes through the pipe to C, and after being purified by passing through the lime water is introduced into the balloon through the flexible tube H. Several generators should be ready, and as fast as one is exhausted it should be disconnected and a new one connected and put into operation. The exhausted generator should now be emptied of



Simple Type of Apparatus

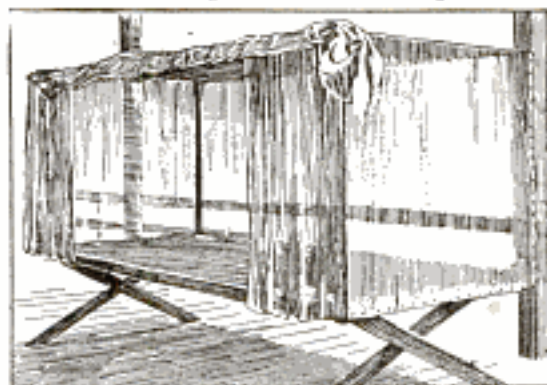
the acid liquor and sludge through the outlet O, and then refilled with acid, this process being repeated until all of the iron has been used up. Of course, as many generators may be used simultaneously as the operator desires in order to hasten the filling of the bag.

There are many more expensive forms of apparatus for this purpose, but the one here described will be found quite effective and very cheap. The barrels should be of hardwood and tight. All the connections should be close and the bung which closes the inlet and the generator should be accurately fitted.

Remember that hydrogen gas mixed with air is violently explosive and do not allow a light or a fire of any sort near the generator or gas pipe.

COT COVERED WITH MOSQUITO NETTING

In the summer time when the nights are hot it is pleasant to sleep in the

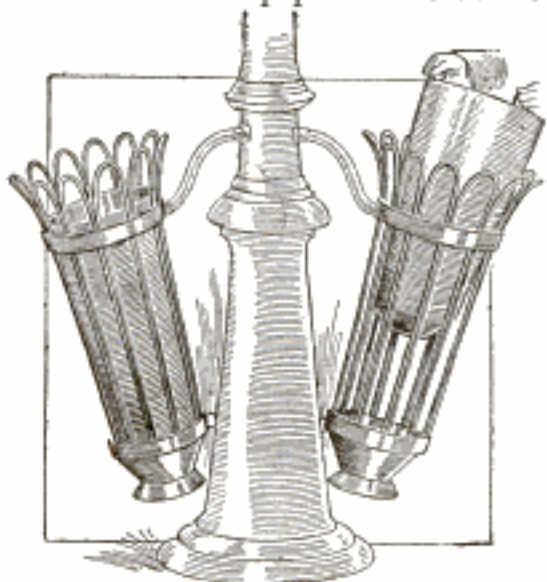


Covering for Outdoor Cots

open, providing that some protection is arranged to keep mosquitoes and other insects and bugs at a distance. A folding bed cot, fitted with a simple frame about 3 ft. high and covered with cheese cloth or mosquito netting makes sleep possible on the hottest of nights.

STREET BASKETS FOR WASTE

One of the many sanitary and street-cleaning devices of Paris is the waste paper and refuse basket shown in this illustration. Lamp posts were utilized



Paris Waste Baskets

for standards and to these were fastened steel baskets or racks which hold removable galvanized-iron refuse cans.

STEAM-DRIVEN OMNIBUS

When all the world is turning to gas, gasoline and electricity for motive power, Germany, which, perhaps, has more gasoline motor omnibuses than any other city in the world, has stopped a moment in the mad whirl to experiment with an omnibus driven by the old tried agent, "steam."

The reason for introducing this new type is to demonstrate the numerous advantages a steam machine has over a vehicle operated by an explosion engine. This type of machine has become something of a nuisance in Berlin on account of the noise and the un-



Berlin Steam Bus

pleasant odor from the exhaust gases. The steam car is driven with but little vibration and when it stops, the engine also ceases. Change of speed is effected without the grinding of the speed gear, and the discomfort of exhaust steam or smoke is comparatively little.

The machine is the only one of its kind ever constructed, but the people of Berlin are taking to it kindly and more will probably be placed in commission. From exterior appearance it is but little different from the ordinary motor-bus. The steam generator is mounted over the forward truck, and the engine under the center of the car. The latter is horizontal, double acting and reversible. Power is transmitted to the rear wheels by chains. The machine carries 25 passengers at a speed of about 15 miles an hour. The engine develops 25-hp. on 7 cents' worth of gas-coke per hour.

CROSSING BELLS RING ONLY FOR CERTAIN TRAINS

An extensive highway crossing bell installation has recently been made by the Big Four Railway, embodying many new features in this branch of signal service. To guard against the constant false alarms and continuous ringing of bells located at crossings near the entrance of railway yards, due to switching on the main lines, an automatic arrangement has been devised which allows the bells to ring for all approaching trains, but silences them when a train remains on the track circuit longer than a minute.

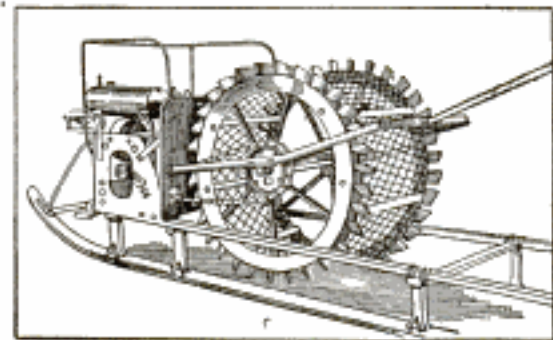
The bell poles or standards are made of I-beam steel, imbedded in a concrete base. The crossing signs are made of malleable iron.



MOTOR SLEIGH FOR POLAR EXPEDITIONS

A meeting of Arctic explorers was held recently in France to experiment with different types of motor sleighs to determine if such machines would be practical for polar expeditions. Dr. Charnot, who is now fitting out for a two years' expedition to the South pole, will take with him three motor sleighs of his own invention.

The Charnot machine consists of a Norwegian sleigh with the power machinery placed in the rear, the motor driving a couple of spiked wheels

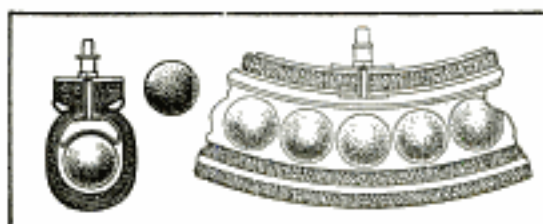


Charnot's Motor Sledge

mounted on a single shaft. The transmission of power from motor to driving wheel is by means of a single chain. Sliding gear transmission gives two speeds forward. On the high gear the sleigh mounted the grades of a hillside with ease at a speed of 8 miles an hour, even though the surface was far from even. A special feature of the machine is the pivoting of the driving-wheel, which makes it possible for it to accommodate itself to irregularities of surface.

PUNCTURE-PROOF BALL-BEARING TIRES

One of the recent automobile novelties is a ball-bearing puncture-proof tire. As far as the shoe and the inner tube are concerned the construction is the same as the familiar standard tires, but between the inner tube and the shoe are placed two continuous strips of sectional molded rubber, with a series of circular openings or holes. These holes are filled with permanently inflated rubber balls. As the balls and



Construction of Tire

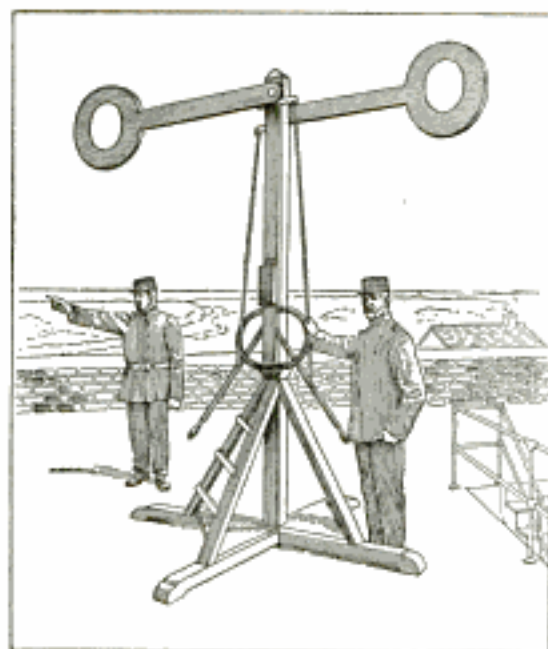
their holder are placed between the shoe and the inner tube, anything penetrating the former must pass through them before reaching it, thus making the tire practically puncture-proof.

A nail or other sharp object going through the shoe could not deflate more than one of the balls, and a number could be thus punctured before the effect would be noticeable. The balls can be easily removed and repaired at the end of a journey.

At a public demonstration given at the Marconi wireless station at Glace Bay a message was sent to Clifden, Ireland, and a reply received within five minutes.

SIGNALING A PRISONER'S ESCAPE

On the roofs of nearly all English prisons are signaling devices for the purpose of notifying the surrounding country of the escape of prisoners, and



Signal Set for "Escape"

also for directing the searching parties if information is received concerning the direction in which the prisoner went. The round discs at the end of the signal arms are illuminated at night and, when flashed, can be seen for a considerable distance.

SASH RETAINERS FOR PASSENGER CARS

This sash lock or retainer is one of the latest invented for passenger cars on steam and electric railways. It is composed of two side locks and ratchets, which make it possible to raise and securely fasten the window at any height desired. The ratchets are hid from sight behind the inner strips of the window frame. It is claimed that windows so equipped will not rattle, and can be raised without a "jimmy."



METALS IN A BATTLESHIP

A first-class battleship, the metal contents of which weigh about 14,000 tons, contains close to the following amounts of the several metals. Steel and iron, 13,200 tons, cost \$396,000; copper, 400 tons, cost \$104,000; nickel, 140 tons, cost \$98,000; lead (including paints), 140 tons, cost \$10,500; zinc, 110 tons, cost \$10,450; tin, 10 tons, cost \$5,800.

GASOLINE-ELECTRIC RAILWAY CAR

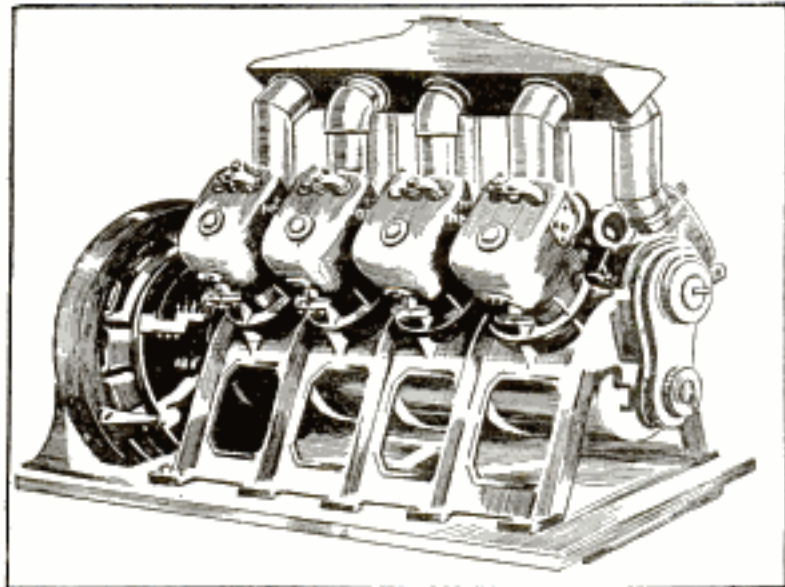
This gasoline-electric railway car, intended to take the place of steam engines and trains for short-line work, is propelled by electric motors which receive their supply of electricity through a generator driven by a powerful gas engine.

The car is of the combination type, and comprises one ordinary passenger compartment, a smoking room, baggage room, engine room, toilet room and observation compartment. The length over all is 50 ft. The gasoline engine is direct-coupled to a direct-current generator, and the current is fed to the motors through the medium of a control system by which the voltage of the generator may be governed according to requirements. The two motors are each rated at 60-

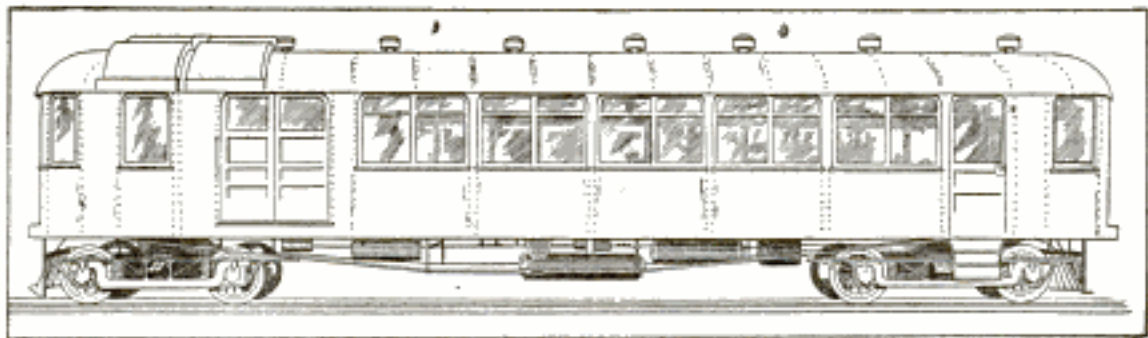
hp. When running at 500 revolutions per minute the engine develops 100-hp., and has a greater capacity at increased speeds. The gasoline tanks, having a capacity of 90 gal., are located under the center of the car. In the trial tests 60 miles an hour was made.

WIDENING THE SUEZ CANAL

The rapidly increasing dimensions of ocean vessels and the growth of traffic have necessitated the widening of the Suez canal 50 ft. for a distance of at least 50 miles from Suez. Native workmen remove the rock and sand formation of the banks to the required width and to a depth that levels them to



the water's surface. Powerful steam dredges and rock crushers then force their noses into the bank, and the excavating machinery ploughs its way into the earth, discharging either into



Electric Car with Gas Engine Power Plant

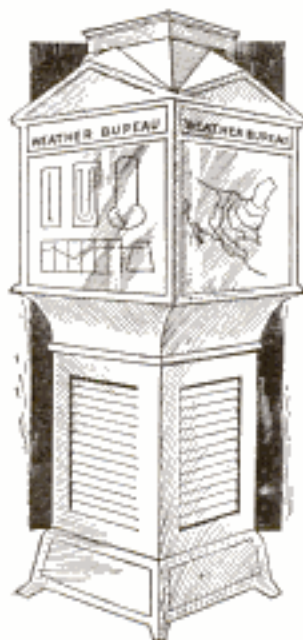
hopper barges or through long pipes on the banks.

GASOLINE FISHING BOAT EQUIPPED WITH WIRELESS

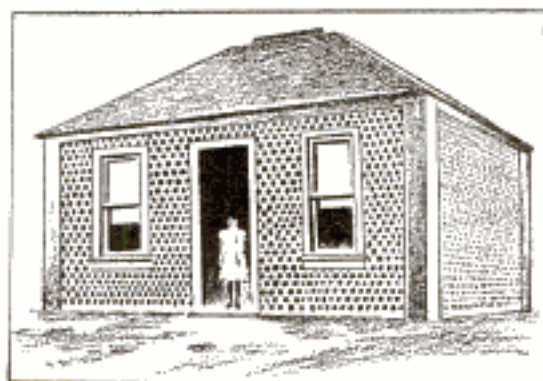
One of the latest developments in the motor-boat world is a large power fishing boat, equipped with a wireless telegraph apparatus. This boat puts out from Gloucester for the banks and gets there ahead of the sailing craft. If the catch is running light and her tanks only half full of fish, the fishermen hitch up the engine to a dynamo, start a wireless apparatus working and pick up Boston. If the market is good and fish scarce the boat is run in and the half catch sold for high prices.

WEATHER BUREAU KIOSK

If the chief of the weather bureau is able to carry out his idea, the people living in the larger cities of the United States will soon have an opportunity to become familiar with the workings of the much abused and often misunderstood "weather man."



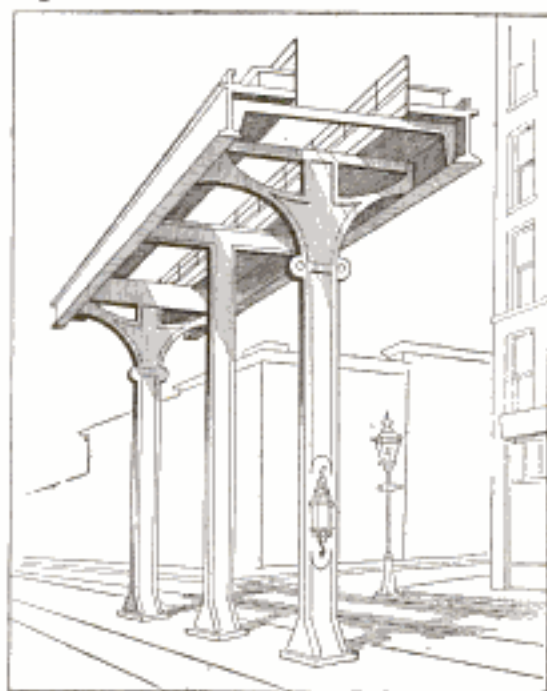
The plan is to place kiosks in all public squares, equipped with a standard thermometer, maximum and minimum thermometers, hair hydrometers for measuring moisture, thermometers with record sheets arranged to show records for a week or more back, and a recording rain gauge with a dial attachment, which will show the rainfall in hundredths of an inch. On one or more faces of the structure maps and charts will be displayed.



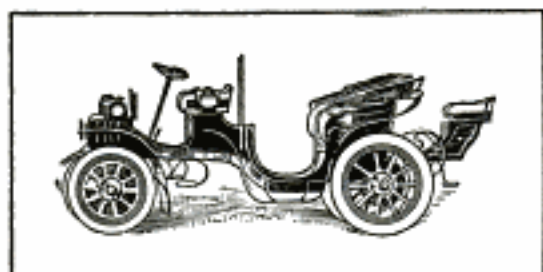
One of the quaintest houses in the mining towns of the west is this solid looking little home at Goldfield, Nevada. The walls are built of bottles held together by concrete.

SUSPENDED RAILWAY PROJECT- ED FOR BERLIN

The traction problem in Berlin has become as hard to untangle, in some respects, as in many of the American metropolitan cities. The surface is already too crowded with cars, and the elevated roads make too much noise and shut out too much light. Therefore the municipal government of the big German city is contemplating a suspended railway of the type which has been in operation for some time in Elberfeld-Barman, Germany. This is the only railway of its kind in the world and has proved satisfactory in every respect.



Built as a Sample



This remarkable looking electric automobile, resembling more the carriage of a princess in a children's fairy tale than a machine for practical use, was recently exhibited by a German firm. The body is dark blue, upholstered in silk of lighter shade. The tires are gilded.

To determine just how much such a line would alter the streets, the trial stretch shown in this illustration was erected in the narrowest street in which the cars will run. As is easily seen, the structure, composed of full girders, consols and posts, is simple and does not take away as much light and air as a regular elevated structure would do. The height of the rails are on the level with the third story of an average building. The cars are suspended by trolley wheels, which require very few metal parts as compared with the heavy trucks of other railways, and even if one or two break, those remaining, and the emergency hooks, would hold the hanging cars in position.

GAS LAMP FOR ILLUMINATING ROLL-TOP DESKS AND PIANOS

The gas lamp desk bracket shown in this illustration is both practical and convenient.



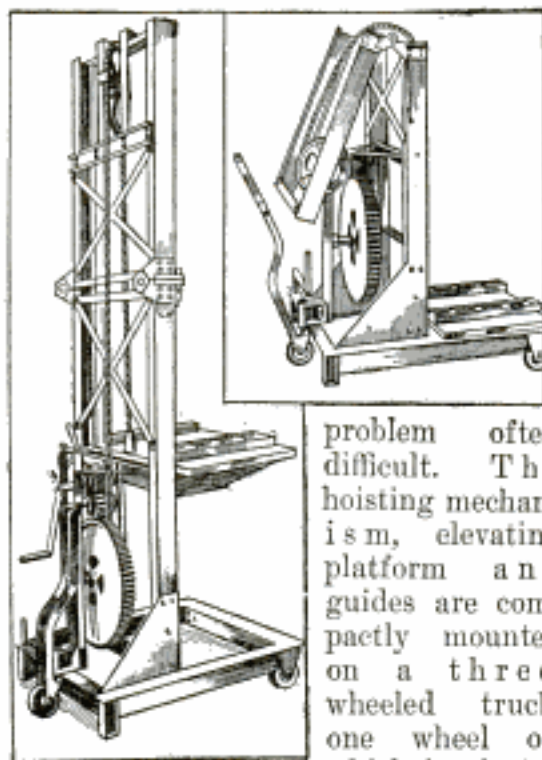
A metal tube, formed in a circle to protect the mantle from being jarred and broken, is affixed to a slate base which rests on the desk or piano top. A flexible tube connects it with the gas connection. The mantle is surrounded by a reflecting desk shade, the interior of which is lined with corrugated mirrors.

FEDERAL BUREAU OF MINES DEMANDED

Reasons why a federal bureau of mines should be established have been advanced by mine owners and employes before the House Committee on Mines and Mining. "Such a bureau is absolutely necessary to investigate the causes of mine disasters," said ex-Governor Flemming, of West Virginia. There are many unsolved problems in mining which the federal government should help clear up. West Virginia cannot do it unaided, nor any other state.

A PORTABLE ELECTRIC ELEVATOR

For handling a large stock of heavy or bulky merchandise the tiering machine, or portable elevator, solves a



problem often difficult. The hoisting mechanism, elevating platform and guides are compactly mounted on a three-wheeled truck, one wheel of which is pivoted with a handle or tongue, so that the entire apparatus can be easily moved to any position desired, but is kept rigidly stationary while loading or unloading by throwing the tongue forward and transferring the weight from the wheel to the feet.

The cantilever construction leaves

three sides absolutely unobstructed, so that any size and shape loads can be handled. As it is often necessary to move a machine from one part of a building to another, the guiding frame is hinged just above the center so that, when folded, it will clear an opening only 6 ft. 2 in. in height.

The lifting mechanism can either be worked by hand or by a small but powerful electric motor connected with the electric circuit of the building by plugs and flexible wires.

LARGEST TEA WAREHOUSE IN THE WORLD

The largest tea warehouse in the world for examination and sale of tea is in Calcutta, India. Built of reinforced concrete and brick, and equipped with the latest electrical appliances, it is a fitting example of the genius of the white race in the land of its darker brothers.

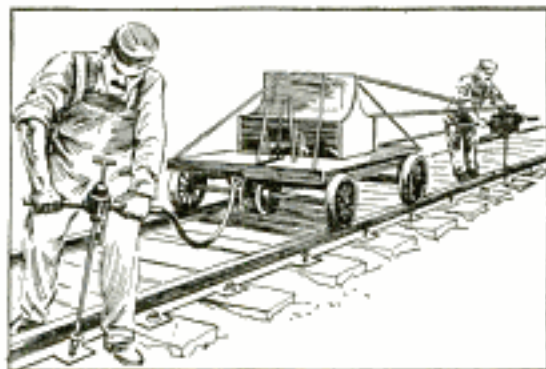
The massive structure is 526 ft. long by 122 ft. wide, and 4 stories in height. Each floor is divided into three large warehouses separated by walls 20 in. thick. Fireproof doors make communication possible between each section. The walls of the structure are brick and the foundation is reinforced concrete. The only stairways are on the outside of the walls. The

building is lighted by electricity and 18 electric elevators convey tea and passengers from floor to floor.

The second illustration is of a tea bulker. This works in connection with a large tea mixer which has a capacity of 64 chests of tea.

HUGE SCREWDRIVER FOR SPIKING RAILS

This auto-car screwdriver was designed for the purpose of making it possible for railroads to use screwspikes in track construction, a method



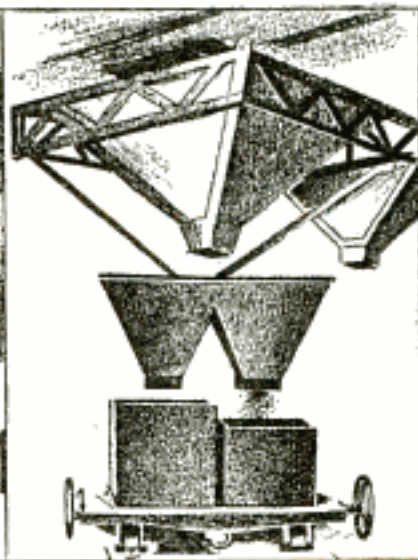
Power Screwdriver

of spiking rails hitherto unpractical because of the labor and expense of boring holes and setting the screws by hand.

The machine is driven by a 2-cylinder, 12-hp, gasoline engine and runs at a speed of from 5 to 40 miles an hour.

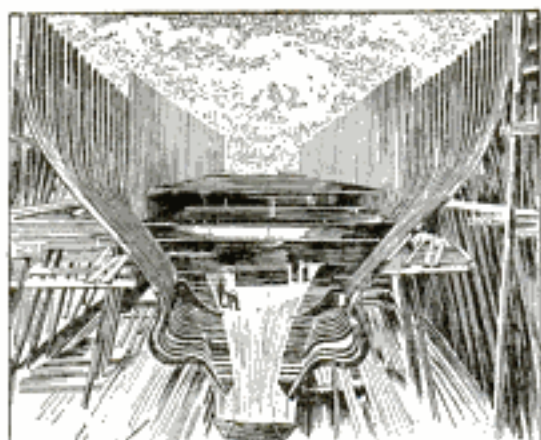


Largest Tea House in the World



Courtesy Indian Ry. Gazette

Tea Mixers



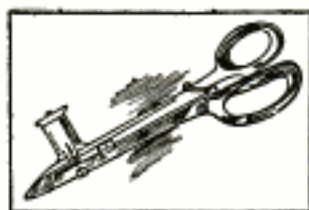
This skeleton of steel is the ribs of the new German Lloyd liner, "George Washington." The ribs present the appearance in the shipyard of a vast iron cage. The bulge near the keel is for the propeller-shaft.

When track-laying, the power is switched to a special gear box, which drives a high speed drill for boring holes, and a telescope shaft at the other end of the machine, which runs a special reduction gear and clutch for driving the screw-spikes. A friction clutch on the spike driver is set so as to release it when the head of the screw sets hard against the rail, thus making it impossible to ream out the hole. A special jig, which slips along the rail, automatically spaces the holes in the ties. Two men, one of whom screws in the spikes while the other bores the holes and sets them in, can do the work faster than an ordinary section gang can place the ties.

Despite the equipment the machine only weighs 425 lb. and can be easily lifted from the tracks or turned around.

CUTS AND SEWS AT SAME TIME

By the invention of an Illinois woman it will be possible for dress-makers and tailors to cut a piece of goods and baste it at the same time—if it works. The basting mechanism



is attached to an ordinary pair of shears and consists of a needle and looper, and a spool which carries the thread.

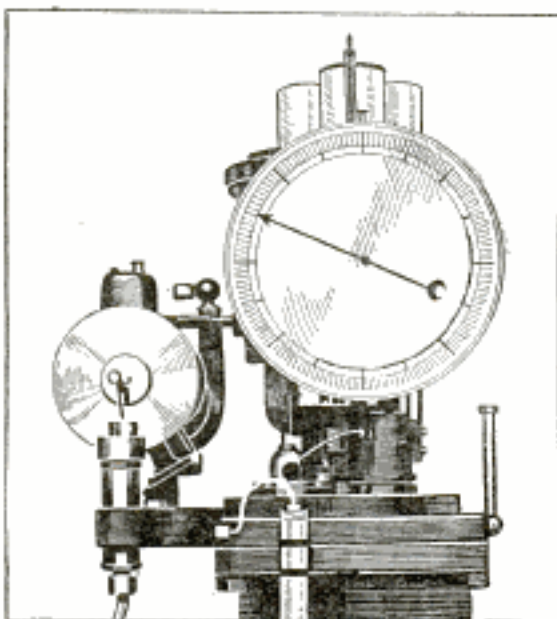
As the shears are closed the needle descends and when they open the needle rises, thus making a stitch.

ELECTRIC FIRE ENGINES IN BERLIN

The chief of the Berlin fire department has just completed a number of strenuous tests with an electric fire engine, and found it so satisfactory that a number are being installed. For a month the machine was sent out on two journeys every day, not only to points in the city and suburbs but to towns 25 and 30 miles distant. The principal object of these distant runs was to thoroughly test the motors and battery on badly paved roads and up grades. During a single week the engine covered 600 miles.

COMBUSTION INDICATOR FOR FIREMEN

Quantities of fuel are wasted in the furnaces of almost every power boiler,



Indicator for Firemen

and to avoid this the apparatus illustrated has been devised. Such waste can be avoided if the firemen have some indication of the efficiency of the combustion, such as the composition of the flue gases would afford. The new device makes four records every minute,

and an almost instant and practically continuous knowledge may be had of the condition of the fire through its use. In ordinary hand firing combustion is reached in from 3 to 6 minutes, and it is most important to adjust the dampers directly after the coal has been fired. By looking at the pointer the condition of combustion may be seen.

INVENTIONS OF MAN IMITATE NATURE

Very few things of worth devised by man can be found which have not in their fundamental principles been copied from nature, and in marine architecture the likeness is most clearly defined. As an instance of natural buoyancy in water a better example could not be cited than the fish, which, by means of the swimming bladder, is enabled to descend by ejecting the air contained in the bladder, and ascend by refilling it. The submarine is patterned after this principle, with the exception that the air is always present in the air compartments and the buoyancy is overcome by allowing water to enter other compartments and regained by pumping it out.

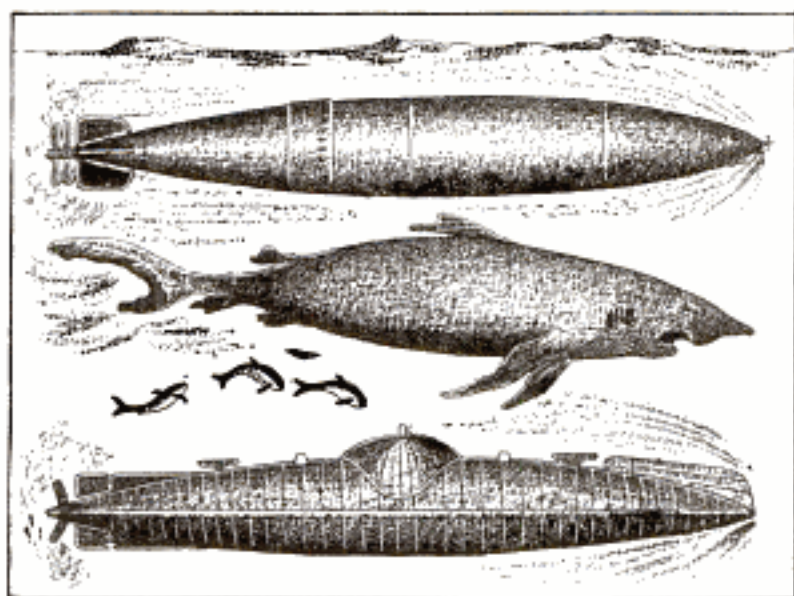
The fish which are the swiftest swimmers have pointed snouts, small fins and more or less cigar-shaped bodies and smooth skins. This is well exemplified in the dolphin and shark, which are among the fastest swimmers in the fish tribe. The ordinary torpedoes and submarines have a general resemblance to these fish, as the illustration points out.

During the construction of the Thames tunnel early in the nineteenth century Brunel, the celebrated engineer, found great difficulty in boring through the soft clay formation with-

out running a terrible risk of an inrush of water. While examining a piece of timber honeycombed by the burrows of the ship worm, or teredo, he conceived the idea of a boring shield in several sections. This type of shield is now in use, thus adding another to the innumerable inventions conceived by watching nature.

NEW METHOD OF EMBALMING THE DEAD

Two bodies, embalmed by a process recently discovered by a Chicago doctor, have been on exhibition for some



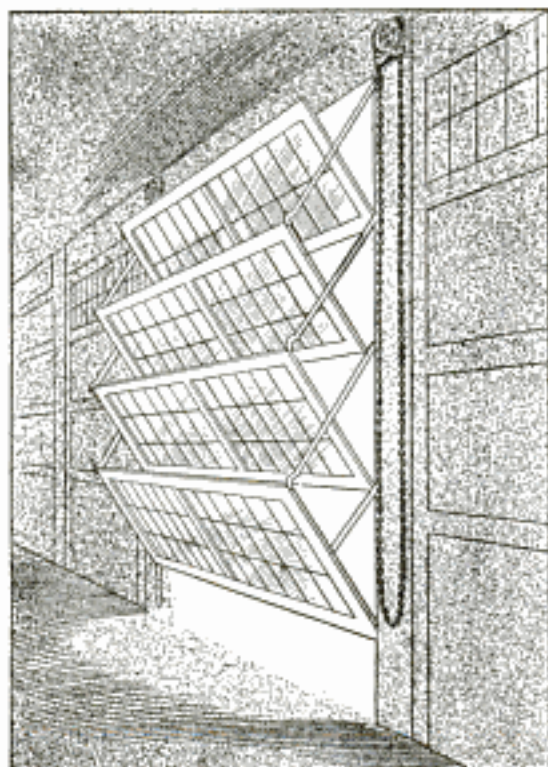
time and from their perfect condition give every indication that they will remain perfect for any practical length of time, and perhaps for ages. The manner of accomplishing this is kept secret by the inventor, but it is known that the bodies are placed in air-tight caskets with the preparation; in the process the body is not disturbed.

To find the capacity of tanks in gallons, multiply the square of the diameter by the length and by .0034.

The origin of the word "furring" of the present day construction comes from olden times when animal skins or furs were used on walls to keep out the cold and wet.

VERTICALLY FOLDING DOORS

Vertically folding doors, the upper panels of which are glazed, are being installed on many engine houses and



Insures Light and Ventilation

manufacturing buildings. Lifted by a chain hoist at the side of each door, the panels or leaves fold upward and inward, coming close together at the top opening. In this position the door is well protected from the weather, cannot be slammed around by the wind, and offers no obstruction.

When closed, the glass panels admit the light freely, and for ventilation purposes the door can be raised to admit as little or as much air as may be desired. By raising the door 2 in., four horizontal openings of 6 in. are made, the door remaining storm proof.

NIAGARA LIGHTS SYRACUSE

Through the medium of 1,000 miles of heavy conducting wires, which stretch over a distance of 165 miles in two complete circuits of three wires each, Syracuse, N. Y., is being illuminated by power from Niagara Falls. All

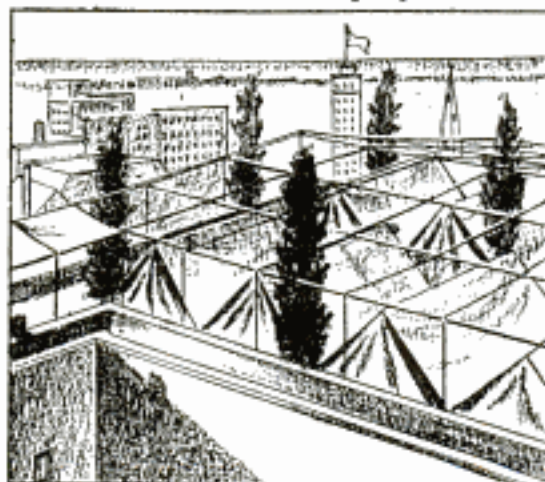
possible provision against disconnection with the Falls power houses have been made, but if such should occur the steam plant of the Syracuse company will be always in readiness as an auxiliary. The current will be received at the Syracuse plant with a 60,000 voltage, and the transforming station will step it down to suit the requirements of the various circuits.

ELECTRIC CAMPAIGN CANE

An electric campaign cane is being manufactured as one of the novelties of the approaching presidential campaign. The handle of the cane is modeled to represent the head of the candidate in whose interests the cane is being carried. Inside the head, which is of glass, is a small electric bulb, which lights it up at night in an effective manner. Instead of being fastened directly to the upper end of the cane the illuminated head is connected with it by a leather sleeve or neck and bobs back and forth with the swing of carrying it. The battery is placed within this sleeve.

CAMPING OUT ON TOP OF A SKYSCRAPER

One of the latest innovations in the hotel world is an open air camp on the roof of Philadelphia's 22-story skyscraper hotel. Far above the noises and excitement of city life the tired guests are lulled to sleep by the wind



Sleeping Quarters on Skyscraper

as it whispers through the waving trees that surround the tents, and were it not for the luxuries of modern hotel life the illusion would be complete.

The tents are lighted with electricity and furnished with plain cots. A table beside each cot, a chair for a fellow camper making the rounds, and a waiter close at hand complete the camp's accessories. The only drawback is the limited amount of space, and the few who succeed in getting accommodations are envied by the hundreds turned away disappointed.

WATER PUMPED BY THE GAS IT CONTAINS

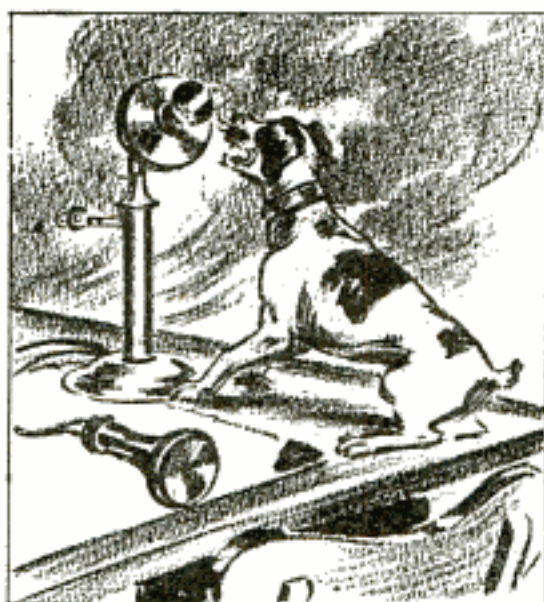
A system of separating natural gas from water, devised by a Los Angeles hydraulic engineer, is being successfully used to pump water from a large flowing well, situated between Redondo and San Pedro, Cal. The well yields a heavy stream of water with much natural gas running through it, and it is this gas which is being transformed into units of power to drive the engine. The gas and water are separated in a large iron tank, which at its trial sent a considerable volume of gas into the air, while 1,000 gal. per minute of pure water was carried to the reservoir. The gas is carried to the engine by suction.

The device is expected to render waste lands productive and add much

value to tracts which hitherto have not been irrigated on account of the great quantity of marsh gas in the water strata.

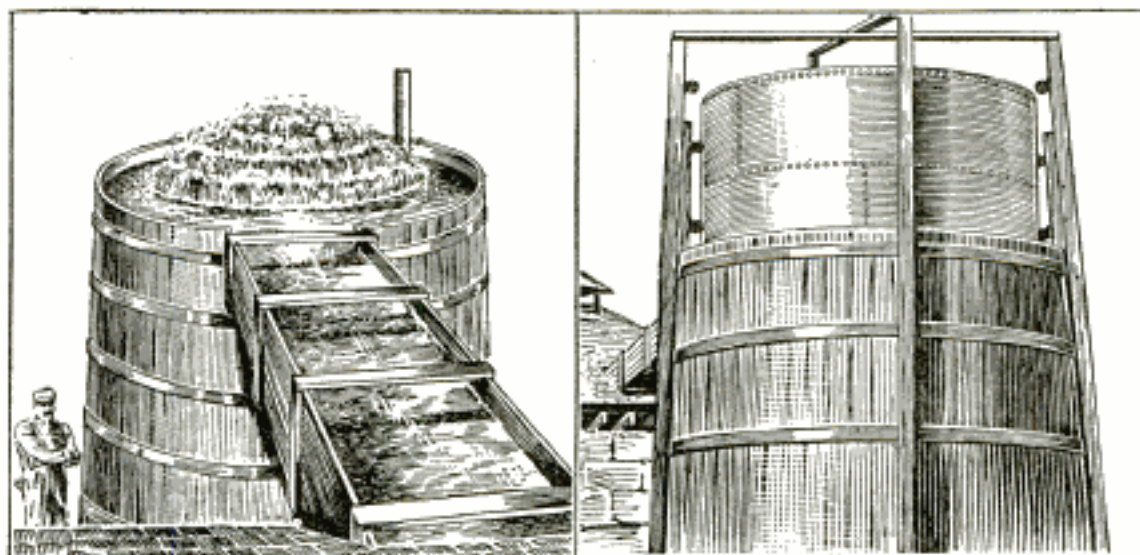
ELEVATOR SAVED BY A TERRIER

When a fire broke out in his master's elevator at Xenia, Ohio, one night



Calling the Fire Department

recently, this smart fox terrier jumped upon the desk in the elevator office and knocked the telephone receiver from its hook. In answer to this signal "Central" made connections. In response to her inquiries for "Number?" the dog barked furiously into the



Apparatus for Separating the Gas and Water

mouth of the receiver. "Central" notified a policeman, who hurried to investigate and found the elevator in flames. The fire department was called out and the structure saved.

CULTIVATING PEARLS IN MEXICO

The first company to successfully cultivate pearls on a large scale is a Mexican concern operating around the island of Espiritu Santo in the waters of the Gulf of California. This company supports several hundred people, operates two schooners, each of which has an auxiliary fleet of 6 diving boats, and supplies the markets of the world with some of the finest pearls ever produced.

The method of cultivation is interesting. In the first place the oysters are gathered in the season when the eggs are being deposited. These eggs are carefully placed in artificial pools with bottoms like the natural bottom of the sea, care being taken to protect them from their natural enemies. At the proper age they are advanced into deeper water, where larger boxes continue to protect them. The shells, which have by this time formed, are here sorted and the dead ones thrown out. The live shells are transferred to

the deep water cages and left to develop. At the end of two years the harvest is ready. The divers then descend and gather them without risk. The gross receipts of the second harvest produced was over \$200,000.

Under the usual system of pearl fishing, the industry is something of a lottery. Bushels of shells sometimes yield but a few gems or possibly none at all. After two years the shells lose the pearl within, and unless opened at the proper time no treasure is found.

BOMBAY PLATFORM CLOCKS

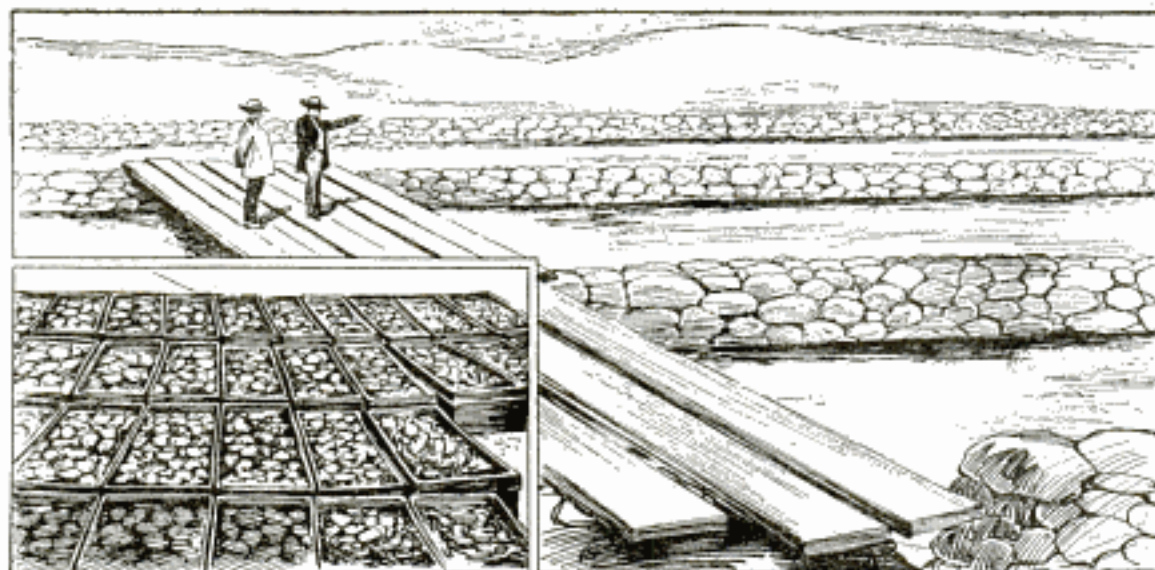
The clock shown in this illustration is the type installed as platform clocks by the Bombay, Baroda & Central India Railway, in India.



The dials of the clock are set at an angle and illuminated by kerosene lamps.

ated by kerosene lamps.

One of the most remarkable of the many curious trading propositions made to automobile dealers was the offer of a Brazilian planter to exchange a carload of coffee for a good make of machine.



Where Pearls are Raised as Scientifically as Potatoes

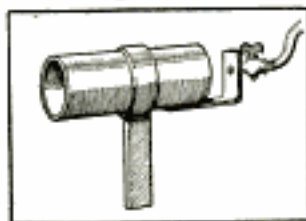


SHOP NOTES



How to Make a Shop Gas Heater

A small shop needs some kind of a heater for melting babbitt, heating soldering irons or drawing the temper in steel. Such a heater can be made to burn gas for fuel by using a piece of 2-in. pipe 6 or 7 in. long with a



strap of iron bent around and made fast to it leaving a shank that will fit a mortise in the bench, or to be placed in the jaws of a vise. An L-shaped piece of metal is riveted to one end of the pipe, as shown in the sketch, with the bend about 1 in. from the end. In this bend, and exactly centering the hole on the pipe, drill a hole and fit in it a pet cock. The opening in the pet cock is bushed down to $\frac{1}{8}$ -in. Attach a hose to the pet cock from a gas jet and the heater is ready for use.—Contributed by E. L. Scoville, Ashtabula, O.

A Handy Spout Rapper

The accompanying sketch shows a spout rapper for the miller, made from $1\frac{1}{2}$ -in. rubber hose by putting a wood handle in one end, with a string attached for hanging it up. This is a simple device, says the American Miller, but will be found exceedingly use-

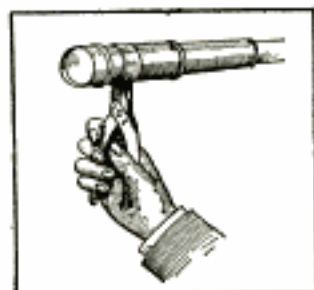


Spout Rapper

ful. One can be made and put in a convenient place on each floor.

How to Turn Thin Tubes Fitted with Threads

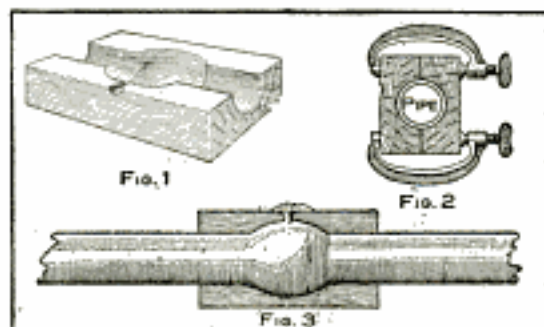
It is often difficult to turn the thin metal tubes in the parts of a telescope, field or opera glass without denting the sides if a vise or pliers are used for gripping them.



The part may be easily held and turned by placing a piece of leather around it and holding the ends with the pliers close to the tube, as shown in the sketch, so the leather will grip the tube tightly.

Another Way to Make a Soldered Joint

The method herein described and the accompanying cut show how to make a soldered joint on brass, copper and lead pipe. The pipe is cleaned and tinned,

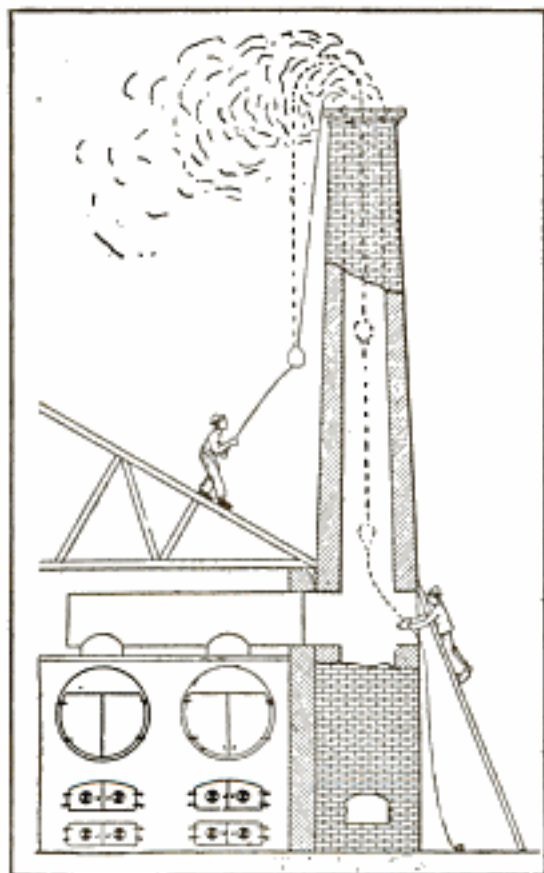


Another Soldered Joint

then placed in a mold made of two pieces of wood. One piece or one-half of the mold is shown in Fig. 1. The two parts of the mold are placed around the pipe joint to be soldered and held in position with clamps, as shown in Fig. 2, while the melted solder is poured. Figure 3 shows the completed joint with one-half of the mold removed.

How to Put a Line over a Stack

In repairing or painting a stack, it is sometimes necessary to place a line



Putting a Line over a Stack

over the top, and the method illustrated herewith, from *The Engineer*, will be found successful.

A paper bag is blown out full, attached to a cord and sent up the stack with the draft. After securing the bag end of the string it is only necessary to pull up a stronger line, then a rope, by which a tackle can be hoisted.

Blown-Out Shots in Mines

Blown-out shots in mines are caused in several ways, viz.: Carelessness of workmen in drilling and tamping; overcharging of hole; insufficient tamping; unskillful placing of the explosive, having the length of the upper drill hole greater than that of the under, and thus placing the shot in the solid, says *Mining Science*. In order to prevent blow-

out shots, it is wise to observe: That the hole is properly drilled and cleaned, and of just sufficient size to hold the cartridge, that the depth does not exceed the undercut and, if possible, the hole pointing upward, and that the hole is stemmed with clay, preferably dampened.

A Handy Shellac Barrel

Owing to the drop in price which brought denatured alcohol down to the present cost, users are enabled to cut their own shellac in quantities. A barrel may be rigged up as shown in the sketch that will hold 35 to 40 gal. of shellac which will not only facilitate the drawing of the liquid but assist in its liquefaction. A few rotations in the barrel will mix it up very thoroughly, says *Wood Craft*. The spigot may always return to its vertical position if a counterweight be attached diametrically opposite. A piece of heavy iron bar, bent to the shape of the barrel, can be attached with screws to make this weight.

Figure 2 illustrates a cross section of the assembled spigot with stopper in place. If made of hard wood and thoroughly soaked in linseed oil it will be found to act freely. In fitting it to



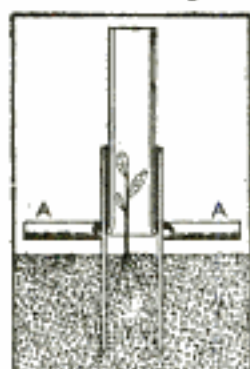
Shellac Barrel

the barrel, a hole is cut out of the latter to receive the 3-in. projection, A. Around this hole is flattened off a surface of about 4 in., so that the surface, B, of the spigot may make a good tight joint with the barrel. Four screws are used to attach the spigot,

being inserted through the rectangular portion and near the four corners. In placing the dry shellac in the barrel a large open-mouth funnel will be found very effective in the way of a time saver. Three pounds of shellac to one gallon of alcohol will be found a fair proportion for cutting.

How to Transplant Plants

The accompanying sketch shows how to make a device to transplant cabbage and tomato plants that will not allow



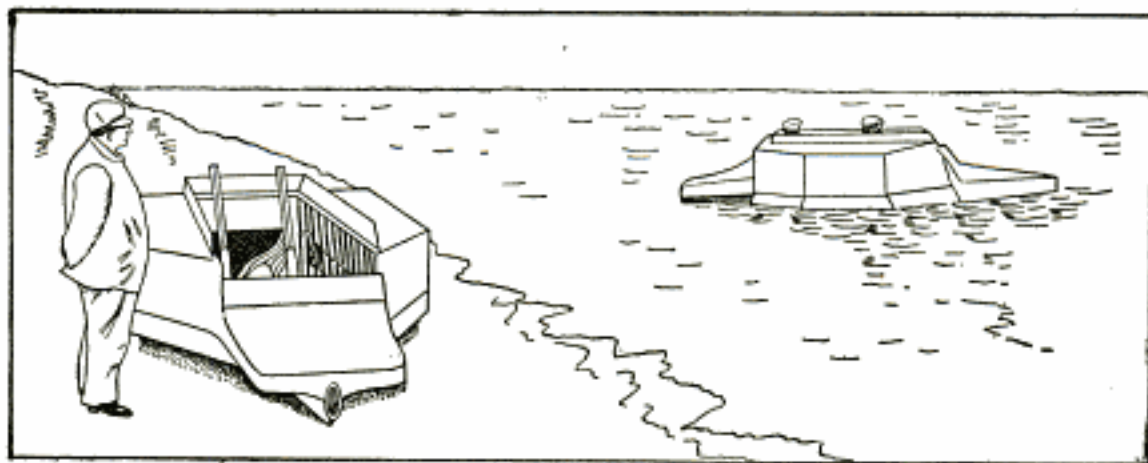
the dirt to fall away from the roots. In making the device, two pieces of brass pipe 2 ft. long, one 2 in. and the other 1 1/4 in. in diameter, must be secured. Two handles, A A, are attached to the outside of the 2-in. pipe. The 1 1/4-in. pipe is bent out at one end in a bell shape to fit the interior of the larger pipe. The larger pipe is set over a plant and pushed down into the ground, and when raised out the plant and earth about its roots are removed intact. The smaller pipe, when pushed down on the earth about the plant, removes them in one solid piece. Plants set in this manner will not wilt, and almost all of them will grow.

A Goose Hunting Boat

A goose is decidedly game and because he is a goose that is no reason he should be a fool bird and take all kinds of chances. Least of all does he take any risks that might endanger his neck—at any rate chances in the shape of a man. Neither does the goose take any chances in the color of a man.

The sportsman knows his goose and treats him accordingly. When the ice breaks up and goes floating about the harbors in large cakes to find its way to the sea, the sportsman sets his plans to fool the wily goose at his own game. About the time when the ice breaks up, great flocks of geese on their way from the south spend weeks feeding in the shallow harbors along the Nova Scotian coast, lingering around the shores of the peninsular province until the real spring has come and the milder weather begins to loosen up the ice in the regions farther north, says Field and Stream. This is the time when the sportsman dons his "ice clothes," gets out his "goose-float" and begins his campaign against the wisest specimen of the feathered tribe.

The "goose-boats" are long, low, squarely built affairs, made of wood, partially covered with canvas, and painted white. They will easily accommodate two men, and can be propelled from the inside without oars or other aid from the outside. The paddles which propel the floats are arranged

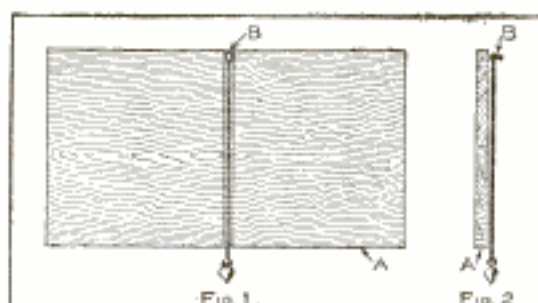


The Goose Boat is Rowed from Inside

underneath the boat and are propelled by a series of chains inside the craft, as shown in the accompanying sketch. The float so nearly resembles an ice cake that its occupants can approach within a few yards of a flock of geese feeding or sitting on the water.

A Substitute for a Level

Secure a board with one straight edge and use this edge for the bottom of the level as shown in the sketch at A, Fig. 1. On one side of the board draw two parallel lines at right angles and per-



Home-Made Level

fectly square with the edge A. Exactly in the center between the parallel lines swing a cord attached to a nail driven in the board at B. To the lower end of the cord tie a plumb bob or weight just a little below the edge of the board A. Figure 2 shows the end view. When the board is held up vertical with its edge, A, resting on the work, the cord must swing parallel with the lines to have a perfect level.

How to Make a Socket Wrench

Secure a small piece of steel pipe, from 2½ to 3 in. long, of suitable di-



Socket Wrench

ameter to make a wrench of the desired size. Fit a short piece of round iron inside the pipe. Take a welding heat on both pieces and weld the pipe down smooth to the shank, drawing the shank

down to the desired size to fit the brace, says the Blacksmith and Wheelwright. Heat the hollow end of the pipe and square it up, drawing the square end down a little below the size of the pipe so that the nuts will not stick inside above the square end.

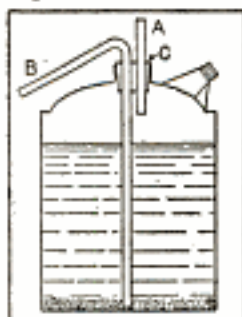
Where the Heat Goes in a Gasoline Engine

It is pretty generally agreed that the heat expenditures in a modern water-cooled gasoline motor are, according to Country Life, about as follows:

	Per cent.
To useful work.....	17
To loss in radiation (not through water jacket).....	15
To loss into water jacket.....	52
To loss in exhaust.....	16
	100

How to Clean Sediment from an Oil Can

The sediment in oil cans may be removed without pouring out the contents by using the device here illustrated. A rubber stopper, C, is fitted with two tubes made from either glass or metal. One of these tubes, B, is adjusted in the rubber stopper so the lower end will almost touch the bottom of the can. The other tube, A, only extends through the stopper. When the pressure is applied to the pipe, A, the sediment passes out through the pipe B.—Contributed by Henry B. Burke, South Acton, Mass.



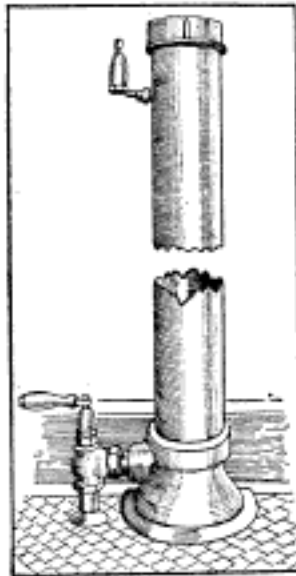
Etching on Steel

Although etching on steel is supposed to be a trade secret, it is more or less generally known in the trades where such work is desirable. The surface of the steel, after being thoroughly cleaned, is first varnished with a solution of gum guaiac or resin in alcohol. The imprint is then applied to the varnish with a rubber stamp con-

taining the letters or design desired, which is inked with a solution of caustic potash. This potash cuts through the varnish, leaving the steel exposed, says the Metal Worker. The etching is then accomplished by a weak solution of nitric acid applied to the steel, which bites out lines in the steel where the varnish has been cut by the potash. The varnish, it will then be seen, acts as a mat to keep the solution of nitric acid confined. The remaining varnish is removed by a strong potash solution, and the piece of steel then rubbed dry, leaving the imprint intact.

One-Pipe Radiator for a Bathroom

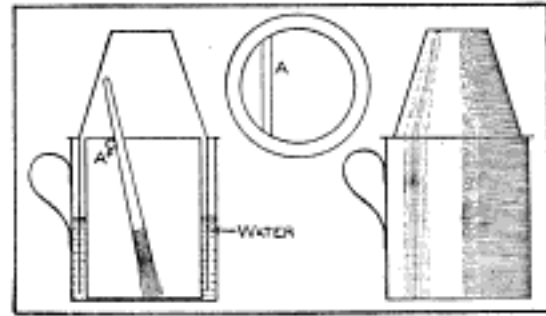
The limited amount of space in the majority of bathrooms makes it very inconvenient for placing a regular radiator with sufficient radiating surface. The solution of this problem is clearly shown in the accompanying illustration. This radiator is made of 3½-in. wrought iron or steel pipe of any suitable length. The pipe is screwed into a specially constructed cast-iron base, or stand; an ordinary cast-iron cap covers the top, says the Valve World. The steam enters the base and passes up into the pipe. An automatic air valve is placed at the top.



A Pattern-Makers' Varnish Can

A receptacle to hold shellac varnish for the pattern shop should be made in such a way as to be readily accessible and to have a tight-fitting cover to exclude the air. The accompanying

sketch shows a double-walled can, or rather a smaller can set in a larger one, the two being soldered together so

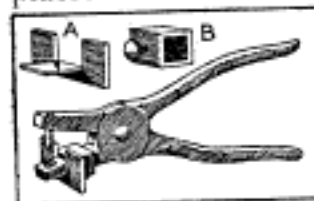


Varnish Can for Patternmakers

as to keep the smaller can in the center. The cover or stopper is of a diameter between the size of the outer and inner cans, and has a high conical top. This cover is inserted between the outer and inner cans, which should have a space of about ¼ in. A little water is kept between the cans so as to make an airtight seal, says Drafting. The high conical top of the cover accommodates the brush handle, which may either be set in the can resting on the bottom, or can be suspended by driving a wire brad in the brush handle and hanging it over the wire, as shown at A in the sketch. This wire is not only good to suspend or lean the brush against, but to wipe the surplus fluid off when removed from the varnish. If the brush is wiped only on the wire, and never allowed to touch the side of the can, the receptacle can be kept clean and tidy.

How to Make a Belt Punch Gauge

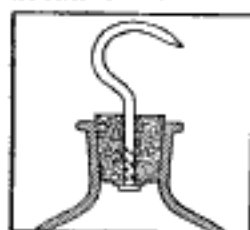
Where belts run over small pulleys it is necessary to have the lace holes placed near the ends of the belt. Some sort of a gauge must be used on the punch to make the holes in line. A gauge that can be quickly attached to a punch may be made by using a piece of sheet metal ⅛-in. thick cut and bent in the shape shown at A in the sketch. A



square block of metal, B, is fitted to the lower jaw of the punch and provided with a thumbscrew as shown. The projecting part of A is placed into the block B and both are slipped on the lower jaw of the punch. The adjustment can be made by placing the block at the point desired and fastening with the thumbscrew.—Contributed by A. W. Griggs, Homer, New York.

A Handle for Corks

To avoid the bother of having corks break in the bottle when removing them numerous times, secure a nail and drive it through the cork from the bottom end, using a small washer between the nail head and the cork to keep the nail from pulling through, and bend the projecting end in the shape of a handle as shown in the sketch. This is very convenient when the contents of the bottle must be used quite often.



How to Cast Wax in Plaster Molds

Brass founders, modellers and others frequently desire to make a wax cast in a plaster of Paris mold, and unless the method of doing it is known, trouble frequently will be experienced. When rightly carried out, however, the operation is simple and certain.

Wax adheres to dry plaster so that it is impossible to remove the cast without tearing. In order to prevent this difficulty, it is necessary to wet the plaster, says *The Brass World*. As an excess of water is detrimental to good results, the following method of procedure should be followed:

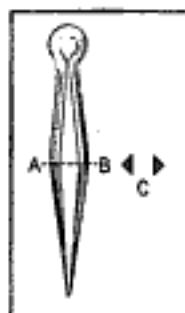
Place the plaster face upon a pail of water and allow it to remain until the water just begins to show in the face of the mold. The whole mold should not be immersed as too much water will then be taken up, but the back of the mold is held in the water with the

hands and the face watched. As soon as the water begins to appear the mold is removed. The water will then spread over the entire surface but not in too great a quantity.

When the wax is cast in the mold, it can be easily removed without tearing. The moisture in the plaster prevents the adhesion. The moisture that remains in new plaster, immediately after casting, seems to be present in too great a quantity to allow a good wax casting to be made in it, and the best results are obtained by drying the plaster and then treating with water in the manner previously described.

Split Cotter Pins Used as Sliver Tweezers

File a split cotter pin to a needle point making it triangular on line AB, as shown by the sketch in the cross section C. Midway between the eye and the end a piece of $\frac{1}{8}$ -in. round rod is inserted and with strong pliers the free ends are bent together; but not quite closed, leaving a space of about $\frac{1}{16}$ in. The tweezers are used by running the point under the sliver, then closing by pinching the ends together. If it is hard to get at the sliver the wound is slightly enlarged by using the tweezers with the points together as a lancet point.



As a hygienic precaution always suck the wound from which a sliver has been extracted and put some disinfectant on it. After the tweezers have been used pass them quickly through the flame of a spirit lamp or put them in boiling water. This will prevent the danger of blood poisoning. If the tweezers are used promiscuously disease may be inoculated from one person to another. These tweezers are so easily and cheaply made that every one may have his own and keep them in his pocketbook.—Contributed by C. E. Warren, M. D.

Gas Engine's Speed Retarded by Improper Ignition

The following is a description, which no doubt has a familiar ring to those who have "been there," but shows how simple a trouble may be when found, but undiscovered appears extremely complicated. This trouble was in a private lighting plant where it was impossible to carry proper voltage at even half-load. A brief examination of the generator showed nothing out of order more than that it was operating under considerably reduced speed, due to the driving power, a horizontal gas engine, which ran unsteadily and seemed to be laboring under divers difficulties, says the Electric Journal.

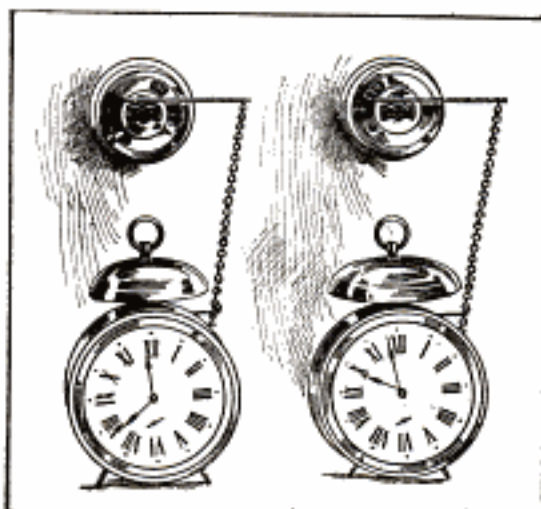
When shut down examination was made for leaky valves by carefully listening while turning the engine slowly. The valves and also the compression were found to be all right. Next the hot tube was examined. As most of the flame which heated it burned above the tube, adjustments were made to lower the flame, which, in the main, was accomplished by turning the less gas, upon which the tube immediately became bright red—much hotter than formerly. The engine was then started. It came sharply up to speed. The entire load was thrown on. The lamp went to full brilliancy with the engine running easily and with plenty of power to spare. The owner, seeing the lights up to candle-power, came running in in great glee and declared he "never had such good light before."

The insufficiently heated tube had simply retarded the explosions and greatly diminished their effectiveness. This was the sole trouble. It was afterward learned that the engine builders had been appealed to. They suggested that, owing to the evident seriousness of the trouble, the engine be shipped to them for overhauling, which they would do for a considerable sum.

Acid will clean old files and make them better, but will not make good files of worn-out ones.

Alarm Clock Switch for Window Lights

The automatic electric time switch device here shown is one of the simplest of the many devices for shutting



Time Switch for Window Lights

off electric lights used for illuminating windows or signs. It is nothing more than a common alarm clock, attached by a chain and lever to a regulation electric switch. The alarm hand of the clock is set for the time desired, the lever on the switch is turned to indicate on or off, and the chain hanging from the end of the lever is fastened in the slot of the alarm key by a hook. The proprietor then leaves his place of business for the night, knowing the device will switch off the lights at the time set.

Changing a Plain Gunstock Into a Pistol Grip

Many hunters have plain grip stock on their rifle or shotgun and would like to change it to a pistol grip. The illustration shows how to do this and avoid the necessity of purchasing a new stock. Cut a piece of selected wood of the

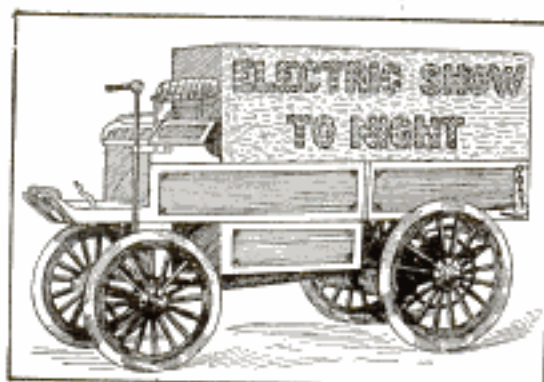


Changing Gunstock

same material as the stock, in the shape shown in Fig. 1. The stock is cut out on the line shown in Fig. 2, making a notch into which the piece of wood is fitted and securely glued. When finished and varnished, the joint will be solid and look as neat as if made from a whole piece of wood.

Electric Signs on Automobiles

The accompanying illustration shows an electric illuminated sign used on



Electric Sign Wagon

electric trucks for advertising a recent electric show. The current used for illuminating may either be taken from the storage battery furnishing the driving power or a set of batteries specially provided and carried on the truck inside the sign box. An automatic flasher could be attached which would make a very unique advertising scheme for night parades.

A Soldering Iron Kink

Drill a $\frac{3}{16}$ -in. hole in one of the tapering surfaces of the soldering iron, as shown, and some hard tasks may be made easy.



This will be of special service in soldering washers on to small rivets. Tin the surface to be soldered and place the washer on the rivet and press the heated soldering iron on the washer with the rivet point inserted into the drilled hole.—Contributed by Chas. E. Frary, Norwalk, Ohio.

Unjointing and Removing Cast-Iron Pipe

When our city bought out the original water company some 15 years ago it established a new supply and abandoned quite a large quantity of 6-in. pipe in the ground, laying a new 12-in. main on the opposite side of the street during the past season, says a correspondent of Water and Gas Review.

I accidentally discovered this 6-in. main, and on breaking into it found it as perfect inside as when laid some 20 years ago. I proceeded to take it out, pipe at that time being worth here \$40 per ton. After trying one day to melt it out with wood, charcoal, etc., I took the first train to Boston in search of a melting apparatus of some kind, I did not really know what. After a good deal of inquiry I found the right thing in the shape of a powerful gasoline torch.

On my return home, and as my men had a lot of bolts uncovered, I set to work melting them out. And this is the simple method I pursued: I dug a good space out around and under the bolt, placed a hood of sheet iron bent around over the top of the bolt to help concentrate the heat, and then turned on the flame, keeping it centered in one spot on the side. In five minutes the metal started, and in half an hour I could take out the pipe.

It is necessary to melt only the upper half or, perhaps, a little more than half, melting from center of sides up to top, first completely one side and then the other, when by calling a couple of men to lift and work the spigot end of the pipe with a bar against the bell it is easily forced out.

The torch used would hold 2 1-5 qt. of gasoline at one charge. A full flame would melt a copper rod 4-5 in. in diameter in 2½ minutes.

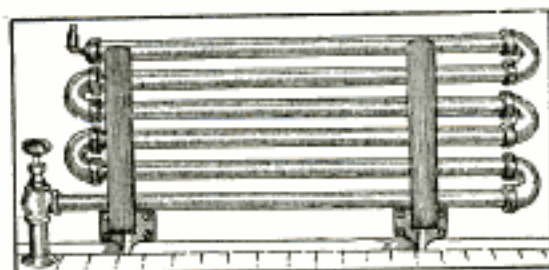
The proper covering of a boiler and the steam piping saves a large per cent of fuel.

How to Heat Turpentine

There are two methods of heating turpentine without danger. When an open pan is used it is made with a jacket—that is, there are two pans, an outer and an inner one, with a space between; superheated steam from a boiler is passed into the space and is allowed to escape through a waste steam valve at the bottom; a safety valve at the side of the pan allows the steam to blow off if the temperature rises too high. Turpentine boils vigorously at a temperature of about 338 deg. F.—much higher than the boiling point of water—hence the steam at ordinary pressure would not cause turpentine to boil, says *The Modern Painter*. Turpentine can be heated to boiling point over a burner or fire, provided it is contained in a still which is closed with the exception of one tube leading to a condensing coil kept cool by being placed in a tub, through which a current of cold water is caused to flow; any turpentine which may be vaporized is condensed in the worm and recovered, and no vapor can pass into the outer air.

Pipe Coil Radiator without Threads

This radiator, as shown in the accompanying illustration, is intended to be used for temporary heating; such as in summer homes where little heat is



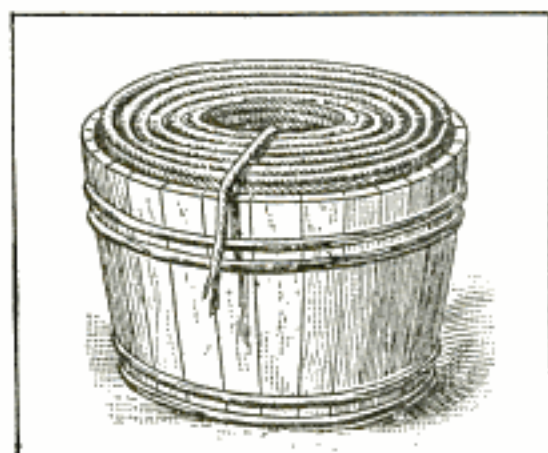
Coil Radiator without Threads

required, in buildings in the course of construction, in rooms drenched with water after a fire or in basements for drying out purposes. The coil radiator is made up of pipe fittings without threads, says the *Valve World*. In place

of the threads the ends of the pipe are turned tapering and the fittings are reamed to a corresponding taper, so that the pipe may be driven into the fitting readily and quickly by unskilled labor, and a good, steam-tight joint will be the result.

How to Handle Coils of Rope

Coils of rope that are left standing on the floor or in the basement become dirty and do not present a good appear-



Storing Coiled Rope

ance to a customer. By keeping them in a tub or even one-half of a barrel that has been sawed in two, as shown in the illustration, the coils will be in better shape than when unsupported, says *Hardware and Metal*. This will permit the moving of a coil about, even after most of it has been sold, without falling down or becoming tangled.

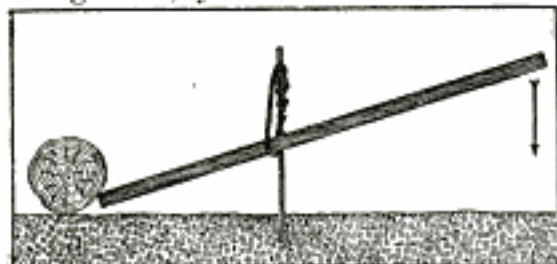
How to Make an Electric Wire Splice

The splice shown in the accompanying sketch I find very satisfactory, and especially so on a duplex and triplex wire. It is quickly made and soldered or covered with tape before or after the final wrap. This splice will not snap in two and will stand any ordinary strain.—Contributed by Frank S. Snyder, Dayton, Ohio.



How to Drive a Small Wire Into the Ground

If you have ever tried to drive a small wire of considerable length into the ground, you will know how diffi-

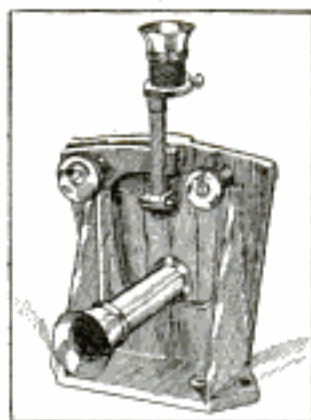


Driving Small Wire Into Ground

cult a job it is to get the wire driven without bending. The accompanying sketch shows how a wire may be driven into the ground by using a stout cord or rope, giving several half-hitches about the wire and forming a loop through which to pass a lever. A weight is placed on one end of the lever, and by pushing down on the other end the wire can be forced into the earth without bending.—Contributed by C. G. Whitcomb, Chicago.

Measuring the Horsepower of Marine Steam Turbines

The rapidly growing adoption of steam turbines for ship propulsion has created a demand for some ready means of ascertaining their horsepower, and as the steam indicator is not suitable for this purpose, we are thrown back on a torsion-meter as the only known method by which such information is obtainable. Torsion-meters are instruments to determine the twisting strain on shafts. They consist of two disks that are mounted on the shaft at a convenient distance apart. In each disk is cut a radial slot near its outer circumference,



and the two slots are in the same radial plane when no power is being transmitted and there is no twist on the shaft. Behind one disk is fixed an electric lamp, masked, but having a slot cut in the mask directly opposite the slot in the disk. This will throw a flash of light along the shaft toward the other disk at every revolution, says Page's Weekly, London.

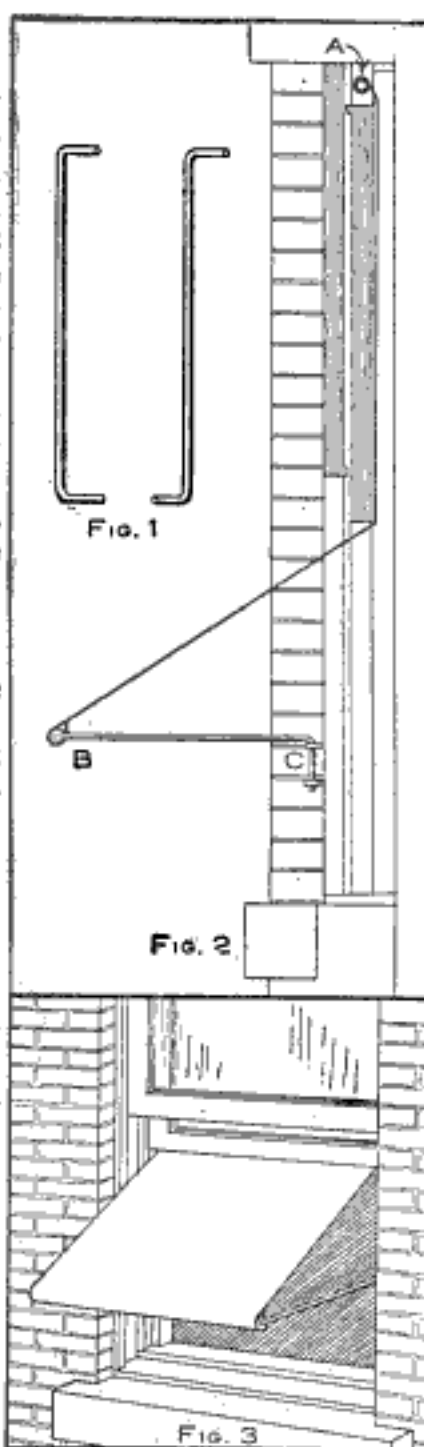
This is where the function of the torque-finder as illustrated comes into service. Behind the disk opposite the one with the electric light is fitted the torque-finder. It is capable of slight circumferential adjustment. When this finder is adjusted with its slot to come in line with the slot in the disks and the electric light, a flash of light is seen at every revolution of the shaft. If the shaft revolves fast enough, the light will appear to be continuous. At each end of the shaft we have what is virtually an instantaneous shutter fixed in the two disks, and nothing between except the beam of light, which once in each revolution flashes clear through the two disks. Let us suppose the shaft is transmitting power. One disk will lag behind the other by a definite amount, and, although three of the slots are still in line, the fourth slot, or the one in the lagging disk, effectually blanks the flash and no light is seen at the eye-piece. This torque-finder is graduated with a scale by degrees, and by this arrangement, with the distance between the disks and the diameter of the shaft, a rule is formulated to obtain the nominal horsepower.

How to Clean Engine Paint

Engine paint may be cleaned by applying a solution of 1 gal. water, 4 oz. of borax and $\frac{1}{2}$ pt. of lard oil. Stir this into a perfect emulsion and apply a coat of it to the surface of the paint and let it remain for a little while, then rub off clean with a rag or waste, says the English Mechanic. Be sure to remove the composition before it becomes dry. Add more borax if the solution is not strong enough.

A Combined Window Shade and Awning

A convenient awning made by using a window shade can be constructed at a trifling cost. Two extending arms as shown in Fig. 1 are made from $\frac{1}{4}$ -in. round iron 28 in. long with 4 in. of each end bent in in the shape of an L and at right angles to each other, making one right and the other left. These arms are used to support the end of the shade and are attached to the window casing with two screw eyes as shown at C, Fig. 2. Place the spring roller of the shade in the window as shown at A, Fig. 2. The hem in the lower end of the shade should be supplied with a round stick as long as the width of the shade. A $\frac{1}{4}$ -in. hole, 4 in. deep, is bored into each end of the round stick to receive the outer ends of the arms B, Fig. 2. The lower sash of the window is raised, the shade pulled down and pushed out through the opening and the arms attached, which hold the shade in the position of an awning as shown in Fig. 3. This will keep out the bright sunlight and admit the fresh air.—Contributed by P. McCarthy, Denver, Colo.



How to Make a Temporary Stencil

It is often the case that a man wants a stencil for a very limited amount of work, or when a stencil cutter is not immediately available. For such cases, one may be readily made from paper and will stand considerable careful usage.

Take a piece of strong, not too thick, manila paper, or, better still, good bond letter paper; and, after marking the desired design on it, give it a good coat of varnish or linseed oil, says Wood Craft. When it is thoroughly dry, lay it on a piece of glass and with a sharp-pointed knife cut out the characters. Such a stencil will do just as good work as any. Care should be taken to lay it on a flat surface when not in use.

New Way to Store Gasoline

A new plan for storing gasoline or petrol depends upon the fire-stopping property of wire gauze that gives safety to the Davy mining lamp. The gauze tube is inserted in the opening of the can or tank, extending to the bottom, and the orifice is then sealed by a plug held in place by fusible solder. If

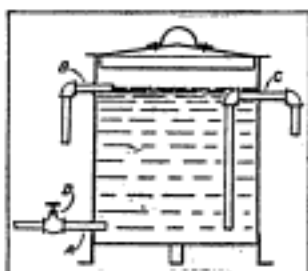
fire occurs near or around the tank, the solder melts and the plug is blown out, when the vapor escaping through the gauze tube burns quietly without exploding, says the Master Painter. In a test of the method, 12 out of 17 ordinary cans filled with volatile oil exploded on contact with fire, throwing

the burning liquid in every direction, but 12 cans fitted with the safety device failed to explode and the liquid burned quietly and harmlessly. Even open receptacles are made much safer by a covering of wire gauze, which prevents explosion in case the oil is ignited.

Quickly Made Oil Separator

An efficient and easily made oil separator for separating oil from the water before filtering is shown in the sketch which is taken from the Practical Engineer.

A gallon oil can or an ordinary waste can may be used for the tank, and pipe, A, is connected to the drip from the engine and fitted with a small valve, D. The



oil and water from the engine enter through this pipe until it is on the level with the pipe B. The oil floating on the surface of the water passes off through the pipe B, while the water runs out through the pipe C, which is $\frac{1}{4}$ in. lower than B, so that the water cannot reach the pipe B. To prevent any oil from getting into the pipe C when starting the separator, enough water should be poured into the can to cover the bottom of pipe C.

Things to Know About Wall Paper

One single roll of common wall paper is 8 yd. long by 18 in. wide, and one single roll of ingrain, felt or cartridge paper is 8 yd. long by 30 in. wide. One single roll of one strip border is 8 yd. long by 18 in. wide and contains 8 yd. of border. One single roll of two strip border is 8 yd. long by 18 in. wide and contains 16 yd. of border. Common wall paper is put up in double rolls; and ingrain, felt or

cartridge paper is put up in triple rolls. Prices are quoted on single rolls.

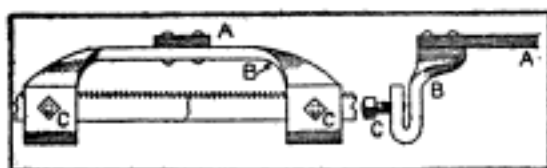
To find the quantity of common paper necessary to cover a room, multiply the height of the room by the length of the four sides and divide by 36, which will give the number of single rolls required. For each single roll of common paper $1\frac{1}{2}$ yd. of border will be necessary.

For ingrain, felt or cartridge paper, multiply the height of the room by the length of the four sides and divide by 49, which will give the number of single rolls required. Deduct one single roll of common paper for every 50 sq. ft. of opening.

Multiply the length of the ceiling by the width and divide by 36 for common paper and divide by '9 for ingrain, felt or cartridge paper to obtain the quantity of single rolls required for the ceiling.

A Home-Made Brazing Clamp for Band Saws

A bar of iron, $\frac{1}{4}$ in. thick by about $1\frac{1}{4}$ in. wide and 10 or 12 in. long, is bent at both ends in the shape shown in the illustration. The short bar, A, is riveted on in the middle of the bar B to be used in holding the clamp in a vise. The bent ends of the bar B are



For Brazing Band Saws

drilled and tapped for two small set screws, C C, which are to be used to hold the ends of the saw while brazing.—Contributed by A. R. Kibbe, New Richmond, Wis.

One part Venetian turpentine added to four parts of glue will make a flexible glue to attach leather to metals. The mass is heated in a glue pot until it becomes sticky and no more bubbles appear. A fresh mixture will work best.

Panel Designs



"Summer"

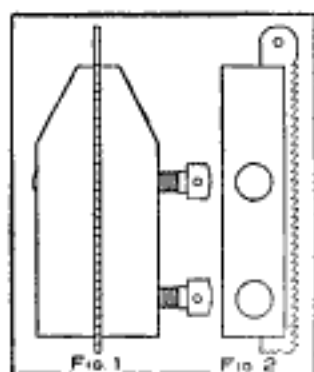


"Winter"

Courtesy Decorator's & Painter's Magazine, London

Substitute for a Hack-Saw

On some kinds of work it is impossible to use a common hack-saw frame with the saw. If the saw blade is placed in a machinist's parallel clamp allowing 1 or $1\frac{1}{2}$ in. to extend beyond the ends of the clamp jaws, as shown in the sketch, it can be used to advantage in holes or irregular work.—Contributed by Chas. H. Beetle, Philadelphia, Pa.



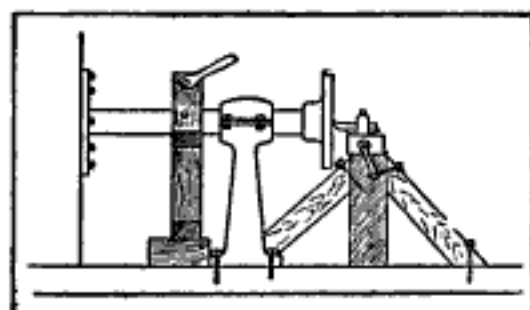
Lining up a Generator and Water Wheel

"Recently in a power house where an old generator, which was direct-connected to a water wheel, was to be replaced by a new machine, we had the following all-night experience," writes C. L. Abbott in the *Electric Journal*: "When the old generator was uncoupled from the water wheel it was found that the water wheel shaft could not be stopped in the usual way owing to a leak in the gate, and it was necessary to rig up a heavy clamp made of 10-in. timbers. This was placed on the shaft and tightened up until the wheel came to a standstill. Then the new half coupling was fitted to the shaft and the key driven home. Before coupling to the new generator it was thought best to make sure that the coupling ran true. The wooden clamp was loosened enough to let the shaft turn slowly. A steel point held on a rest showed that the face of the coupling was running out of true a full thirty-second of an inch, probably due to the key being high and driven in too tightly. As it was past midnight and it was necessary that the generator be running in the morning something had to be done without delay. The power house was

on a lonely stream several miles from the nearest town; hence there was no means of getting good tools quickly. An old slide rest and lathe tool were found and mounted on wooden supports so that a cut could be taken across the face of the coupling. A man was stationed at the wooden clamp with a wrench to govern the speed by tightening or loosening the bolts, while another poured cold water on the clamp to keep it cool.

"After the first cut was taken off it was found that the tool was too dull to make a second cut, and as there were no other tools available, matters looked serious. After groping around some time with a lantern some pieces of emery cloth were found in a tool box. These pieces were wired around the water wheel shaft in such a manner as to leave a clear space in the middle. The wooden clamp was again loosened, and as the shaft whirled the emery cloth around, the tool was quickly ground sharp on the improvised grindstone.

"Without further mishap the coupling was turned true, coupled to its



Lining up the Shaft

mate on the generator shaft and the machine put in operation.

"As that group of grimy, tired-eyed men stood there in the gray of the morning and watched that machine running as smooth as a watch they felt well repaid for their night of toil."

Large gate valves may be cleaned from mud that goes in with the steam from a foaming boiler by opening and closing the valve a few times while water is running through it. This can be done safely when there is no pressure on the boilers.

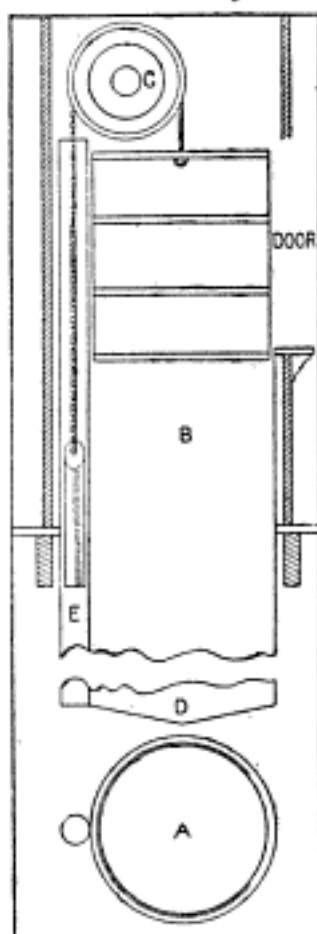
How to Make a Cold Dumb Waiter

Perhaps one of the greatest hardships to be encountered by comparatively prosperous people is that of having to get through the hot summer months without ice, as in the case of most farm homes and in many suburban localities where there is little or no ice delivery.

The accompanying illustration will show how to construct a device to keep eatables cool, and especially in the north, where the ground stays cold the year round at a reasonable depth.

The casing of this dumb waiter hole is round, as shown at A, and should be made of galvanized iron. The depth of the hole depends on the locality, but scarcely needs to exceed 8 or 10 ft., says Domestic Engineering. If the casing extends through the cellar it would be well to set it deep enough so that the waiter, when down, will stand below the cellar floor, as this would secure a lower temperature than that of the cellar. The bottom of the casing, D, is made slightly funnel-shaped, to facilitate cleaning, and the whole casing is soldered up watertight so that there will be no danger of water rising in from the inside.

Another and smaller galvanized tube, E, is made to contain a counterweight for the dumb waiter, and this tube should be long enough to balance



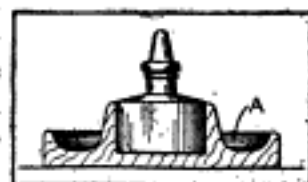
the run of the waiter and extend up high enough so that the weight will not be pulled out at the top. The door should be long enough and sufficiently wide to admit of taking the waiter out in order to clean the casing. A brake may be attached to the wheel, G, if the load varies too much for the counterweight.

Should the casing extend through a cellar, there may be a door put in the casing so as to give access to the waiter from the cellar, making the carriage do the service of a regular dumb waiter.

The fact that a house is already built is no bar to putting in one of these cold storage plants, as a circle may be cut out of the floor as large as the casing, and the hole bored with a large auger, and the dirt carried out of the door. The casing may be put down in sections and soldered before being put down into the ground. If the work is carried down from the bottom of a cellar it will be all the easier. The main feature of this device is the fact that it will keep things from freezing in the winter as well as from melting in the summer.

How to Make an Ink Bottle Stand

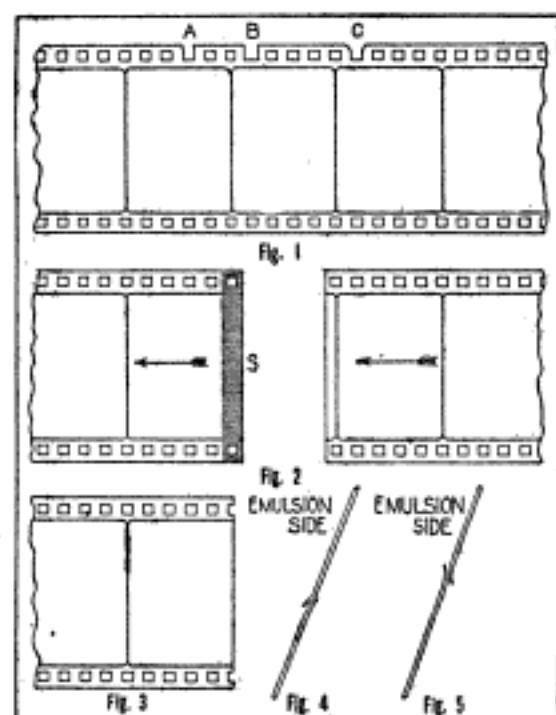
This stand as shown in the accompanying cut is made with a rather large bottom to prevent upsetting of the ink bottle. The special feature is the groove, A, which forms a receptacle to hold tacks, pens, etc. The stand is made of wood, and, being round, it requires but a few minutes' time to turn it on a lathe. When sandpapered and varnished, it makes quite a useful and ornamental article for the drawing table.—W. E. W.



Small leaks in steam boilers may be stopped by putting in a small quantity of wheat bran through the manhole into the boiler.

How to Repair a Moving Picture Film

When a socket hole is broken out in a film as shown at A, Fig. 1, it is best to trim it rounding, as at C, to be used only until time may be had to make a splice. The hole should never



Repairing Moving Picture Film

be trimmed square as at B, says the Moving Picture World. It is better to make a splice as soon as possible, and to lose one picture in doing so, rather than have the notch catch, which is liable to cause the loss of several pictures.

The splice should be made as shown in Fig. 2, scraping the end S where the film is cut, and on the end of that part toward the beginning of the film, as shown in the direction of the arrows. The cut is made between the sprocket holes, not through them, as in Fig. 3. In passing through the machine the emulsion side of the film is never touched except by the rollers, while the celluloid side comes in contact with all the rigid parts of the machine, and if there is anything that is not smooth, there is trouble; so it can be seen by Fig. 4 that, no matter what it hits, the film will pass safely; but in Fig. 5,

with the wrong splice, it is always inviting trouble.

How to Paint over Cement

It is not safe to paint over the surface of cement until it has stood exposed to the weather for about one year unless the surface has first been sized with acid water to kill the alkali, and even then there is some danger of bad results. Here is a somewhat tedious method for preparing and painting such a surface, but it has the sanction of some of the best painters, says the Master Painter. Slack one-half bushel of fresh stone lime in a barrel and add in all 25 gal. of water; when slacked and cold add 6 gal. of the best cider vinegar and 5 lb. of best dry venetian red. Mix well and then strain through a fine wire strainer. Use it when about the consistency of thin cream. Give the cement surface a coat of this, and after standing a day or so apply a coat of red lead and linseed oil paint. After this has dried you may paint the surface any color you wish. Some jobs require two coats of paint over the red lead paint. In this case make the second coat of paint serve as filler and paint both. This second coat may be made with plaster of paris and oil of the consistency of buttermilk. Then break up some white lead and oil to make a paint the same consistency as the plaster paint. Now take equal parts of each of the two mixtures and "box" them together, and thin to a working consistency with turpentine. This second coat should be applied as heavy as possible, or as heavy as you can spread it well. After this coat is dry apply your next and finishing coat of paint, which should be quite glossy, or about as you would for the last coat on woodwork outside. The object in giving it this plaster paint is to prevent the running and wrinkling of the paint where considerable paint is to be applied to the surface. And it must be made to dry quickly, so that you will not likely give the finishing coat

before the second coat is dry enough, for if you do that there will be blistering or cracking. Observe particularly that no plaster is to go in the last or finishing coat.

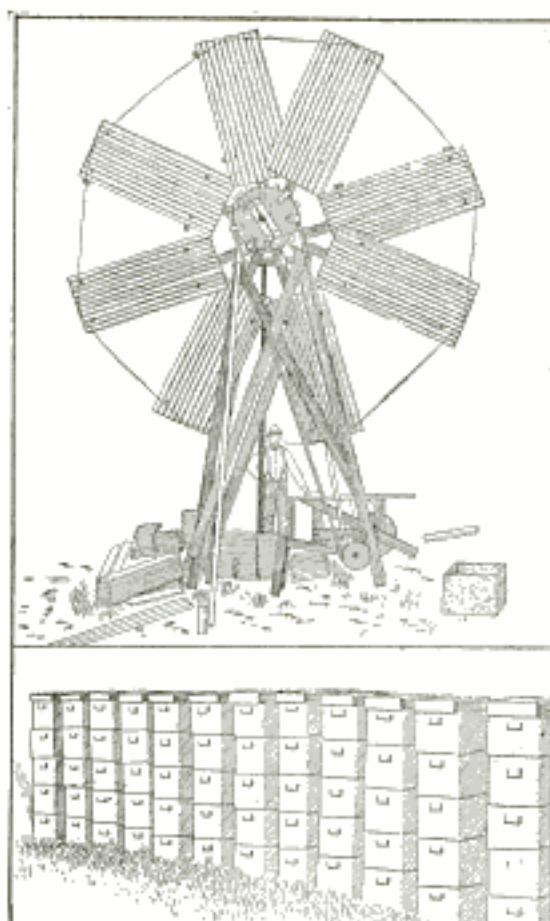
Home-Made Power Windmill

As I am owner of several hundred colonies of bees, I am constantly in need of new beehives, frames and hive parts. These apiarian accessories of the present day are very expensive. Being a mechanic of a small amount of ability, I concluded to manufacture the accessories at home. A circular saw could be installed very cheap, but the power to drive it was quite another thing. The cheapest gasoline engines were too expensive for me, and I had no water power to use, so I decided to harness the wind and turn it into service. The illustration shows how this was accomplished. The windmill was constructed from house building material, which was not damaged for building purposes, and to which use I will put it when through making beehives.

The axle for this mill was made out of a heavy 2-in. gas pipe. It revolves in iron bearings which fit into the bolsters of the frame. The axle is drilled on each side of the bearings, and iron pins inserted through the holes. The framework and crossarms are made from 2 by 4-in. material, 12 ft. long. The arms for the wheel are secured to the axle by means of a clamp, which is effected by the arm being half sunk around the axle, and a corresponding piece for the opposite side, with $\frac{1}{2}$ -in. bolts inserted to draw them together. One of the arms is secured to the axle by means of a pin to prevent the wheel from slipping on the axle. In order to secure the rest of the arms in addition to the clamps, a wire was placed encircling the outer circumference of the wheel and fastened to each arm. The pieces of sheet steel roofing are fastened to the crosspieces on the arms by means of large screws. A friction brake is used to control the mill, and

is also used in starting and stopping it. The power of the mill is transmitted to a line shaft at the lower part of the frame by means of a rope drive belt.

The mill is set with the surface of



Develops 3 or 4 Hp.

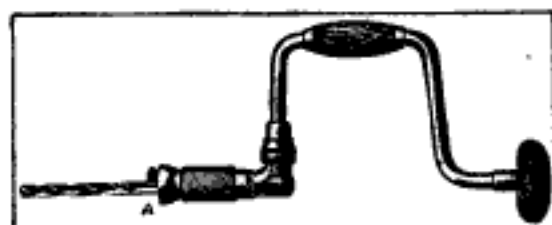
the wheel facing north and south, and is securely braced fore and aft. In addition to this, it is guyed to the ground with steel telephone wire. The mill has been operated in a gale of 50 miles an hour, and there was no apparent danger of tipping over. It makes no difference if the wind comes from the north or the south, as all that is necessary to get the forward movement on the machinery is to cross the rope belt. To accommodate this belt crossing, the bearing of the driving wheel side is placed on a lever which can be raised or lowered as the case may demand.

The mill is geared 40 to 1, and drives a 6-in. circular saw with a rim speed of from $\frac{1}{2}$ to $\frac{3}{4}$ of a mile per minute. I have no way to rate the power, but

I am of the opinion there is 3 or 4 hp. when running in a stiff breeze.—Contributed by T. P. Robinson, Bartlett, Texas.

How to Drill Tapered Holes in Marble Slabs

Sometimes the plumber needs to drill holes in slate and marble slabs in which to insert wood plugs for holding retaining screws. When a straight hole is

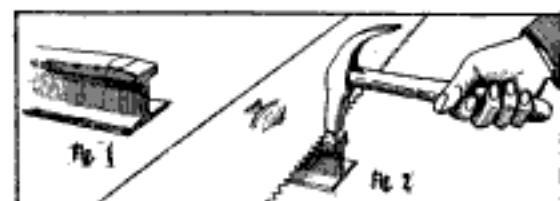


For Drilling Tapered Holes in Marble

drilled the wood plug is liable to shrink and slip out, even though it may be well fitted and driven in tight. Tapered holes are necessary. These holes may be drilled in one operation by removing one jaw from the chuck on the brace as shown at A in the sketch. This will set the point of the drill a trifle to one side of the center line. When a hole is drilled with this device it will have sufficient taper to hold the wood plug tightly.

Home-Made Saw Set

Secure a piece of T-rail about 1 ft. long (if railroad iron is not available, any piece of iron about 2 in. square will do) and bevel one end on top with a file, $\frac{1}{8}$ in. down by $\frac{3}{8}$ in. back. On this bevel make a gauge mark $\frac{3}{16}$ in. down from the top of the bevel as shown in



Home-Made Saw Set

Fig. 1. Lay the saw on the flat surface of the iron with the points of the teeth to the gauge mark. Strike each

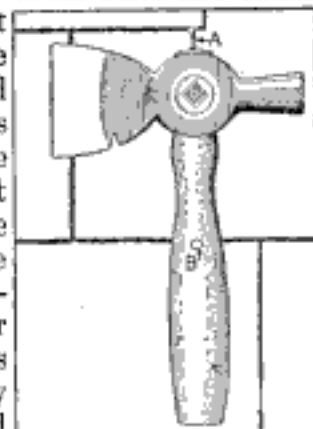
tooth, as shown in Fig. 2, one smart blow, or two light blows with a light hammer having a small face (a horse-shoeing hammer works well).

The gauge mark given is for soft wood, such as white pine, hemlock, etc. To set the saw for hard wood, draw it back a trifle from the gauge mark. The above is a quick, effective and accurate method of setting a saw.—Contributed by N. J. McLean.

A Measure on a Shingling Hatchet

In shingling roofs, considerable time is lost by going back and forth across the roof striking chalk lines and chalk-

ing the lines, but by using the measure attached to the hatchet as shown in the sketch this lost time may be saved and the work accomplished with greater speed. A nail is driven part way into the wood handle as shown at A, leaving about $\frac{1}{2}$ in. extending. Bore a small hole in the handle at B, in which to place a hardwood pin. This hole and pin should be placed at the right distance from the extreme end of the nail, A, to equal distance that the shingles show to the weather.



In using the hatchet, the first double course of shingles are laid in the usual way with the line; then, by placing it as shown, eight or ten courses of shingles may be laid while going across the roof once. Always place the hatchet at the lower right-hand corner of the shingle when placing it, and see that the left-hand corner is even with the last shingle placed.—J. E. B.

In putting up leather belting be sure to place the hair side next to the pulley. It not only clings to the pulley better but will wear much longer.



Amateur Mechanics

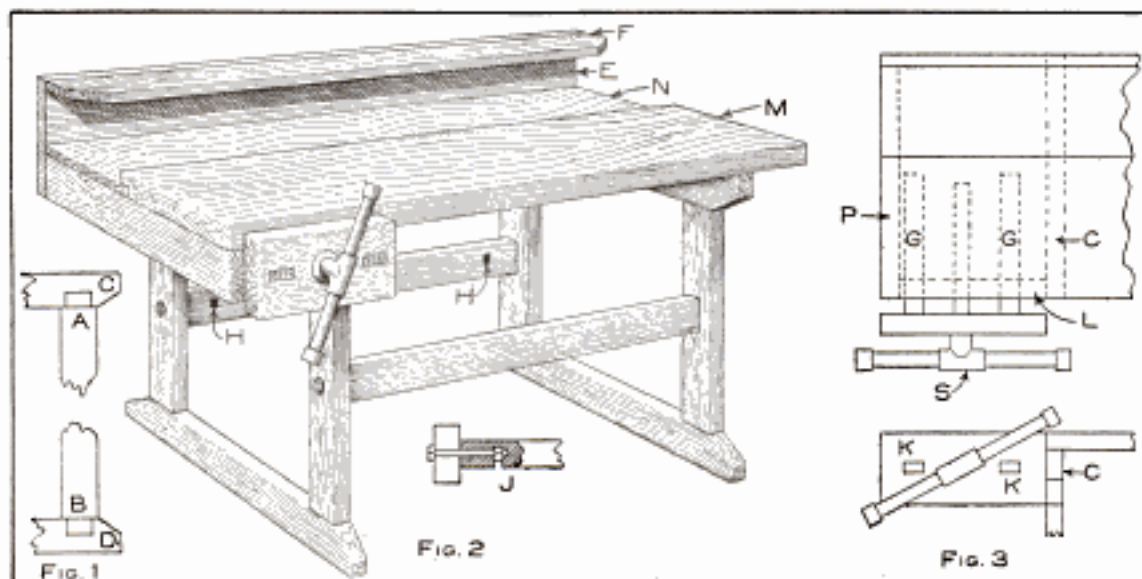


Home-Made Workbench

By C. E. McKinney, Jr.

The first appliance necessary for the boy's workshop is a workbench. The average boy that desires to construct his own apparatus as much as possible can make the bench as described herein. Four pieces of 2 by 4-in. pine are cut 23 in. long for the legs and a tenon made on each end of them $\frac{1}{2}$ in. thick, $3\frac{1}{2}$ in. wide and $1\frac{1}{2}$ in. long as shown

center of each end of the braces to a depth of 4 in., as shown at J, Fig. 2. On the back side of the braces bore holes intersecting the other holes for a place to insert the nut of a bolt, as shown at HH. Four $\frac{3}{8}$ by 6-in. bolts are placed in the holes bored and the joints are drawn together as shown at J. The ends of the two braces must



Details of Construction of Home-Made Workbench

at A and B, Fig. 1. The cross pieces at the top and bottom of the legs are made from the same material and cut 20 in. long. A mortise is made $1\frac{1}{4}$ in. from each end of these pieces and in the narrow edge of them as shown at C and D, Fig. 1. The corners are then cut sloping from the edge of the leg out and to the middle of the piece as shown. When each pair of legs are fitted to a pair of cross pieces they will form the two supports for the bench. These supports are held together and braced with two braces or connecting pieces of 2 by 4-in. pine, 24 in. long. The joints are made between the ends of these pieces and the legs by boring a hole through each leg and into the

be sawed off perfectly square to make the supports stand up straight.

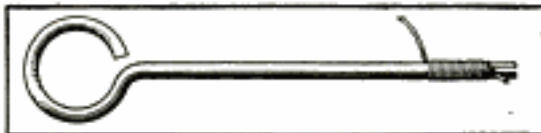
The main top board, M, Fig. 2, may be either made from one piece of 2 by 12-in. plank $3\frac{1}{2}$ ft. long, or made up of 14 strips of maple $\frac{1}{2}$ in. thick by 2 in. wide and $3\frac{1}{2}$ ft. long set on edge, each strip glued and screwed to its neighbor. When building up a top like this be careful to put the strips together with the grain running in the same direction so the top may be planed smooth. The back board, N, is the same length as the main top board M, $8\frac{1}{2}$ in. wide and only $\frac{3}{4}$ in. thick, which is fitted into a $\frac{1}{4}$ -in. rabbet in the back of the board M. These two boards form the top of the bench as shown in Fig. 2 and are

fastened to the top pieces of the supports with long screws. The board E is 10 in. wide and nailed to the back of the bench. On top of this board and at right angles with it is fastened a 2½-in. board, F. These two boards are ¾ in. thick and 3½ ft. long. Holes are bored or notches are cut in the projecting board, F, to hold tools.

Details of the vise are shown in Fig. 3, which is composed of a 2 by 6-in. block 12 in. long, into which is fastened an iron bench screw, S. Two guide rails, GG, ½ by 1½ in. and 20 in. long, are fastened into mortises of the block as shown at KK, and they slide in corresponding mortises in a piece of 2 by 4-in. pine bolted to the under side of the main top board as shown at L. The bench screw nut is fastened in the 2 by 4-in. piece, L, between the two mortised holes. This piece, L, is securely nailed to one of the top cross pieces, C, of the supports and to a piece of 2 by 4-in. pine, P, that is bolted to the under sides of the top boards at the end of the bench. The bolts and the bench screw can be purchased from any hardware store for less than one dollar.

Forming Coils to Make Flexible Wire Connections

When connections are made to bells and batteries with small copper wires covered with cotton or silk, it is necessary to have a coil in a short piece of the line to make it flexible. A good way to do this is to provide a short rod about ⅛ in. in diameter cut with a slit in one end to hold the wire and a loop made on the other end to turn with the fingers. The end of the wire is

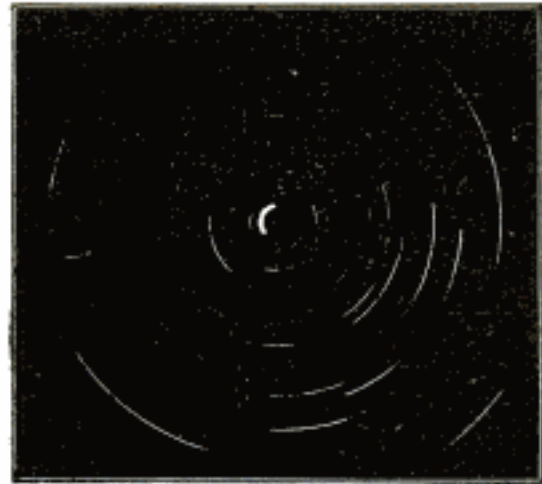


Forming Wire Coils

placed in the slit and the coil made around the rod by turning with the loop end.

Photographing the North Star

The earth revolving as upon an axis is inclined in such a position that it points toward the North star. To an observer in the northern hemisphere the effect is the same as if the heavens



Photograph of the North Star

revolved with the North star as a center. A plate exposed in a camera which is pointed toward that part of the sky on a clear night records that effect in a striking manner. The accompanying illustration is from a photograph taken with an exposure of about three hours, and the trace of the stars shown on the plate by a series of concentric circles are due to the rotation of the earth.

The bright arc of the circle nearest the center is the path of the North star. The other arcs are the impressions left by neighboring stars, and it will be noticed that their brightness varies with their relative brilliancy. Many are so faint as to be scarcely distinguished, and, of course, telescopic power would reveal myriads of heavenly bodies which leave no trace on a plate in an ordinary camera. The North or pole star is commonly considered at a point directly out from the axis of the earth, but the photograph shows that it is not so located. The variation is known astronomically to be 1¼ deg. There is a slight irregularity in the position of the earth's

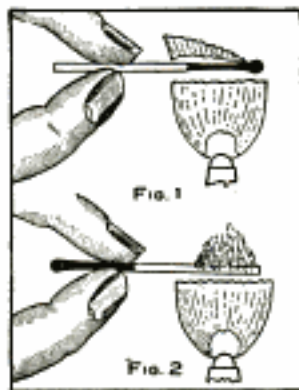
axis, but the changes are so slow as to be noticed only by the lapse of a thousand years. Five thousand years ago the pole star was Draconis, and in eighteen thousand years it will be Lyrae. We have direct evidence of the change of the earth's axis in one of the Egyptian pyramids where an aperture marked the position of the pole star in ancient times, and from this it is now deviated considerable.

This experiment is within the reach of everyone owning a camera. The photograph shown was taken by an ordinary instrument, using a standard plate of common speed. The largest stop was used and the only requirement beyond this is to adjust the camera in a position at the proper inclination and to make the exposure for as long as desired. On long winter nights the exposure may be extended to 12 hours, in which event the curves would be lengthened to full half-circles.

The North star is one of the easiest to locate in the entire heavens. The constellation known as the Great Dipper is near by, and the two stars that mark the corners of the dipper on the extremity farthest from the handle lie in a line that passes across the North star. These two stars in the Great Dipper are called the pointers. The North Star is of considerable brilliancy, though by no means the brightest in that part of the heavens.—Contributed by C. S. B.

How to Relight a Match

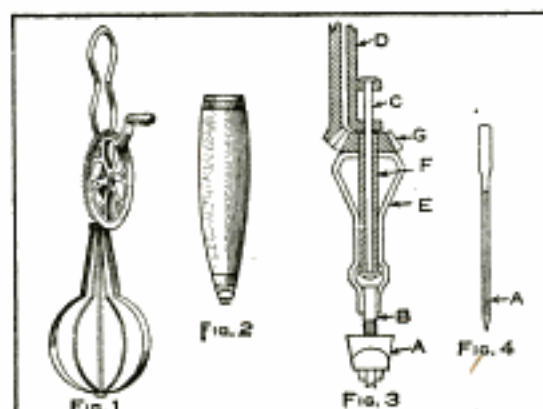
A match may be a small thing on which to practice economy and yet a great many times one wishes to relight a match either for economy or necessity. The usual method is to place the burnt portion of the match in the flame to be relighted as shown



in Fig. 1. It is very hard to relight the charred end and usually burnt fingers are the result of pushing the match farther in the flame. Hold the burnt end in the fingers and place the other end in the flame as shown in Fig. 2. A light will be secured quickly and the flame will only follow the stick to the old burnt portion.

Home-Made Hand Drill

In the old kitchen tool box I found a rusty egg beater of the type shown in Fig. 1. A shoemaker friend do-



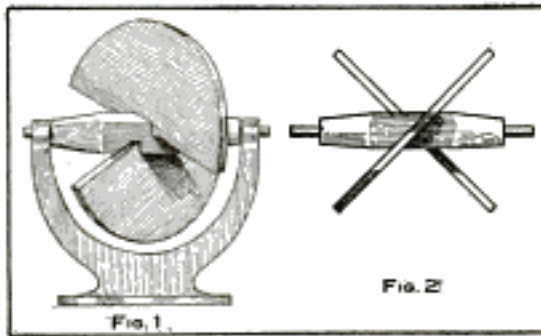
Details of Hand Drill Construction

nated a pegging awl, Fig. 2, discarded by him due to a broken handle. With these two pieces of apparatus I made a hand drill for light work in wood or metal. By referring to Fig. 3 the chuck, A, with stem, B, were taken from the awl. The long wire beater was taken from the beater frame and a wire nail, C, soldered to the frame, D, in the place of the wire. The flat arms were cut off and shaped as shown by E. The hole in the small gear, G, was drilled out and a tube, F, fitted and soldered to both the gear and the arms E. This tube, with the gear and arms, was slipped over the nail, C, then a washer and, after cutting to the proper length the nail was riveted to make a loose yet neat fit for the small gear. The hand drill was then completed by soldering the stem, B, of the chuck to the ends of the flat arms E. Drills were made by breaking off sewing-machine needles above the eye as

shown in Fig. 4 at A, and the end ground to a drill point.—Contributed by R. B. J., Shippensburg, Pa.

How to Make a Stationary Windmill

A windmill that can be made stationary and will run regardless of the



Runs in Any Wind

direction of the wind is here illustrated. Mills of this kind can be built of larger size and in some localities have been used for pumping water.

Two semi-circular surfaces are secured to the axle at right angles to each other and at 45 deg. angle with that of the axle as shown in Fig. 2. This axle and wings are mounted in bearings on a solid or stationary stand or frame. By mounting a pulley on the axle with the wings it can be used to run toy machinery.

Electric Anaesthesia

It is a well known fact that magnetism is used to demagnetize a watch, and that frost is drawn out of a frozen member of the body by the application of snow. Heat is also drawn out of a burned hand by holding it close to the fire, then gradually drawing it away. The following experiment will show how a comparatively feeble electric current can undo the work of a strong one.

I once tried to electrocute a rat which was caught in a wire basket trap and accidentally discovered a painless method. I say painless, because the rodent does not object to a second or third experiment after recovering, and

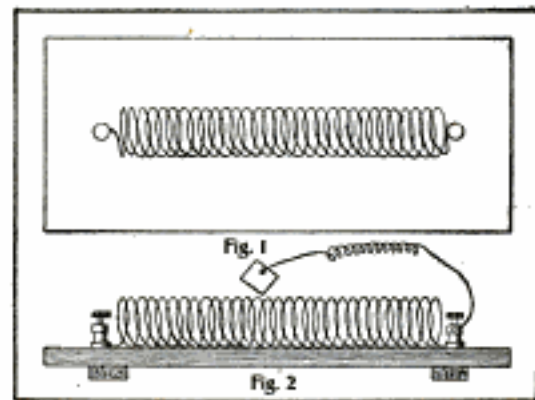
is apparently rigid and without feeling while under its influence.

To those who would like to try the experiment I will say that my outfit consisted of an induction coil with a $\frac{3}{8}$ -in. iron core about 3 in. long. The primary coil was wound with four layers of No. 20 wire and the secondary contains 4 oz. No. 32 wire, and used on one cell of bichromate of potash plunge battery. The proper amount of current used can be determined by giving the rodent as much as a healthy man would care to take. Fasten one secondary electrode to the trap containing the rat and with a wire nail fastened to the other terminal, hold the vibrator of the coil with your finger and let the rat bite on the nail and while doing so release the vibrator. In three seconds the rat will be as rigid as if dead and the wires can be removed.

Now connect your wires to the primary binding-posts of the coil and wind the end of one of them around the rat's tail and start the vibrator. Touch the other terminal to the rat's ear and nose. In a few minutes he will be as lively as ever.—Contributed by Chas. Haeusser, Albany, N. Y.

A Simple Battery Rheostat

A spring from an old shade roller is mounted on a board 4 in. wide, 9 in. long and $\frac{3}{8}$ in. thick. A binding-post is fastened to this board at each end, to which is attached the ends of the spring, as shown in Fig. 1. The temper of a small portion of each end of the

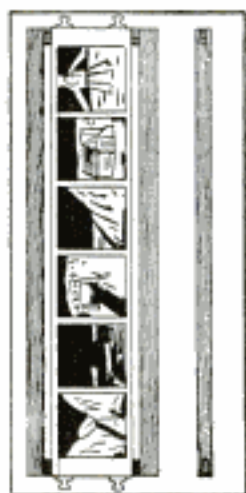


Battery Rheostat

spring will need to be drawn. This can be accomplished by heating over an alcohol lamp or in a fire and allowing it to cool slowly. The ends are then shaped to fit the binding-posts. A wire is connected to one of the binding-posts and a small square piece of copper is attached to the other end of the wire, as shown in Fig. 2. When this device is placed in a circuit the current can be regulated by sliding the small square copper piece along the spring.—Contributed by H. D. Harkins, St. Louis, Mo.

A Frame for Drying Films

No doubt many amateur photographers are troubled about drying films and to keep them from curling. The problem may be solved in the following way: Make a rectangular frame out of pine wood, $\frac{1}{4}$ by $\frac{1}{2}$ in., as shown in the sketch. It is made a little wider and a little shorter than the film to be dried. This will allow



the end of the film to be turned over at each end of the frame and fastened with push pins. Do not stretch the film when putting it on the frame as it shrinks in drying. The film will dry quicker and will be flat when dried by using this frame.—Contributed by Elmer H. Flehr, Ironton, Ohio.

A Home-Made Novelty Clock

This clock that is shown in the accompanying engraving is made in scroll work, the cathedral and towers being of white maple, the base is of walnut with mahogany trimmings, all finished in their natural colors. It has 11 bells in the two towers at the sides and 13



miniature electric lamps of different colors on two electric circuits. The clock is operated by a small motor receiving its power from dry cell batteries. This motor turns a brass cylinder over which runs a continuous roll of perforated paper similar to that used on a pianola. A series of metal fingers, connected by wires to the bells, press lightly on this brass roll and are insulated from the roll by the perforated paper passing between. When a perforation is reached a finger will make a contact with the brass roll for an instant which makes a circuit with the magnet of an electric hammer in its respective bell or forms the circuit which lights the electric bulbs as the case may be.

At each hour and half hour as the clock strikes, the motor is started automatically and the chimes sound out the tunes while the colored lights are turned on and off; two small doors in the cathedral open and a small figure comes out while the chimes are playing, then returns and the doors are closed.—Contributed by C. V. Brokenicky, Blue Rapids, Kansas.

ILLICIT DISTILLING IN IRELAND

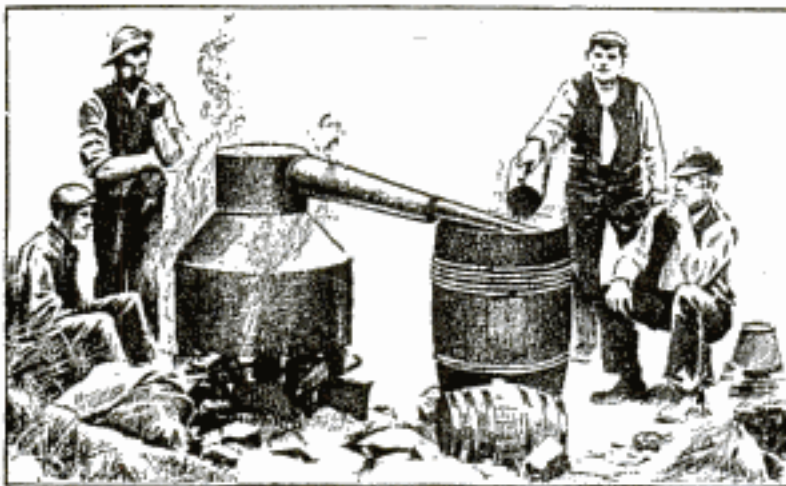
Notwithstanding the vigilance of the Royal Irish Constabulary, the illicit still has not been altogether wiped out in Ireland, although the quantity as well as the quality of the whisky thus produced has greatly fallen off in the past century.

The product of these stills is a cheap whisky called "poteen," and is in the most part made from the fermented infusion of sugar or treacle. A century ago when it was distilled from all-malt, the flavor was most agreeable, and its consumption was by no means confined to the peasantry, the only class that will now drink the ill-flavored stuff. The stills are now found only in the mountains and on lake islands, where the country is the wildest. When not in use the distilling utensils are hidden in bogs, peat stacks and other ingenious hiding places.

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BRIDGE**

This reinforced simple concrete bridge, adapted for country roads, can be built for \$650. It has a span of 35 ft. between abutments, is 18 ft. wide and has only two girders between supports. The floor slabs span between

these girders and are 8 in. thick. The posts for the iron-pipe hand rail were embedded in the concrete when it was poured. A 6-in. wearing surface of macadam was laid on the roadway of

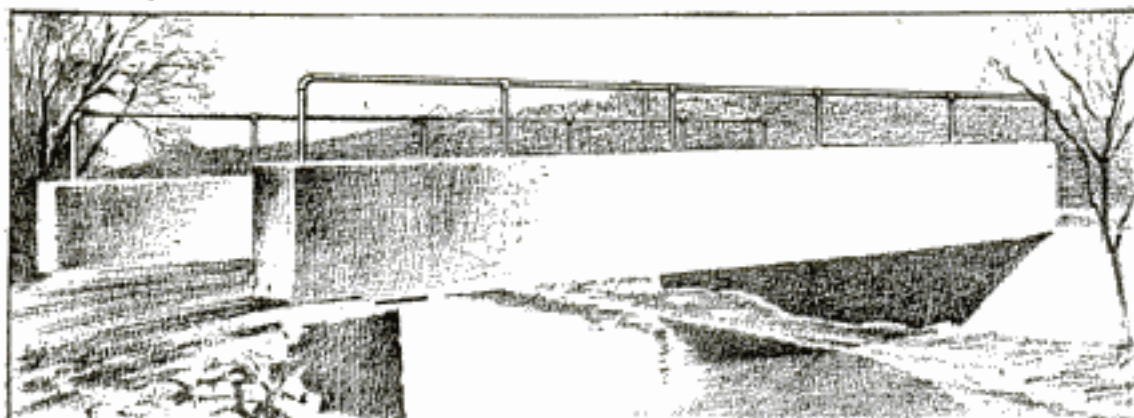


Making "Poteen" in the Mountains

the bridge and rolled with a 15-ton steam roller. In many instances a great part of the material used in construction can be found at the bridge site.

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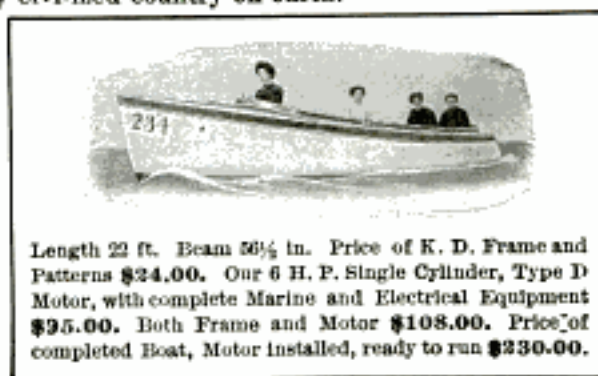
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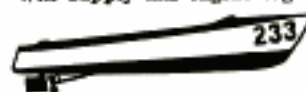
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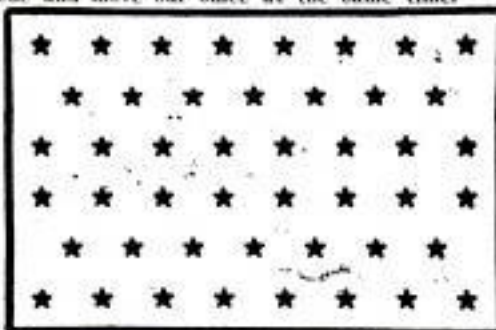
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COYNE COURSE \$75, NOT \$7.—On page 130 of the May issue of Popular Mechanics appeared the advertisement of the Coyne Plumbing and Bricklaying School, St. Louis. The price for their full course was quoted as \$7, which was a typographical error. It should have read \$75, which is really a very reasonable charge for the service rendered. Naturally the mistake deluged the school with orders from readers anxious to take advantage of such a "bargain," and has caused a lot of correspondence. In order to put the Coyne school in a right light we wish to make it plain that the error was entirely ours, and was due to the fact of our trying to get out our issue and move our office at the same time.



Another mistake occurred in the illustration of the official flag of the United States which changes on July 1, to include two new states. The description correctly described the field of stars, but the illustration lacked two stars of the required number. The illustration should have been as given herewith.

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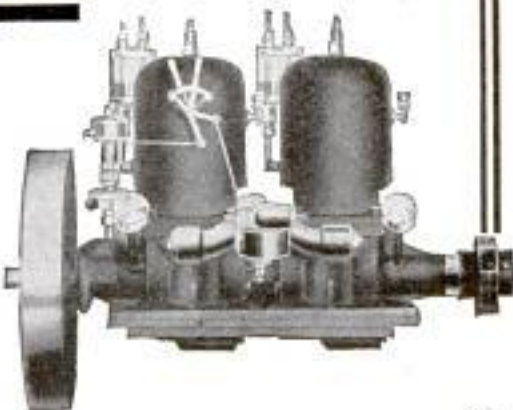
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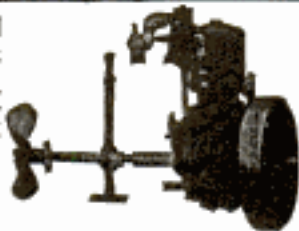
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FAMOUS SHIP IN ICE 60 YEARS.—Reports from Captain Jarvis, of the Royal Mounted Police of the Canadian Northwest, state that Explorer McClure's famous ship "Investigator," once a British man-of-war, which was caught in the ice 60 years ago and has been fast there ever since, last summer was so free that vessels could approach close. The mild Arctic winter of 1907-8 may mean that ice on the Arctic coast will not be so heavy this summer as to prevent steam whalers from reaching the "Investigator."

McClure had to abandon the ship because the men became afflicted with scurvy. They left all the supplies on board, and no one, as far as is known, has ever visited the ship since.

STEEPLEJACK HAS NARROW ESCAPE.—Hundreds of people recently watched Joseph Bailey, a New York steeplejack, battle with death and at last extricate himself from a dangerous position at the top of a 200-ft. chimney in Jersey City. Bailey was sitting in a boatswain's chair when a gust of wind swirled it around and threw him out of it. As it did so he grasped a rope dangling from the chimney top and the wind blew the chair out of his reach. The steeplejack struggled hand over hand up the swaying rope to the top, where he had barely strength enough to crawl over the edge.

SAN FRANCISCO'S CHINESE THEATRE TO COST HALF A MILLION.—San Francisco is to have the largest and most magnificent Chinese theatre ever built in a white man's country. The seating capacity will be in the neighborhood of 3,000 and it will cost \$500,000. The walls will be of granite and reinforced concrete. One of the promised architectural surprises will be the way in which the three galleries will be "swung."

WHIRLED DOWN HILL IN SECTION OF WATER PIPE.—H. Engels, an Oakland, Cal., boiler maker, met with an experience which nearly cost him his life while at work inside a 28-in. water pipe. The line of pipe ran along a steep hillside and was held in position by wooden supports. While Engels was riveting two sections together the supports gave way and the section in which he was working started down the hill at a terrific speed. It rolled several hundred feet and finally dropped into a ditch in which a stream of water was running. Engels' companions supposed, of course, that he had been killed, but rushed to the ditch. The in-piped man was taken out alive, but seriously cut and bruised, and almost drowned.

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Best Marine Engine Made

Absolutely Safe and Sure

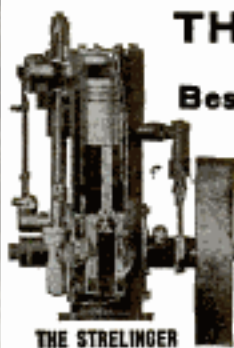
Easy to Start and Control

Durable, Reliable, Economical and Powerful.

Its unparalleled popularity is proof that it is the ideal engine for launches and boats.

Write for our 1908 Catalogue and Price List.

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(4 Cyl.—1 to 4 Cyl.)

THE STRELINGER MARINE ENGINE CO.

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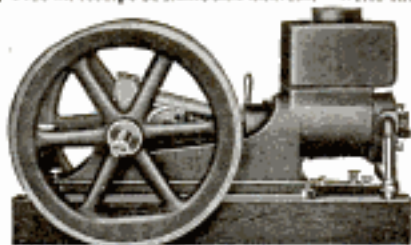
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Faucet WATER MOTORS



Complete with emery wheel, buff wheel, pulley to run sewing and washing machine, polish. In some cities where we have no agents, and where the water pressure is good, a sample motor will be given free; apply at once if you want to make some extra money, or if you can devote your whole time, liberal salary and commission will be paid.

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ENGINEERS WANTED

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1908 MARINE MOTORS



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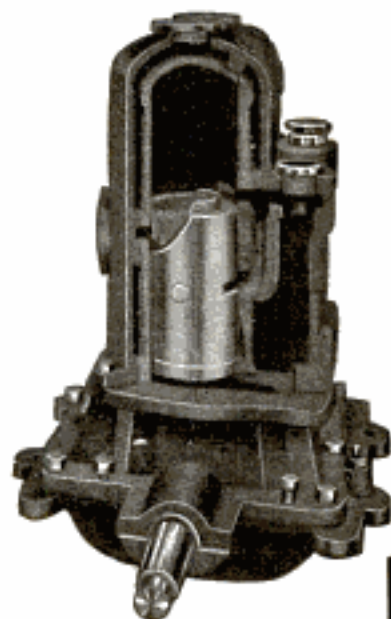
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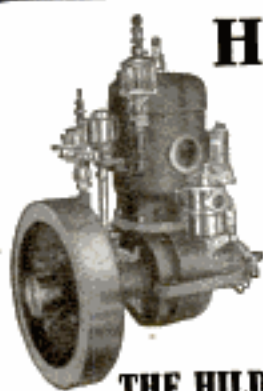
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The Refined Motor

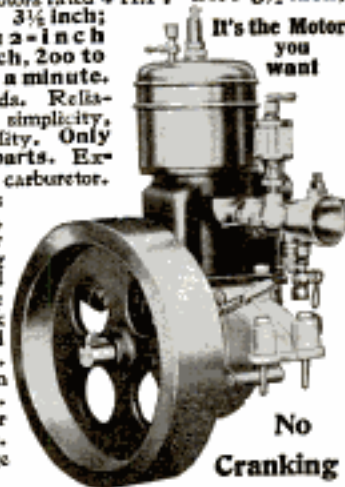
3 H.P. but developing as much power as other motors rated 4 H.P. Bore 3½ inch; stroke 3½ inch;

turning a 12-inch propeller, 17 pitch, 200 to 800 revolutions a minute.

Weight 50 pounds. Reliability, strength, simplicity, power and durability. Only four movable parts. Exclusive float feed carburetor.

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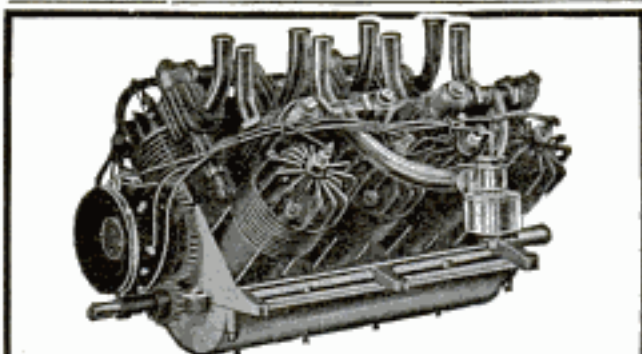
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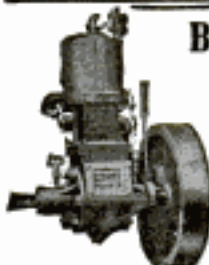
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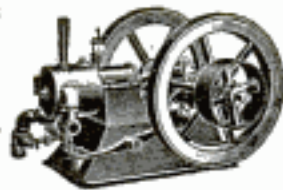
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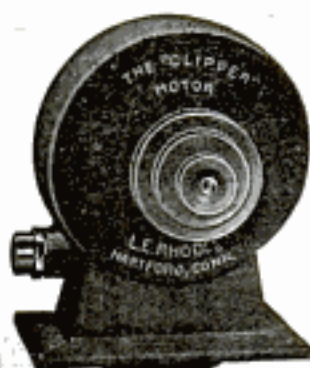
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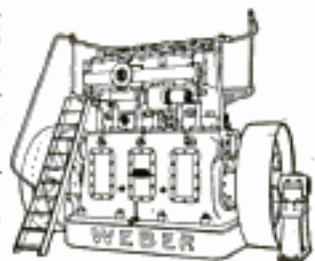


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BILL JONES was a country storekeeper down in Louisiana and last spring he went to New Orleans to buy a stock of goods. They were shipped immediately and reached home before he did. When the boxes were delivered at the store by the drayman Bill's wife happened to look at the largest one; she uttered a shriek and called for a hammer. A neighbor, hearing the scream, hurried to her assistance, asking what was the matter. The woman, pale and faint, pointed to the inscription on the box: "Bill inside."

TELEPHONE WOULDN'T WORK.—An agriculturist, whose beard was both long and gray, and who never before had been thirty miles from his native farm, was calling on a relative at the latter's downtown office when he concluded that he might as well use the telephone as journey away uptown. He'd seen his relative work the 'phone, and he guessed he'd do some of it himself, b'gosh.

He disappeared into the adjoining room for this labor-saving task. By and by he came back.

"Gosh darn it," he complained, "I can't get any answer."

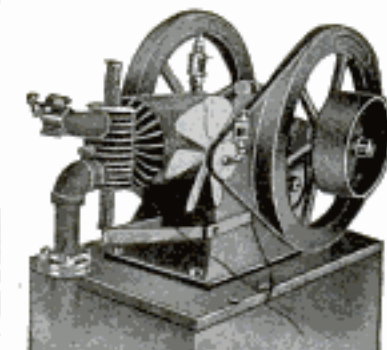
"Try again," said the relative, and accompanied the old man.

The veteran agriculturist glued his mouth to the 'phone and proceeded to blow for all his lungs were worth.—From the New York Globe.

YOUNG AERONAUTS FLY 100 BALLOONS.—Members of the Junior Aero Club, an organization of boys who are interested in the study of aeronautics, recently had their first lesson in the manufacture and use of hydrogen gas and incidentally liberated 100 pilot balloons from the roof of Leo Stevens' balloon factory. Under Mr. Stevens' instruction, the boys did the actual work of filling the little balloons and sending them up. Most of the balloons were sent up in threes, looking like aerial pawn-brokers' signs.

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Powerful, Speedy, Dependable
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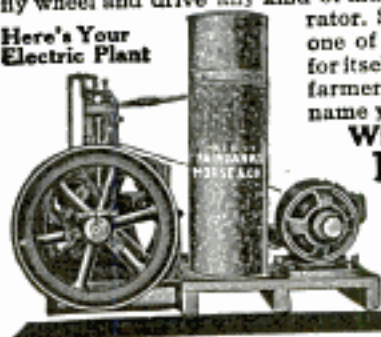
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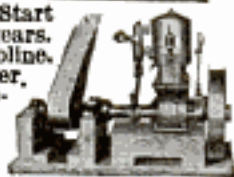
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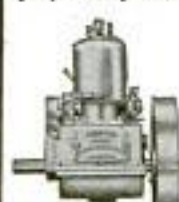
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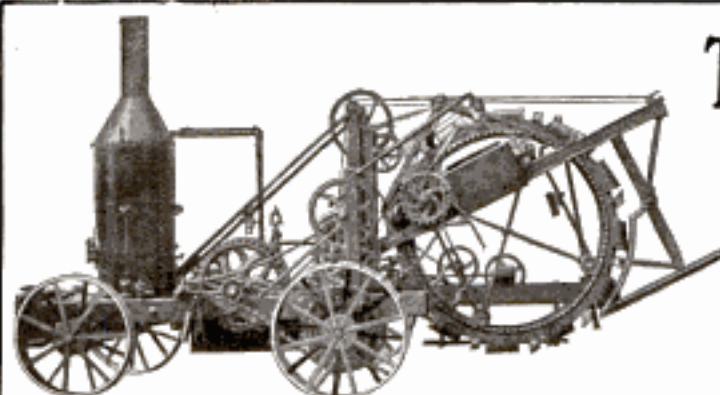
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GOVERNMENT BALLOONS FOR METEOROLOGICAL RESEARCH.—Two more hydrogen gas balloons have been received at Washington for government service in meteorological research. These balloons are to be operated from Mount Weather, Va., as captives, rising to great heights and carrying automatically operated instruments for observing variations in temperature, moisture, pressure and direction of wind currents, barometrical pressure and other points of value for weather predictions. The balloons were manufactured on Carl E. Myer's balloon farm at Frankfort.

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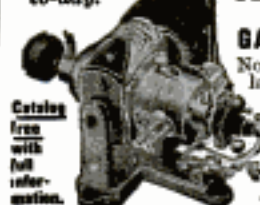
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BIG FUND FOR AIRSHIP RACES.—International airship racing on the same plane as international yacht racing is the object a group of aeronautic enthusiasts is seeking to accomplish by creating a prize fund large enough to attract all nations. In pursuance of this plan a call has been made for 200 persons to contribute \$100 each. James Means of Boston, Alexander Graham Bell of Washington, Octave Chanute of Chicago, and Lawrence Rotch of Boston are heading the movement.

MAURETANIA MAKES NEW RECORD BY MINUTE MARGIN.—By the remarkably close margin of one minute, the Cunard liner "Mauretania" established a new ocean record over the long route from Liverpool to New York. Her time for the passage was 4 days, 23 hr. 59 min. The fastest previous time was exactly 5 days, made by the "Lusitania."

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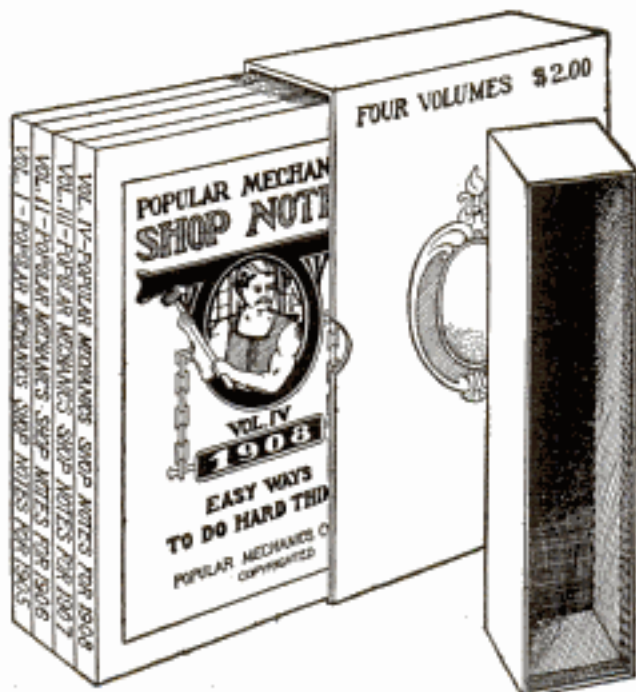
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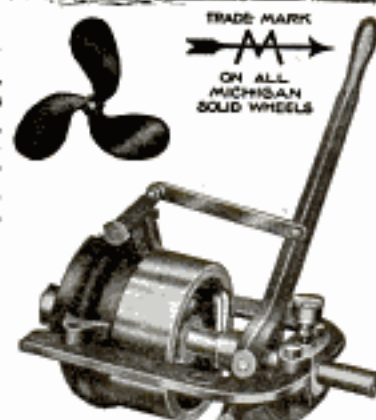
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(Concluded on page 124.)

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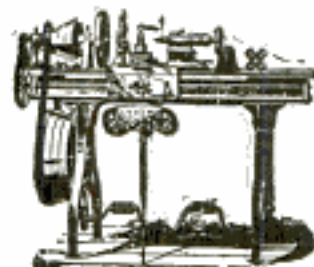
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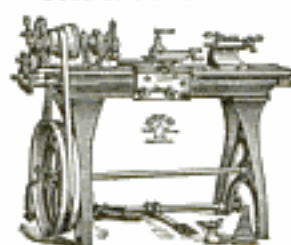
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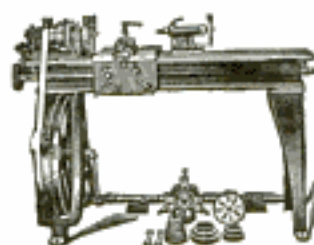
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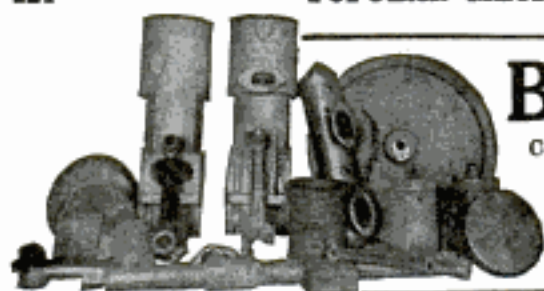
We are in receipt of a number of letters from subscribers in Canada who are under the impression that the postal authorities of that country have rescinded their order regarding the postage rate on magazines mailed into Canada from the United States.

For their benefit we will announce that some modification has been made in favor of daily papers, but as yet no reduction whatever has been allowed on weeklies and monthly magazines. For that reason we are unable to reduce our subscription price to Canada, as some of our readers feel they have a right to expect, and which we shall be very glad to do the moment the Canadian Government replaces the former mailing conditions for magazines.

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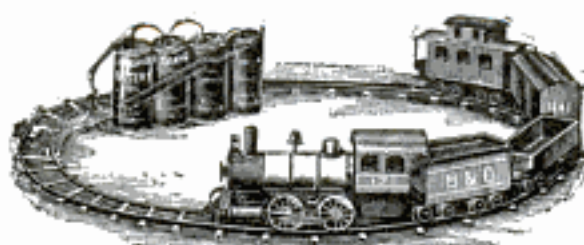
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(Continued from Page 123)

There are skeletons of men and women and children of all ages. In great chests of drawers in the center of the show room are skulls of every age and variety, as well as wired hands and feet.

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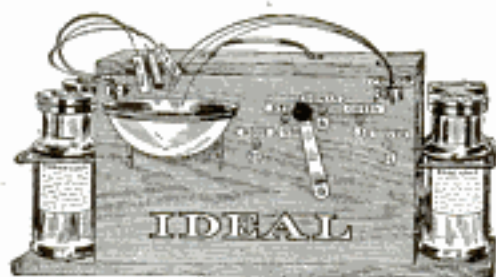
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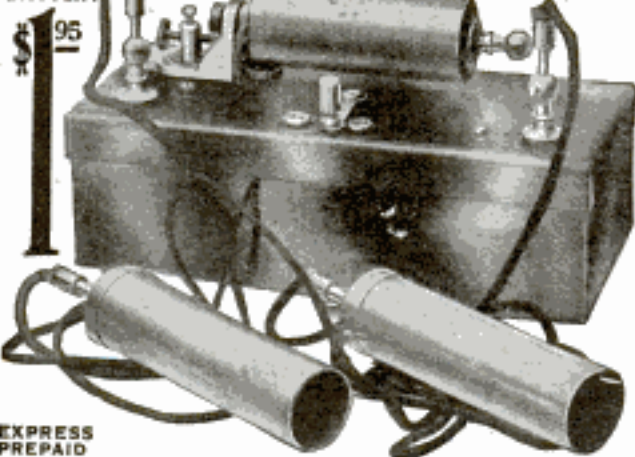
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MATCHES ARE FIREBUGS.—Edward Peterson, state fire marshal of Minnesota, has issued a bulletin on "Fire Danger From Matches." He says:

"Reports made to this office show that 10 per cent of our \$8,000,000 annual fire waste and the loss of several lives is due to carelessness with matches. Six hundred thousand dollars a year is too much to pay for the privilege of using a poor match instead of a good one.

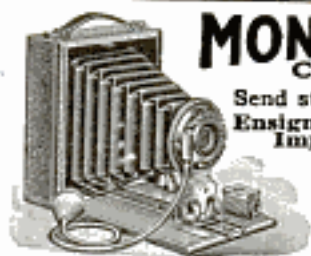
"Nearly all fires caused by careless use of matches are due either to the explosive qualities of the head of the match, or to the fact that the wood in the stick continues to glow for an average interval of forty-eight seconds after the flame is out. In lighting, the head often explodes or the stick breaks; flaming chemicals fly and ignite waste paper, sweepings, lace curtains and clothing. After using the match a twist or a toss given to it without looking to see if it is still glowing will often place it where it may start a fire. And a large proportion of match fires result from one of these hot sticks being thrown upon inflammable substance.

"Matches lying loose in drawers or on desks or on the floor or walk are liable to take fire from rubbing or from a blow. On the mantelpiece they are often ignited by heat from the grate or stove.

"In each 100 match fires forty-one are from flying match heads or glowing sticks thrown into rubbish, which fact says 'clean up the place.'

"The name 'parlor' is given to all matches except the 'safety.' They are made without sulphur, thereby avoiding the odor given out by the 'lucifer' match. Its head contains phosphorus, chloride of potash, rosin, whitening and powdered flint, held together by glue. Phosphorus ignites at 140 degrees Fahrenheit. The heat produced by the friction of the particles of flint in the head when it is struck ignites the phosphorus. The chloride gives up the 39 per cent of oxygen it contains, with explosive spluttering and intense heat which fires the rosin and they together fire the paraffin with which the stick is saturated, and the stick itself. By substituting either saltpetre or sulphur for chloride a silent and slow match is made which does not snap and fly.

(Concluded on page 128.)



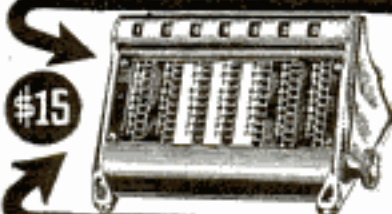
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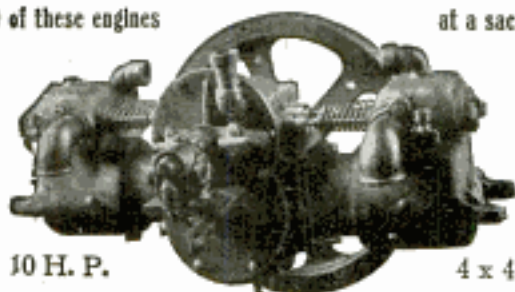
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(Concluded from page 126.)

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"The legislatures now in session in several states are considering the advisability of prohibiting the use of any other but the 'safety' matches."

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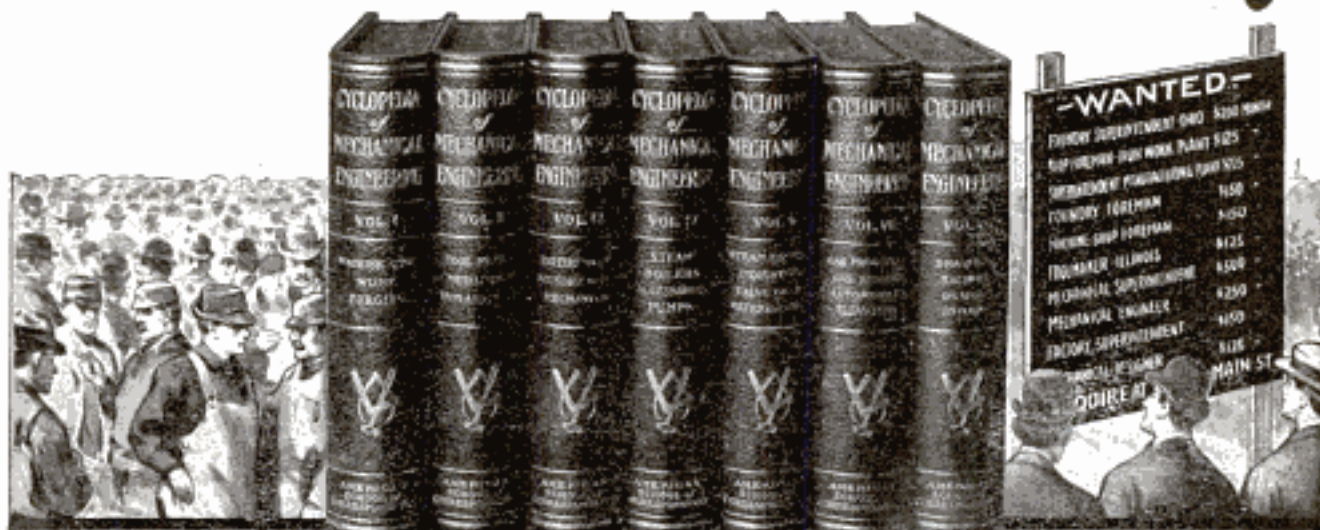
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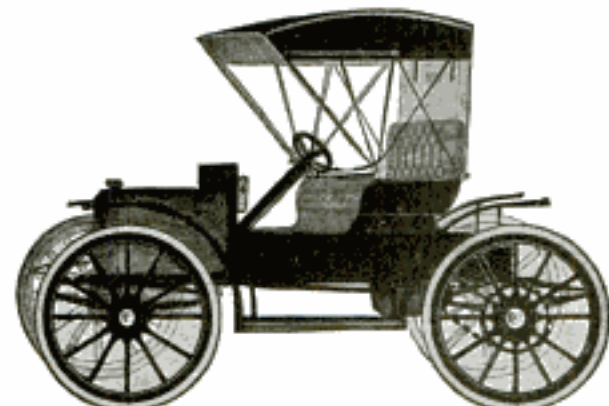
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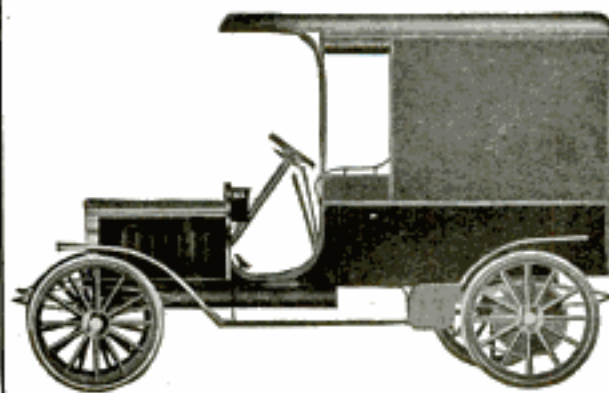
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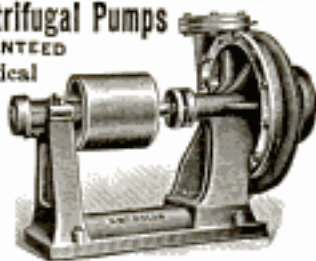
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WOOD PULP FROM SAWDUST.—In considering the enormous but necessary use of the forests of America to furnish a supply of material for wood-pulp paper, the plans of a Canadian company, at the entrance of Rainy river, 20 miles from Vancouver, are of great interest.

A large plant has been erected which will convert the vast waste from the saw mills, including the sawdust, into pulp for paper. The refuse from the mills will be conveyed to the pulp plant, where the entire mass will be disintegrated into suitable fineness and then used in the manufacture of the paper. The enterprise is being closely watched by lumbermen, not only in Canada, but in all parts of the United States.

STEAMSHIPS OF CONCRETE.—Italy, according to foreign reports, will soon be building seagoing steamships with hulls made of concrete. The first occasion on which concrete was used as a shipbuilding material was in 1855, when a small boat made of it was exhibited at the Paris exposition. The vessel, which is still afloat, was constructed of wire netting covered with cement.

COMMON BRICK FOUND BEST.—Common brick has proved itself the victor over many newer and more fashionable building materials in a severe fire test conducted by the geological survey at Chicago. Two samples of brick were subjected to severe heat, one taken from an old foundation and the other practically new. Fifty per cent of the new brick was split, while 70 per cent of the old was not damaged. The natural building stones behaved worst of all materials tested, being almost completely destroyed.

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GENERAL LEE'S HUMOR.—Several years ago, relates the Washington Herald, when the elevator was first put in the capitol at Richmond, an incident occurred showing the sense of humor of the then General Fitz Lee. The general was of stout build and he wanted to see how the machine would work. He was a close friend of Judge B. Witt, of the Hustings court.

Judge Witt was holding court the day the elevator was completed and he was called to the telephone by Governor Lee.

"Sam," said the governor, "I want to see you for a moment and want you to come to the office at once."

"Certainly, governor," said the judge, always one of the most accommodating and obliging of public men.

"By the way, Sam, the elevator is finished and you can come up to my office without having to walk up the steps."

Judge Witt got back on the bench and ordered a short recess of the court. Then he hurried over to see the governor. He made known his presence and he was ushered into the governor's office.

"Hello, Sam," said the governor. "Glad to see you. Come up on the elevator?"

"I did," replied the judge.

"That's all right, then," remarked the governor. "I am just going to dinner and I did not care to try that elevator till I was certain it would hold you. That is all, Sam; thank you."

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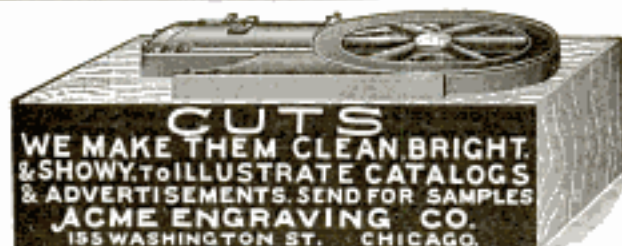
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SILK THREADS ARE USED AS CAPILLARIES IN THE HUMAN BODY.—One of the great problems which has hitherto defied surgical skill has recently been solved by a well-known London surgeon. The new operation, described by the originator, Prof. W. Sampson Handley, of the Royal College of Surgeons in England, is a method for supplying channels for lymph circulation in limbs whose lymphatic vessels have been destroyed by cancer growth.

The lymphatic circulation of the body is carried on by a vast number of minute vessels like veins, which collect the lymph from all parts of the body. Any stoppage of these vessels which prevents the free circulation of the lymph will result in the parts below the stoppage becoming practically water-logged, the condition resembling that which follows the obstruction of veins.

According to Dr. Handley, in about one case of six, after the operation for breast cancer, the channels through which the lymph supply of the arm is returned to the body are destroyed, the condition resulting being known as "brawny arm." Extremely painful, the swollen and practically paralyzed limb adds to the other terrible sufferings of the cancer victim.

RECORDS MADE OF INDIAN MUSIC.—The phonograph has recently been used by the United States Bureau of Ethnology to register the native songs of the Indians. Several hundred songs have thus been obtained and it is designed to secure the most complete record possible of the vanishing melodies.

These Indian songs as transcribed from the phonograph records have elicited the interest not only of scientists but of professional musicians as well.

The Indian is a natural musician. On transcribing a number of these songs, for instance, a striking circumstance was noted, namely, the use of the major chords of the over third and under third. As you probably know, this is one of the most notable characteristics of our modern romantic composers.

GOLDFISH THRIVE IN WARM SPRING.—Experimenting to satisfy her curiosity the mistress of a number of goldfish and a piece of property near Reno, Nev., on which are situated a number of warm springs, placed a dozen of the fish in two springs. One spring proved too warm and half the fish died, but the six in the other spring so quickly increased in numbers that the owner has been able to stock all the warm springs and streams in the vicinity with thousands of goldfish.

JAPANESE CRUISER BLOWS UP.—The Japanese training cruiser "Matsushima" was blown up and sunk April 30 by an explosion in one of the magazines. Two hundred and forty officers and members of the crew of 415 were lost. The explosion was caused by a defective shell. Within an incredibly short time the vessel had disappeared, with the exception of her bridge and conning tower.



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SMALL LAUNCH BATTLES WITH WIND AND ICE FOR 30-MILE TRIP.—After hours of battling with the floating ice Charles W. Davis, of Au Sable, crossed Saginaw bay, the first man to accomplish the feat this season. He started from Au Sable on a Friday in a 30-ft. gasoline fishing launch, and did not reach the other shore until Saturday night.

Davis' purpose was to fish. A few miles out of Au Sable he encountered a heavy sea and high winds. For hours his little craft fought against the rough weather and the floating ice until he was forced to put in to Au Gres for shelter.

He spent the night at Au Gres and ventured out into the bay Saturday morning. It is 30 miles across to Sebawaing. The wind had quieted down and Davis believed a few hours' run would land him there. The bay appeared to be clear, and it was not until he had reached the middle of the bay that he encountered ice. The wind rose again, and in a short time was blowing a gale. He was going with the wind, and it was impossible to turn back.

The craft carried a sail, which was to be used in case of a breakdown in the machinery, and this Davis hoisted and stopped the engine. Hardly was the sail up than the boat struck the ice. The craft buffeted its way through miles of loose ice cakes. Several times it ran up on the ice. With a pike pole he shoved off and resumed his course. When the boat docked here Davis crawled out of the craft exhausted.

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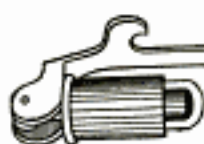
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