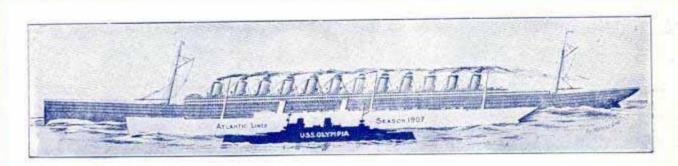


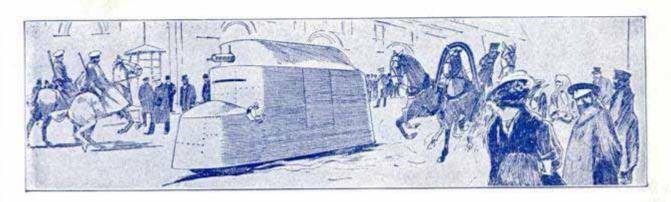
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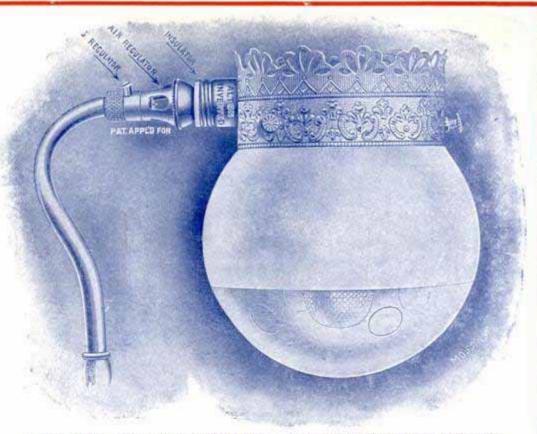
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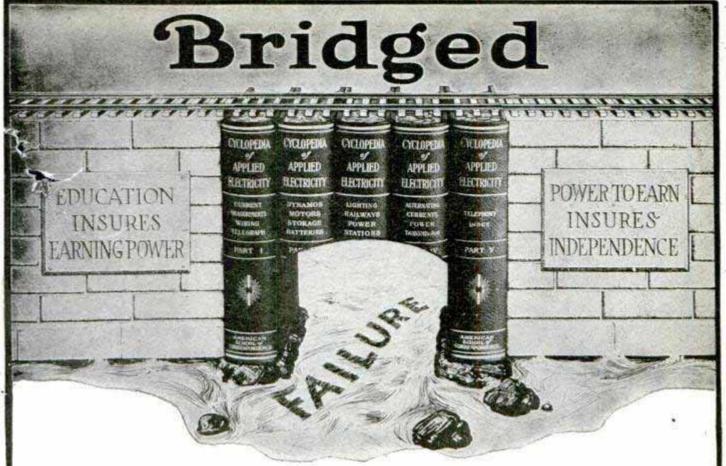
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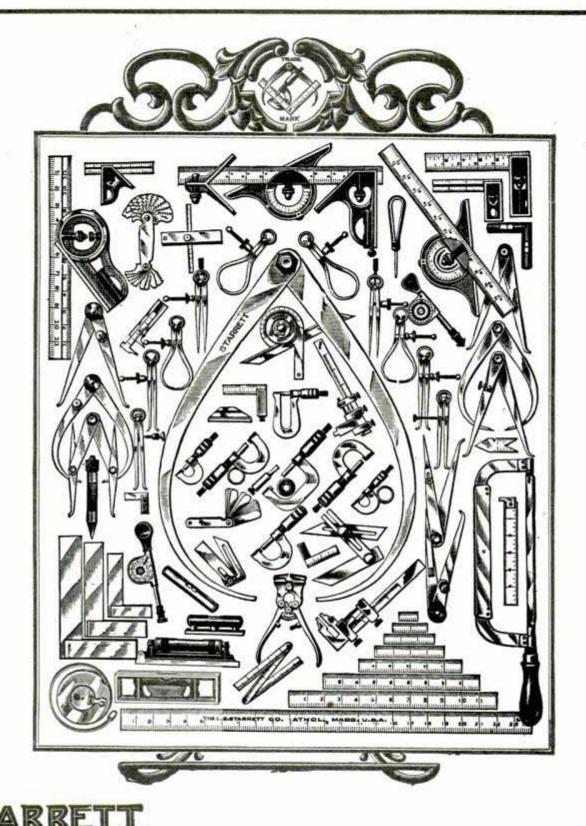
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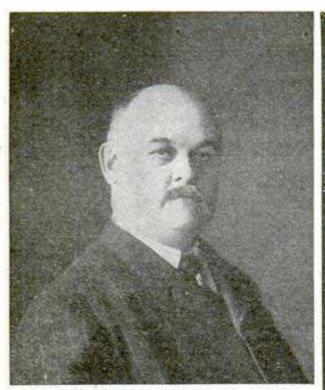
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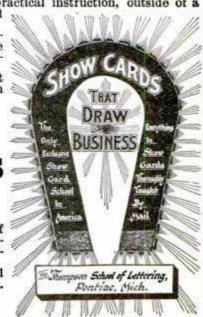
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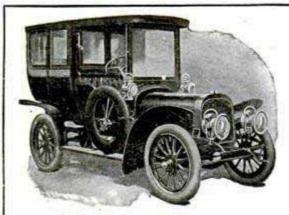
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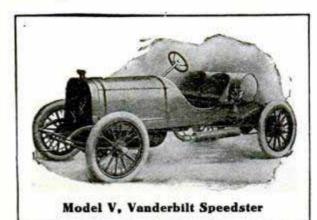


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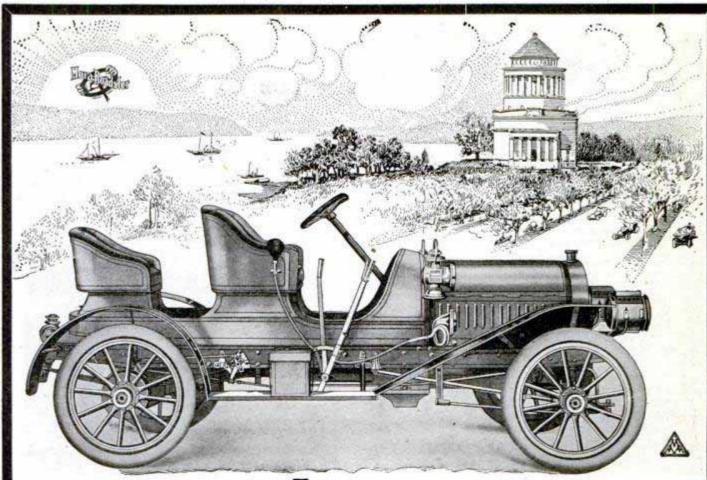


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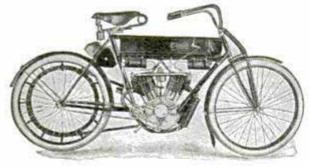
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type. Equipment. 2 oil side lamps, 1 tail lamp, horn and

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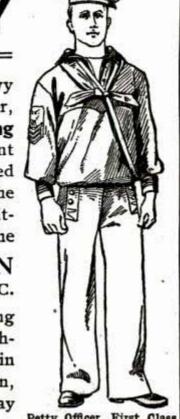
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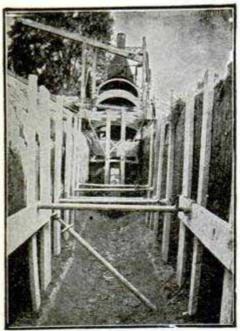
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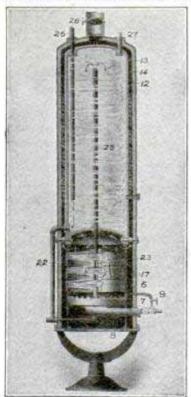
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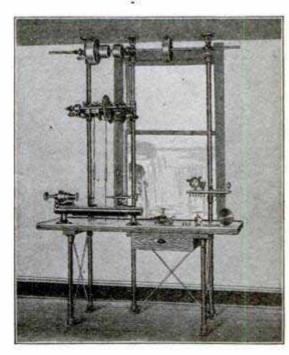
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The Post Office Department of Canada has abrogated the treaty in force with the United States for many years by which periodicals have been mailed from this country to Canada at 1 cent per pound. The rate is now made as high as to the most distant point in the world and forces Popular Mechanics to raise its subscription price to all Canadian subscribers to \$1.50 per year.

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POPULAR MECHANICS

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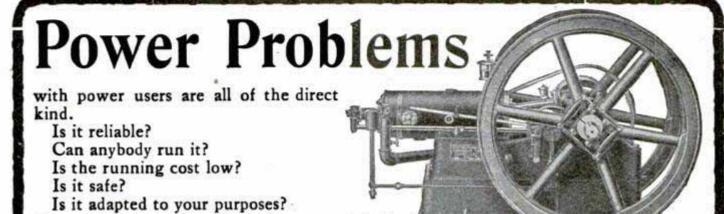
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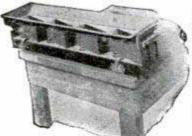
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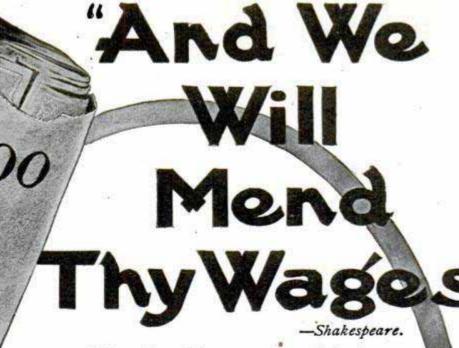
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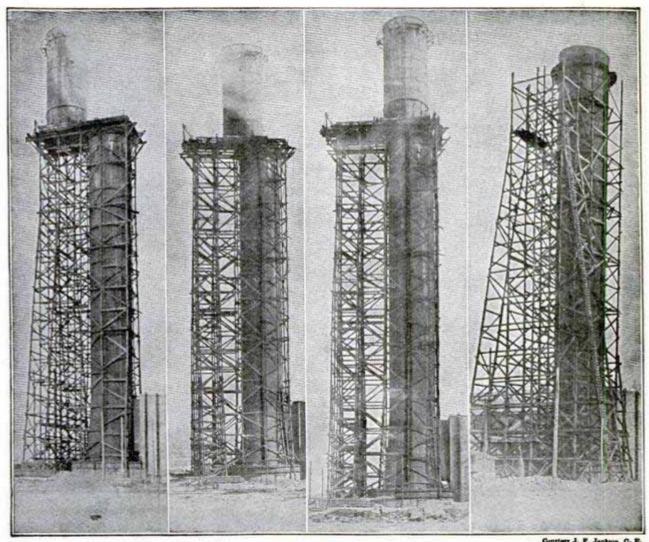
# POPULAR MECHANICS

Vol. 9. No. 6.

CHICAGO, JUNE, 1907.

# REMARKABLE WORK ON HIGH STACK

Section Weighing 40 Tons Added at Height of 200 Feet Without Shutdown



Four Stages in the Work on High Stack

One of the most formidable of many daring engineering feats in midair was the extension of the mammoth stack at the smelter works a few miles from Douglas, Ariz. The original stack was one of the largest in the West, being 200 ft. high and 25 ft. diameter on the inside, but had become too small and an extension of 60 ft. at the top was decided on. The difficulties of the undertaking were increased by the condition that the plant could not shut down for even an hour and that the men must work on a platform 200 ft. above the ground amid clouds of smoke, deadly gases and heat constantly belching from the giant chimney.

Four months were spent in erecting the false work, which was built of 12 by 12-in. timbers braced with 3 by 12-in material, all bolted with heavy bolts. It was almost universally predicted that the structure would collapse under the strain, for the 60-ft. section weighed 40 tons—as much as a fair-sized locomotive. The section was successfully hoisted to the platform and then the task of shifting it into place began. The illustrations show the progress of the work at four stages. Slowly the ponderous mass moved to one side as the cloud of smoke sought its new channel. Then a signal flag fluttered from above announcing that the new section was ready to lower and attach.

The feat was accomplished in less than three hours, while in all the big plant not an engine slowed down, nor a single blower reduced its pressure, nor a safety valve popped as a result of steam generated but not used. It was an accomplishment requiring skill, science and personal courage of the highest order, as well as ability to anticipate every possible condition of failure and provide against it in advance.

### PANAMA CANAL COMPARATIVELY SMALL UNDERTAKING

The building of the Panama Canal has been unduly magnified as an engineering undertaking, although it is the largest job of its kind to date. It is estimated to cost about \$150,000,000, but this is less than \$2 per head for each man, woman and child in the richest country in the world, or about 25 cents per

head per year for eight years. That certainly will not "bust" us.

The distance from ocean to ocean is only 40 miles, and the chief engineer can go over the entire line and return by rail between breakfast and supper. Everything that modern science, in all its branches, can contribute is being utilized to do the work economically, speedily and safely. In a single machine, coal and steam, with an engineer under a canopy, do the same work which if performed in the old way would make a thousand men with shovels and wheelbarrows toil under a relentless sun. The working conditions are really easy and comfortable as compared with the privations, hardships and dangers which in the early days beset the construction of hundreds of miles of railroad in the United States.

There are at this moment right here at home not a few engineering works under way, and financed by private capital, too, which in the aggregate will cost several times as much as the canal. In many respects the engineering difficulties are vastly greater than those at Panama, and, barring the one item of climate, the

dangers to life and limb are even greater.

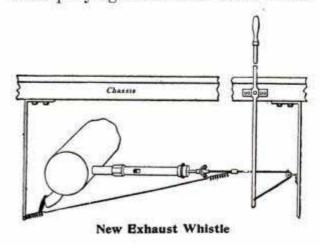
And yet so familiar are we with these things they create wonder for a few days only, and after that scarcely a passing comment. In New York City alone the great works of tunnels under city and river, railway terminals and depots, water supply and other similar enterprises now in progress aggregate the enormous sum of \$625,000,000, or more than four Panama canals, while three of the

undertakings amount to \$100,000,000 each.

A railroad builder in Chicago whose reputation is national among railroad men said: "The digging of the canal is, of course, a big thing, but considering the facilities available for the work is relatively not a bit bigger than lots of engineering work which the railroads of this country have been doing for years past. They have not made any fuss or splurge, and for the most part the public has never even heard about it. In constructing the first track across Arizona, for instance, the men were in constant jeopardy of death from hostile Indians, thirst, starvation, poisonous reptiles, and sunstroke, and could not communicate with nearest headquarters for weeks at a time. Scores lost their lives or were devoured by wild beasts of the deserts or mountains, and to this day no trace of them has ever been found. To a railroad constructor the canal job does not present the formidable obstacles which loom up like mountains to so many people."

# "NIGHTINGALE" AUTOMOBILE WHISTLE

A new whistle for automobiles has been brought out by a Paris firm, which is blown by the exhaust. It is quite musical and produces a pleasing sound, the pitch and volume being regulated by a lever operated from the seat. The accompanying illustration from L'Au-



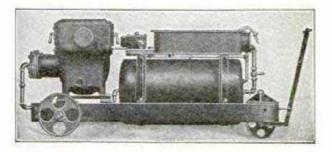
tomobile shows the manner of mounting and operating the whistle.

The balloon "United States," in which Lieut. Lahm won the cup last year, has been purchased by the Aero Club of St. Louis.

A Japanese commission has started for England to place the contract for a battleship of 21,000 tons displacement, at a cost of \$11,250,000.

### PORTABLE AIR COMPRESSOR

The rapidly increasing number of uses to which compressed air can be put in and around a manufacturing plant, makes a portable compressor a

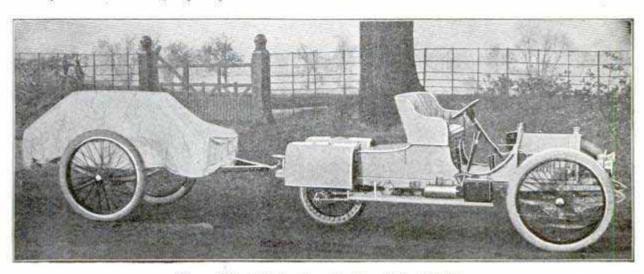


Easily Drawn About

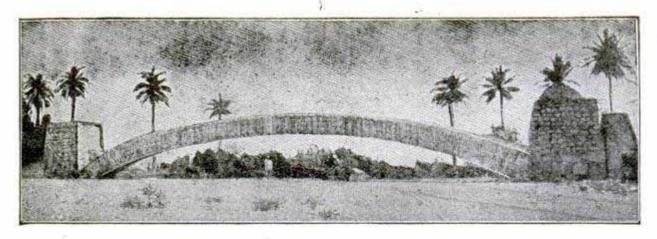
desirable machine. The compressor illustrated is a complete plant, operating with an electric motor and can be used wherever current can be obtained. One hundred feet of air hose is carried in the box over the storage air tank.

### **AUTOS FOR EGYPTIAN DESERTS**

The experiments with motor cars by the Egyptian government have met with such success that considerable attention is being devoted to the production of cars specially designed for work in that country. The type illustrated consists of a light weight 3-wheel motor car of 12 to 18 hp. with a 2-wheel trailer. The wheels are fitted with 5-in. tires, says the Automobile, to prevent sinking in the sand.



Three-Wheel Motor Drawing Two-Wheel Trailer



# TEST BRIDGE BUILT IN A GARDEN

Almost 100 years ago the curious arch bridge shown in the illustration was built in the garden of an English army engineer, at Seringapatam, India. The structure has a span of 112 ft., rise of 11 ft., and is 4 ft. wide. Thickness at the springing is 5 ft., and at the crown 3 ft. 10 in. Ordinary bricks and mortar were used.

It seems Capt. De Havilland had recommended a 5-span bridge of similar arch construction to cross a river. He was laughed at and his plans rejectel. He built the single span at his own expense, and although he lived to the age of 90 years, his demonstration has already outlasted him 50 years, and bids fair to endure for centuries.

Six British antiquated warships sold at auction for \$383,000. They originally cost nearly \$8,000,000.

# ENORMOUS GROWTH OF CEMENT INDUSTRY

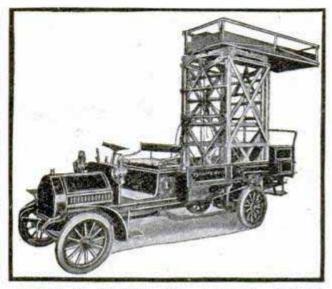
The production of Portland cement in this country has increased in 35 years from 3,000 bbl. a year to 4,000,000 bbl. in last year, and this with the prospect of an increase during the next year of 20%. Without being in the hands of a trust, the prices have increased in the past 18 months from 15 to 20% from legitimate demand.

This enormous output for 1906 would be sufficient to build a first-class cement sidewalk 5 ft. wide 3.6 times around the world, or build a sidewalk 456 ft. wide reaching from Chicago to New York.

The uses to which this material, mixed with sand or crushed stone, are put are almost unlimited. They range from the smallest culvert to the enormous concrete arches spanning our largest streams; from the humblest cottage made of concrete blocks to the finest skyscraper and office buildings built from reinforced concrete.

### MOTOR TOWER WAGON

Tower wagons for constructing and repairing the overhead wires of street railways are usually drawn by horses, as a repair car can seldom get to the place on account of other cars blocking the tracks. The Toronto Railway Co. has imported a motor tower wagon from Switzerland. The tower is carried in the manner shown in the cut and



raised to double its present height when repairs to the trolley wires are being made.

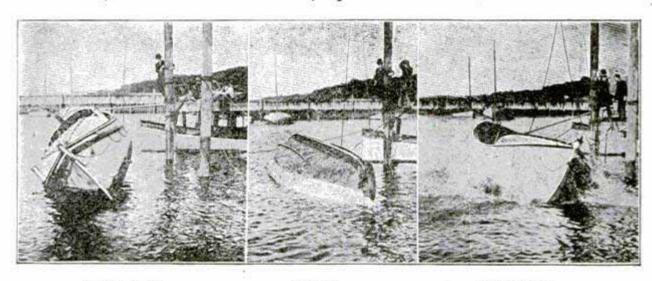
# LIFE-SAVING BY GASOLINE

### Motor Lifeboats Can Travel 200 Miles at a Trip

In place of fourteen strong arms, pulling seven oars, with another pair at the steering oar, now a 4-cylinder 4-cycle gasoline engine pushes the craft along at 10 miles an hour. A solid 18-in. propeller, with a reversing clutch, propels the 34-ft. boat. Two gasoline tanks, one with a capacity of 25, the other with 75 gal. of the colorless fluid in which is locked up so much effort, admit a radius of 200 miles. Never lived a crew of men with the strength to pull so far without stopping—or ever will live a crew which could, even for a short distance,

a long way, or where continual high seas forbid the launching of such a heavy boat, of course the early boat with its proved worth will remain.

It seems odd, when one thinks of it, that a little cockle shell 34 ft. long should live and ride out seas and wind which are too much for the huge hulk which wrecks and needs assistance. But these little boats are built with one single idea—safety—and all the skill and inventive ability of the builders are designed to this one end. The boats are built of one of the most expensive materials which can be ob-



Partly Over

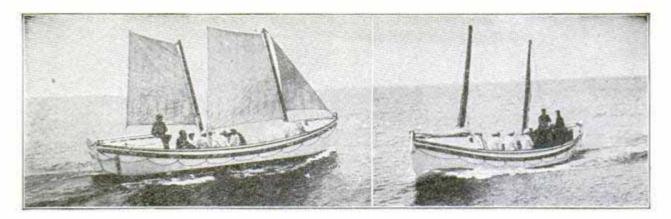
Keel Up

Self Righting

equal the speed of the little pulsating engine under the hood in the stern of the boat.

Nearly a dozen of these boats are now in use in this country, and every one has had a chance, and successfully demonstrated its superiority for the work it does, over any previous type of craft used for the same purpose. So successful are these boats that others are being built and installed—old boats, not too weatherworn, are being changed to motor boats, and as soon as appropriations allow, the work will be extended until the coasts are all supplied with these craft, wherever it is possible to use them. Where shallow water extends from the beach

tained—mahogany. This because that wood is close grained and resists stress and decay much better than other woods, is so formed that it can be worked and bent and made into a boat without hurting its strength, and because it is light for its strength. Two layers are used, crossing each other on the slant, with fine canvas and waterproof paint between. The boats cannot be sunk. They have a false bottom, through which run 8-in. tubes, closed with valves, which keeps the But let a wave fill the water out. boat and in less than half a minute the water all runs out of these tubes back into the sea. The boats cannot stay upset, and turn over with difficulty;



the bottom is a heavy keel of metal—gun metal—because that does not rust easily and because it does not set up electrolysis with the copper rivets, as would some other metals. This 1,800-lb. of keel flops a boat right side up as fast and as often as a wave upsets the boat—and it must be a mighty wave indeed which accomplishes the feat. The boat cannot sink, for there are eight watertight compartments in it, any one of which is sufficient to hold the boat on the surface full of men and women. And in these eight compartments are 82 copper air cases, so that the boat can be smashed into small pieces, cut in two, in ten, in a hundred parts, and still there will be enough floating for those in the boat at the time of the accident to hold on to.

The photograph; show the difficulty which is experienced in trying to upset one of these boats. A number of men, with block and tackle, had to pull and haul a long time, until, inch by inch, the boat finally heeled over, took water, and at last turned bottom up. Released, and in a second the heavy keel flopped back the boat and in no uncertain manner—witness the splash!

Further tests showed that it took 39 men, standing on the rail of the boat, to bring it awash, and 49 men had to crowd into the hull when it rode evenly to make it take water. The engine is so arranged that when the boat tips to such an angle that the men would be thrown out, the engine stops. This is in order to prevent injury by the propeller to anyone thrown into the water and also that the boat

may lose headway to make it no harder than is necessary for the men to get back into the boat. The engine is protected in a compartment in the rear, so that it does not get needlessly wet, but all the working parts are so inclosed that salt water does no damage. The engine is started, reversed and stopped by levers outside the compartment partition.

The safety and the speed of these boats are not their only advantages. In the lifeboat when the crew have to toil at the oars, but few hands are available to help shipwrecked persons into the boat or to make a safe landing beside a wreck. In the gasoline boat all the crew, save an engineer and the captain, are free from work, and arrive fresh and strong at a wreck, and can devote their entire time and attention to saving the crew and passengers. Each boat is equipped with mast and sails to use as an auxiliary or in case of accident to the power.

The limitations of the boat are only in the difficulty of launching—some sort of sheltered water of sufficient depth being essential, but it makes up for this in its increased radius, which permits it to travel 50 miles to a wreck, if necessary, distancing the ordinary surf boat, which might be launched nearer the wreck.

The cost? Eight thousand dollars for a new boat and \$3,000 for putting an engine in and remodeling an existing lifeboat—little money indeed. compared with the life of the craft and its activity and the service it renders. The Life-Saving Service is enthusiastic about the possibilities and achievements of the power craft.

### POPULAR MECHANICS

## RAISING ALLIGATORS IN INCUBATORS

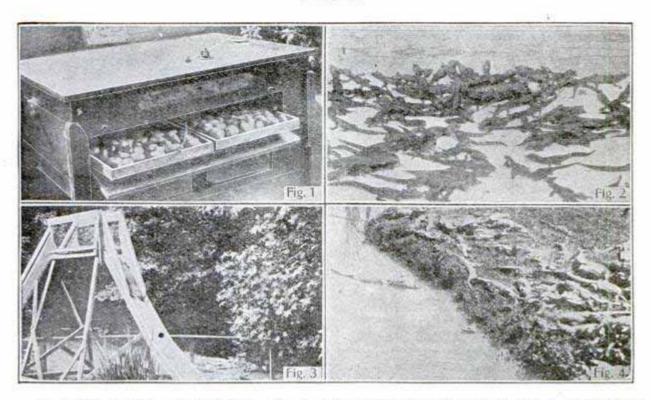


Fig. 1—The Incubator for Hatching. Fig. 2—Baby Alligators Just Hatched. Fig. 3—An Alligator Shooting the Chute. Fig. 4—A Scene at the Alligator Farm, Arkansas

Of all the interesting uses to which incubators have been put that of hatching alligator eggs is probably the most unique. An Englishman at Hot Springs, Ark., is engaged in raising alligators for the market. The demand for the hides to use in manufacturing purposes is constantly increasing, while parks and zoos buy the live reptiles for exhibition.

More than 3,000,000 alligators were killed in Florida alone from 1890 to 1900, and as they cannot be raised in captivity they are rapidly becoming extinct in this country. On the alligator farm, however, they have sufficient liberty to thrive. An alligator lays from 30 to 60 eggs, which are placed in the incubator, where they are hatched by the heat of the sun. Hence the condition of the weather determines the time of incubation, even in the incubator. All the young alligators of the same hatch are placed in one pen which is built to include part of an artificial lake, and in passing from one pen to another the visitor notices the increasing size of the

reptiles until those 12 ft. in length are reached.

Four 'gators each 8 ft. long have been trained to shoot the chute which they do by climbing to a platform 18 ft. high, and at the word of command sliding down a 30-ft. chute into the water.

### DIVERS SEARCH OCEAN BOTTOM FOR LOST MAILS

Two hundred and ninety-nine big sacks of mail were lost when the "Dakota" went down off the coast of Japan. Eighty bags floated ashore and were recovered by the postal officials who were patroling the shore. Divers from the navy were sent down to search the vessel and the ocean bottom but failed to recover anything, as the sacks had floated away.

The recovered mail was sent to Tokyo, where it was carefully dried and after inclosure in an official envelope, forwarded to destination. Over 20,000 letters and 533 registered packages were thus dispatched.



MODERN CIVILIZATION IN RUSSIA.—"One Prefect has risen to the demands of modern life in Russia. The Prefect's new automobile may be seen on the Nevsky Prospekt, steel-armoured like a cruiser, carrying its little quick-firer in a turret."—Motor, London.

### MOVING HOUSE A MYSTERY

Engineers, builders and scientists are alike baffled in all attempts to explain the mystery of the "moving house" in Berkeley, Cal. It is a neat two-story dwelling owned and occupied by Mr. W. C. Webb and his family. Soon after its completion, about a year ago, the house commenced moving, apparently of its own accord, and gradually moved toward the street until it had traveled a distance of 12 ft. A few weeks ago the movement ceased.

The building has a strong concrete foundation which rests on apparently solid rock. The ground is perfectly level, and the change in position is not due to gravitation. The soil down to rock foundation is of a clayey nature.

Strange to say, the house remains perfectly intact—has not cracked, and has not lost its exact perpendicular position. Mr. Webb and his family have

Traveling House

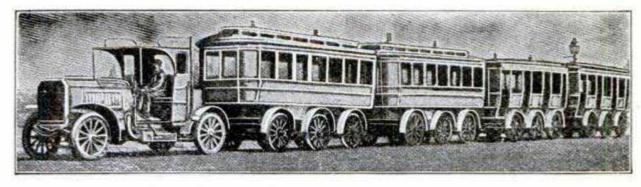
not moved out of the building, as it seems entirely safe. However, should it begin to move again, they will vacate. So slowly and easily has the house moved that the occupants could feel nothing peculiar.

Dwellings stand on each side of this building, and singular to state, neither has "budged" the fraction of an inch from its foundations. Webb's house has reached the inner edge of the sidewalk. In his back yard there is a wide and deep—several yards—chasm extending clear across his lot; but no further earth disturbance has been manifested, except in front, where the sidewalk and street are bulged up a little.

### NEW PROCESS FOR ALUMINUM

Although the cost of extracting aluminum by electrolysis has been reduced from \$8.00 to less than 40 cents a pound, there is a "long felt want" for a cheaper process. According to The Mechanical Engineer, London, that want is now met by a method which will make vast deposits of clay a source of boundless wealth and In brief the new process is this: Obtain aluminum carbide by heating kaolin and carbon in an electric Then heat the aluminum carbide with alumina (oxide of aluminum), which will yield carbonic acid gas and pure metal.

The great Assouan dam, Egypt, will be raised 23 ft. at a cost of \$7,500,000.



A RENARD ROAD TRAIN now in service in England. Power from the motor car is transmitted by shafting to each trailer car, thus making each car self-propelling.

### STUDENT SHARPSHOOTERS

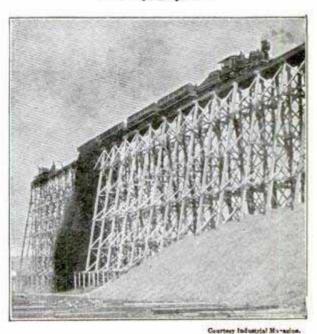
A pleasing addition to collegiate contests of "brainstorm" and football is suggested by the executive committee of the National Rifle Association of America. It is proposed to introduce rifle practice into all the educational institutions in the United States, with big intercollegiate and interscholastic shooting matches every spring. first of these has already been announced for June 21-22 at Creedmoor, N. Y., with a handsome intercollegiate trophy. The idea deserves enthusiastic support. To be the champion shot of the student body of the United States would certainly be an honor worth working for.

### RECLAIMING LUMBER FROM BOT-TOM OF MISSISSIPPI RIVER

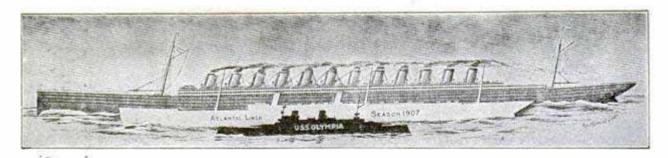
From near its source in northern Minnesota to La Crosse, Wis., a distance of about 1,000 miles, the Mississippi river flows over a corduroy bed composed of pine logs that have become watersoaked and sunk as they were being floated down stream, accumulating there through 50 years of logging. Most of these logs are of the smaller variety, 8 or 10 in. at the butt, and known to lumbermen as "pig iron" Norway. It is now proposed to lift these logs from the river and recover the millions of feet of lumber they contain. Some of the best lumber has come from logs that have lain submerged through several decades and no matter how long sound pine logs remain under water they do not deteriorate.

The plan is to lift the logs with a hoisting engine erected on a flatboat, place them on the river bank and have a Government scaler inspect them and record the marks found. Where the original owner can be found, he will be compensated at the rate of \$8 per thousand feet. This represents so much clear profit to the owner and leaves a margin of profit to the hoisters, who can readily dispose of the reclaimed logs at from \$12 to \$14 per thousand feet.

A balloon occupied by two German aeronauts, ascending near Berlin, covered the 812 miles' distance to the English coast in just 19 hours, or less time than required by ordinary methods of transportation.



Making a 95-Ft. Fill on Union Pacific Near Omaha



### ABSOLUTE SAFETY AT SEA

### Great Ships with Speed of Trains Predicted Within 25 Years

Length	1,200	ft.
Breadth	125	
Depth	81	ft.
Draught	40	ft.
Gross tonnage	67,500	tons
Passenger accommodation	6,700	
Engines	170,000	hp.
Speed per hour	35	miles
Cost	7.000.000	

Sea travel, because of great ships and faultless navigation, will be made absolutely safe, predicts J. R. Oldham, a naval architect, writing in the American Marine Engineer. The above figures are his prediction of the popular ocean liner within the next 25 years. The ship will have a double shell throughout, as embodied in the structure of the "Great Eastern." He says:

"In 25 years from this date a steamer approximately 1,200 ft. in length, 125 ft. in breadth and 81 ft. in depth will be afloat. This vessel will be designed for a reserve merchant cruiser. She will have a strong protective deck and a complete double shell from keel to structural deck; her top sides externally will be of nickel steel, while the inner shell will be strongly built on the cellular system with steel of exceptional ductility to permit of a great degree of buckling without a fracture.

"The bottom will also be sheathed with teak wood, which will permit of 'coppering' to avoid fouling and will add greatly to the safety of the ship in the event of grounding.

"There will be two longitudinal and 24 double transverse bulkheads extending from the bottom to the structural deck, forming coffer dams, and without any doors or port openings, elevators and stairways being arranged in every compartment. The speed will be 30 knots an hour, secured with improved turbine engines of 170,000 hp., driving

five screw propellers.

"There will be 60 boilers with 400,-000 ft. of heating surface, and 12 smokestacks. A special feature of the general arrangement will be extra large pumping power, with boilers and pumps placed well above the load-water line. I propose that certain compartments containing 2,500 tons shall be kept full of water, so that in the event of grounding these compartments could be emptied in 12 minutes, which would in most cases of grounding enable the ship to float off, as 2,500 tons would represent one foot draught of water."

To compensate for this loss in freight tonnage an extra charge of \$25 per passenger might be necessary, but there would doubtless be sufficient travel to provide it. With proper care in navigating the chief danger would be to smaller craft which might get in collision, for the big ship at full speed would exert an energy equal to 40 railroad trains running at 60 miles an hour, or practically 3,250,000 foottons.

Second Lieutenant E. R. W. McCabe of the U. S. Cavalry will ride an Arabian stallion from Portland, Ore., to New York City, a distance of 3,181 miles, to determine whether the breed has the endurance required for cavalry mounts.

A gang of expert thieves stripped telephone poles of wire for a distance of three blocks in Chicago, recently, and secured in all about 600 lb. of copper.

### BACHELOR OF AUTOMOBILING, NEW DEGREE?

Cornell University is certainly up-todate. For two years past the curriculum has contained courses in all things pertaining to autos under the direction of the most competent instructors obtainable. Anyone who may imagine that, because these courses are given in a college, they are necessarily impractical, is altogether mistaken, for they include instruction in every possible detail of automobile construction, with history of each part and comparison of modern with obsolete forms, both American and foreign. Of course an important feature is the study of the gas engine and the chemical changes of combustion, with comparative efficiency of various fuels.

After theories have been mastered, comes the course in practical application, each student making drawings of some special type of engine from the principles and formulae which he has learned. These drawings must include all details as to dimensions, material, fuel, finishing, etc., and be so complete that they could be sent to a foundry and used in actual construction work. Students are required also to test the leading makes of engines for different conditions of load, speed and fuel.

### PHOTOGRAPHING WITHOUT CAMERA OR PLATES

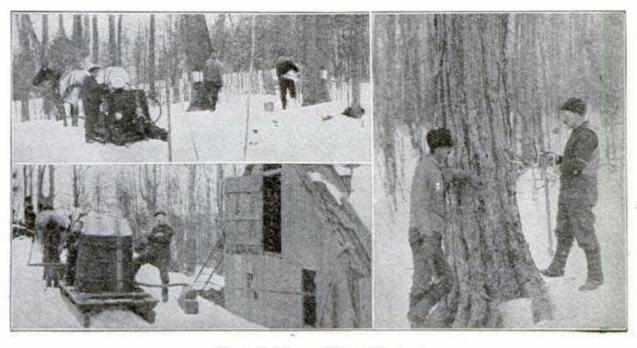
The two processes—"Taking Pictures Without a Camera" and "Photographing Without Plates"—described in our April number may be combined and pictures made without either camera or plates.

Select the picture you wish to make a photograph of and treat it as described on page 453 of the April number, substituting a piece of printing paper for the plate, as instructed on page 429 of the same number, thus making the negative on regular photopaper. Oil the paper on the back (see page 429) and strike off as many copies as desired.

In photographing without plates the best exposure is a minute and a half with a wide-open "stop" instead of "top," as it reads in our April issue.

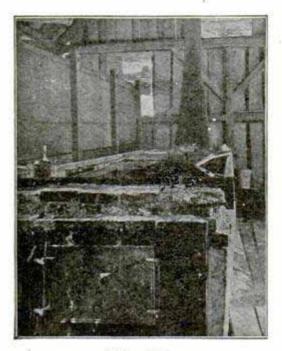
### MAKING MAPLE SUGAR

The manufacture of maple sugar is one of the important industries of Vermont, although there is made in Chicago every month as much so-called "maple" as the Green Mountain state can produce in a year. In Vermont the process has graduated from the scattered open kettles to a system in



Scenes in Vermont Sugar Orchard

which the sap is collected in tanks on runners and hauled by team to the sugar house. The sap is transferred to



A Sugar Pan

other tanks by means of pipes. In fact the entire process has now been reduced to one in which hand labor is largely eliminated. It takes 7½ gal. of sap to make 1 lb. of sugar; a tree will yield from 15 to 30 gal. of sap annually.

# WHAT ABOUT DENATURED ALCOHOL?

Well, what about it?

The law removing the tax on alcohol which has been denatured, making it undrinkable but suitable for light, heat or power, went into effect January

first—two months ago.

To our knowledge only one large distillery—at Peoria, Ill.—is running on denatured, and the farmer who expected to work up his frosted potatoes and decayed beets something after the fashion of apples in a hand cider press, is still feeding them to the pigs. It is given out that denatured can only be profitably produced in a big distillery costing thousands of dollars, and that the Standard Oil has arranged to control the output, making the retail price 35 cents in order to protect the price

of gasoline. Incidentally we learn that alcohol will be too expensive for the many domestic utilities and that the gasoline stove is to go on blowing up in the good old way.

A large number of inquiries are coming to this magazine asking where denatured can be bought, and where can the writers procure the lamps, flatirons, cookers, and other household conveniences which have long since be-

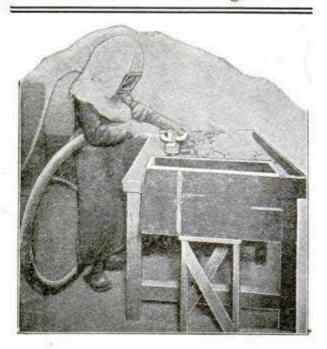
come commonplace in Germany.

In that country denatured alcohol costs 12 cents per gallon, and it is as easily obtained as kerosene here. However there is no occasion for being discouraged; we have had it two months and Germany 12 years, and before long we shall have both the burners and the fuel. There are fine manufacturing opportunities for making these alcohol burning utensils, as well as engines of both small and large power.

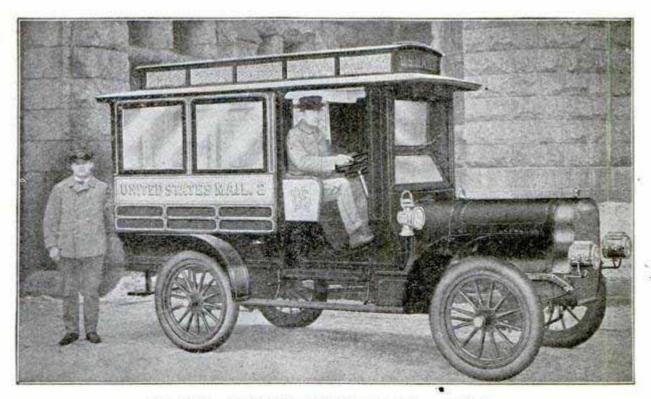
Industrial locomotives for switching cars in factory yards are common in Germany, ranging from 6 hp. up. Such locomotives are also in operation in other countries, Peru for instance, has them, some of which are in use

at the government arsenal.

Before many years we, too, will enjoy the benefits of this safe, inexpensive and intense heat and light.



In pollshing metal parts with a sand blast the workman must protect his eyes and face from the flying particles which cut like knives. A glass window is provided in the



### MAIL COLLECTION BY AUTO

### Mail Faced for Cancelling in Car as Fast as Collected

The efficiency of the U. S. postal service is to be increased as rapidly as possible by the introduction of automobiles. The feasibility of the innovation has been demonstrated; first in Baltimore during last year, and recently in Milwaukee, since Feb. 20. The postmasters in both cities are enthusiastic in their approval, and Washington, Detroit and Louisville have been selected as the next places to receive the improved service.

In Milwaukee there are three of these cars, designed by Postmaster D. C. Owen, and leased to the department by the builders at \$3,500 each per year. They are under a four years' contract to furnish chauffeurs and keep the machines in first-class condition for ten hours' work daily. The service has been highly satisfactory, the cars averaging 70 miles a day each, and collecting from 500 street boxes.

Besides the chauffeur each car carries a collector, who takes up the mail and "faces" it ready for the cancelling machines immediately on arrival at the office. This means a great saving in time. The presence always of at least one man on the car will prevent rob-

beries which occasionally occur while the collector enters an office building.

### FRENCH PILOT AUTO BOAT

At the present moment there is special activity on the Seine in the trial of all kinds of motor boats. Their latest novelty is "Pilot I," a 25-hp., kerosene-driven auto, constructed specially for use as naval scout boat and in coastwise service requiring both speed and endurance. Consequently she is built strongly to stand buffeting;



New Scout Beat

completely decked, and made of steel throughout her 30 ft. of length. The screw is good for 600 revolutions a minute,

### SCIENTIFIC CULTIVATION OF BACILLI'

Hundreds of scientists are engaged in the work of searching for the at present unknown germ which will kill some other deadly germ. Only the few



Prof. von Behring

privileged favorites ever see the secret workroom where the cultivation of the germs is carried on year after year.

In one of the illustrations is seen the eminent scientist, Professor von Behring, seated in his bacilli breeding laboratory. The vessels on the shelves contain enough deadly germs to depopulate a big city. The other illustrations show his assistants at work experimenting on living animals in the Institute for Hygiene and Therapeutic Experiment, of which he is the director.

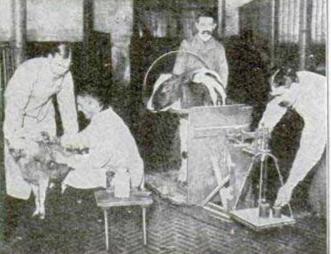
### STREET CAR SAFETY DEVICE

An ingenious device has been invented by an employee of the street railway in Denver and is being tested. Whenever a passenger stands on the lower step a buzzer sounds in the motorman's compartment and warns him not to start the car until the signal ceases, which it does the instant the passenger reaches the platform or the ground. Contact points are placed in the step which are brought together by the weight of the passenger.

### \$12,000,000 FOR A SHORT CUT

There is no better illustration of the modern business axiom that time is money, than the big project undertaken by the Southern Pacific. In order to shorten its route across the Sierra Nevada and to avoid the steep grades, the railroad will soon begin boring a tunnel through a spur of the mountains which will be 36,000 ft. long, require three years of hard work, and wipe out the tidy sum of twelve millions. It will be the biggest and dearest thing in that line on this side the world. The present route will be left untouched and after the tunnel is finished will be reserved for slow, light traffic.





Inoculating a Horse, Sheep and Calf

# THE TRUTH ABOUT BURNING ASHES

### Recurring Discovery That Comes to Light Periodically

By Carl Shelley Miner, Director the Miner Laboratories, Chicago

Some time ago an item purporting to be sent out from Altoona, Pa., appeared in the daily papers in which it was stated that a cobbler of that town had discovered a compound which, when mixed with ordinary ashes, made of them a fuel superior to the best anthracite coal. Shortly afterward a second item informed the public that the government had become so interested in the process that it had detailed several of its experts to make exhaustive tests of the cobbler's marvelous compound. At about the same time, advertisements appeared in the papers offering for sale shares of stock in a company organized for the manufacture and sale of a compound which, when mixed with one part of coal and two parts of ashes, would produce from 50 to 150 per cent more heat than could be secured from the best coal. Up to this time the story had appeared to be only the joke of some clever correspondent. When it came to the point of selling stock, the matter assumed definite shape and the public became interested. The papers published a formula purporting to be that of the notorious cobbler, and chemists and technical men everywhere have been bombarded with questions regarding the process and its possibilities. Dozens of people over the country have experimented with it in their own stoves and furnaces, and many of them have, no doubt, considered their results as warranting a favorable opinion of the process. It is in order to make clear to the readers of Popular Mechanics certain facts chemical and practical in regard to this problem that this article is written.

The published formula is as follows: "Common salt, 1 lb.; oxalic acid, 2 oz.; water, 1 gal.; mix and moisten a mixture containing one part coal and three parts ashes, and a better fuel than pure coal is obtained." The advertisements assert that two tons of ashes mixed with 20 cents' worth of this compound and one ton of coal will produce more heat than five tons of the best fuel.

Let me begin the discussion by stating explicitly that you cannot burn ashes. Ashes are a mineral matter which has absolutely no fuel value. Ordinary ashes, however, contain a small amount of unburned coal, and this coal can be burned under proper conditions. Ashes and coal are of variable composition, but, for the purpose of this discussion, we will assume that ordinary hard coal contains 10 per cent of ash, by which we mean absolutely incombustible material; and the ashes from a well-regulated furnace contain 25 per cent of unburned coal, which is a liberal estimate. There would then remain 13\frac{1}{3} per cent of "ashes," of which 3\frac{1}{3} would be coal and 10 per cent genuine ash. Therefore the loss if these ashes are thrown away is 3\frac{1}{3} per cent of the coal used. In the form of a table this statement appears as follows:

Coal contains— Combustible material Incombustible material or ash												
Ashes contain— Combustible material Incombustible material	$\frac{25}{75}$	per per	cent,	equivalent equivalent	to to	3 1/3 10	per per	cent	of of	the the	coal coal	used used

So, if we admit that this method will enable us to burn all the coal in the ashes, and that is the limit of its possibilities, we may hope to save 1/33 of our coal bills. The advocates of this formula cannot claim that it contains any heat-producing material except the oxalic acid, and that is present in so small a quantity as to be negligible in making this calculation. The water and salt have

no fuel value. There is, therefore, absolutely no basis for the claim that ashes

and coal mixed with this compound are a better fuel than coal alone.

This is not by any means the first attempt to produce a compound that will increase the combustion of coal in stoves or furnaces. Some years ago a combustion powder for this purpose was exploited in Germany, which appeared to be a great success, for when it was thrown into a fire the flame brightened up at once and appeared to burn more briskly. The unsympathetic government chemists, however, analyzed the powder and, finding it to be only common table salt, branded the whole thing as a fake. The salt is retained in the present formula. There have, however, been formulæ devised more satisfactory than that one. The basis of all of them is some material which will release oxygen, the gas necessary to promote combustion, in close proximity to the coal in the ashes. is obtained by mixing the ground ashes with the compound before putting them into the furnace. In the cobbler's formula the oxalic acid is probably intended to furnish oxygen. It contains oxygen, but it also contains carbon and hydrogen in amounts more than sufficient to combine with its oxygen, and it therefore uses up oxygen instead of furnishing it. The water is the only constituent of any possible value in this formula. It is composed of hydrogen and oxygen and at high temperatures breaks up into these two gases and so might furnish oxygen for the combustion of the coal in the ashes with which it has been mixed.

The scheme of mixing water with ashes to burn the coal out of them has been known for years and has been used by householders all over the country. It is covered by a United States patent for "a method of producing complete combustion by mixing a finely divided substance with water and introducing the same into a-furnace with a heat independent of that produced by combustion of the mixture." Comparative tests made with ashes mixed with water and ashes mixed according to the cobbler formula show practically identical results. In both cases there was left about 7 per cent of unconsumed coal in the ashes. It therefore seems clear from both theory and practice that there is no new and useful improvement covered by this formula, but it is, as might have been

expected, merely a rehashing of an old and time-tried method.

The probability is that neither method has any real value, but that the results obtained are due entirely to the repeated burning to which the ashes are subjected. It is reasonable to assume that if the ashes are fed back into the furnace often enough, with plenty of fresh coal, the coal in them will eventually be

It may be as well to say a word in regard to propositions, of this kind in general. The cheapest form of fuel is coal. The best way to get the heat out of it is to burn it, that is, to combine it with oxygen, and the cheapest form of oxygen is the oxygen in the air.

The addition of wonderful compounds does not increase the heating power of coal, nor does it ever furnish a cheaper source of oxygen than the oxygen of the air. Keep these facts well in mind and do not allow yourself to be misled

by bright flames or clever advertising matter.

What Niagara Falls Costs .- To an electrical engineer the beauty of the falls is somewhat dimmed as he reflects that the 3,500,000 hp. is worth more than \$100,000,000 a year.

A Genuine "Trouble" Line.-To avoid a personal conference the Shah has had a telephone line built from his palace to the public square for the use of subjects having grievances to present. When he gets enough troubles for one day he gives the "busy" signal. The Czar might profitably employ a few thousand miles of wire in the same way.

### POPULAR MECHANICS

# HOW PAINT IS MADE

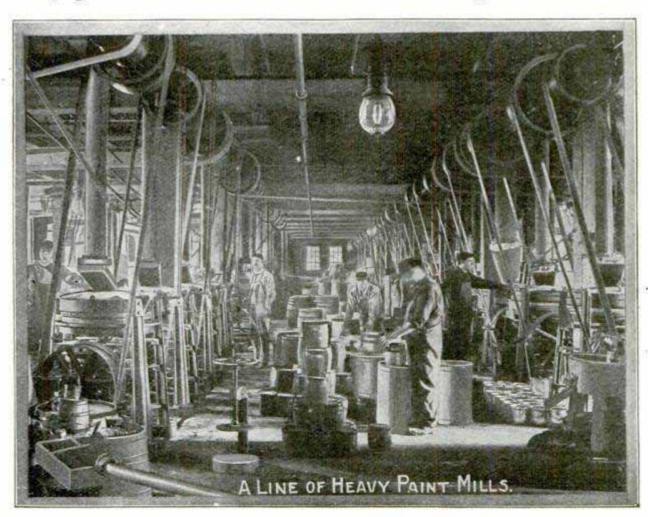
## An American Industry - Few People Realize Its Magnitude

By J. Oliver Curwood

Of all those products with which America has taken the lead in the struggle of nations for industrial supremacy paint is one of the least known, so far as its making is concerned, and almost without knowing it the people of this country have had developed under their very eyes an industry which had the honor of being spoken of in Congress recently as "a rival of the steel industry so far as rapid growth is concerned, an industry which is of incalculable value to this country, and one which should be protected and encouraged by every manner of means."

This was spoken apropos of a movement to have distributed throughout the country millions of pamphlets, encouraging home owners to care for their buildings, and telling them how to do it, just as the Government is giving in this same way its advice and support to the nation's farmers.

As in nearly everything else, mechanical and inventive genius have placed the United States at the head of all other nations in the manufacture of paint. America is the home of "templates," of standardized screws, bolts, rivets, etc. The Yankee mind is given to short cuts. From machinery it cuts away useless metal, needless wheels, superfluous parts. It rejoices in new and better ways of doing old That is why American enthings. gineers were ready to guarantee the completed Nile bridge in less than onefourth the time and at a much lower cost than the English builders. And



that is why this country has today become the "paint pail of the world"—so quickly, too, that Americans themselves hardly realize the fact.

In 1860 there was not a gallon of machine-made paint in the world. Today there are 250 paint factories in this country. They represent a capital of nearly a quarter of a billion dollars. Last year they produced 80,000,000 gal. of paints, and the steadily growing demand, especially from abroad, where the superiority of American paint is as conceded as that of American steel, it is expected will bring this year's product up to 100,000,000 American machinery has made this tremendous output possible. has also made it possible for the home owner to go to a store and pick from a shelf any tint or variety of paint he wishes, a gallon costing him less today than a gill of drying oil would have cost a century or so ago.

There is not one person in ten thousand who knows how paint is made today; not one in that number who knows that white lead is only one of several valuable bases, and that modern scientists have discovered other and equally good things to take the place of turpentine in many paints, which will soon be so scarce and high that were it exclusively used in paint manufacture a gallon would cost several times what it does now. This fact brings us to the first step in modern paint making—the work of the scientific department. Every big paint factory has its laboratory, which is equipped with as high-priced men and apparatus as the scientific department of a pharmaceutical concern. men, over 1,000 of them in this country, are constantly at work striving to make their products better and cheaper for the public at the same time, for inno other industry is competition between manufacturers more keen. No sooner does one firm put out a new paint than it is analyzed by its rival firms, and the good qualities of the new paint are incorporated in their own. To this department of a paint factory first comes all of the material which is to go into paint. In a big room is a miniature paint plant. There are miniature grinders and mixers in which only half a pint of paint can be made at a time. A certain batch of material comes in. It is first proved in this miniature factory, and if the chemists say it is all right, the material goes to the factory proper.

First the "base" is made. Perhaps half a barrel of zinc white, white lead, or some other base substance is dumped into one of the big, churn-like mixers. To this is added linseed oil. Then the "churn" is set in action, and steel paddles begin whipping the mixture. This "churn" looks like a simple invention, yet it is a product of the last ten years in its perfected form, and its existence has lowered the price of paint a half. For an hour its paddles stir the base. Then this base, after coloring matter has been added to it (if a colored paint is desired), is slowly run into a grind-

ing machine.

Paint is a combination consisting of finely ground pigments suspended in a liquid menstruum, and the more finely the pigments are ground the better the paint. Because of this it may be safely said that this "mixer" is the invention which has made America the "paint pail" of the world. While the paint makers of other countries were grinding their dry colors in oil with slab and muller this piece of machinery was creating new paint factories all over the United States. Imagine two huge steel "grindstones" fitted close one upon another, and revolving slowly in opposite directions with tremendous pressure from both below and above, and you have a good idea of a grinding machine. Between the surfaces of these "stones" the paint slowly runs until the pigments are ground to microscopic fineness. When it oozes from between them it has had brought upon it a grinding pressure of several tons, and is in its finished form. Linseed oil and turpentine or some other thinner is then added to it in other "mixers," when it is ready to be placed in cans.

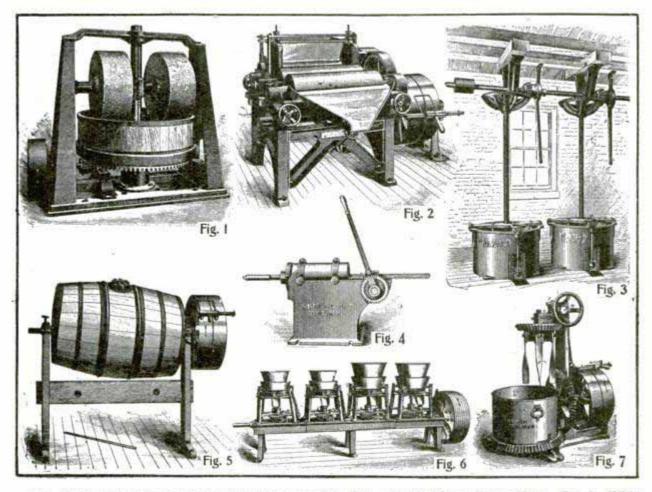


Fig. 1--New Portable Revolving Bed Chaser or Pan Mill. Fig. 2--Three Roller Mills. Fig. 3--White Lead and Color Mixers. Fig. 4--Collapsible Tube Filler. Fig. 5--Eccentric Varnish Cutter and Mixer. Fig. 6--Color Mills. Fig. 7--Ink Mixer

It is pointed out that in other ways than its actual product is the paint industry valuable to the country. For instance, it has increased the production of flaxseed from 10,000,000 to 35,-000,000 bu. annually, and it has increased the annual smelter output of pig lead from 200,000 to 350,000 tons a year. It is also offering unexcelled opportunities for young men. So rapidly has the industry grown, and so fast is it developing at the present time, that it is difficult to secure a sufficient number of the right sort of Scientific care is necessary in the making of American paint, and thousands of young men are now working from department to department of the country's paint factories in order that they may be given a thorough understanding of the business. every big factory tutors many of its employes in this way, and it is frankly conceded by them that within a few months these men are earning wages

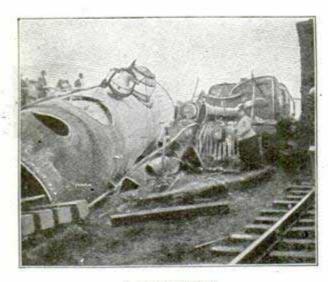
which it would take them years to arrive at in nearly all other manufacturing occupations. Even at this the constant cry of paint manufacturers is "Men—men—we want men."

That the paint industry is bound to be one of the two or three biggest things in the country seems evidenced by the investigations of those who favor the "pamphlet education" scheme, which show that there are about 5,000,-000 property owners in the United States whose loss through not properly caring for the exteriors of their buildings is about \$35,000,000 a year. When these are added to those who already use paint, and when the constantly increasing foreign demand is taken into account, it is pretty safe to say that the paint making business will increase in prodigious leaps during the next three or four years.

Ice from frozen sea water is fresh.

#### LOCOMOTIVE COLLIDES WITH ITS OWN BOILER

The strangest freak of all the queer accidents in the line of railroad collisions happened recently on the Southern Pacific near Gilroy, Cal. A loco-



A Freak Wreck

motive actually collided with its own boiler.

The locomotive was a mammoth one of the Atlantic type and was hauling a passenger train at the time the huge boiler exploded with a noise heard for miles around. The boiler went up into the air and landed on the track 200 ft. ahead, leaving the trucks, drivers and engine frame. The boiler fell in time to be run into by the remaining portions of the locomotive, which were carried forward by the momentum of the train, which after shoving the boiler a short distance came to a stop. The engineer, fireman and superintendent of block signals riding in the cab were all killed. The accident occurred in the night. The illustration is from a photograph taken the next morning.

#### BURY OUR GOLD IN GUAM

Among the natives of Guam, American gold coin is held in high esteem—at a high premium. So high, in fact, that whenever the natives get hold of a gold piece they proceed at once to bury it, thus withdrawing it

from circulation. It is for this reason that the governor of the island has very recently requested the Navy Department to send only currency instead, in bills of the denomination of \$1, \$2 and \$5. Fifty thousand dollars in bills, as requested, will be sent soon to the island by the Government transport sailing from San Francisco.

Guam is between Hawaii and Japan, where a United States coaling station

is maintained.

## A TELESCOPE LINE

A simple system of observing objects and places concealed at a distance is being demonstrated in Massachusetts. By this means it is expected that a manager, for instance, can sit in his office and actually see what is going on in any department of a large works. If the plan succeeds it will be possible for a central office to watch the interior of all the banks in a city.

The system consists of tubes or pipes with branch tubes proceeding from the main tubes at angles, and mirrors for reflecting the rays of light from one tube to the other.

At the observing end a pair of field glasses magnifies the reflected image where the distance requires it. The



The Observing Instrument

pipes can be laid underground, and through walls, or wherever necessary to secure the desired connections.

## REMARKABLE STEEL CASTING

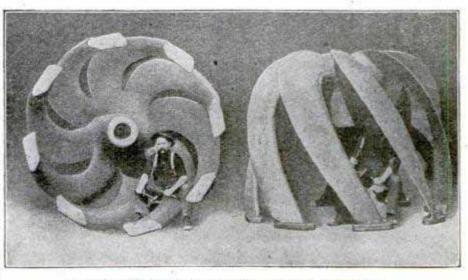
This is not the picture of a devil-fish swallowing a man, but of a cutter for a government suction dredge, for which we are indebted to courtesy of the American Machinist. The man in the case emphasizes the size of this huge steel casting, of which the height is 6 ft. and the diameter 71 ft. The difficulties of so large a steel

casting can hardly be appreciated outside the foundry. When the metal was ready to pour, the mold represented 19 cores rammed up in a flask 12x12x11 ft. Almost 4 weeks were spent in assembling the parts. The casting was a perfect success, showing neither settles nor shrinkage cracks. The casting weights 10,540 lb.

#### DIGGING COAL WITH A DREDGE

What is the use of picking coal out of the bowels of the earth when all that is needed is a No. 6 sand pump attached to a 13-hp. portable engine on a raft and a scow on which to load the coal? That is the way they do it on the Susquehanna, 16 miles above Harrisburg, to the tune of 25,000 tons of the best quality of anthracite yearly. The same is now being done at other points along the river.

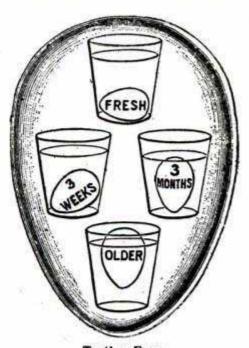
The explanation of this apparent marvel is quite simple. The anthracite is a fine deposit, which has been washed down by freshets from the coal and culm piles along the banks, and it ranges from pea to buckwheat size, with a little chestnut. These deposits are of exceptionally fine quality, for the down stream motion has a sifting action, separating slate from coal, because the former is too flat to be carried readily by the water. The deposits collect especially in eddies, on sandbars and below bridge piers.



Height, 6 Ft.; Diameter, 71/2 Ft.; Weight, 10,540 Lb.

#### TO TELL THE AGE OF AN EGG

A fresh egg will sink when placed in water and rest on its side; if three weeks old it will incline slightly with the small end down; if three months old it will stand on the small end, and



Testing Eggs

if older it will float with large end out of water more or less, according to age.

#### COIN COUNTING MACHINE

The illustration shows a new English machine which automatically counts coins and rolls them securely in a paper wrapper. The coins are



Counts and Wraps the Coins in Strong Packages

emptied into the hopper at the top and come out counted and wrapped at the bottom as fast as six men could do the work by hand. The machine cannot make a miscount. It is operated by an electric motor.

## BIG SCHOONER HAS GAS EN-GINES

The old time mariner refuses to compromise and allow either a steam or gasoline auxiliary engine. He wants all sails or all power. The idea is losing ground, how-ever, and recent ship construction has demonstrated the advantages of a gasoline engine for use when little or no wind prevails. One of these vessels, the "Northland," plying along the Atlantic coast, is a 4-masted schooner spreading 9,000

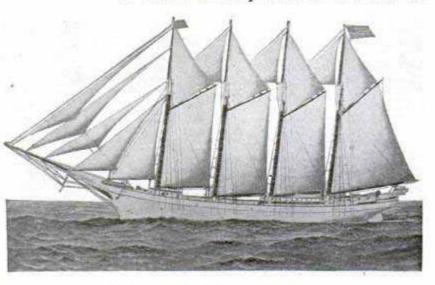
ft. of canvas; her dimensions are: Length, 242 ft.; breadth, 44 ft.; depth, 26.6 ft. Her masts are 161 ft. high; her cargo, 3,000 tons.

One 500-hp. gasoline engine gives the schooner 5 knots an hour in calm weather. Another smaller gas engine lights the vessel and furnishes an electric searchlight which is something unusual for sailing craft; and still another engine hoists the sails and anchors, and hoists the cargo in and out of the five hatches.

The success of the "Northland" is likely to be immediately followed by the construction of many others using gasoline engine auxiliaries.

## NEW COAL FIELD; 24 FT. THICK

The day when all the coal shall have been burned up has received another big postponement. Word comes from England of the discovery of a mammoth coal seam, 24 ft. thick, and covering 2,000 acres, in South Staffordshire. To be sure, it is rather deep-1,750 ft.—but that difficulty will be overcome by means of new machinery, both hydraulic and electric. The cages will be lifted by hydraulic power according to designs which will combine the best features of American, English and German machinery. Lighting and hauling will be done by electricity. By these improved methods it is expected to obtain an output which will beat all



The New Way-Power and Wind

records—3,200 tons in 8 hours—and keep 2,000 miners busy.

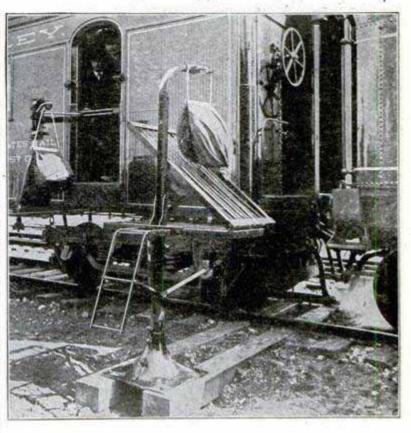
# DELIVERS MAIL AT 70 MILES AN HOUR

The new 'mail handling invention shown in the accompanying photograph will both receive and deliver mail sacks at the same moment. and, with this task accomplished, automatically swing on its own axis out of the way of trains which follow. The Government insists that a mail-catching device shall be equal to the task of being operated while the trains are running at a speed as high as 60 miles an hour. Tests of this machine have proven that it will receive and deliver mail to trains running at all the different speeds up to 70 miles an hour. shown in the photo, the machine is equipped with a kind of reversible cradle of steel wires which hangs from a crane and the crane in turn

is suspended from a swivel post. Another important feature of this invention is found in the fact that it holds the mail pouch which is received by it tightly, thus avoiding any possibility of its falling under the train wheels.

# WRECK ONLY \$103.12

Don't get drowned; it is better to be killed on a railroad—that is, it is better for your family. Owing to a peculiar Federal law the liability of a steamship company for a disaster is limited to the value of the wreck. The Joy Line, to which the steamer belonged, has filed a petition under this law, setting forth that the wreck has not been located, that the total value of the property recovered from it is only \$103.12, and asking that their liability be limited to that amount. That would produce 56 cents for the heirs of each of the 183 persons lost.



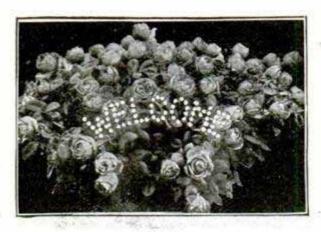
"Welcome the Coming: Speed the Parting" Sack

We suggest that the Joy Line should change its name, which it will probably be glad to do after reading the following newspaper dispatch:

"The wreck of the steamer "Larchmont" has been found by a fisherman off Watch Hill, R. I. It has been sought for more than a month, and the United States revenue cutter "Cactus" will proceed to the spot and endeavor to recover any bodies which may still remain in the wreck."

# UNITED STATES NEGLECTS ARSENIC PRODUCTION

Over half the world's production of metallic arsenic, white arsenic, and arsenic sulphides is utilized by the United States, the supply coming largely from England, Germany, Spain and Canada. There are extensive deposits of arsenical ores in this country, and every year several hundred tons of arsenic sulphide, obtained in purifying sulphuric acid at chemical manufacturing works, are wasted by burial; yet we remain dependent on foreign countries for our supply.



## ELECTRIC BOUQUET A NOVELTY

A pleasing electric novelty which any electrician can easily make is the electric bouquet. The idea is suited to many occasions, such as receptions, weddings and presentations. large bouquet or design of natural flowers are placed small incandescent lamps, either white or colored, arranged in the form of letters to produce either initials or words. For example, on the recent occasion of a reception given by his employes to their manager on his return from a long absence a mammoth bouquet of roses was presented to him, in the middle of which glowing in soft colors was the word "Welcome." Current was taken from a wall bracket through a flexible cord 20 ft. long, which permitted the bouquet to be carried about the room.

# AN EARTHQUAKE HOUSE

It is to be built in Kingston, Jamaica, of drain pipes set on end and filled with cement, faced on the outside with cement and on the inside with thin wood. To one who has never "quaked" it would seem that a house

of solid concrete would be far more likely to withstand shocks, and still better would be the light frames which they put up in Japan, but a man who has been there says it's all right. He ought to know, for he is Col. H. E. C. Kitchener, oldest brother of Lord Kitchener, and a resident of Kingston. His house was badly damaged by the last shake, and he is now in England buying materials for the above mentioned style of house, so as to be ready for the next one.

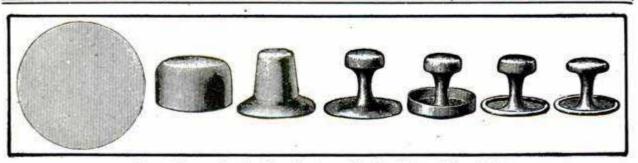
## SUBWAY IN TOKIO?

In their omnivorous appetite for everything "Western" the Japs are eager to add underground railways to the large collection which they already possess. So far, however, the subway is "all in the air," for the company is not even formed. If it materializes, the distance is to be 12 miles and the fare  $2\frac{1}{2}$  cents.

Meanwhile the Tokio Electric Tramway Co. is trying to get permission to add 60 miles to its line.

## MAXIM'S LATEST PEACE PER-SUADER

It has been predicted that the more highly perfected became the weapons of destruction, the more unlikely would the nations be to resort to war. If that is so Hudson Maxim, the well known inventor of high explosives, is a universal benefactor. His latest peacepersuaders are "stabilite" and a perfect time fuse. Stabilite is a new smokeless powder having certain advantages over the usual smokeless—it will not



Seven Stages in the Manufacture of a One-Piece Collar Button

decompose; is not affected by impurities; can be used as soon as made. By the time fuse a shell may be caused to explode after passing through any thickness of armor, making most of the crew permanently peaceable.

Mr. Maxim insists that the United States would be practically defenseless in case of war with any first-class

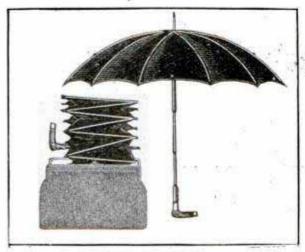
power.

## WELLMAN ARCTIC BALLOON TO SAIL THIS MONTH

The Wellman balloon, "America," for Arctic exploration has been entirely rebuilt, nothing of the first construction remaining save the gas bag and a single motor, and is now en route for Dane's Island, north of Spitzbergen and only 600 miles from the Pole. Only Felix Riesenberg, of Chicago, and two Norwegian companions remained at the headquarters in the frigid zone the past winter, during which time communication has been entirely cut Much depends on whether Mr. Wellman finds the big balloon house erected last summer still standing. If the winter storms have wrecked it, another will have to be built.

#### A FOLDING UMBRELLA

The latest Paris fad in umbrellas is one which folds up in a case which can be carried in the pocket of an ordinary coat. The illustrations show the case, umbrella half opened and also



Folds to Pocket Size

ready for use. The handle telescopes and the ribs are hinged to fold several times. The umbrella can also be used as a cane.

## TAXIMETER COMPUTES CAB FARES

With the advent of any mechanism which shall fix the fare due at the end of a cab-ride, one of the chief diver-



Registers Everything but "Tips"

sions of Cabby will be gone. But cabriders will rejoice with exceeding great joy.

Across the sea comes news of the general adoption of a "taximeter" for every hired vehicle in Paris, its adoption ordered in London after June 1, and now one forerunner of this peace-preserving innovation is exciting much

interest in New York City.

Without going too far into details, it may be said that the French device displays on its face, in plain view of the traveler, the fare due as fast as it accumulates, and this goes on just the same when the cab is standing still for a call and whether it travels fast or slow. The machine is operated by

clock work and connection with one wheel, and is sealed so its mechanism cannot be tampered with.

## FILE WITH CIRCULAR TEETH

A new style of file comes from London, for which several good things are claimed. From the accompanying cut



The New File

it looks reasonable that this file should be self-cleaning, the chips being pushed continually toward the outer edge. The grooves are so deep that they cut without slipping and last longer without sharpening, which can be done much below the usual cost because of the simple shape of the teeth. It is claimed to work well on all metals and even marble.

#### PROMOTION OF THE DEAD

All the 107 men whose bodies were found in or-near the hulk of the batits magazines when the ship was in dry dock at Toulon. Only 58 of the bodies have been identified, so that the chief significance of the promotion lies in the fact that the widows and other relatives will receive higher pensions in consequence of the promotions.

## 38 1-2 MILES AN HOUR BY AUTO

That was the average speed made by M. Sorel, from Paris to Nice, in a 60-hp. car. Done on a wager, full time, 164 hours.

#### BIGGEST WHISTLE IN THE WORLD

The biggest steam whistle in the world is on a street railway power house at East St. Louis, Ill. It is a three-chime and can be heard 20 miles. It takes half a ton of coal to produce the steam necessary to blow the whistle one minute. The "whistle" is really three whistles, the largest of which is nearly 6 ft. high and almost as large around as a man. It has connection to an electric clock regulated by Washington time and is blown for 10 seconds at 7 a. m., 12 noon and 6 p. m.

## RAISING A SUNKEN BOAT

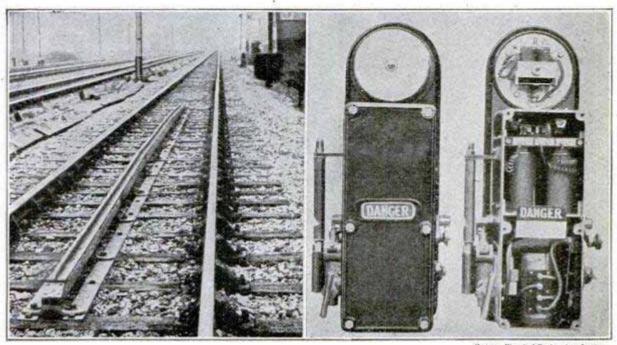
Trying to Be a Submarine

tleship "Jena" have been promoted. It will be recalled that the "Jena" was wrecked recently by the explosion of The screw propeller "Minnie M.," in summer service on Georgian Bay, filled with water while at her winter dock, sunk and then rolled over on her side. The boat was raised by coffer-damming the engine and boiler room and the hatches, and while the pumps were removing the water five heavy lines were carried to blocks fastened on As the water shore. was pumped out the

boat gradually righted herself and was taken to the repair docks under her own steam.

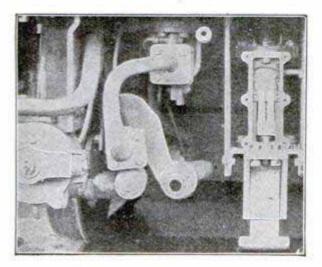
# NEW RAILROAD DANGER SIGNAL

By Which Train Dispatcher Can Warn Engineer of Moving Train



Signal Rail

A new system of signals has been installed on 22 miles of the Great Western Railway of England. It signals the engineer of a train while running at full speed between stations. A section of third rail 60 ft. long, called a ramp, is placed in the middle of the track at intervals of each half mile. A contact shoe suspended from the locomotive makes contact with each ramp as the train passes. Electric wires connect the ramps with the telegraph office in the company's signal towers. The operator can thus



Contact Shoe is at the Right

Closed

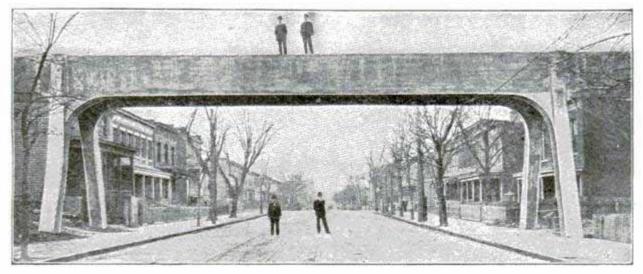
Courtesy Electrical Engineering, London

Open

cause the signal box in front of the engineer to ring a bell to indicate a "clear" track, or blow a whistle and show the word "danger."

#### FIFTY MILES TO THE MOON

So far as seeing it is concerned. Thanks to Mr. John D. Hooker, a philanthropist living at Los Angeles, we may some day see photographs of the moon's surface distinguishing objects 100 ft. apart. In other words, anything they have up there half as long as the capitol building will be plainly discernible. All this and many greater wonders will be brought about by means of a 100-in, mirror, which will be mounted in the Carnegie Institution's new solar observatory on Mount Wilson, Southern California. But it is several years in the future, for first a 41-ton block of glass, 13 in. thick, must be cast without crack or blemish, and then four years must be consumed in just grinding and polishing it. The cost of the big mirror and its smaller auxiliaries will be \$45,000. A lens of equal size costs \$1,000,000.



Courtesy St, Ry. Journal

# ELEVATED RAILROAD BUILT OF CONCRETE

The feature of greatest popular interest on the new electric railroad from Richmond, Va., to Chesapeake Bay is the elevated part, 2,800 ft. long, where the road enters Richmond from the north. The height of the structure varies from 18 to 70 ft.

The plan of a riveted girder viaduct was rejected on the ground of expense, a wooden trestle was considered too temporary and too liable to destruction by fire, so concrete reinforced by steel was adopted. The cement used was of the best grade and the stone was granite crushed and thoroughly screened to 1 in. Granite dust was substituted for sand, being found to have 20 to 50 per cent more tensile strength. The mixture was in proportion of 1:2:4, and was calculated to stand a compressive stress of 500 lb. per sq. in. and a shear of 50 lb. All concrete was required to go into the molds within 15 minutes of mixing. After removing the molds small holes were filled with a 1:2 mortar and finished off with cement and sand laid on with a brush.

The spans of the viaduct vary from 23 ft. 6 in. to 67 ft. 5 in., the longest spans being over streets. They were planned to support a train weighing 150,000 lb., and expansion is provided for at intervals of 200 ft. by means of sliding joints. The track rests on oak ties, and these on pine stringers which rest directly upon the concrete girders. At intervals of 5 ft. a 3-in. bolt, sunk

9 in. into the concrete, passes up through stringer and tie, and half way between these long bolts are short bolts which go through the stringer only.

## LOBBYING WITH AUTOMOBILES

The Wisconsin legislature threatened to pass a law reducing the speed limit of automobiles below 12 miles in towns and 20 miles in the country. To demonstrate that such action was unnecessary several leading owners of fast cars took the lawmakers out for a spin of 30 minutes each, during which the cars were driven at speeds ranging all the way up to 40 miles an hour. Each machine was equipped with recording instruments. The tests included emergency stops and other features of control.

## MAKING STEEL EXPERTS

The Bethlehem Steel Works proposes to furnish a course of free instruction for 3,000 young men, with a view to making them experts in the manufacture of steel. About 200 have already accepted the offer, and although the works are near Pittsburg, not one student came from that city. More than half of these ambitious boys are of German descent, one-fourth are Irish, and only one-fifth "strictly American"—whatever that may be.

# LOCOMOTIVE AND STEAMER IN COLLISION

The cobbler should stick to his last and a boat should stay in the waterseems to be the moral of a queer accident which occurred near Beulah, Mich. A small steamer was trying to play turtle by getting across country with the help of several men, horses and bobsleighs. At the crossing of the Ann Arbor railroad the boat was nearly safe, when the men were terrified by the approach of an express train threatening them in the darkness. In an instant there was a terrific crashing and splintering, with wild jumping from both boat and train. Net results: A sternless boat, a pilotless engine, a speechless crowd, and no one killed.

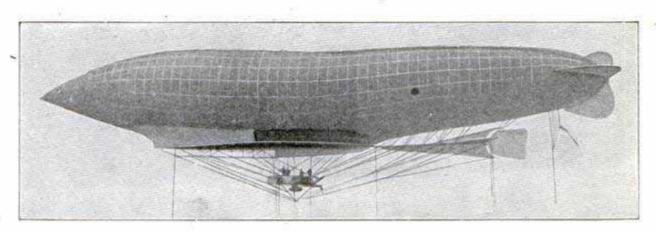
#### THE BATTLE OF THE AIR

The dove of peace seeking an olive branch, whether on land or water or in the air, is liable to be shot to pieces by the target practice of nations professing to hope that they shall not learn war any more. Even if she were a duck and could dive she would be run down or blown up by a submarine. Near Danzig the German war department will practice all kinds of shooting at balloons, both free and captive, their size being 2,500 cu. ft., and the length of the holding cables being 3,000 ft. They will also try to find out how much damage could be inflicted from a balloon or airship on an enemy beneath.



THE BIGGEST LEATHER BELT IN THE WORLD

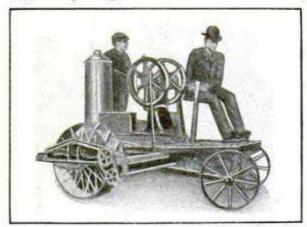
It was made in Chicago and runs a saw mill at Tacoma, Wash. It is 114 ft. long, 7 ft. wide, 3-ply thick, weighs 2,300 lb., and 225 steers contributed the centers of their hides to make it. Notwithstanding its size and weight, and the tremendous strains to which it is subjected, not a peg, rivet or any metal fastening whatever holds it together. It was simply stuck together with best quality of cement under 250 tons pressure.



War Balloon Built on the Lines of a Fish

#### HOME-MADE TRUCK FOR GASO-LINE ENGINE

By using the truck from an old steel binder and buying a small wagon wheel and a few extra bolts, a young farmer rigged up a good truck for mounting



Home-Made Traction Engine

his 1½-hp. gasoline engine. He put a plank platform on the truck and used the same gearing that had been used to run the binder. A sprocket-chain belt was run from the engine through a hole in the platform down to the pulley, and the outfit moved itself along nicely.

This portable engine is used on the farm for the following purposes: Pumps water for stock at a cost of 7 cents a week; saws wood; cuts corn fodder; runs grindstone, fanning mill, and corn-sheller.

#### MELTING OLD TIN CANS PROFITABLE

Old tin cans which are not left to kick about alleys and vacant lots are collected and turned to profitable use. When reduced they are worth \$5 to \$12 a ton. There are several methods. The simplest is to melt the whole mass of tin, solder and iron into rough ingots, which may be used for sash weights, etc. To separate the tin completely a chemical reaction is necessary. After melting out the solder the combined scrap iron and tin must be exposed to the combined action of some free alkali, preferably caustic soda, and electricity or air at 250°. One process is to dump the scrap on an endless

moving frame which carries it alternately into and out of a vat of alkali in solution, caustic soda or potash. The frame is connected with the positive pole of a current of high amperage, and the tin is soon deposited in the solution as crystals, leaving the iron free. Afterward the crystals may be reduced easily to block tin and the solution used continuously, so that the expense of the whole is slight and the pure tin is valuable.

## PROPOSED TEST OF DEATH

There are some unfortunates who live in constant terror of being buried alive. Although there is no reliable evidence that the mistake occurs so often as these people imagine, the horror of it is so great as to justify them in demanding that the chances should be reduced to a minimum. Many devices have been proposed and some adopted, but none is entirely reliable.

The latest suggestion is a French invention which consists of a piece of paper, copper, brass or silver on which words are written with a solution of a neutral acetate. The piece is then fastened at the nostrils of the subject with the written side next the face. If decomposition occurs it will begin within the body, and the sulphurous gases will escape through the nostrils, in



"The Piece Is Fastened at the Nostrils"

which event the writing on the paper will be made visible by the chemical action of the gas. In this way death would actually announce itself. While the test has the advantage of being one which need not require a physician, as it can easily be applied by anyone, the serious objection remains that sulphurous gases sufficient to bring out the writing frequently occur to the living in certain cases of stomach trouble.

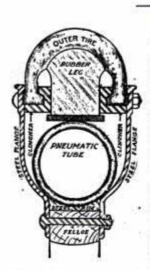
## ARTESIAN WELL RUNS ELEC-TRIC LIGHT PLANT

An enterprising South Dakota farmer makes his artesian well run an electric light plant, and so successful is his plan that other farmers are

adopting it.

A motor which had been in use on the well for some time is used to generate the current. The well is a 2-in. one of good pressure, and the wheel, which is somewhat larger than other moter wheels, is driven at 450 r. p. m. The dynamo, of 600 watts capacity, supplies 12 incandescent lamps and an electric stove. Only two lights can be used while the stove is in use.

# AUTO TIRE THAT CAN'T PUNCTURE

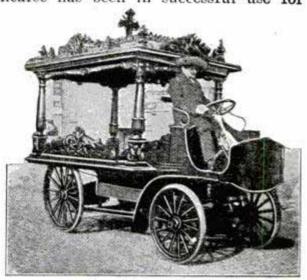


Over 10,000 miles without a puncture or one cent of expense for repairs is the record of the automobile tire shown in the accompanying cut. This tire recommends itself for running over wire nails, glass, broken rocks, and any and all of the things which acci-

dentally or intentionally are found wherever motor cars go. The outer tire is solid rubber 1 in. thick; other details will be readily understood from the illustration.

#### MOTOR HEARSE FOR BERLIN

In one California city an autohearse has been in successful use for



For "Rush" Funeral

several months. So far as known the first vehicle of the kind in Europe has just been put in service in Berlin. The approval of the police department was necessary and this has been secured. With the motor hearse it is announced that funerals will take place in one-third the time.

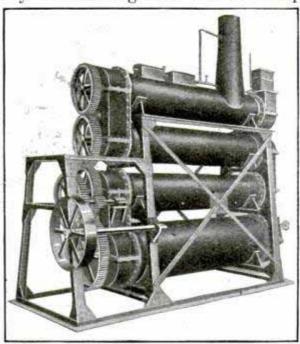
#### A GIANT SMELTER

In an age of electricity copper becomes the "precious metal." That means bigger and better smelters, and plenty of them. The biggest yet is now going up at San Bruno Point, 8 miles south of San Francisco, and will cost \$5,000,000 and two years of work. When finished, the plant will take copper ore only, expected to come from mines all along the Pacific coast, from Alaska to Valparaiso, but principally from Nevada, Arizona, California, and Mexico. Of course the distance will depend on the richness of the ore, but this smelter is expected to reduce even 2% ores profitably from short distances. At any rate, the Pacific has such a copper coast that the big smelter will be going full blast.

"Gladiator" is the killing name of an English automobile.

#### HYDRATED LIME

The first cost of quick lime is a little less, but it is likely to cost more in the end than the hydrated. A few reasons why the cost is greater are: the lump



**Hydrating Machine** 

lime is perishable, requiring careful storage and always presents the danger of spontaneous combustion. It is crude and unreliable, requires time and apparatus for slaking, and any excess used must be thrown away. Hydrated lime avoids all these objections and has many further merits. Passed through a machine, it comes out so finely divided as to produce the best quality of plaster, mortar, or cement as to strength, smoothness and density. As it shrinks less there is no cracking or blistering, and the older it is the better it gets.

The hydrating of lime is nothing new, but it is done now with modern machinery. The ordinary lime enters the first cylinder through the hopper seen at the right of the cut, and as it is passed along by the revolving mixers it is sprayed continually by water entering through the funnel. Having passed through, it drops into the second cylinder, and so on to the bottom, where it comes out as hydrated lime. Then it is passed through a very fine screen, which takes out all impurities

and delivers it as a white, dry powder ready for packing and stable in any climate.

#### FIVE CARS LIMIT OF FAST TRAINS

Hereafter the 18-hour trains running between New York and Chicago will consist of but five cars—a compartment observation car, two Pullmans, a diner and a combination buffet and baggage car. The Pennsylvania line started out with this limit and has adhered to it, despite the great demand for the fast service. The New York Central, however, has been handling six and even seven cars, and now the management declares it a physical impossibility to maintain the schedule with such a heavy train and has restricted the number of cars to five.

# NEW TELEPHONE SYSTEM FOR OFFICES

The latest time-saving addition to business system is a little instrument which enables the head of a business or department to converse with one or all of his subordinate officers in an



Telephoning at Ease

ordinary tone of voice, in any part of his office, and without holding the apparatus to his ear or mouth. Their re-

plies will come to him in like fashion, so that the whole conversation will be just the same as if all parties were talking together in one room. If the manager wishes to communicate with one person only, he can easily make it impossible for anyone else to overhear, and if he wishes to keep the replies secret from someone in his own office, there is a receiver which he can use in the ordinary way.

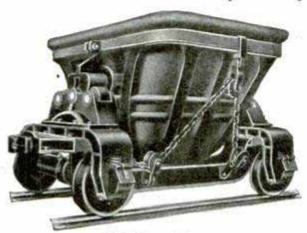
#### ROAD CUT THROUGH LAVA

Roads over lava are common enough, but cutting one through 40 ft. of lava scarcely cooled, is a different propo-This engineering novelty comes from our new territory of Hawaii. It seems that the old government road in the Kan district has been covered by the outflow from Mauna Loa and the territorial legislature has made a beginning of reopening the road by appropriating \$15,000. It bids fair to be a hot job as well as a hard one, for the cooled surface is as hard and brittle as glass, while the lower strata are still molten. But the engineers insist that it is perfectly feasible. At any rate, hot-foot will keep them stepping.

## SLAG DUMPING CARS

"Cinder pot" or slag "ladle" is the name given to a metal receptacle, mounted on a car, in which the slag from a smelter is removed to the dump. They are of all sizes, shapes, and designs, each claiming special merits. One pattern, as seen in cut, consists of a round pot, swung between two trucks, and

tilted sideways by means of steam or compressed air in the cylinder which is mounted on the forward truck. The special merit claimed for this style is a false bottom which can be pushed up



Side Dump Car

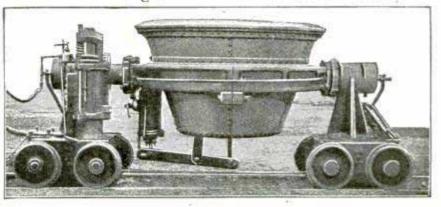
by means of the lever and piston underneath the pot, and so dislodge any crust which has formed on the bottom.

The other kind shown in cut is tipped by a draw-chain, pulled by the engine as it leaves the car. The "ladle" has a capacity of from 70 to 286 cu. ft., 210 cu. ft. being standard; it is mounted on a car body of cast steel. It may be arranged to dump either side or at the end. Simplicity, strength, and certainty of action are claimed for this style, and no linings which will need renewal.

Either of the above patterns may be connected in series, so that the whole trainload can be dumped at once, either by steam or draw-chain, from the engine.

#### SELF-LIFTING AIRSHIP

The "helicopter" is the high sounding name of the machine which is to



Side View of the Cinder Pot

outsail the aeroplane, and solve the problem of aerial flight. Two professors of Johns Hopkins are working along new lines, and the usual fine prospects of success are published. Discarding all balloon and aeroplane levitation, they propose to ascertain by experiment the utmost possibilities of "direct thrust" for lifting purposes. This direct thrust is to be furnished by propellers 40 ft. in diameter, driven by a steam engine of 100 hp. Engine, boiler, furnace and water are to weigh 1,000 lb., the rest of the apparatus 700 lb., and the inventors believe that they can generate power enough to raise this weight plus the operators. Their prime object is to get the thing to go

straight up; after they get up they

will try going sideways.

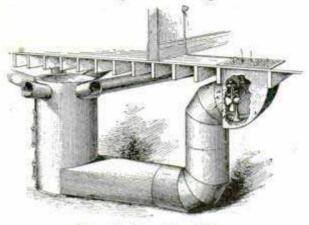
The idea of such large lifting propellers is not new, but heretofore they have been worked by man power, which proved inadequate. After they get up the professors figure that half the horsepower will be sufficient to keep them up. Here's hoping that they may get up, stay up, and when they get ready come down without any dull thud.

## FORTY-FIVE MILES AN HOUR THROUGH CLOUDS

That was the experience of Alfred Leblanc, a young Parisian, who went up with a spherical balloon. A strong wind drove him and a companion through the night across France and Mecklenburg. In the morning they saw the Baltic Sea getting uncomfortably near, decided they had had enough and came down safely on the island of Rugen. They found that in 14 hours the balloon had sailed 630 miles.

## ELECTRIC FAN IN HOUSE FURNACE

The new system of forcing air through a house furnace by means of an electric fan was recently described in this magazine. The illustration shows where to place the fan which is to be used only when required. The

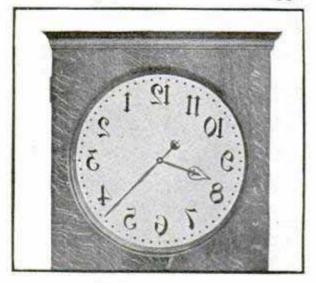


Showing Location of Fan

switch for turning on the current can be placed in the room above.

# REVERSED CLOCK FOR BARBER SHOPS

Every barber shop has a clock which is invariably placed on the wall oppo-



Hold Before a Mirror

site the big mirror which faces the customer in the chair. The clock face is reversed as seen in the mirror and not one man in a thousand can read the time. A jeweler in Glendine, Mont., has now invented a sane clock for barber shops. The Keystone says the figures on the dial are reversed and the hands move just opposite to those of ordinary clocks. The result is the reflection in the glass is so "you can understand it." To demonstrate, hold this page in front of a mirror and read the time of the clock in the illustration.

## WIRELESS STATION ON AIRSHIP

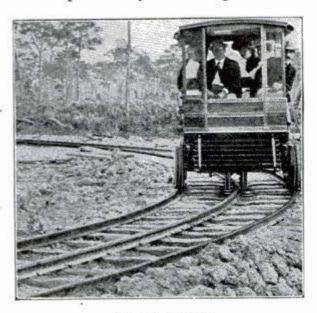
The possibilities and practical utility of wireless telegraphy in aerial navigation will be thoroughly investigated aboard Count Zeppelin's airship this summer. A wireless station has been installed on the craft, in which, instead of extending upward as in other stations, the receiver extends downward, consisting of a bronze wire 300 ft. long. Power from the airship's two 80-hp. motors works the transmitter, which is capable of sending messages 150 miles.

# WHEN IS A BATTLESHIP A CRUISER?

The line of distinction between the battleship and the cruiser is becoming so fine as to be invisible to the naked eye, except of the naval expert. For instance, here is the British cruiser "Indomitable," just launched, 530 ft. long, displacing 17,250 tons, and speeding 25 knots—28.8 miles. Her armor and armament are nearly as heavy as those of a battleship, and to "the man in the street" she is really nothing less than a fast one. This little toy will cost the British taxpayer \$8,645,000, and yet there's more to follow—the "Inflexible" and the "Invincible," now under construction. To match these the United States has nothing better to exhibit than the "Montana" and the "North Carolina," now being built for a speed of 22 knots, and to cost \$6,575,000 each.

#### A FLANGELESS CAR SYSTEM

For some weeks past there has been in daily operation in Miami, Fla., a suburban passenger railway the cars of which run on flangeless wheels. To take the place of flanges a third rail of ordinary type is laid in the center of the track, against which run small side bearing wheels or rollers attached to the car. A glance at the illustration will explain why it is impossible for



Taking a Curve



Flangeless Wheel Car

the car wheels to leave the rail or climb it. The curve in the track seen in the other picture is 45 ft. radius; the car passes over this curve at 25 miles an hour without lurching. The cars used have a rigid wheel base of 5 ft. 10 in.; track is standard gauge. It is stated the car requires no more power to start or travel the curve than on straight track. If desired the center rail can also be used as an electric third rail.

## MOVING PICTURES OF THE HEART

By the use of X-rays and the cinematograph, an apparatus for repeatedly photographing moving objects at very brief intervals, scientists have succeeded in photographing movements of internal organs like the heart and lungs. These moving pictures when reproduced on a screen are of great assistance to medical men.

In order to pay the national debt thousands of Koreans are joining the "Debit Redemption Society," the members of which abstain from smoking and similar luxuries, eat one meal less each day, wear less clothes, and many other sacrifices of a like nature.

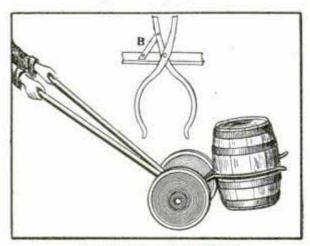


# SHOP NOTES



## Handy Keg Carrier

The illustration shows a two-wheel truck for picking up and carrying nail kegs or other small heavy objects. The handles and jaws may be made of iron

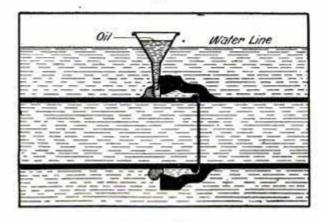


Easily Made; Very Handy

or the handles may be made of wood and bolted on the jaws. One handle is held in a stationary position by means of a brace, B, shown in the detail sketch. The jaws should be curved up near the axle so as to lie parallel with the floor when the handles are held in the hands.—Contributed by Experimenter.

# How to Calk Pipes Under Water

One way is to use "lead wool," a substance consisting of minute fibers of

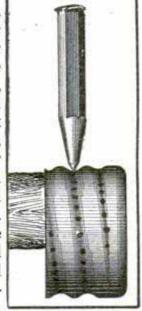


Ready to Pour

lead, which on being compressed form a solid mass. But when this cannot be obtained the apparatus shown in the accompanying sketch will permit pouring melted lead in the usual manner, unless the water level is too high. An ordinary funnel is used for the purpose and is arranged in position as shown in the sketch. Oil is then poured in the funnel, thus displacing the water and preventing the melted lead from touching the water until it has passed through the oil. This gives the melted lead a greasy surface which prevents the water from coming in actual contact with it and allows it to fill the cavity. The lead can then be calked in the usual manner.—Contributed by C. E. Thomas, Chicago.

## To Tighten Threads in a Cap

Here is a good way to tighten a screw cap or cover for a bottle, jar, or other article. If the cap does not hold, put it over the end of a round stick and with a nail, or, better, a center punch, make small dents in the thread about 1 in. apart. This makes the thread deeper and will usually hold very well.—Contributed by E. N. Bunce,

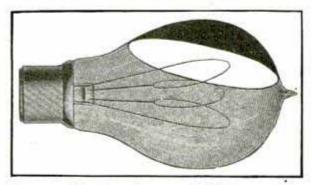


1050 Kilbourne Ave., Seattle, Wash., Fremont Station.

To write on celluloid or celluloidin paper, first rub the face of the paper with a chalk crayon and wipe the dust off with a clean cloth.

## Cheap Reflector for Incandescent Lamp

A very good reflector for electric light bulbs, lantern globes, lamp chimneys, etc., is made as follows: With pen and ink lay out a circle on the

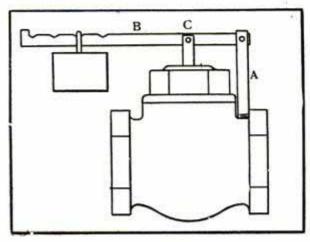


Aluminum Lacquer Reflector

bulb or chimney the size of the reflecting surface desired. Then give this section of the bulb two coats of aluminum lacquer or aluminum enamel. Do the coating while the lamp is lighted, so as to get the coating on evenly. To draw a circle on glass with a pen compass, paste a small piece of cardboard on the glass and push the center point of the compass into the cardboard.—Contributed by Charles E. Frary, Norwalk, O.

## Safety Valve Made from Check Valve

The accompanying sketch shows how I made a safety valve from a check valve. The body of the check valve was tapped to receive the stud, A,

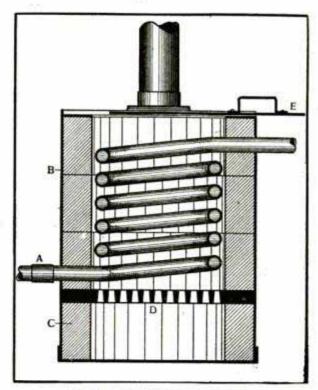


Home-Made Safety Valve

which was slotted out at the unthreaded end to receive the lever, B. A similar stud is screwed into the valve disc and is hinged to the lever at C. This stud passes through a hole in the cap, which should be drilled a little larger than the stud so that it won't bind. In connecting with the steam or other pipe be sure that the pressure comes on the lower side of the disc, otherwise the valve will not operate.—Contributed by C. E. Mayne, Park City, Utah, Box 223.

## Reheater for Compressed Air

Engines run by compressed air frequently give trouble on account of the moisture in the air freezing in the cylinder. This is due to the loss of



For Heating Compressed Air

heat produced by the expansion of the air in the cylinder. The engine of which I have charge is a long distance from the compressor (3,000 ft.) and thus the heat produced by compression was allowed to escape before the air reached the engine.

When first started the engine would run all right, but after it had been running a few minutes the valve would work stiff and the link would begin to quiver. Then the piston would groan, and after running irregularly for a little while the engine would stop altogether and all the pressure we had wouldn't move her an inch until the cylinder was thawed out.

In order to overcome this difficulty and at the same time to expand the compressed air, I built the reheater here shown, which successfully prevents the engine freezing up and materially reduces the consumption of air.

A piece of 1-in. pipe was coiled as shown at A, and enclosed in a sheet iron casing, B, having lap joints riveted together. This was lined with fire brick as shown at C, and provided with a circular grate, D. The fuel is put in from the top, which is covered by a sliding lid, E, of sheet iron. Another sliding door not shown in the sketch is placed at the bottom to allow the removal of ashes and to regulate the draft.

The operation of this reheater has been so successful that we now run it all the time; even during the warmest weather when there is little danger of freezing, the object being to reduce the amount of air used. The engine develops 12 hp. at 85 lb. air pressure.—Contributed by A. E. Scheetz, Trevorton, Pa.

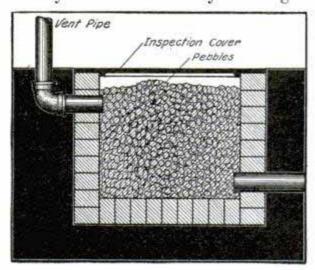
#### How to Make a Drill Chuck

A very serviceable chuck for holding drills and small work can be made from an old brace. With a hack-saw cut the chuck, A, off the brace, leaving about 2 in. of the rod on the chuck. The rod portion is then

to be heated, straightened out and turned up true, as shown at B. An old lathe center, C, is then drilled to receive B and the chuck driven in. Then drill a small hole at D for a spanner wrench and the chuck is complete.—Contributed by A. S. C., 466 E. Buchtel Ave., Akron, Ohio.

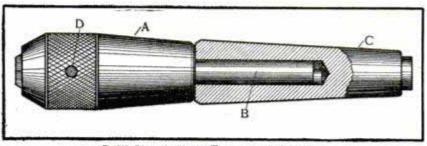
## Muffler for Gas Engine

The silencing of a large gas engine is often a difficult problem. The ordinary gravel box stuck on the end of the pipe takes only the sharp edge off the noise, says a correspondent of the American Machinist. We used it for some years, but a job came along where an engine of 30-hp. had to run on Sundays and occasionally all night.



Muffler for Large Gas Engine

As it was located in a quiet residential neighborhood, it was essential that the engine cough should not be heard. We dug a hole about 3 ft. each way and lined it with a single course of brick set in cement. The top of the pit was fitted with an inspection cover to facilitate cleaning. The pit was filled with clean pebbles about the size of a walnut



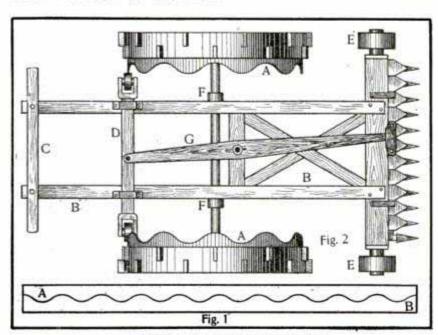
Drill Chuck Made From an Old Brace

and the exhaust pipe turned into it. In one corner a vent pipe was introduced and carried to a convenient height. This pipe prevented the accumulation of any pressure, and also carried the smell out of reach.

It answers perfectly, and we have many times since adopted the same plan. The pebbles want removing about every six months, washing and replacing. Don't use anything but pebbles (broken bricks won't do), and don't let them be too small.

be obtained from druggists and always from dealers in asbestos.

## Home-Made Lawn or Weed Mower



Made from an Old Field Mower

## A Simple Lightning Protector

In the protection of telephone cables an idea that may be valuable needs investigation, says Journal of Elec-It was found from eleven tricity. years' experience in the installation of aerial cables that if a single loop 2 ft. in diameter were made in the end of the cable, or even a "goose neck" of 3 or 4 ft. in length, that in case lightning should puncture the cable, one need never look for trouble beyond this loop; that lightning coming into the cable from an overhead line would encounter such impedance at this point that it would jump the conductors and go to the cable sheath every time.

#### To Glue Asbestos to Iron .

Silicate of soda glue is probably the best substance to use for the purpose named. Brush the glue on the back of the fireplace and then stick on the asbestos fiber, using the asbestos freely. This glue will withstand the heat and hold the asbestos firmly in place, says the American Artisan. It can usually

Anyone having an old field mower and a few metal-working tools can make a good lawn and weed mower. The following parts of the old machine will be needed: The driving wheels and shaft, a portion of the cutter - bar, including knives and fingers, bolts, nuts, and any other part which can be used, depending on the make of the old machine.

Procure a strip of sheet steel, Fig. 1, 6 in. wide, about 1/32 in.

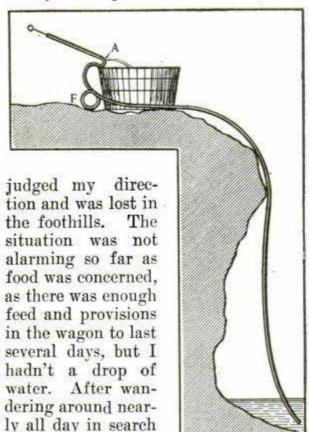
thick, and long enough to go around the circumference of the driving wheels. Cut this along the wave line AB and rivet the two pieces to the two driving wheels as shown at AA, Fig. 2. These should be riveted to the wheels in a position such that the crest on one side will be opposite the trough on the other.

The frame B is made of wood, also the handle, C. The piece D can be made of either wood or iron, and is fitted with a roller at each end to reduce the friction against the cams, AA. Two wheels, EE, about 6 in. in diameter and 3-in. face, are fastened to the front of the machine in order to prevent the cutters from striking the ground.

The driving wheels must be in the right position and then made fast to the shaft in order to have the cams work properly and it will be necessary to use two collars, FF, to prevent lateral movement of the shaft. When the machine is pushed along the cams operate the cam bar, which oscillates the lever, G, and thus works the knives.—Contributed by Geo. G. McVicker, North Bend, Nebr.

## An Emergency Pump

Once while freighting on the border lands of the Rocky mountains I indiscreetly attempted a short cut, mis-



of my road I discovered a wide crevice in the rock with
water at the bottom, which was some
15 ft. below the surface. A rope and
bucket could not be used on account of
the rocky slope, so I used a tub and a
piece of hose as shown in the accom-

panying sketch.

Removing the iron rod from the endgate of the wagon I used this for a plunger. On the threaded end of the rod I screwed two nuts and wrapped the portion of the rod between the nuts with string until I had a piston that would fit in one end of the hose. I then cut a hole in the hose at A to let the water run into the tub. To prime my newly-constructed pump I tied a rope to the other end of the hose and lowered a few feet of it into the water below. Then by pulling up the end of the hose with the string I succeeded in getting the plunger wet.

I then began operating my pump as follows: Holding the hole closed with my hand, the plunger was pulled

nearly all the way out. I then put my foot on the hose at F, uncovered the hole and forced the plunger in again. Continuing in this way I soon had a good stream flowing and in a few minutes had a tub of water which was relished greatly by myself and horses.— Contributed by George G. McVicker, North Bend, Neb.

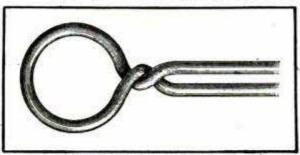
## Damp-Proof Coating for Walls

Dissolve 30 parts tin in 40 parts hydrochloric acid and add 30 parts sal ammoniac. Prepare a powder of 50 parts freestone, 20 parts zinc oxide, 15 parts pounded glass, 10 parts powdered marble and 5 parts calcined magnesia. Make the powder into a paste with the liquid first prepared. Add coloring matter if desired. This composition may also be used for repairing stone work or molding statues.

Old varnish may be removed from a metal surface by dipping it in equal parts of ammonia and 95 per cent alcohol.

# Tempering a Hammer

Blacksmiths' and machinists' hammers frequently chip around the edges. This is caused by the hammer being too hard, says a correspondent of the



For Drawing the Temper

Blacksmith and Wheelwright, who recommends the following process for

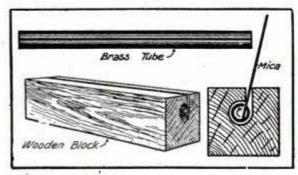
drawing the temper:

Make a ring of ½-in. round iron to fit the face of the hammer. Then chill the hammer face. Next, heat the ring red hot and fix it round the hammer and bring the edge of the face down to a blue color; remove the ring and cool

the hammer head. The center will be hard and the edges fairly soft and you will have no more bother.

## Mica Winding Device

We had been having a great deal of trouble with our producer-gas engine due to the short-circuiting of the spark plug. The sparking device, which is of the "make and break" type, is so designed that the mica insulation must



Device for Winding Mica

cover a stem over 6 in. long. After sending the spark plug to several repair shops, with results which were unsatisfactory, I decided to try the method here illustrated, which has

proved very successful.

First, I procured a piece of brass tubing 8 in. long, and by means of a hacksaw slit it open from end to end. Then I made a block of wood 7 in. long and drilled through it a longitudinal hole, a little smaller than the hole in the spark plug, but somewhat larger than the diameter of the tube. Then by placing the tube in the hole, with the end projecting, it was an easy matter to twist the tube with one hand while the mica was fed in with the other. By overlapping the edges, I found that scrap mica could be used in this way with excellent results.

When enough mica is wound on the tube, place one end in the spark plug and push it in with a twisting motion. The tube can then be withdrawn by turning it backwards, thus allowing the mica to release itself and cling to the hole in the spark plug. By using this simple device I can insulate a plug in less time than it would take to get

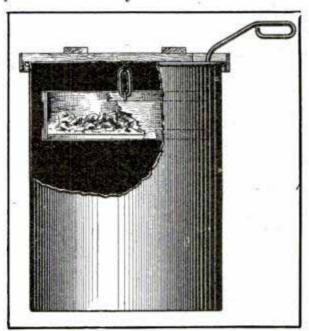
a repair man, and with results that are much more satisfactory.—Contributed by J. A. Manning, Manager of Manning Wood Fibre Co., Owen Sound, Ontario.

## How to Make a Focusing Glass

Remove the film from an old plate, apply a thin, even coat of shellac and, while it is wet, spread over the coated side a piece of white tissue paper. Or, frost the glass as described in the March number, 1907.—Contributed by F. H. Schubart, 241 Pine St., Elizabeth, N. Y.

#### A Dustless Ash Sifter

To make this device all that is needed is a galvanized iron can, such as is generally used for scraps or ashes; a circular sieve, a wooden cover and some round iron for making the links and handle. The links are hung on screw hooks screwed into the cover and support the sieve by means of hooks fast-

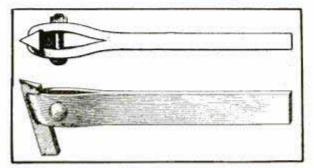


**Dustless Ash Sifter** 

ened to the sides. In operation the sieve may either be moved backward and forward or it may be given a revolving motion. The revolving motion is more effective at first, but soon causes the ashes to pile up around the edge of the sieve.

#### Tool Holder

Take a piece of steel the right size to fit the tool post. Split about 2 in. back. Spread the under ends and file the notches so as to hold a piece of a three-cornered file. Put a bolt on the machine and screw to clamp the file.

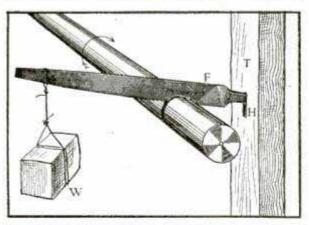


Holder for Threading Tools

In this tool holder old files can be used to make many different shaped tools, says a correspondent of the Blacksmith and Wheelwright, and it is not necessary to temper them. Simply break the file off at a convenient length and grind up on the emery wheel, leaving the teeth on the eyes to bed in the holder.

# Cheap Method of Cutting Shaft

The end of a shaft often projects into valuable operating space and in many cases is very annoying or even dangerous. In order to provide a cheap and efficient method of cutting



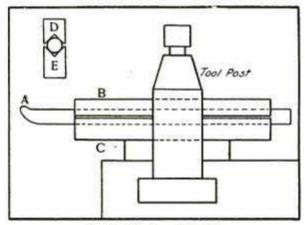
Making a Shaft Cut Itself

off the unnecessary portion, a correspondent of the American Miller recommends the use of an ordinary flat file and a weight, as shown in the accompanying sketch. The vertical timber, T, has a hole at H to hold the file, F, which bears down on the shaft and cuts the same by its own rotation.

The weight, W, may be a brick or other heavy object and is fastened to the file by a piece of wire. It may be necessary to guide the file by hand at first, but after the groove is fairly started the file will guide itself.

## Boring Tool for Lathe

Round tool steel down to 4 in. can be used to advantage for making boring tools. The steel is to be forged to a cutting point at A and, after being tempered and ground, is clamped between two grooved pieces of machine



Boring Tool and Holder

steel, B and C, shown in detail at D and E. These are made just wide enough to fit the hole in the tool post, and when the screw is tightened up it makes a very rigid tool. The grooves in the steel clamps are made V-shaped in order to accommodate different sizes. Contributed by E. Viall, Menomonie, Wisc.

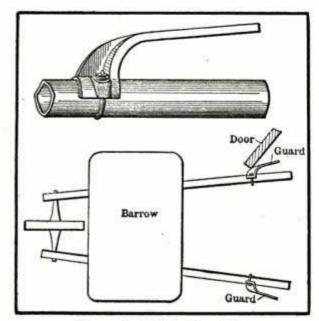
# To Make Transparent Paper

To make ordinary paper transparent, spread a thin solution of Canada balsam in benzole on the paper to be prepared and allow it to dry. If the paper used for this purpose is not too heavy, the result will be a fine transparent membrane, with a hard, clean surface. This solution can be used to

advantage for making blueprints, or photographs of pictures printed on opaque paper.—Contributed by H. Maude, 311 W. Main St., Madison, Wisc.

#### Knuckle-Guard for Wheel Barrow

The device here illustrated was exhibited at the International Exposition of Safety Devices, and was pronounced



Prevents Injuring Knuckles

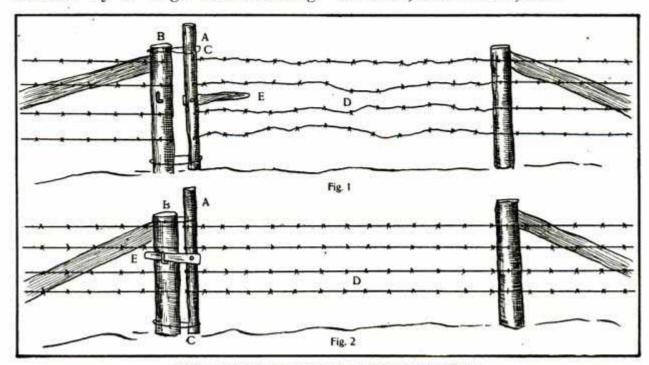
by some to be the neatest device on exhibition, says the American Machinist. It was designed and manufactured by a large manufacturing concern for use in their works, to protect the knuckles of those who push barrows from being barked by doors when passing through doorways.

Clean funnels and measures for varnishes and oils by soaking in strong solution of lye or pearl-ash.

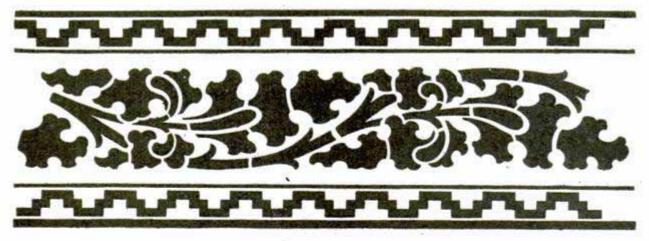
## Gate for Wire Fence

In the western states where pasture fences are constructed of barbed wire it is frequently a difficult problem to construct the gates in a good substantial manner so that the wires will not sag and allow the stock to break through. About the cheapest and most practical method of overcoming this difficulty is shown in the accompanying sketch.

A round stick, A, is fastened to one of the fence-posts, B, by means of wire loops, C. Fastened to this stick are a number of wires, D, which are continuations of the fence wires. These wires will be loose when the stick, A, is in the position shown in Fig. 1, but when it is turned by means of the lever or handle E, which also acts as a latch, the wires will be drawn up tight as shown in Fig. 2.—Contributed by G. G. M., North Bend, Neb.



First and Second Operations in Closing Wire Gate



Design for Frieze-London Plumber and Decorator

#### Using the Handsaw

To cut across the narrowest amount of wood is the most effective, or at least the most rapid way of cutting with a handsaw, says a correspondent of the Wood-Workers' Review. This fact is not generally recognized; or, to be more precise, it is usually ignored.

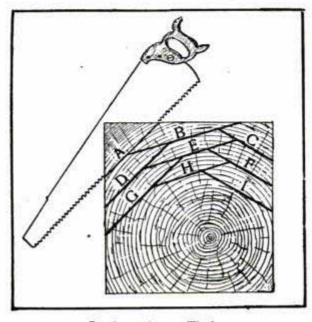
For instance, let a 6-in. board be sawed flatwise; that is, so the board will be cut across the broad side; then afterward turn the board up on edge and cut it off by sawing the short way through it. It will be found that on an average the board can be cut in two much quicker when the teeth pass the short way through the board.

Therefore the lesson to be thus learned is, that when sawing a large piece of wood, to so use the saw as to to make as short a cut as possible. In order to do this in the most practical manner a piece of timber of very considerable size should be cut by beginning at one corner and sawing to a reasonable depth. (See diagram marked A.) Then change the slant of the saw so the timber will be cut to the line B; then, as the cutting edge of the saw will begin to touch a wide surface, again shift the saw to another position, or slant, and cut inward to C, and so on D, E, F, etc., in their order, as shown. In this way the timber will positively be cut in two one-quarter to one-half quicker than if it were kept at one angle all the way through. Printing from Cracked Negative

avoid the teeth all touching across a broad surface at once, and to contrive

Very satisfactory prints may be obtained from cracked negatives, if the film is not injured. Place in the frame carefully and cover with tissue paper or ground glass to diffuse the light as much as possible. Rotating the frame during the printing operation is also beneficial. By making prints in this way the cracks will be hardly perceptible.—Contributed by J. W. Beardmore, 301 13th St., S.E., Washington, D. C.

An easy way to clean painted walls is to dampen a piece of flannel with a few drops of ammonia in tepid water, and wipe the surface gently.



Sawing a Large Timber

## Making Boiled Water Palatable

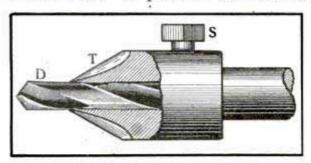
Typhoid fever is principally transmitted by drinking water. Boiling kills the germs, but such boiling renders the water flat and unpalatable. The following simple means can be applied by any housekeeper to make the family drinking water both safe and palatable. It is highly recommended by Professor Marsden Manson, of San Francisco, Calif., who has thoroughly tried it, says Cooking Club Magazine.

 Take exactly 2 gal. of water. If the water is not clear, beat up the white of one egg and add it to the water before boiling. This will gather up every particle of foreign matter in the water and carry it to the bottom. The water should be brought to a brisk boil and then stood aside to cool and settle.

2. Pour off the clear water and stir into it a level teaspoonful of bicarbonate of soda. Then stir in two-thirds of a teaspoonful of hydrochloric acid. This will make the water perfectly safe, sparkling and refreshing, without any flat taste.

# Adjustable Countersink and Drill

This tool is very useful for making center holes in work to be turned up in the lathe. A piece of tool steel is



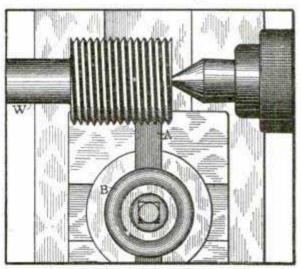
Adjustable Countersink and Drill

drilled to receive a small drill, D, which is held in place by a set screw, S. The cutting teeth, T, are made at an angle of 60°, or the same angle as the lathe center. These teeth may be cut on a milling machine and should be shaped like those of a reamer. The cutting end is to be hardened and tempered in the usual manner. The great

advantage of this tool is that the drill may be replaced if broken or it may be adjusted to any desired length.— Contributed by J. W. Beardmore, 301 S. E. 13th St., Washington, D. C.

#### Thread Chaser for Tool Steel

As tool steel often expands when hardened it is a difficult matter to cut threads which will be the exact size after hardening. Not long ago I had occasion to cut threads in tool steel, and knowing the peculiar properties of this material, allowed three thousandths of an inch for expansion. But



Chaser for Hardened Tool Steel

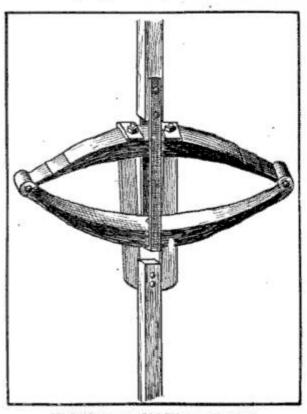
on trying the thread I found that it was too large.

Not wishing to go to the trouble of annealing and recutting the threads I made a chaser, A, of a piece of brass that would fit the tool post, B. A tap having the required number of threads was placed in the lathe and the brass was fed up against it. The work, W, was then placed in the lathe and flour of emery applied to the threads. The brass chaser was then brought up against the threads, thus reducing the size and giving them a good polish. In this way the threads were cut down much better and quicker than could be done by annealing and recutting .-Contributed by E. V., Menomonie, Wis.

To clean old medals, soak them in lemon juice for 24 hours or longer.

## Pump Rod Spring

This device will prevent the jerk in the plunger rod of a windmill pump. An old wagon or seat spring will answer the purpose very well and can be



Made from an Old Wagon Spring

fastened to the plunger rod by sawing out a piece of the rod about 2 in. longer than the height of the spring. The spring is fastened to the two ends of the pump rod by means of iron straps, the upper rod being fastened to the lower half of the spring and the under rod fastened to the upper half.—Contributed by H. C. A., Brooklyn, N. Y.

## Stock Solution for Preparing Sepia Paper

	FORMULA.	
A.	Carbonate of potash1	oz.
	Water	oz.
B.	Gold chloride	gr.
	Water7½	dr.

Mix solution A, stirring well, and allow to stand till clear. Then filter and bottle for stock. When wanted for use add to 10 oz. water 1 dr. of A and 20 drops of B, which amount will tone one sheet and give a warm sepia. The bath will keep.

## To Insert a Hose Nipple

When it is found very difficult to insert a nipple in a hose, such as an air brake hose, heat the nipple to a point where it will soften the rubber. The nipple can then be inserted without any difficulty, says a correspondent of the American Machinist, but it is well to have a bucket of water handy to immerse the end in as quickly as possible, so as not to spoil the hose.

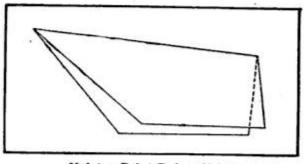
# Rendering Wall Paper Washable

This may be done either before or after the paper is hung.

Dissolve 2 parts borax and 2 parts shellac in 24 parts water and strain through a fine cloth. Apply to the paper with a brush or a sponge, and when dry polish to a high gloss with a soft brush. Washing will not remove nor smear the colors.

## Removing Cinders from the Eye

As a safe and efficient means of removing any foreign substance from the eye, a correspondent of the American Machinist submits a scheme successfully used by the eye doctor in his shop. A piece of letter paper is folded and cut with a sharp knife to an angle of about 30°, as shown by the sketch. The folded paper is then held between



Moisten Point Before Using

the forefinger and the thumb, and the point is slightly moistened on the end of the patient's tongue. Then that part which is cut at an angle is held at right angles to the surface of the eye and brought straight down over the eyeball until it comes in contact with the substance in the eye, which it invariably moves at the first trial. If the point is too sharp, bend it up a little on the thumb nail.

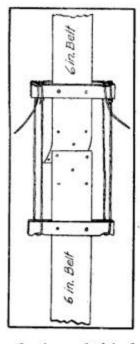
## Sawdust for Cleaning Hands

Sawdust is not only useful to put under automobiles or other machines to catch and absorb the dripping oil, but is also useful to "wash" greasy hands with, says Gas Power. The clean, porous, angular and finely divided wood makes an excellent absorbent and possesses enough grit to make it just the thing for working into creases and cracks and taking out the oil and dirt both by absorption and friction.

## Belt Tightener

The accompanying sketch shows an easily constructed belt tightener which was designed by a correspondent of the

American Miller: It four consists of pieces of wood which be anywhere from 2 to 3 in. wide and long enough to extend 4 or 5 in. each side of the belt to be spliced, and 3 in, thick. The ends should have the sharp corners cut off and slightly notched in, so that the rope will not slip off. Use a rope about 3 in, diameter or about the size of clothesline.

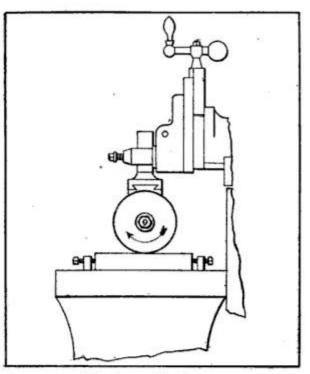


Place one of the wood pieces behind the belt above and below the splice, far enough apart to allow you to draw belt tight and have plenty of room to make the splice. Place the other pieces directly in front of the back ones and drive two 6d. wire nails through each and through the belt. Then take the two ropes; make a 'oop in each and place loop over the two cleats at top, one on each end. Run the rope down around cleats at bottom, then back around cleats at top. Pull up on bottom cleats and tighten ropes, and when sufficiently tight, wrap rope around upper cleats and throw half hitch over, and it is fast for splicing.

## Shaper Used as Surface Grinder

Many toolmakers have run up against the proposition of trying to do a smooth and accurate job of surface grinding with an old and worn-out machine, or else the machine is too small to handle the job.

A shaper can be very easily used for this purpose as shown in the above

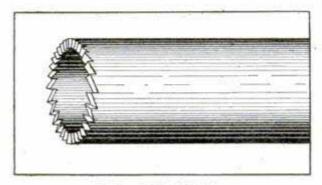


Grinding with Shaper

illustration. This method is far superior to the use of an old surface grinder, both for accuracy and convenience. The emery wheel is electrically driven and should rotate in the direction shown by the arrow. Care should be taken that no emery be allowed to get into the bearings, as this would quickly damage the shaper. Waste can be used to protect the bearings from flying emery.—Contributed by A. J. M., Denver, Colo.

## Enlarging Hole for Propeller Tube

The cutting off of rails, bolts or other metal when encountered in an auger hole in wood is always a nasty proposition. Let the length of the hole be something like 4 ft., and the obstructions the ends of some six or



Made of Steel Tubing

eight ½-in. bolts, and the job is all that can be desired in the way of cussedness, says a correspondent of the American Machinist.

We had a launch hull all ready for the engine when the customer suddenly changed his mind and decided that he wanted a reversible wheel instead of a solid one. In this case it was found that the tube of the wheel furnished with this make of engine was extra large, necessitating reboring of the shaft hole.

It was found that if the hole in the log were enlarged to the required diameter for the shaft tube it would be necessary to cut a little from the ends of the bolts, eight in all, and the hole was but 2 in. in diameter. It looked like a new wheel and shaft for Mr. Customer, who was a foreman in a large factory.

He said he would get a large twist drill and have a long shank fitted. When the drill came we started it, the lip of the drill got hold of the first bolt end, and we strained until the log threatened to split, without budging the drill. I wished that I was in the mining country and could run a diamond drill in that hole. However, the diamond drill gave me an idea. Procuring a piece of steel tube about 10 in. long, and the same diameter as the

hole required, I cut a series of teeth on one end, giving them a slight outward set. The teeth I then case-hardened. For turning the bit I attached to it a length of 3-in. pipe.

We bored in with a wood bit until a bolt was reached, and then cut the latter off with the cutter. It was slow business, but did the job. We had to reharden and sharpen the cutter several times during the job.

## Threading Pipe With Cold-Chisels

Some 25 years ago the piping went wrong at an important water station of one of the railroads entering Chicago. The Superintendent of Water Service, who is responsible for the following account of the incident, got together such men and tools as he could and hurried to the scene, says the Valve World. Arriving at the station he found the 4-in. wrought-iron pipe broken squarely off, only 2 ft. of water in the tank, and no means of getting a piece of pipe from any shop cut to length and threaded inside of 24 hours.

Unwilling to interrupt the water supply and determined not to acknowledge defeat until the last resource was tried, he cut a piece of pipe to length with cold-chisels, chalked the unthreaded end, placed it in line end to end with a threaded old piece of the same size pipe, and with a two-pointed tram, one point engaging the thread of the old pipe, the other ascribing on the chalked end of the blank pipe, he followed the thread with one point, always keeping the tram parallel with the axis of the pipe.

The path of the right-pitch thread was thus ascribed by the tram point on the chalked surface of the blank end of pipe requiring thread. The spiral scribe mark made by the tram was nicked with chisels, and deepened and made continuous, until at the end of an hour and a half a good thread was cut, the job put up without a drop of leakage and without interruption of

the water service.

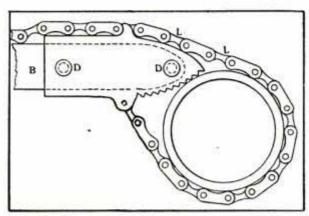
#### Air Mains

Pipes supplying air to rock-drills should be of a size to permit the passage of air at a velocity not greater than 25 to 30 ft. per second, while all bends and angles (especially short ones) should be avoided, as they add greatly to the friction of the air, and thus decrease the pressure. The friction of the air is proportional directly to the length of the pipe, and to the square of its velocity, says Compressed Air. For this service, pipes up to 5 in. diameter are provided with couplings; above that, with flanged joints made up with gaskets. Great care must be taken that these joints are perfectly tight, as the loss, even from a pin-hole, is considerable.

## Home-Made Chain Pipe Wrench

To make this wrench, procure a piece of old bicycle chain, A, and a steel handle, B, about 1 in. wide and the same thickness as the solid links, LL, of the chain. The handle should be about 15 in. long. Make two steel jaws, C,  $\frac{3}{16}$  in. or  $\frac{1}{4}$  in. thick, and rivet to the handle by the rivets DD.

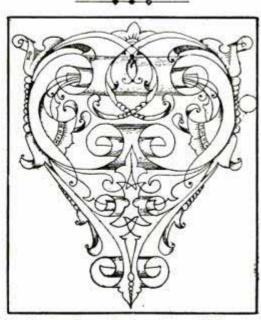
An old leaf spring or almost any flat piece of tool steel will furnish the necessary material for the jaws, which



This Works Well

should be cut nearly to size with a hacksaw and then finished by filing. If the steel is too hard to cut, anneal it by heating to a red heat and allowing it to cool very slowly. After shaping and drilling the jaws, harden and

temper to a dark straw color.—Contributed by H. L. G., Milwaukee, Wis.



Vehicle Design from Blacksmith and Wheelwright

## Pumping Without Attendance

A gas-engine-driven pumping plant requires very little attention, if one knows just how to manage. In a plant where there are two engines used for pumping water into a storage tank and located more than a mile apart, one being run during the daytime and the other at night, the operator lives about halfway between the two engines. At 6:30 a.m. he passes the reservoir and notes the amount of water and conditions in general, and then stops the engine that has run all night. At about 7 o'clock he starts up the other engine and then goes about his day's work. At 5 in the afternoon he starts up the night engine and then goes to the other and stops it. The engines require some intelligent attention while running, but not constant attention.

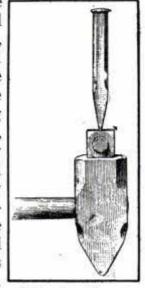
At another plant, the oil tank under the engine holds 20 gal. Only 11½ gal., sufficient for 10 hours' run, are put in the tank, however, and when this amount is exhausted the engine stops of itself, and requires no attention until ready to start up next day.

For white solder for silver use: Silver, 1 oz.; tin, 1 oz.

#### To Remove Fast Nuts

When it is found impossible to remove a nut by any other method, take

hammer, sledge a dull cold and chisel, as per sketch, and strike several blows, then change sides and hit some more, thus causing the nut to swell. when it can be easily This will removed. remove the nut every time, says a correof spondent the Blacksmith and Wheelwright, unless it is a very large one.



It can then be removed by heating to nearly a welding heat and cooling quickly in water.

## Locomotive Turned Without Turntable

Several years ago I found it necessary to turn a locomotive around to head in the opposite direction. ing neither turntable nor "Y" available, I selected a place on the railroad where there was practically no cut or grade and a tangent of about 200 ft. Placing the engine at the end of the tangent, I cut the track at the opposite end and swung it about 30 ft. (at the end) in a proper curve—keeping the last 60 ft. straight to hold the engine-and ran the locomotive to the end. Then I had the other end of the tangent cut and swung on the opposite side in the same way, and again ran the engine to the end. After repeating this process five times, I had the engine replaced on the track, headed the right way, the track, of course, being kept in gauge all the time and the curve in proper degree. Where the ground on each side can be utilized and the rail-joints are exactly opposite, the track can be reset in the opposite direction without drawing spikes at the end. The entire operation, including

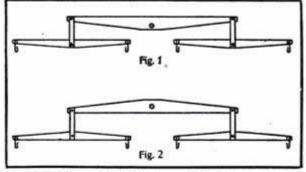
the rail connections, was done in two hours and was performed with lining bars and ordinary trackman's tools.—Contributed by G. H. Crumb, Bloomfield, Mo.

## Welding Compound

Borax, 10 parts; sal ammoniac, 1 part; grind or pound roughly together and fuse in a metal pot over a fire. Continue heating until all the froth has disappeared from the surface and then pour the clear liquid into any suitable receptacle to cool and solidify. When cold grind to a powder.—Contributed by Y. Pavlik, Jr.

## Correct and Incorrect Designs for Eveners

Many articles are designed for appearance at the expense of strength. This is true of the eveners used on wagons, which are often made with the taper on the side which bears the tension. The evener shown in Fig. 1 is designed for strength while the one shown in Fig. 2 is designed for appearance. The conditions in Fig. 2



Correct and Incorrect Design

are similar to those of a leaf-spring in which the short leaves are on the wrong side, because the grain of the wood intersects the tapered edge in much the same manner as the leaves do in a spring.—Contributed by G. M. L., New York City.

Brass and steel may be cleaned quickly and cheaply by rubbing with vinegar and salt, or with oxalic acid. Wash immediately and polish with Tripoli earth and sweet oil.



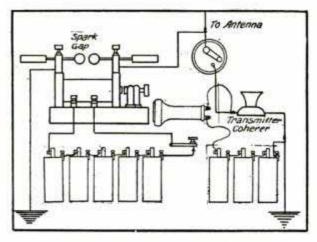
# **Amateur Mechanics**



## How to Receive Wireless Telegraph Messages with a Telephone

#### By A. E. Joerin, Wireless Telegraph Demonstrator

Any telephone having carbon in the transmitter (all ordinary telephones have carbon transmitters) can be used to receive wireless messages, by simply making a few changes in the connections and providing a suitable antenna. Connect the transmitter and receiver in series with three dry cells and run one wire from the transmitter to the antenna. Connect the other transmitter wire to a water or gas pipe in order



Wiring Diagram for Wireless Telegraph

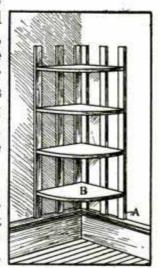
to ground it, and then hold the receiver to your ear. Any wireless telegraph message within a radius of one a new pen, such as moistening in the mile will cause the transmitter to act as a coherer, thus making the message audible in the receiver.

By using an ordinary telephone transmitter and receiver and a 1-in. jump spark coil, a complete wireless telegraph station can be made, which will send or receive messages for a radius of one mile. The accompanying wiring diagram shows how to make the connections. By putting in an extra switch three of the sending batteries may be switched in when receiving, thus obviating the necessity of an extra set of batteries.

## Easily Made Book Shelf

A very cheap but useful and attractive book shelf is shown in the accompanying drawing. The vertical strips,

A, may be 3 in. by 2 in, and are screwed to four shelves, B, each cut to the shape of a quarter circle. The screws are all countersunk and as the heads all come on the side next to the wall, they do not show. The design might be varied somewhat to suit the fancy of the builder, although the appearance of the shelf



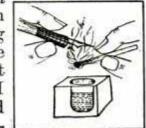
Corner Shelf

constructed as shown is very pleasing, especially so if the workmanship is good and the wood carefully stained and varnished. The total cost of the one I made was less than 75 cents.— Contributed by Geo. C. Murphy, 412 Critenden St., Owensboro, Ky.

# Breaking in a New Pen

There are many ways of breaking in

mouth, wiping on a blotter, dipping in the ink and rubbing on the edge of the ink well, etc., but the best way that I have found is to hold a lighted match un-



der the pen for just an instant and then plunge immediately into the ink. This will effectually remove all the oil or grease on the surface and, unless the pen is overheated, will not draw the temper.—Contributed by A. C. Pearson, Duluth, Minn.

## How to Make a Jump Spark Coil

By the New England Coll Winding Co.

The induction coil is probably the most popular piece of apparatus in the electrical laboratory, and particularly is it popular because of its use in experimental wireless telegraphy. Ten years ago wireless telegraphy was a dream of scientists; today it is the plaything of school-boys and thousands

of grown-up boys as well.

Divested of nearly all technical phrases, we may briefly describe an induction coil as a step-up transformer of small capacity. It comprises a core consisting of a cylindrical bundle of soft iron wires cut to proper length. By means of two or more layers of No. 14 or No. 16 magnet wire, wound evenly about this core, the bundle becomes magnetized when the wire terminals are connected to a source of electricity.

Should we now slip over this electromagnet a paper tube upon which has been wound with regularity a great and continuous length of No. 36 magnet wire, it will be found that the lines of force emanating from the energized core penetrate the new coil winding

almost as though it were but a part of the surrounding air itself, and when the battery current is broken rapidly a second electrical current is said to be induced into the second coil or secondary.

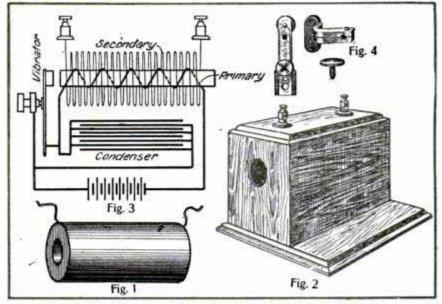
All or any of the parts of an induction coil may be purchased ready-made, and the first thing to do is to decide which of the parts the amateur mechanic can make and which would be better

to buy ready-made. If the builder has had no experience in coil winding it would probably pay to purchase the secondary coil ready-wound, as the operation of winding a mile or more of fine wire is very difficult and tedious, and the results are often unsatisfactory. In ordering the secondary it is always necessary to specify the length

of spark desired.

The following method of completing a 1-in. coil illustrates the general details of the work. The same methods and circuits apply to smaller and larger coils. The ready-made secondary is in solid evlindrical form, about 6 in, long and 2g in. diameter, with a hole through the winding 11 in. in diameter as shown in Fig. 1. The secondary will stand considerable handling without fear of injury, and need not be set into a case until primary is completed. The primary is made of fine annealed No. 24 iron wire cut 7 in. or 8 in. in length, as the maker prefers, and bundled to a diameter of 3 in. wires may be straightened by rolling two or three at a time between two pieces of hard wood. If the amateur has difficulty in procuring this wire, the entire core may be purchased ready-made.

After the core wires are bundled, the core is wrapped with one or two layers of manila paper. The straighter the wire the more iron will enter into the construction of the core, which is de-



Wiring Diagram and Parts of 1-In, Induction Coil

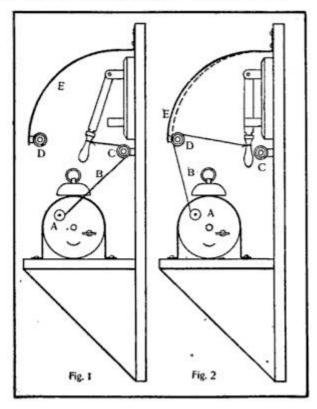
sirable. Beginning half an inch from one end, No. 16 cotton-covered magnet wire is wound from one end to the other evenly and then returned, making two layers, and the terminals tied down to the core with twine. Core and primary is then immersed in boiling paraffine wax to which a small quantity of resin and bees-wax has been added. This same wax may be used later in sealing the completed coil into a box. Over this primary is now wrapped one layer of okonite tape, or same thickness of heavily shellacked muslin. This completed primary will now slip into the hole in the secondary.

Should the secondary have been purchased without a case, a wooden box of mahogany or oak is made, large enough to contain the secondary with an inch to spare all around, with room also for a small condenser, but if it is not convenient to do this work, a box like that shown in Fig. 2 may be purchased at a small cost. A 3-in. hole is bored in the center of one end, through which the primary core projects \(\frac{1}{8}\) in. This core is to be used to attract magnetically the iron head of a vibrating interrupter, which is an important factor of the coil. This interrupter is shaped as in Fig. 4, and is fastened to the box in such a way that the vibrator hammer plays in front of the core and also that soldered connections may be made inside the box with the screws used in affixing the vibrator parts to the box. The condenser is made of four strips of thin paper, 2 vd. long and 5 in. wide, and a sufficient quantity of tin-When cut and laid in one continuous length, each piece of tin-foil must overlap the adjoining piece a half inch, so as to form a continuous electrical circuit. In shaping the condenser, one piece of the paper is laid down, then the strip of tin-foil, then two strips of paper and another layer of foil, and finally the fourth strip of paper. This makes a condenser which may be folded, beginning at one end and bending about 6 in. at a time. The condenser is next wrapped securely with bands of paper or tape, and boiled in pure paraffine wax for one hour, after which it is pressed under considerable weight until firm and hard. One of the sheets of tin-foil is to form one pole of the condenser and the other sheet, which is insulated from the first, forms the other pole or terminal. (This condenser material is purchasable in long strips, ready for assembling.)

The wiring diagram, Fig. 3, shows how the connections are made. This method of connecting is suitable for all coils up to 1½-in. spark, but for larger coils better results will be obtained by using an independent type of interrupter, in which a separate magnet is used to interrupt the circuit. Besides the magnetic vibrators there are several other types, such as the mercury dash-pot and rotary commutator types, but these will become better known to the amateur as he becomes more experienced in coil operation.

## **Automatic Time Switch**

This device can be used to either open or close the circuit at any desired time. An alarm clock is firmly fastened to a wooden bracket and provided with a small wood or metal drum, A, to which is fastened a cord, B. The other end of the cord is tied to the switch handle so that when the alarm goes off the switch is either opened or closed, depending on whether the cord is passed over pulley C or pulley D.



Will Open or Close Circuit as Desired

When the cord is passed over pulley C, as shown in Fig. 1, the circuit will be closed when the alarm goes off, but if it is passed over D the circuit will be opened. Pulley D is fastened to a piece of spring steel, E, which in operation is bent, as shown by the dotted lines, thus causing the switch to snap open quickly and prevent forming an arc.—Contributed by Douglass Royer, Roanoke, Va.

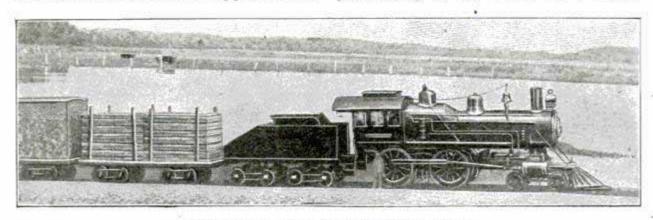
## A Neat Model Locomotive

Noting your description of a model locomotive made out of wood, I herewith enclose a photograph of a locomotive and tender complete made of brass, 52 in. in length including tender. Gasoline is used for fuel supplied from

on the cars are 5-cent ink bottles. The engineer at the side of the locomotive is a picture out of a magazine, and the picture of Hon. M. B. Cullum, Mayor of Duluth, appears through the cab window.—Contributed by Chas. Rigdon, Plumbing Inspector, Duluth, Minn.

## Protection of Spring Lock

After shutting the front door and hearing the spring lock snap into its socket, most people go off with a child-like faith in the safety of their goods and chattels. But the cold fact is that there is scarcely any locking device which affords less protection than the ordinary spring lock. It is the simplest thing in the world for a sneak-



The Locomotive Has a Speed of 6 Miles an Hour

a small tank in the tender; the boiler is made of 5-in. seamless drawn brass tube with one 3-in. brass flue running the entire length of the boiler. It is provided with steam brakes and steam whistle, springs and equalizing lever. Cylinders 1¼ in. by 2-in. stroke. Drivers are 6 in. in diameter. The locomotive will run on circular track with a speed of about 6 miles per hour, the gauge of the track being 5¼ in. The whole locomotive and tender weighs about 87 lb. and was made by the undersigned.

The enclosed picture was taken in a store window where the locomotive was put up for exhibition. The background consists of a photograph of a lake in Dakota cleverly arranged by the artist who took the picture. The roadbed as well as the cars are made up for the occasion from magazines. The wheels

thief to slip a thin knife between the door-casing and the strip, push back the bolt, and walk in.

Fortunately, it is equally easy to block that trick. Take a narrow piece of tin 3 or 4 in. long, bend it at right angles throughout its length, and tack it firmly in the angle between the casing and strip, so as to make it impossible to reach the bolt without tearing off the strip.

Another way is to drive nails through the strip at intervals of half an inch, enough to protect the bolt from tampering.

A good imitation amber may be made of the following ingredients, melted carefully together: Pine rosin, 1 part; shellac, 2 parts; colophony, 15 parts.



RECORD LOAD FOR 1907.—The record breaking load for the past winter was the one shown in the above illustration. It was brought into the mills at Tomahawk, Wis., a distance of four miles, and contained 20,000 ft. of white pine. It was hauled the entire distance by one team, except on the hills. The value of the load when sawed up was about \$500.

#### BLASTING A BIG BLUFF

It took 1,400 kegs of giant powder, poured into hundreds of holes drilled deep into the bluff for four months, but when the contractor touched the button, literally, the whole thing toppled into the Columbia river. All this happened opposite "Eighteen Mile Island," on the line of the new Portland and Seattle which "Yem" Hill is pushing down along the north bank of the Columbia. It cost \$6,000 to call that bluff, but the show-down was well worth the price, for now instead of an expensive tunnel, simple grading is all that is necessary at that point.

#### POULSON WIRELESS PRO-GRESSING

Vladimir Poulson, the Danish inventor, expects soon to establish wireless communication across the Atlantic from Denmark to America. He has erected a station a few miles from Copenhagen and an American station

will be completed in a few weeks. His system is based on "singing" electric waves which, he says, have inexhaustible power, where the spark system loses energy over long distances. Mr. Poulson first perfected his system for a distance of 40 miles, increasing it to 190, 380 and 760 miles; now he declares that he can operate over greater distances than the Atlantic's breadth.

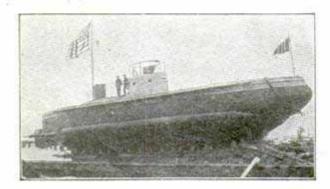
#### PLAN DEEP WATER CHICAGO TO ST. LOUIS

A depth of 24 ft. from Chicago to Peoria and 18 ft. from there to St. Louis is perfectly feasible, according to the report of the commission appointed by the governor of Illinois. He has sent the report to the state legislature and urges legislation to promote the project. That would mean a flow of 840,000 cu. ft. per minute through the Chicago drainage canal, and the development of 173,000 hp. available between Lockport and Utica—if the legislature agrees, and if the

Niagara Falls preservation society keeps still, and if Canada does not "view with alarm."

#### TO RACE UNDER WATER—PRIZE \$4,000,000

The most novel race for the largest stakes ever offered will take place under the waters of Narragansett Bay shortly. The contestants will be the



The "Lake"

pride vessels of two noted types of submarines, the "Lake" of the Simon Lake company and the "Octopus" of the John P. Holland type. The stakes, valued at \$4,000,000, are the contracts for the proposed new submarine warships for the United States government.

The contest cannot fail to be one of thrilling interest, but owing to the inconvenient location of the course, the spectators will be few. The first submarine flotilla, consisting of the "Porpoise," the "Shark," and the "Plunger,"



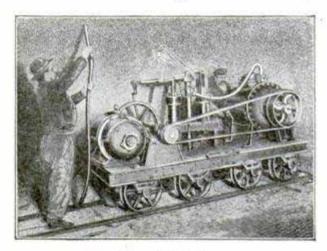
The "Octopus"

under command of Lieutenant Chas. P. Nelson, will be in attendance, and from observations made from these vessels the race will be decided. Both of the contesting vessels have been put in splendid trim, for the firms repre-

sented have long been rivals and more depends on the outcome than the mere awarding of the contracts which occasions the race.

#### A CEMENT INJECTOR

This is a French device for injecting liquid cement between the earth and the convex surface of the tunnels of the Metropolitan railway. As is evident from the cut, the cement is contained in the right-hand cylinder. An electric motor pumps compressed air into this, and so the cement is forced through the pipe and nozzle which the workman has thrust through a hole in the arch. It is expected that the



Cement Injector

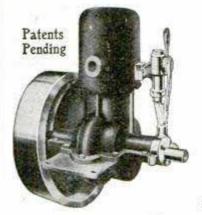
cement will be forced into all openings in the earth, and also spread out over the outer surface of the tunnel, thereby preventing the collection of waterpockets and seeping.

#### CAMELS ASSIST AUTOS

In a 5,000-mile automobile race through Asia and Europe from Pekin to Paris, to an important degree the success of the event will depend upon camels. Three weeks before the race begins a caravan of these "old reliables" laden with gasoline for supplying the competing cars will file slowly out of Pekin, to distribute the fuel supply along the full length of the course. Thus is the latest type of racing car dependent on the old-time "ship of the desert."

# SKIDOO! MARINE ENGINE

The 2-Cycle engine sensation of the year, entirely new design, improved and perfected in every detail, introducing many exclusive features which challenge comparison with any other engine of its class regardless of price.



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Complete Engine-

With Fresh Water Boat Fittings \$39.90

With Salt Water Boat Fittings 43.90



Weight, bare, 52 pounds; height from base 11¼ inches. Swiftest, most powerful, efficient and reliable engine of its size on earth. Drives Canoe, Rowboat or 14-20 foot Launch with load, 6 to 10 miles per hour. Easy to install and operate. Reversible—runs either way. Unfailing endurance powers—economical and safe—cannot back fire. Simple and compact in design, strong and durable in construction. Elevated gearless commutator of special design, plunger pump without visible pipe connections, perfect lubrication. Highest grade material and workmanship.

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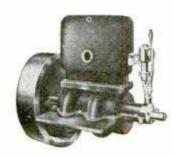
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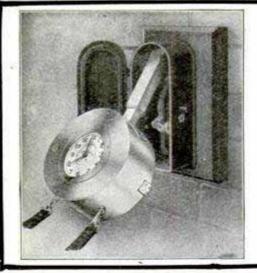
and in swiftness, power, efficiency and reliability of operation. Lowest in price, yet the only engine in the world which is sold subject to approval for 30 days' actual trial.

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Complete Engine with Fresh Water Boat	
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which run from \$5.00 to \$5.00 a hooding, and with your share bought more scales. Say you only bought one the first year, two the second, four the third, eight the fourth and sixteen the fifth year, you would have thirty-two scales in operation, worth \$3,200, besides a handsome profit for the work done. The first years you could look after the scales during spare time.

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GIRL AS LOCOMOTIVE FIREMAN.—Miss Henrietta Snyder, of Philmont, N. Y., has successfully passed the examinations of the Railway Educational Association of Brooklyn and secured a graduation certificate showing her competency to fire a locomotive. The young woman, who is 26 years old and very strong, wishes to become a locomotive engineer and has applied for a job as fireman. She declares that shoveling 6 or 7 tons of coal a trip would be child's play to her.

LIVING SKELETON POSED FOR OBESITY.—An exceedingly thin man taken up in Paris on a charge of vagabondage, said that his profession was posing as a model for obesity. He explained further: "Why, it was in this way: I was in the service of a manufacturer of chemical products which reduced obesity. I donned a mail of rubber which could be inflated like a pneumatic tube. Then I was photographed. Afterward my portrait was exhibited in a case with the inscription, 'Before treatment.' The rubber was then deflated a little, and another photograph was taken, entitled, 'After a month's treatment.' Finally, I was divested of my rubber 'garment, and a photograph of my original self taken. It was labeled, 'After two months' treatment.'

INCREASED USE OF MOTOR CARS.—M. Faroux, a French statistician, estimates that about 550,000 motor cars have been manufactured in the nine years since the experiments of self-propelled road vehicles first succeeded. These machines sold for more than a billion dollars. Until a year ago France, the pioneer, led the world in the production of the motor vehicle. Now the United States has taken the lead. According to M. Faroux, the United States built 60,000 automobiles in 1906; France, 55,000; England, 28,000; Germany, 22,000; Italy, 19,000, and Belgium, 12,000. In 1901 the United States built only 314 cars, and that same year France built 23,711. There are 20,212 automobiles owned within fifty miles of the New York city hall.

McADAMITE INSTEAD OF BRASS.—This is a new alloy, of which the base is aluminum but the exact composition is a secret. Although about ope-third the weight of brass, its tensile strength is double, and its resistance to compression nearly quadruple. The special field for its use, consequently, seems to be in manufacture of machinery, although its sonorous quality makes it a good bell metal also. Being non-corrosive, the new alloy will not tarnish, and it takes a high polish.



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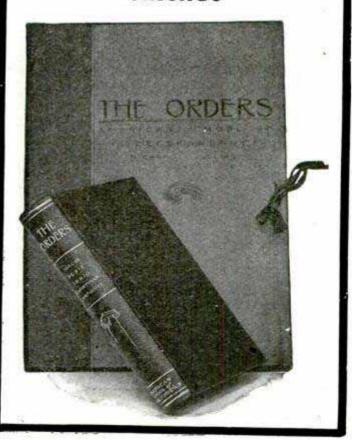
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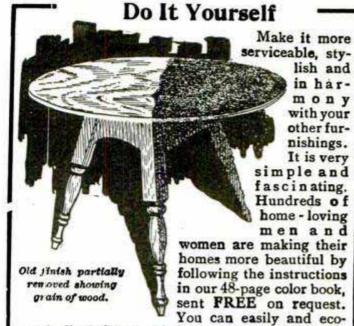
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My name is.....

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# (BARE)

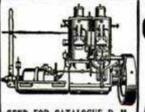


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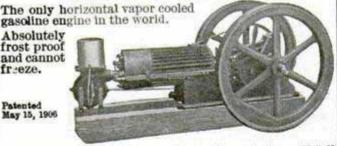
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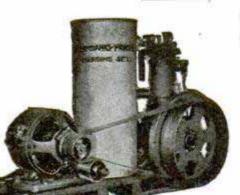
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The "first luff" plays the wiolin,
And "Jimmy-legs" the flute,
The bo'sun on a horn Francais
Is learning fast to toot,
The cook has bought a light guitar,
Of sweet and tinkling tone,
The captain in his cabin, too,
Has placed a graphophone.

Some lubber in the starboard watch Manipulates the bones, Manipulates the bones,
A concertina and a fife
The youngest middy owns,
But all the horns and other things
You bet are thrown away,
And every man is at his post
When the guns begin to play!
—Minna Irving, in The Blue Jacket.

STRAINS ON LARGE SHIPS.—It is generally believed that the ill-fated turbine destroyer which was lost some years ago off the East Coast broke her back because she was not strong enough to stand the strain of heavy seas. Some idea of the strain to which ocean liners are subjected is afforded in an article on the precautions which have been taken to protect the hulls of the new Cunarders. When the ends of six hundred feet ships are wave supported the vessel sags in the middle; when the wave is amidships the vessel sags at both ends. The effects of this longitudinal bending reveal themselves in an extraordinary way. In recent years rivets have been sheared on the topmost decks of ships, steam pipes have been broken, and plates buckled. To provide for the alternate lengthening and compression of the decks they are now cut in two or more places and sliding joints are provided. During an unofficial trial of one of the German-American boats in a heavy seaway, the sliding joints on the topmost deck were found to show a total movement of three-quarters of an inch, the joints closing up as the ship buried her head in an encoming sea, and opening out as the wave moved to amidships, while on the deck below the plating showed signs of buckling, and the oakum was squeezed entirely out of the butt joints in the deck planking. planking.



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A twin cylinder 7 H. P. Marine Motor used by M. J. Gould, of Dexter, N. Y., for 7 seasons. Sent to our shop for a new crank shaft.

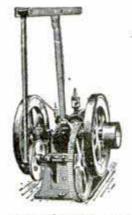
averaged 6000 miles during a season, making two round trips of 24 miles each day for six months, Sundays included, making a total of 42,000 miles without an accident.

A single cylinder 31/2 H. P. Stationary Motor used for 6 seasons during the summer months for driving cooling fans, sent to our shop for general overhauling and jump spark ignition.

STATIONARY AND MARINE MOTORS, 31/2 H. P. UP

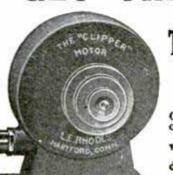
Economic Engine Works, 7 Fulton Street, Utica, N. Y.

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description and price. L. E. RHODES your water pressure is 25 lbs. or over, buy a

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The Engine you have been looking for; safe, sure and noiseless. A new and perfect model. Distinctly new and prominent features-Such as water cooled bearings making a large saving in grease. The grease being always stiff makes it easy to keep engine clean. Grooved shafts preventing blowing from case. End bearings having half boxes to take up wear. Crank pins have center oilers, all bearings babbitted with best babbitt. Workmanship and material the best. These new features make it a superior engine.

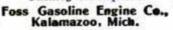
R. S. HILL, 24 Woodbridge St., E., Detroit, Mich.

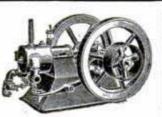
No Better Gas or Gasoline Engines made than the

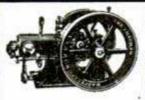
> FOSS ENGINES,

Simple, Substantial, Efficient

Catalog on request.







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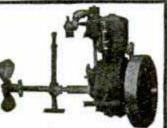
1½ horse, but tested to 33½ per cent above rated power.
DON'T buy a CHEAP engine; it doesn't pay. Buy the simplest, strongest and best designed engine at the lowest results retained. gine at the lowest possible price; that's right, we build them.

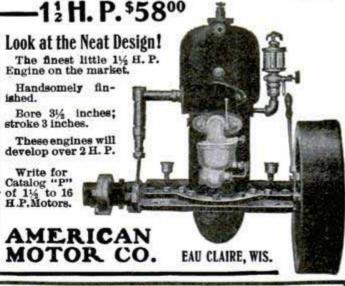
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High-grade MARINE and AUTOMOBILE ENGINES 2 to 30 H.P. 2 and 4-cycle, latest improvements; best ma-terial; lowest prices. Also sell castings, with drawings.

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It's cheaper in the end. (That's what my customers say.) My 3 H. P. Engine drives 22 launch. Price with full launch outfit, shaft, propeller, tank, batteries, coil, piping, etc. No extras. Everything furnished \$110.

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RACE BETWEEN TRAIN AND BARN .- That is a good RACE BETWEEN TRAIN AND BARN.—That is a good deal like the old story of the race between the hare and the tortoise, and strange to say, in this case also the tortoise won. It was a heavy freight on a down grade, and the barn was a big one which was started rolling down a steep hill by a high wind toward the track of the Chesapeake & Ohio railroad. The engineer saw it rolling, and although it was nearly half a mile away, knew he could not stop his heavy freight in time, so he put on all steam. Almost safe, but not quite. The big barn just struck the caboose, demolishing that and itself. Nobody hurt, for the crew jumped in time.

TRAGIC REALISM.—Butchered to make a moving picture holiday was the fate of William Zeitz, an actor, near Londen. Bound too securely to a railroad track, he was literally ground to pieces by an express train and strewn along the road bed, his blood spattering the frantic photographers who had placed him there to be the central figure in an imaginary train-wrecking scene. Arrangements had been made with the railroad company that all trains should stop at a given point while pictures were being taken, but somebody blundered, and poor Zeitz paid the penalty. Two of the photographers fainted and were taken to the hospital; the rest of the party were arrested. Some one ought to suffer for a blunder which was worse than a crime, and in England he probably will.

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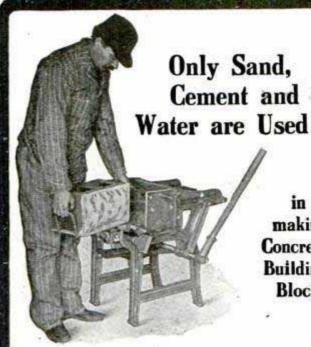


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Bearings are made of the best copper hardened babbitt. Crank shafts made of hand forgings turned out of the rough by us. Connecting rods made of bronze. Equipped of a float feed carburetor of our special design. We use only the best grade of oilers, coils, and plugs which is a very important factor to insure satisfactory results. We guarantee this engine to turn a 16 inch 2 blade propeller 800 revolutions per minute. Judge the speed by the model of your boat. Send for catalogue and agency proposition. Sizes from 1½ H. P. to 30 H. P.

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#### No Experience Necessary

Only common labor required. With our instructions the beginner can make as good blocks as an experienced mechanic.

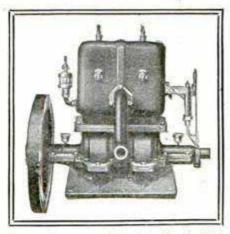
Concrete is stronger, warmer, more attractive and better in every way than brick or stone, and complete in a house costs no more than a frame structure. One barrel of Portland Cement will make about sixty of these beautiful blocks 8x8x16 inches. Send for our new illustrated catalog of machines for making the blocks. It tells all about mixing, etc,

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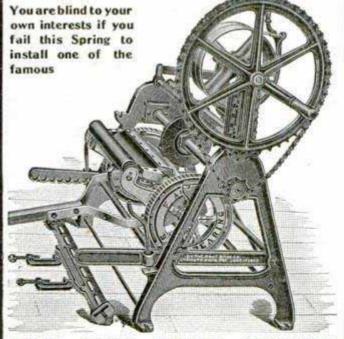
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Engines that are put up right are built on scientific principles and are built to run as well as to sell. build all sizes.

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and sharpen your Lawn mowers in the only up-to-date, rapid, accurate and scientific way. The 1907 model is now ready and contains features that make it useful the year round. We can't begin to mention them here, but a postal will bring full description price, etc. Ask your jobber about this machine.

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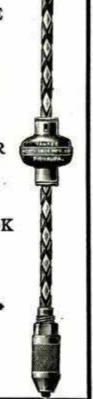
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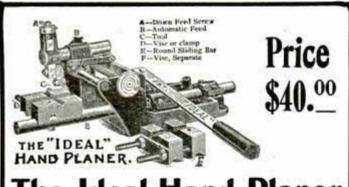
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SAINT CLAIR MOTOR CO., Dept. E. DETROIT, MICH.



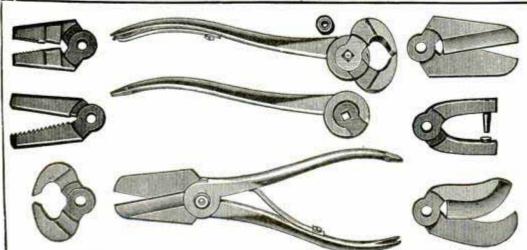
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IS MADE BY THE

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By the time these lines are in print a steamer will be hastening from Cape Town to rescue eleven victims of the hope deferred which makes the heart sick. They are huddled on a desolate island in the southern Indian ocean, buffeted by Antarctic blizzards, subsisting precariously on seal and penguin for five months, and unaware that deliverance is at band. These eleven men are the remnants of the crew of the Norwegian bark "Catherine," and they will owe their rescue primarily to the endurance and persistence of Captain Ree and two companions. The three men were selected to make the attempt to reach Australia, 4,000 miles away, in a 20-ft, dory, and for 1,000 miles their little boat was swept by savage seas before they were picked up by a passing ship. Many times they gave themselves up for lost.



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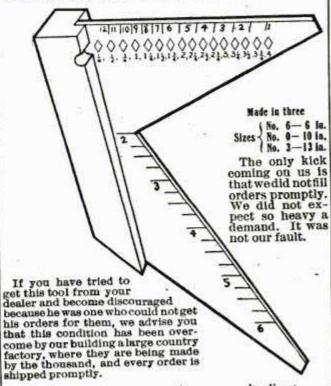
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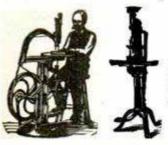
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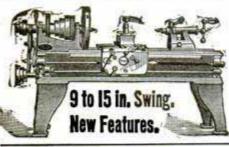
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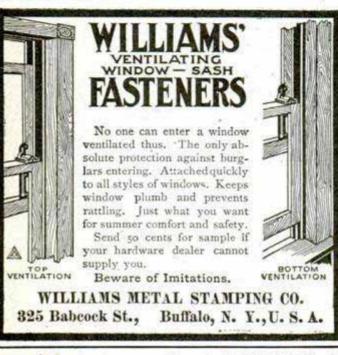


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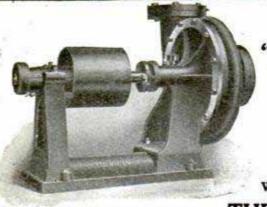
BULL FIGHTER KILLED,—Sunday the 13th, was a great day at the bull ring, and after some brilliant work by the matadores, Antonio Montes, one of the public's favorites, was caught and thrown by a bull after he had delivered the death stroke. Montes received injuries about the legs and abdomen which later proved fatal. Montes had had trouble getting this bull, a native Mexican product, into a good position for the fatal thrust, and when he finally did so, after much maneuvering, he himself was backed up against the wooden fence which surrounds the ring. He killed the bull beautifully, but in the animal's final lunge and in his dying rage, the bull caught and threw the matador three times, inflicting the fatal hjuries. After preparing the body for shipment back to Spain, where all good bull fighters come from, and where they are always buried, it was placed in the chapel of the Spanish cemetery in this city, where, through the carelessness of the guard, the candle was allowed to fall over and set fire to the draperles, burning down the chapel and cremating the body of the bull fighter. Aside from the natural interest in such an event and the stirringly dramatic features of the fight, death and cremation, it was one of the most interesting sights to see the crowd of Mexicans of all classes, from the highest to the lowest, which hung about the house where the dying favorite lay. This crowd was never less than 200, and often greater than 2,000, a most interesting commentary on the statement, often heard, that bull fighting as a sport is on the wane in popularity here. However, some little agitation, backed by well-known people, has been begun looking toward a permanent closing of the bull rings. What the result of this talk and the petitions will be cannot be forecasted, but the fact that this was tried once before and was a signal failure, and also that a new steel ring has just been built and will be ready for occupancy next year, point to a probable failure of the agitation.—Modern Mexico.

## LATH

9 to 13 inch Swing

List price, \$65.00 and up according to size. When ready to buy send for Lathe Catalog and prices

W. F. & John Barnes Co. 100 Ruby St., : : Rockford.III. SLEEPS ON BELT; CRUSHED TO DEATH.—Oliver B. Sinnison, night fireman at the street railway power house at Hagerstown, Ind., was crushed to death between a broad belt and a flywheel, recently. The unfortunate man laid down on the belt to sleep after a hard night's work and the night engineer, who was oiling the engine preparatory to starting up for the day's run, not seeing the sleeper, opened the throttle. The big wheel made a half revolution and the fireman's body was crushed to a pulp.



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Deep well pumping machinery. Air compressors for all duties.

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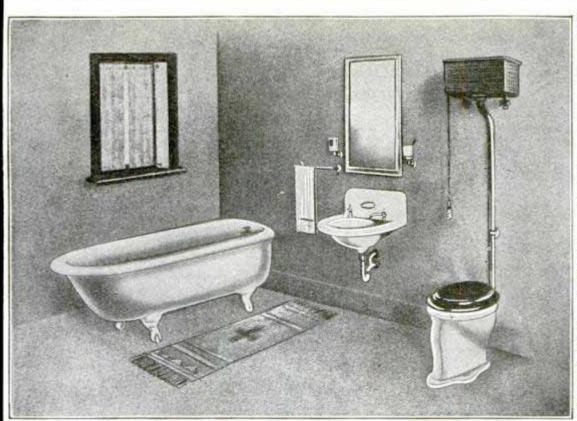
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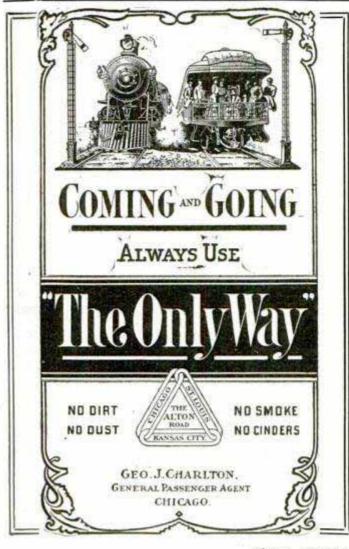
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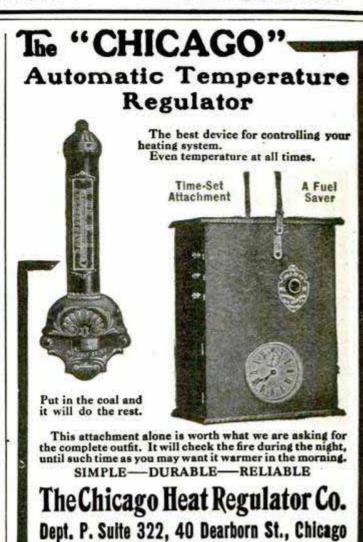
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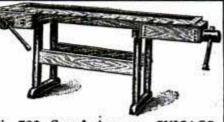


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#### THE ENGINEER.

Who comes with Faber sharpened keen, With profile long and sober mien, With transit, level, book and tape, And glittering axe to swat the stake? The Engineer.

Who sets the level, bends his spine, Squints through the glass along the line, Swings both his arms at rapid rate. Yells, "Hold that bloomin" od up straight?" The Engineer.

Who raves and snorts like one insane, Jumps in the air and claws his mane, Whene'er he sees a scraper take A whack at his most cherished stake? The Engineer.

Who swears he'll charge "an even ten" For stakes destroyed by mules or men While on all fours he tries in vain To find the vanished stake again?

The Engineer.

Who saws the air with maddened rage, And turns with haste the figured page, And then, with patience out of joint, Ties in another "reference point?"

The Engineer.

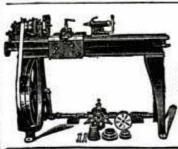
Who calls it "your unrivalled gall,"
Whene'er you kick for "overhaul,"
And gives your spine the frigid chill
Whene'er you spring an "extra bill?"

The Engineer.

Who deals with figures quite profuse; Then tells you solld rock is loose; That hard-pan's nothing more than loam, While gumbo's lighter than sea foam? The Engineer.

Who, after all, commands our praise (In spite of his peculiar ways). While others harvest all the gains That spring from his prolific brains?

The Engineer.



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SOLDERENE COMPANY,

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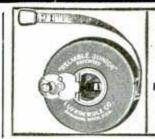
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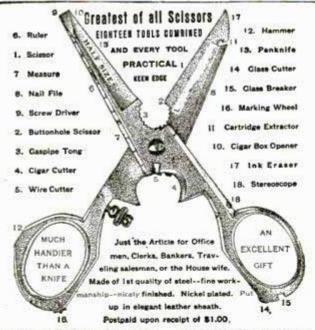
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While Mr. Lawson and Mr. Rogers are making money and having fun by putting copper at a price which causes everything connected with the motor to climb up into the clouds, I recall a story a friend of mine told me illustrative of Mr. Lawson's quickness of repartee. The only Thomas was being borne to his magnificent summer home near Marblehead in one of the fastest motor-boats in New England waters, when, as he passed a smaller launch, a rather pretty but decidedly pert young woman hailed the Standard enemy with, "Hullo, Tom, how's copper?" Instantly came the retort, "Great. How's brass?"

A lady who went on the oshen
Said, "My, what a terrible moshen!"
She turned deadly pale,
As she leaned on the rail,
And said, "Oh, good land o' Goshen!"

When you varnish your boat remember: One coat of varnish never cracks, Two coats of varnish seldom crack. Three coats of varnish often crack. Four coats of varnish always crack.

A LEADING QUESTION.—"Are you a married man?" asked the lawyer, who was doing the cross-examining. "No," answered the witness, who had one arm in a sling and traces of the strenuous life on his face. "I was run over by an automobile last week."—Chicago News.

DIFFERENT.—"My wife simply pelted me with beautiful flowers when I came home from the club last night." "How nice!"
"Not much. They were all in flower pots."—Milwaukee

Sentinel.

Tarantula Tom: "Why did Bill plug the tenderfoot?"
Lava Bod Pete: "It all comes of Bill's distressing ignorance o' legal terms."
T. T.: "How uz that?"
L. B. P.: "Well yer see that'er tenderfoot sold Bill some corn and he was sorter slow about payin'. So the stranger writ him a letter saying, 'I will draw on you at sight." Bill that the meant gun play, so when he meets the stranger he draws first. It was a misunderstandin'."—Grain Dealers' Journal.



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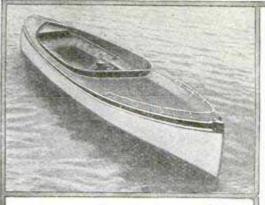
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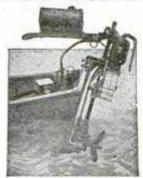
They are built of smooth, pressed steel plates, with air chambers in each end like a lifeboat. The smooth, steel hull has handsome lines, and glides through the water with the least possible resistance—they are faster, more durable and safer—they don't crack, leak, dry out, or sink, and are elegant in design and finish.

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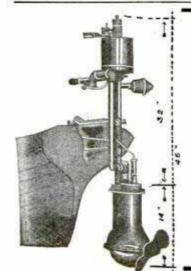
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LARGEST BOOK IN THE WORLD.—The largest book yet printed is a colossal atlas of beautifully engraved ancient Dutch maps. It takes three men to move it from the giant bookcase in which it is stored in the library of the British museum. This monster book is bound in leather, magnificently decorated, and is fastened with clasps of solid silver, richly gilt. It is unlikely to be stolen, however, for it is nearly 7 ft. high and weighs 800 lb. This, the largest book in the world, was presented to King Charles II. before leaving Holland in the year 1660.

SAVED BY HANGING.—Hanging at a rope's end has ended many lives, but it is something new to read of two men saved from imminent death by hanging from opposite ends of the same rope. The rope was looped over a point of rock on Scawfell Mountain, England, and its ends were fastened to the waists of two tourists, one of whom had slipped and dragged the other after him. There the two men hung helpless, two awful pendulums of life and death, swinging over a sheer drop of hundreds of feet. Not until the pendulums had marked off several hours, during which they expected momentarily to feel the rope give way, were they discovered by accident and rescued with difficulty.

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THE CALL OF THE FUTURE.—One of the greatest railway men in the world has predicted that within twenty years the steam locomotive will be found only in museums, and that its place will be supplied by the electric motor, propelling trains across the continent at the rate of seventy-five miles an hour. Such a possibility as this strkingly illustrates the astonishingly rapid rate of development in which the mechanical world is progressing. The nineteenth century was the age of steam; the twentieth century is to be emphatically the age of electricity.

No one can safely predict the limits to which electrical development will proceed, but it is safe to say that at the end of this century conditions of life upon this globe will be wonderfully changed from those which now exist, by reason of the increased ability of man to control this mysterious but marvelous force to his advantage.

Some discontented ones will tell you, young man, that the more labor-saving devices human intelligence produces, the smaller are your chances of success. This is the dismal plaint of short-sighted, small-souled pessimism. Beware of it.

It was considered a labor-saving device to build the

dismal plaint of short-sighted, small-souled pessimism. Beware of it.

It was considered a labor-saving device to build the steamship, but the steamship has brought the whole world into four very close and compact corners. It was considered a labor-saving device to build a locomotive, but the locomotive takes you to the open plains, the fertile valleys and the gold-lined mountain sides, so you can reach the harvests of the Almighty, which, had you relied on your tired legs, could never have been gained. In the near years to come New York will be one in a mighty chain of great cities. Fifty years ago San Francisco was only a village of shacks. Thirty years ago the Omaha, the Kansas City, the Seattle, the Los Angeles of today, were only misty dreams of the few who dared to look to the future with faith.

The boy of today has little to fear that the field is becoming overcrowded in our own country. It is just being opened. It is for the young men who are just beginning to think what a wonderful world this is, to study well the achievements of the past and to see in what manner they are to be improved.

Never did the world call more loudly, more insistently, for young men with force, energy and purpose—young men trained to do some one thing—than today. And every year that cry grows louder, more insistent.

But the times demand men of large, liberal, energetic minds, and the man who insists on doing business in the old-fashioned, humdrum way is as much behind the procession as is the man who insists on traveling with an ox team instead of by railway.

No opportunities today?

Young man, when a small-souled pessimist hisses that lie at you, give him the laugh, and dig in for your big share of God's great goodness to this age of ours.—Toledo Times-Bee.

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Mr. Parker on November 1, 1903, after having been a member of the Examining Corps of the U. S. Patent Office for over five years, resigned his position as Examiner to take up the practice of Patent Law.

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DO PATENTS PAY?—That they do, and handsomely, appears certain from a few instances selected from the many thousands of patented articles. Of course, exact and reliable statistics on this subject are not easily obtained, but the following figures are pretty close to the amounts realized: Sewing machines, \$3,000,000; linotype machines, \$1,300,000; screw bottle and glass ball stopper, \$1,000,000; steel umbrella rib, \$800,000; Westinghouse brake, \$600,000; iron boot-protectors, \$500,000; knife cleaner, \$400,000; automatic weighing machine, \$375,000; automatic inkstand, \$250,000; tag on shoe strings, \$150,000; walking toys, \$140,000; pigs in clover, \$100,000; rubber pencil top, \$100,000; label tag, \$100,000; pencil sharpener, \$75,000; glass lemon squeezer, \$50,000; corset busks, \$50,000.

PULLS TEETH WITH HIS FINGERS.—The street peddler had displayed on his little table the following sign, according to the London Telegraph:

"A box of this cement given free to anybody who can break any of these apart."

There were spools, blocks of wood and other articles that had been cemented together. Most of them bore marks of having been struggled with by persons whose hands were grimy, in vain attempts to wrench the pieces apart.

A swarthy little fellow who had stopped in front of the fakir's stand pointed to a round peg that appeared to have been dipped in the cement and driven into a good sized chunk of wood, and asked him what would be the reward for pulling it out.

"If you can pull that out," said the peddler, "I'll give you a crown."

The peg projected a little more than a quarter of an

you a crown."

The peg projected a little more than a quarter of an inch above the block.

The swarthy little fellow placed his left hand on the block to hold it down, took the peg between the thumb and forefinger of his right hand, and pulled it out with apparent ease, a portion of the wood coming away with it. "Bless me!" gasped the man behind the table, "What are you?"

"Me Japanese dentist," replied the little fellow, pocketing the silver and walking away with a grin on his face.

Japanese dentists use their fingers for forceps, and a part of their training consists in evergises and work which

part of their training consists in exercises and work which develop an amount of power in their hands which would be incredible if it were not so well authenticated.

\$25,000,000 IN CASH immigrated into this country last year. It came in the pockets of a million immigrants, and doubtless the inspectors would testify that some of it was tainted, but it was good enough to go into circulation and the savings bank. Probably there was as much more which the cautious travelers did not think it safe to show.

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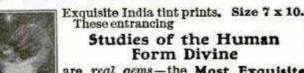
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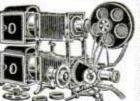


HARD MEN CUT HARD WOOD .- The operatives in the South American mahogany camps require to be men of considerable nerve power. For the most part they are native Indians and Caribs, but the "boss" of each camp, who requires brains as well as nerves, is almost invariably a white man. In many cases, too, he is a white man who has had occasion to quit his own country rather hurriedly, leaving behind him a reputation sufficiently besmirched to make his return undesirable—from his own point of view. So at least the following incident would seem to show: seem to show:

At Karata, a settlement near the mouth of the Wawa, while on my way to some saw mills, I made the acquaint-ance of a middle-aged American—a hardy, very jovlal, and apparently genuine fellow, whose name I will give as Brown, and with whom, I must admit, I came to be quite favorably impressed. I learned that he had once been master of a large merchant vessel registered in New York, although now he was "boss" of a mahogany camp, for the time being taking a vacation; and as I was indebted to him for not a little advice regarding the preservation of health in the rather swampy mahogany regions with which he was so well acquainted, and which I was visiting for the first time, on my return to Karata I made a point of seeking him out and thanking him for his very useful guidance. He was seated at the door of Karatas' only (Continued on page 704.)

(Continued on page 704.)

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(Continued from Page 702)

"saloon" when I met him, and, thrusting an empty sugar box towards me, he bade me be seated.
"This is Wilton, a friend and countryman of mine," said he, jerking his head towards his companion; and Mr. Wilton gave me a hearty handshake, but a rather surly look, which, however, softened noticeably as soon as I mentioned the word "whisky."

"Are you in the mahogany line, too?" I asked.
"Yes'm," he grunted. "Boss of the next camp to Captain Brown's."

Then Captain Brown solicited my impression of my upriver journey, which I duly gave him,
"Where did you put up?" he asked, as soon as I had con-

cluded.

cluded.

"At Courtney's," I replied, "and a more obliging man I never came across in all my life."

"H-m!" came from the captain.

"Yes, and I don't think I ever met a better-looking man, either," I went on, "At first I couldn't make him out at all. He seemed so refined—far too well educated a man to be a mere saloon-keeper. But they told me afterwards that he had robbed a bank in the States where he was employed—forty thousand dollars, I think it was—and that explained it."

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strained cough, Wilton put his hand swiftly to his hip pocket; but Captain Brown as swiftly grabbed his countryman's wrist, the while he whispered something into his ear. Then the skipper's big foot trod upon my toes with such force that I could have howled out with the pain. I couldn't for the life of me imagine what it meant, but it was a hint of some sort, that was evident, so I took it, and became silent. Later on, in Wilton's absence, the captain explained. and became silent. captain explained.

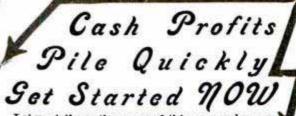
"I wonder he didn't put a bullet through you," he smiled. "He meant to, at first, Wilton is Courtney's brother under another name, and they did that bank job

together.

"You must keep a close tongue in your mouth about here," he continued. "Courtney was followed down here by a Pinkerton detective. He couldn't arrest him, but he put a six-shooter under his nose and scared Courtney into

(Continued on Page 706)

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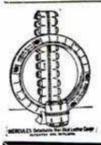
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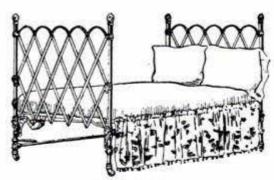
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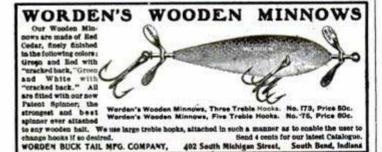
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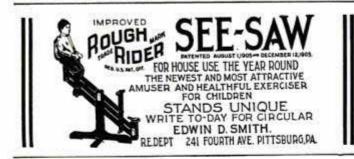


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#### (Concluded from Page 704.)

giving up a portion of his haul; and Wilton at first took you for another Pinkerton chap come after the balance."

Then I understood why Wilton's hand had gone to his hip pocket so swiftly. I was surprised, naturally, for there was no likeness between Wilton and Courtney, nor anything else to suggest a connection. But what surprised me most was Captain Brown's subsequent confession. "We're none of us angels down here, you know." he said, smiling blandly. "We stay here because we're obliged to—not for our health. I'd very much like to have another peep at a certain little New Jersey village, but I daren't move that far. I should be nabbed. You see, I was running the company's ship from New York to South American ports for many years, and all of a sudden I got sick of it. It was timber I was carrying, and I just steered for Cuba, where folks don't ask awkward questions, docked there, found one buyer for the timber and another for the vessel, both at half price, and—well, here I am."

Thereafter I resolved that, at least during my stay in those wild regions, I would reverse the usual sentiment and look with suspicion upon every one with whom I might change to much shoulders with the shead where himself.

look with suspicion upon every one with whom I might chance to rub shoulders until he should prove himself worthy of my better opinion.—Manchester (England) Evening News.

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ADVERTISING THAT TELLS. OR HOW TO ADVERTISE IN A SMALL WAY SUCCESSFULLY.—By Geo. Carl Marcs. Illust., 206 pp. Price, 50 cents, Guilbert Pitman, 85 Fleet St., London.

FORMS FOR CONCRETE CONSTRUCTION.—By Sandford E. Thompson. Bulletin No. 13 published by the Association of American Portland Cement Manufacturers, Philadelphia. Copies free on request.

AIR BRAKE CATECHISM.—By Robert H. Blackall. Nearly 400 pp. Illustrated by folding plates and diagrams. Price, \$2.00. A complete study of the Westinghouse equipment, including the Schedule E T Locomotive Brake Equip-

ment; the K (Quick-Service) Triple Valve for Freight Service, and the Cross-Compound Pump. Nearly 2,000 questions and answers. The Norman W. Henley Publishing Company, New York.

IGNITION, VAPORIZATION, INSTALLATION AND OPERATION OF A GASOLINE MOTOR.—Published by United Manufacturing Company, Detroit, Mich. Price, 10 cents. A booklet acquainting the purchaser of a boat motor with a practical knowledge of the principles in the installation and operation of the same.

MODERN STEAM ENGINEERING in Theory and Practice. By Gardner D. Hiscox, M. E. Illust.; 487 pp. Cloth. Price, \$3.00. A complete and practical work dealing with all the branches with which a modern engineer must be familiar. Forty-two tables of the properties and application of steam in its various uses are included, also nearly 200 questions and answers. The Norman W. Henley Publishing Co., New York.

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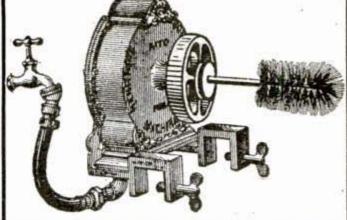
CEMENT-MAKING MACHINERY.—A handsome illustrated catalog published by Power & Mining Machinery Company, Milwaukee. All the apparatus used in Portland cement factories are described.

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EQUIPMENTS AND SUPPLIES for Contractors. Railroads, Mines and Mills is the title of a large cloth-bound, illustrated catalogue published by the Henry J. McCoy Co., New York. The book is exhaustive in its line, contains many tables and other valuable information, and is fully indexed.

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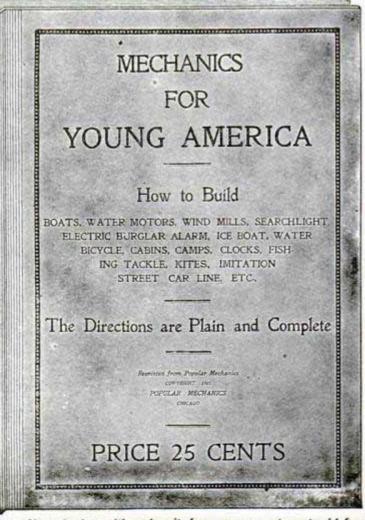
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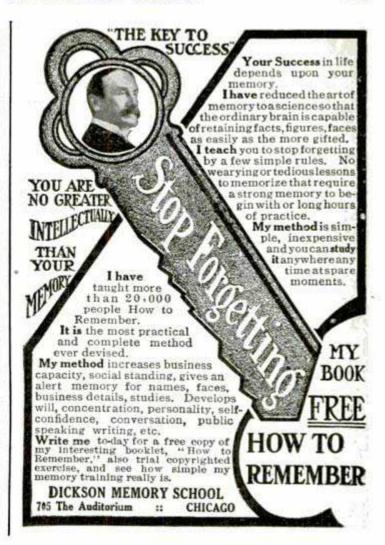
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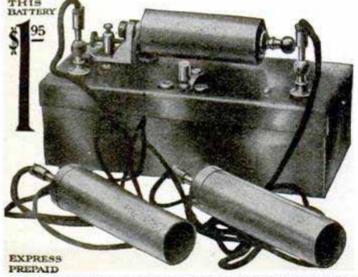
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THE STUDY HABIT.—This was the subject of a speech by Elbert Hubbard, delivered at the banquet which was part of the notable exercises during the celebration of its fifteenth anniversary by the International Correspondence School. In part Mr. Hubbard said:

The other day in Chicago, I called on a professor of physics; and when you call on a professor of physics, you must talk about electricity. If you don't know what to say, I will tell you what you will say. It is this: "Oh, electricity! a great mystery! Nobody knows anything about it! It is manifestation!" That is what you will say—unless he says it first.

unless he says it first.

You are perfectly safe in saying this. You will never shock anybody, ladies present, or young men present; it is all right. "Electricity is a great mystery; nobody knows what it is." I was just going to say it when he said it. "Good by," I said.

I walked down the steps and caught a trolley car. Over the head of the motorman I saw a sign, "Don't talk to the motorman." This suggested an interview. And so I said, "Pardner, what is electricity?" "The juice," he said. He

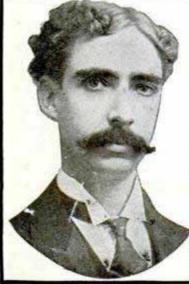
"Pardner, what is electricity?" "The juice," he said. He knew.

I asked, "Where do they get it?" "Oh!" he said, "it's everywhere. It allus wuz. Edison didn't invent it." "Well," I said, "where do you get it?" "Oh!" he says, "it's everywhere. It's God's greatest gift to man." I said, "I thought woman was God's greatest gift to man." I said, "I thought woman was God's greatest gift to man." "Same thing," he says. "Electrical manifestation. Very dangerous if you don't know how to handle it." (Laughter.) "Why," he says; "look here." He gave the wheel a turn; the car shot forward. "What?" I said, "does electricity make this car go?" He said "Yes." I asked him "How?" He explained it to me. He says, "I have taken the Electrical Course in the International Correspondence Schools. I know." (Laughter.)

He says, "I am getting ready for a better job." He carried us ten miles in perfect safety. We stopped a dozen times—stopped within six inches of where we wanted to stop. I got off the car. "Good by," I said, as I jumped off. "Good by, pard," he said. He didn't even look up at me. He didn't know I was the great literary light. (Laughter.) He didn't care. He was just intent on doing his work. I looked back at him, and I said, "There goes an educated man. He is 'on' to his job." And the educated man, boys, is the man who is "on" to his job, and who is getting ready for a better job.

What do I care whether he has had any college course or not? I don't care whether he has been to Syracuse. I don't care whether he has been to Syracuse. I don't care whether he has been to Syracuse. I don't care whether he has been to Syracuse. I don't care whether he has been to Syracuse. I don't care whether he has "Litt. D." behind his name, as this gentleman first on the program, or "Big D." No. If (Continued on page 718.)

(Continued on page 718.)



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WHEN YOU WANT ANYTHING AND DON'T KNOW WHERE TO FIND IT WRITE POPULAR MECHANICS (Continued from page 712.)

he is "on to his job, if he carns a living, if he adds to the wealth and to the happiness of the world, and if he is

getting ready for a better job, he is an educated man.

There is no science of education. If there were a science of education, you could take so much boy and so much curriculum, and mix them, and produce so much truth and so much economy; but when you send your boy to Phillips Exeter, for two years, and Harvard for four—and when he comes back, and you have to support him the rest of his life, you cannot say that there is any science of education.

The science of education is a little like the law of heredity. The law of heredity is that law of our nature that provides that a man shall resemble his grandmother,

or not, as the case may be. (Laughter.)
You know, and I know, that some of the best educated men in the world today are men who never had college advantages; and you know, and I know, that the men who have struck "thirteen" in every department of human and a struck "thirteen" in every department of human college were not college men. What college taught Line who have struck "thirteen" in every department of human endeavor were not college men. What college taught Lincoln the art of statesmanship? What college of art taught Rembrandt how to mix his wonderful colors—the greatest portrait painter the world has ever seen—dead and turned to dust two hundred and fifty years ago, and we cannot even imitate him today. What college of oratory taught Ingersoll how to make a speech? What college taught John Mitchell how to marshal forth and influence four hundred thousand men—half a million men, and cause them to march on and on to human betterment—to own themselves? (Applause.) What college taught our dear friend here, how to set a million men learning the Study Habit? Why, these men were self-taught; and every man at the last.

to set a million men learning the Study Habit? Why, these men were self-taught; and every man at the last, who has an education, is self-taught.

College cannot give you an education. You can send your boy to college, but you cannot make him think. There is a difference between going to college and being sent to college. And the hope of the world lies in this: that the educated men of the world know the futility and the foolishness and the fallacy of so much that has passed for education in the days gone by.

There is only one thing you can be dead sure of, when you send your boy to Harvard or Yale or Princeton or Dartmouth—only one thing you can bet on—and that is, that he will learn to smoke cigarettes. That is one of the habits he will acquire there—but whether he acquires the Study Habit or not, is the problem you have got to leave to the infallible dice.

Study Habit or not, is the problem you have got to leave to the infallible dice.

Oh, yes! I know; this is all "sour grapes," isn't it? It is not, boys. I have a few college degrees of my own, and I usually carry them with me, like my friend here who has an alphabet behind his name on the program. Yes, sir; he acknowledges it himself. (Laughter.) He makes no endeavor to conceal the fact that he is an educated man. He is not ashamed of it. No, sir; look on the program. (Laughter.)

cated man. He is not ashamed of it. No, sir; look on the program. (Laughter.)

I did call on an educated man the other day, out in St. Paul—Mr. James J. Hill. Mr. James J. Hill, when he was forty-six years of age, was station agent in St. Paul. He was earning eighty-five dollars a month. Now, I know he was a candidate for Oslerism, and I put this proposition to you for the encouragement of the gentlemen who are present here tonight, who are also candidates for Oslerism. When Hill was forty-six years old he went through bank-ruptey.

Do you know the greatest poem ever written by an American—"Opportunity," written by John J. Ingalls, of Kansas? They produce everything in Kansas. But poetry is one thing, and truth another. The burden of that song is this: that opportunity knocks once at each man's door. That is poetry.

is this: that opportunity knocks once at each man's door. That is poetry.

I don't wonder my friend wanted to prove an alibi. Truth is another thing. The real fact is, you cannot get away from opportunity in America. When he knocks at your door, you had better get up and let him in, or your panels will suffer. Opportunity waits for you right behind the corner with a stuffed club. You cannot get away from opportunity. The only way is to lie right down and die. Where would the International Correspondence Schools be tonight, I wonder, if we had put that Oslerism idea into effect sixteen years ago? (Laughter.) Our president was getting going. Sixty-odd years young. Getting old is a bad habit, and you want to acquire good habits, boys,



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and if you have the Study Habit you are in the line of fame. Don't shed any tears about this thing of college education. If you get an education in college, so much the better; that is all that college will give you. Lots of persons go through and it doesn't take at all.

I called on James J. Hill. There are three men who own five-eighths of the railway mileage of America. This does not prove they are good and virtuous characters—it proves they have money. This man is an educated man. The first thing he said to me was this: "I have been wanting to see you for some time." and I was just like this—all goose flesh, you know, because I had a very delicate errand with him. I wanted a pass to Seattle; and waiting in the entry way of his office was another man, and he had a regular alphabet behind his name, too, with titles around and across. He wanted passes to Seattle.

And the great man said to me, "I have been wanting to see you for some time. Why on earth do you say that Rembrandt was a greater painter than Rubens? I have read your book. Not one of those paintings you mention is authentic." He knew the Dutch school through and through. I had written a book on it—which does not prove that I know anything about it, because we always talk most about things we know least of. (Laughter.)

So he explained it to me. He knows the Dutch school by heart. He has the best collection of art owned by a private individual in America. I went with him in his private car for one day, and in a little shelf over his desk he has a collection of authors—Ruskin, William Morris, Longfellow, Emerson. He has the Study Habit. He is finding out things; and while we were in the car, a man came in—one of the smart newspaper fellows, you know, and he thought he would puzzle the old man a little. He said, "Mr. Hill, do you like the Black Essex?" "He thought Mr. Hill would not know what the Black Essex is. So he asked, "Do you like the Black Essex?" "Yes," replied Mr. Hill; "I raise them.

"What do you feed them?" "Yes," replied Mr. Hill; "I rai

"I feed them ground oats and meal."
"Wet or dry?"

"Dry."
"Well," said the fellow; "Mr. Hill, do you not know it takes a pig three times as long to eat dry feed as wet?"
"I know that, young man; but what do you figure a pig's time is worth?" (Laughter.)
The Black Essex is a party without the Study Habit. No difference whether he eats dry feed or wet.
I know, you wonder whether I got the pass.
But Mr. James J. Hill is a graduate of the university of art. He went through bankruptcy at forty-six. But so wonderful is this web of life, that we grow by antithesis. Worse than this, he was born in Canada. (Laughter.) But he overcame the handicap, and today we call him the strongest railroad man in America—this man that hailed from Canada. from Canada.

from Canada.

But just to even things up, the strongest and best man that Canada has was born in Illinois. He had the felicity to be born within fifty miles of where I was born. (Laughter.) A very wonderful soil. Sir William Van Horn—country boy, yes. He warmed his feet on October mornings where the cows lay down, and the fellow that has not done that has got to go back and get the experience—in another incarnation. He learned to be a telegraph operator; improved his time, made sketches and designs, and became a very proficient artist. Yes, a fellow whose canvasses had a market. He became assistant train-despatcher—train-despatcher, general freight agent, traffic manager—Canada wanted Sir William Van Horn.

I saw him two years ago. What do you think he was doing? He was making designs for a book his daughter had written, and he just for the fun of the thing was using his brush making water colors; a man with a universal, all-around education—a man who is not preparing to die, but who is preparing to live—an educated man with the Study Habit.

the Study Habit. I got the pass. I got the pass, boys. I went up to Butte. They told me of a wonderful girl. They said she was a genius. I have never seen a genius, and I have looked into the mirror a few times. (Laughter.) They said, "You should

go and see this wonderful girl." And I went. I rang the bell, and her mother came to the door. "Mary isn't here; she has gone to Boston to complete her education." I wonder if she really thought she could complete her education in Boston. If so, it is the only place in the round world where you can.

There was a man who used to talk about education, who knew about as much about it as I. He is dead now. I refer to the late Socrates. (Laughter.) His pupils came to him one day and said. "Socrates, what kind of people shall we be in Elysium?" "You will be the same kind of people in Elysium? "You will be the same kind of people in Elysium as you are right here. Yesterday I got ready for today, and today I am getting ready for tomorrow. I am getting ready for the higher growth. I am going to school. If there is another world, I don't know a better preparation for it than to live right here now."

He was "getting ready for a better job." He had the Study Habit.

Now, over in England two or three years ago. I was

He was "getting ready for a better job." He had the Study Habit.

Now, over in England two or three years ago, I was invited to a banquet; and I was seated next to the Earl of Yarmouth. We were both getting a square meal for nothing. We were taking great joy in our work. (Laughter.) We discussed the race problem; we settled the coal strike; and finally we got around to economics, and the Earl said to me: "In America, you know, in America," he says, "you have no leisure classes." I said, "Yes, we have; we call them 'hoboes'." (Laughter.) And he smiled, and I smiled; but I knew what I was smiling at, and he didn't know what he was smiling at. He says, "Very droll, most amusing; most amusing." And he said, "What is a 'obo?" I said, "You're one." (Laughter.) Only I said it to myself. (Laughter.) I knew he would never appreciate it. The point was entirely too subtle for him. But it just came to me that he was a hobo. There is no difference or choice between him and "Weary Willie of Pittsburg." Well dressed; that is all right; but if somebody didn't buy him clothes and send him remittances, in a little while he would be wearing clothes exactly like the clothes worn by men of the hobo class. It is just a mathematical proposition. He lives on the labor of others, on the labor of men who are dead. He is a hobo.

Yes! And the problem of civilization today is to eliminate the parasite. We live in the richest country the world has ever seen. There is wealth enough for everybody. Yes, and there is work for everybody and there is not too much work for anybody; if everybody would work a little, nobody would be over-worked. No. The reason of some people having to work from daylight until dark, and their work is never done, is because some other people never work at all.

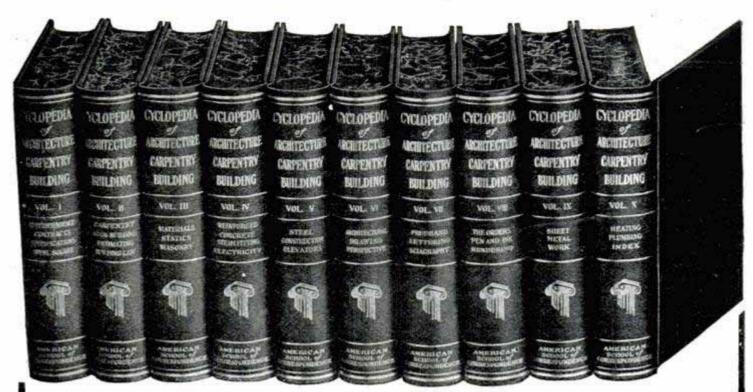
We used to educate men who didn't work, and when you

work at all.

We used to educate men who didn't work, and when you talked about an educated man, you meant a man that didn't work. And when you talked about a working man, you meant a man who had no education. But this will never be a civilized country until every man works, and until every man has an education—until every man has the Study Habit. (Applause.)

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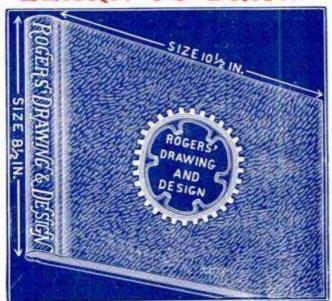
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