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**APRIL, 1906**

**VOL. VIII. NO. 4**

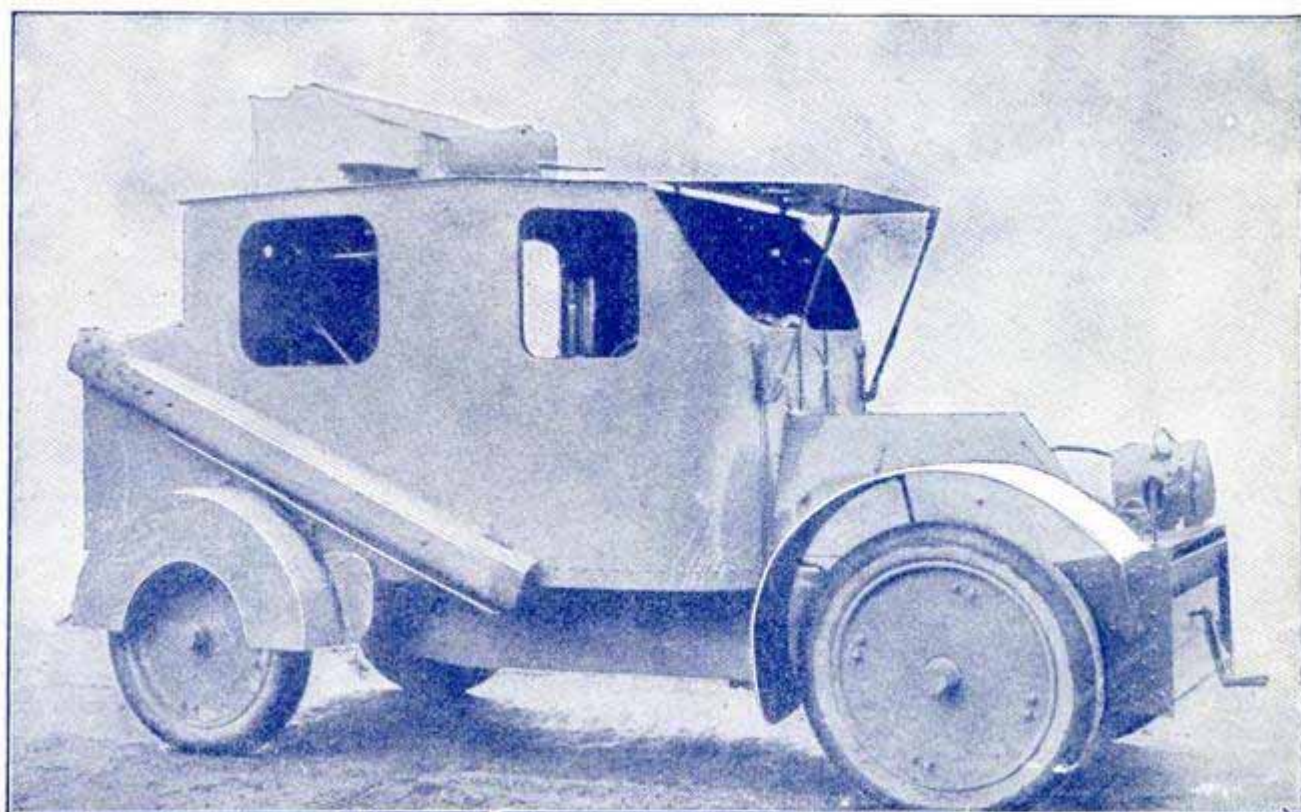
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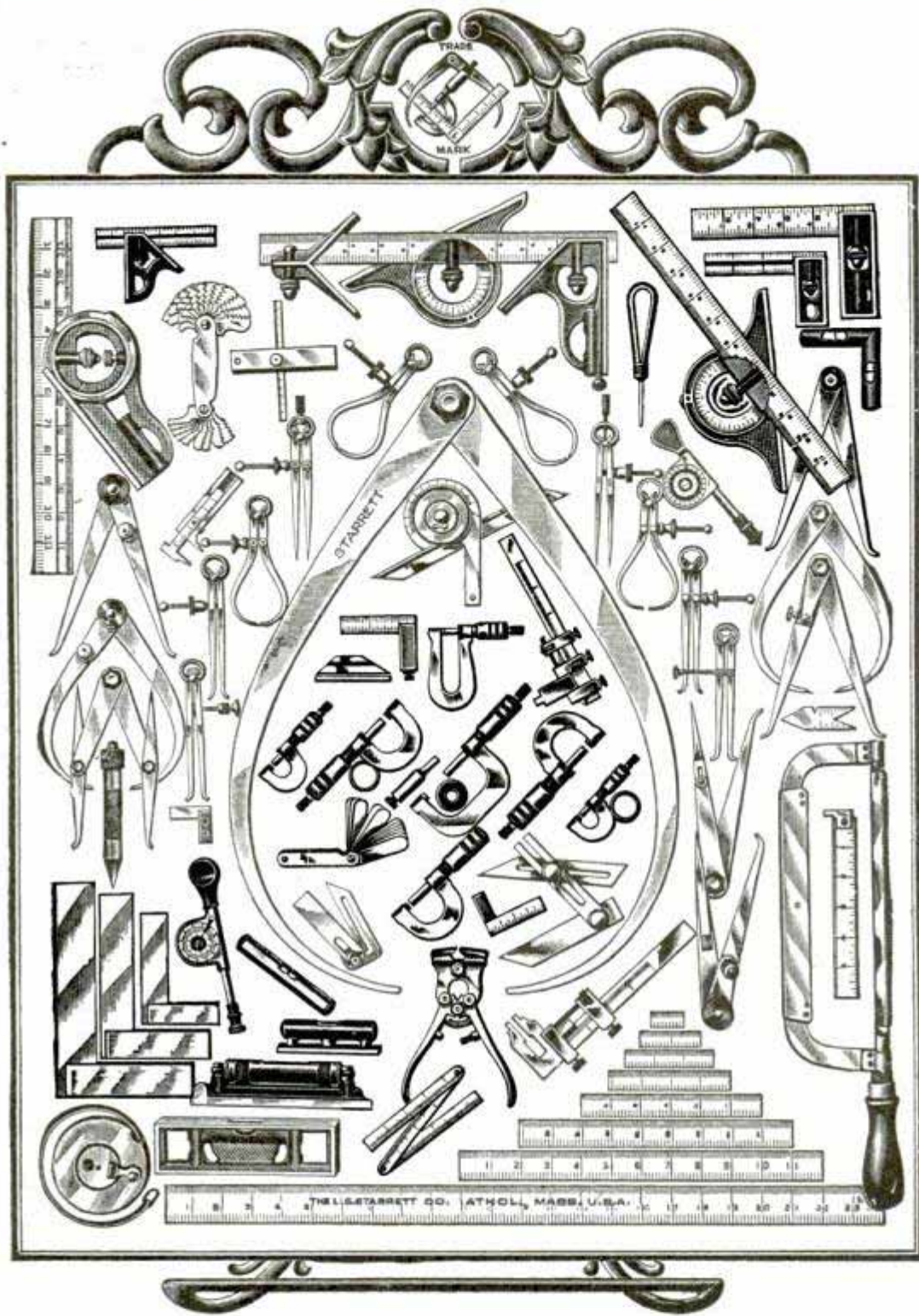
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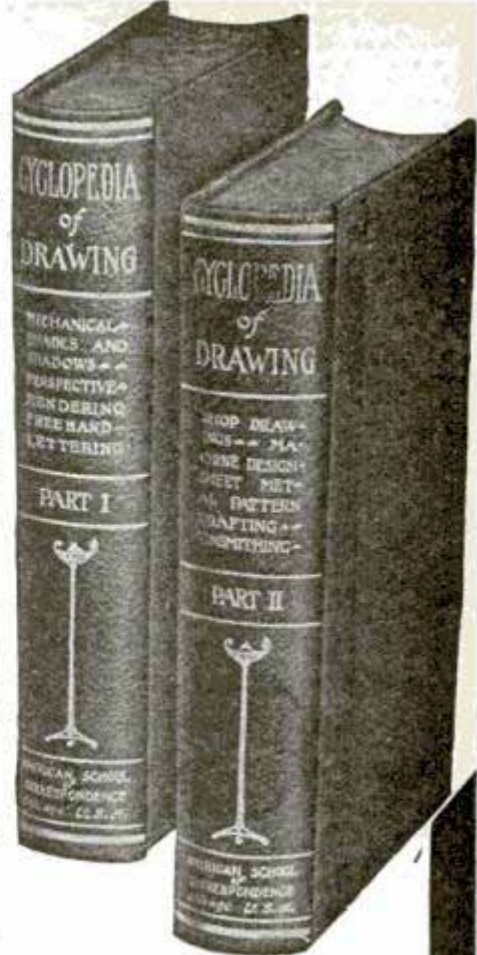
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# Regarding Kornit

*By President Charles E. Ellis*



PRESIDENT CHARLES E. ELLIS.

**I** NOW, after one months' time, am again pleased to be in a position to report to you what progress we have succeeded in making in bringing the Kornit factory to a state of perfection. Every day since I last came before you has been utilized in perfecting our factory. The machinery has been erected, shafting and belting put into order; and if it were possible for my readers and investors to make a visit with me to our factory at this time, I am satisfied that you would all be pleased with the splendid progress made. We have rushed the erection of all the machinery and equipment until now our factory is nearly ready to produce "Kornit" for the first time

in this country. We have been complimented by engineers and experts in this line. We have received many endorsements, because of the fact that in erecting our factory, we have never lost sight of the fact that it was wise to buy and put in only the best machinery and equipment. Before Popular Mechanics goes to press again, I earnestly believe from all indications that we shall be producing "Kornit;" and when this time comes I cannot explain to my readers and co-investors what a pleasure it will be for me to see "Kornit" produced in a perfect and economical manner.

## MR. KURT BIERICH

Mr. Kurt Bierich, the son of the inventor, will arrive in this country on or about the 15th of this month. From recent letters which I have received from his father, Mr. Johann Gustave Bierich, the inventor of "Kornit," I am pleased to report to you that he writes that great progress has been made in turning out "Kornit." Mr. Bierich, Sr., informs me that it is now possible to make Kornit non-absorbent. While for the last four years they have readily sold all the Kornit manufactured in Russia, at the same time, it has not been entirely non-absorbent. I am now informed by Mr. Bierich, Sr., that Kornit can be produced so that it will not absorb a single particle of moisture or water. Mr. Bierich also writes me that great progress has been made in molding Kornit; and that Mr. Kurt Bierich will bring all of these details to us this month and be present when the first slab of Kornit is pro-



# RESISTED 96,000 VOLTS OF ELECTRICITY

many years in his father's factory at Menkenhof, Russia, and knows the scientific production of Kornit from beginning to end. He has also spent many months in the manufactory at Riga, Russia, where Kornit is made up into all kinds of mercantile articles. Mr. Bierich represents his father's interests in this matter and will remain in this country and see to it that Kornit is produced perfectly homogeneous. I cannot express to you what a valuable acquisition for our company to be enabled to draw on this unlimited knowledge possessed by Mr. Bierich, Jr. Young Mr. Bierich is a graduate of Freiberg University as an expert chemist.



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

To all of you who can make it convenient to visit this office and afterwards our factory, I would earnestly solicit that you do so. After you have seen the articles which are produced from Kornit, after you have seen Kornit manufactured from the waste hoofs and horns—which is now only used for fertilizing purposes—it will be more possible for you to realize what an elegant opportunity, what an enormous fortune can be made out of this new industry.

A slab of Kornit one inch thick was tested in Trenton, New Jersey, by the Imperial Porcelain Works and was found to have resisted 96,000 volts of electricity. It may be interesting to note here that the heaviest voltage that is transmitted in this country is between Niagara, Buffalo and Lockport, New York. The voltage transmitted by this company is between 40,000 and 50,000 volts. Kornit is equally as good for a non-conductor for electrical purposes and supplies as is hard rubber.

The average price of hard vulcanized rubber for electrical purposes is today considerably over one dollar per pound—at the present writing fluctuating between \$1.25 and \$1.40 per pound. Kornit can be sold at twenty-five cents per pound and an enormous profit can be made at this price, so that it can easily be seen that where Kornit is equally as good, and as a matter of fact, in many instances a better non-conductor than hard rubber, it can compete in every case where it can be used, with great success on account of its price. For electrical panel boards, switchboards, fuse boxes, cut outs, etc., etc., there are other materials used, such as Vulcanized paper fibre, slate, marble, etc. A piece of vulcanized paper fibre 3x4x1 inch in lots of one thousand, brings twenty cents per piece. A piece of Kornit of the same dimensions could be sold with the enormous profit of over 100 per cent, at ten cents. The non-absorptive qualities of Kornit render it such that it is far preferable to that of vulcanized fibre. It will not maintain a flame. Of all the materials which are now in the electrical markets for supplies and insulators, there is, as we have stated before, none that are satisfactory. Kornit will fill this place. Its tensile strength per square inch averages from 1,358 to 1,811 pounds, which the reader can readily see is more than satisfactory. This test was made by a well-known electrical engineer, who is now acting in that capacity for the United States Government, with a Standard Riehle Bros. testing machine.

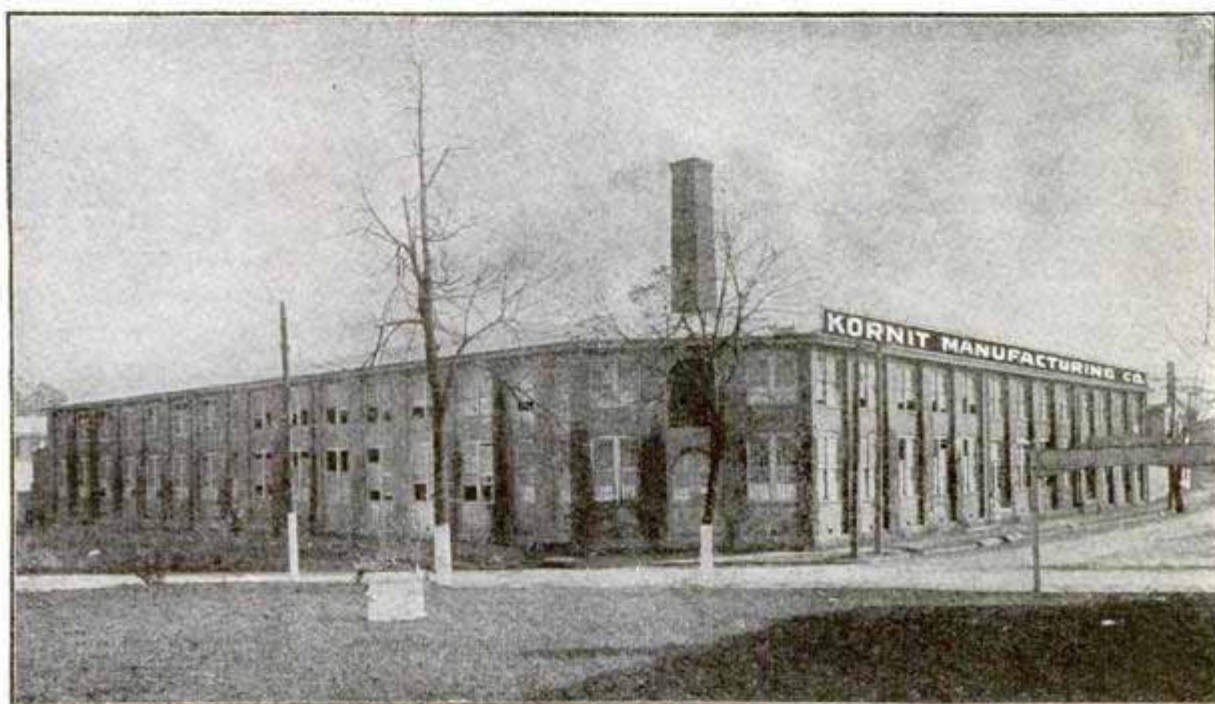
Waste horns and whole hoofs are being sold by the ton today principally only for



fertilizing purposes. There is one town alone, Leonmister, Massachusetts, where they have an average of eight tons of horn shavings every day. These horn shavings are now only being sold for fertilizing material. These eight tons of horn shavings manufactured into Kornit and sold for electrical purposes would easily bring \$3,000. At this price it would be selling for less than one-fifth of what hard rubber would cost and about one-half what other competitive materials would sell for, even though they were not as satisfactory as Kornit.

The last reports from my London correspondent, Mr. Jones, informs me that the

be used for the manufacturing of furniture, buttons, door handles, umbrella, cane, knife and fork handles, brush and sword handles, revolver handles, mirror backs, picture frames, toilet accessories, such as fancy glove boxes, jewel cases, glove stretchers, shoe lifts, etc.; office utensils, such as paper knife and pen holders, ink stands, pen racks; medical instruments, such as syringes, ear trumpets, etc., etc.; pieces for games, such as draughts, chessmen, dominoes, checkers, counters, chips, cribbage boards, etc.; telephone ear pieces, stands, etc.; piano keys, typewriter keys, adding machine and cash register keys, tea trays, ash trays, scoops,



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

English factory is working at the present time every night and are many months behind in their orders. This is indeed wonderful, considering the fact that the English factory has been in existence less than one year.

To those of my readers who are interested in the Kornit Manufacturing Company with me, I am in a position to say, we are to be congratulated, when we realize what an elegant opportunity lies before us in this great and magnificent country.

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

Besides electrical insulators, Kornit can

mustard and other spoons, salad sets, cigar and cigarette cases, cigar and cigarette holders, match boxes, and hundreds of other useful and ornamental articles, all at a large and remunerative profit.

Unless I am greatly mistaken in all my views and information, shares in the Kornit Manufacturing Company will in a few years be paying regular dividends from 20 to 100 per cent, and all those who have had a chance to investigate and look into the matter with me are of the same opinion.

When I say to you that my good old father owns quite a block of Kornit shares and that every one of the shares which he owns cost him ten dollars each, you can see what great confidence I have in the future paying large dividends, benefits and profits. You can obtain shares today at \$10.00 each.



It is a fact that employees here in my office are investing their savings in shares of the Kornit Manufacturing Company, and why? Because from day to day they have an exceptional opportunity to learn the inside facts, and they can easily see that everything points in the direction of success and big earning capacity. I was quite pleased and not a little surprised to have the wife of one of my employees in my home come into this office the other day and hand us fifty one-dollar bills for five shares in Kornit.

These fifty one-dollar bills meant a lot of saving, and it meant saving for a long time. Dear reader, I sincerely believe that this wife of a hard-working man will receive such a reward for her persistent saving that she will feel that when she came to this office with those fifty one-dollar bills, she did the wisest and most profitable thing. Everybody should learn to save and feel that they have provided for a rainy day. I am personally interested in each and every one investing in the Kornit Manufacturing Company. I want to see them all prosper and have Health and Happiness. If I can see every reader of Popular Mechanics have at least five shares in the Kornit Manufacturing Company I would be so happy that I would scarcely know how to express myself; and, dear reader, it is not by any means impossible for you to do this. You can do this if you will only try. If you will try earnestly and stick to it I will help you gain your object. The way to do this successfully is first to write me. Write me just how you are situated and just what you want to do; just how many shares you wish and how you wish to pay for them. Take me into your confidence, I will be your friend, and I will try to arrange it so you can do just what you wish. Do not think I will not be interested in all you write. Your letter will come to my personal desk. I will open and read it myself and you shall hear from me by return mail. I was a poor country boy myself and I am in earnest sympathy with all of the readers of Popular Mechanics.

If you could only know how hard I have worked to bring the Kornit Manufacturing Company where it now is—how I have laid awake nights thinking and planning—you could then better understand how interested and proud I would be to hear from you that you were going to join me in this great new

manufacturing business of producing Kornit and selling it all over the United States.

I promise you that I will work even harder than I had to work to make my first company the great big dividend-paying success of which I am now so proud.

Sit right down and write me now. Take as many shares as you can, I believe you will never regret it. On the contrary, that you will say that was the time that I did one of the wisest things I ever did in my whole life.

If you can only take one share, well and good; you will be just so much ahead; you will have an interest in the Kornit Manufacturing Company which will pay you just as much profit in proportion to your investment as any other share-holder.

I should prefer you would take from five to one hundred shares, but, as I have said before, write me and say just what you would like to do and just how you think you can do it, and as soon as I get your letter I will answer you and try and arrange it so you will succeed. If you will write me I will also send you an illustrated booklet telling you all about Kornit, with a score of pictures taken in Russia showing the Kornit factory in that country. This booklet may be the means of teaching you how to take the first step to permanent success and wealth. Anyway, try. I will do all I can. Address your letters to me and mark them "Personal." Address

## CHARLES E. ELLIS

PRESIDENT

717B, Temple Court, - New York City, N. Y.

---

[Mr. Ellis besides being President of this company, is also President of two other large and successful companies now paying large dividends, owning shares therein large conservatively at over \$250,000.00. Mr. Ellis has other investments in New York City real estate, bonds, stocks and mortgages to the amount of many hundreds of thousands of dollars. Any bank or mercantile agency will tell you his guarantee is as good as gold. This is a successful man who wishes you for a Co-partner, as a Shareholder and Dividend Receiver in this company. Remember you will do business personally with Mr. Ellis in this matter.]



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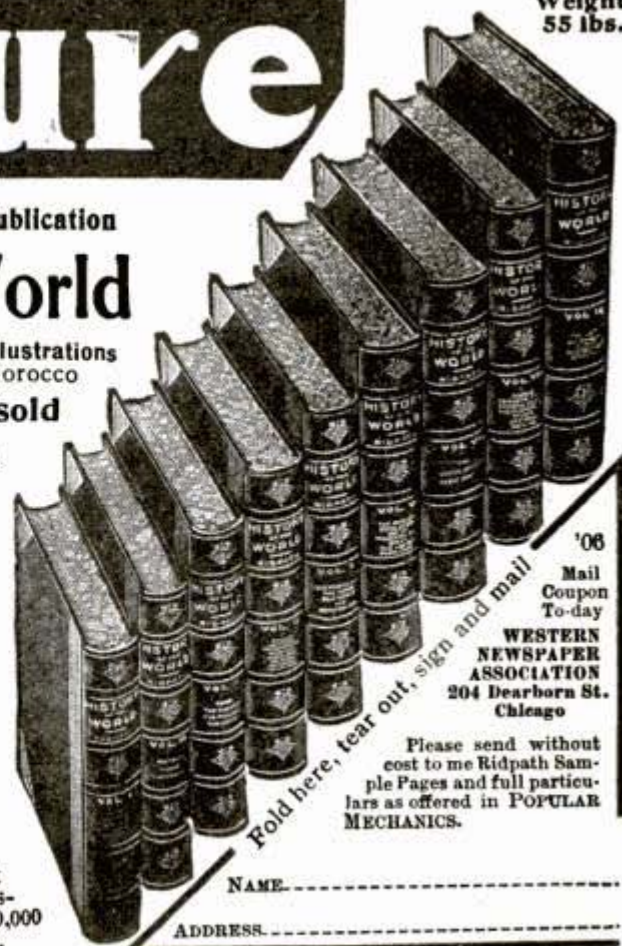
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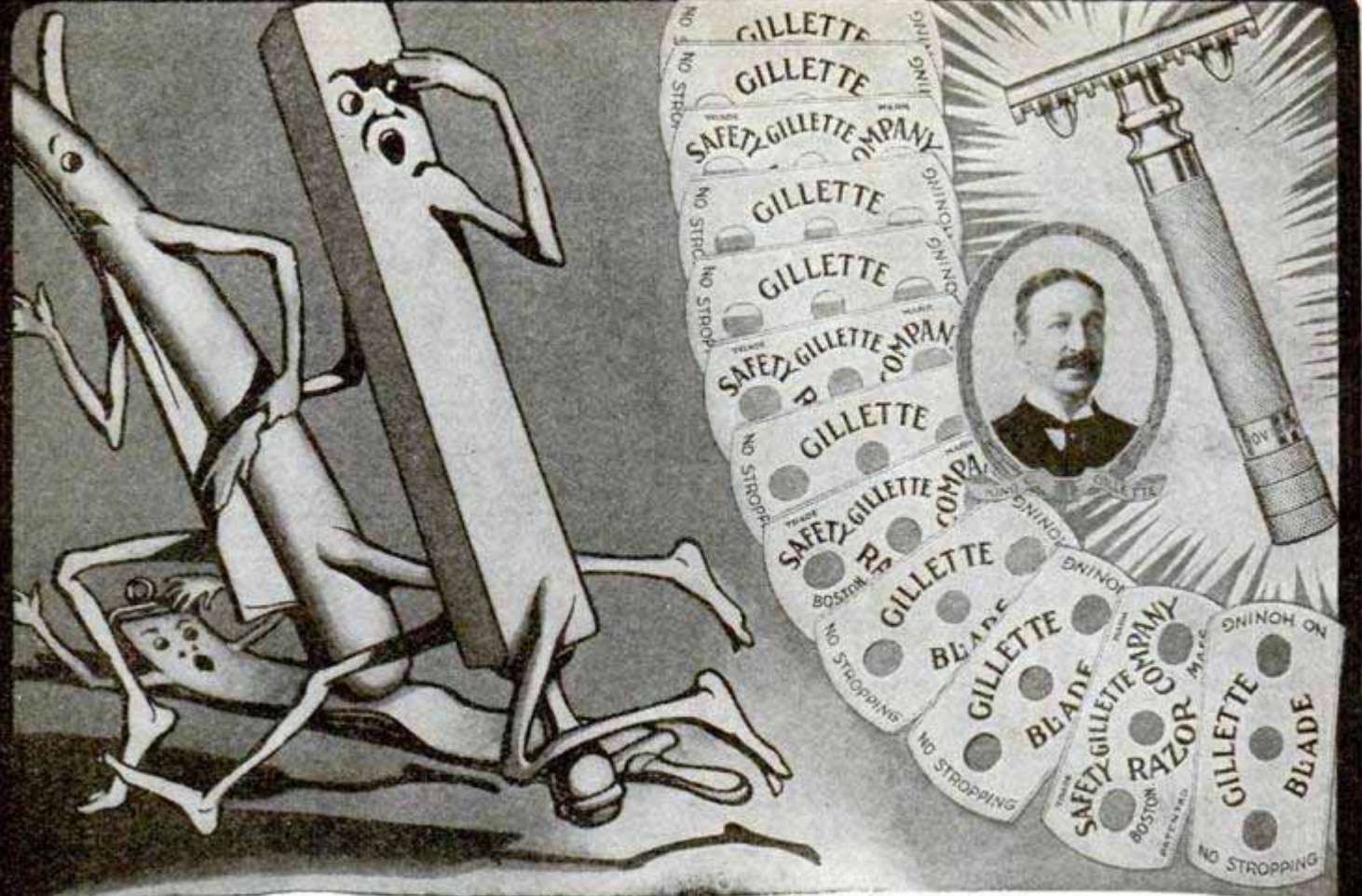
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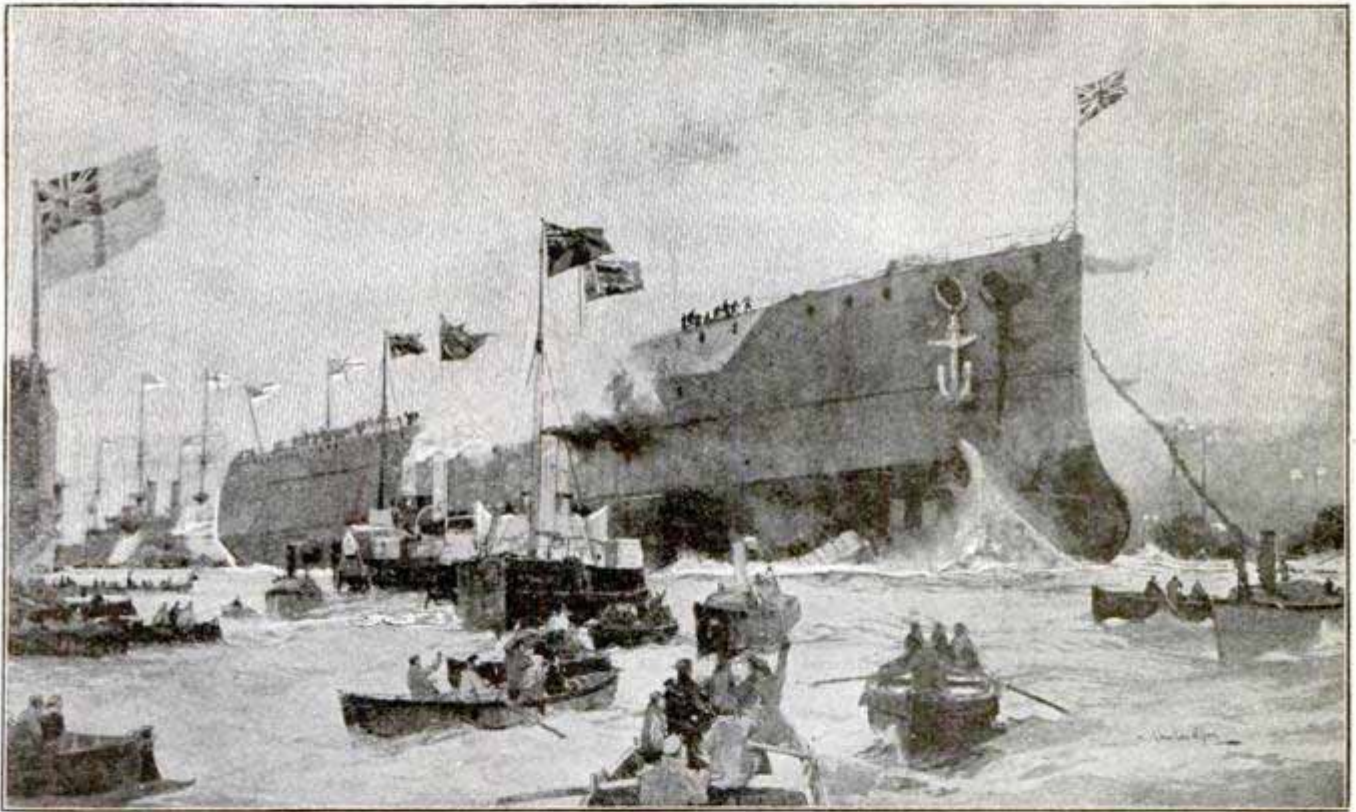
# POPULAR MECHANICS

Vol. 8. No. 4.

CHICAGO, APRIL, 1906.

10 Cents a copy.  
\$1.00 a year.

## MONARCH OF BATTLESHIPS



**Launch of the "Dreadnought"--Largest Battleship Ever Built**

England's new sea terror, greatest battleship ever built, the "Dreadnought," concerning which so much in general and so little in particular has been revealed to the world, has been launched. The vessel was laid only last fall and is to be completed within a year. Details of construction have been carefully guarded, but it is claimed that the "Dreadnought" will embody all that was learned from the Russo-Japanese war, and England's naval officers were the only ones who were given opportunity to study the

conflict from the decks of Japan's battleships. It is said that the vessel will be immune to torpedo attack; that her displacement will be 18,500 tons; speed, 19 knots; main armament, ten 12-in. guns, besides which she will carry eighteen 3-in. quick-firers. She will be propelled by turbines.

The Japanese at their own government shipyards have started on the construction of a battleship of 24,000 tons which, when completed, will be even greater than the "Dreadnought."



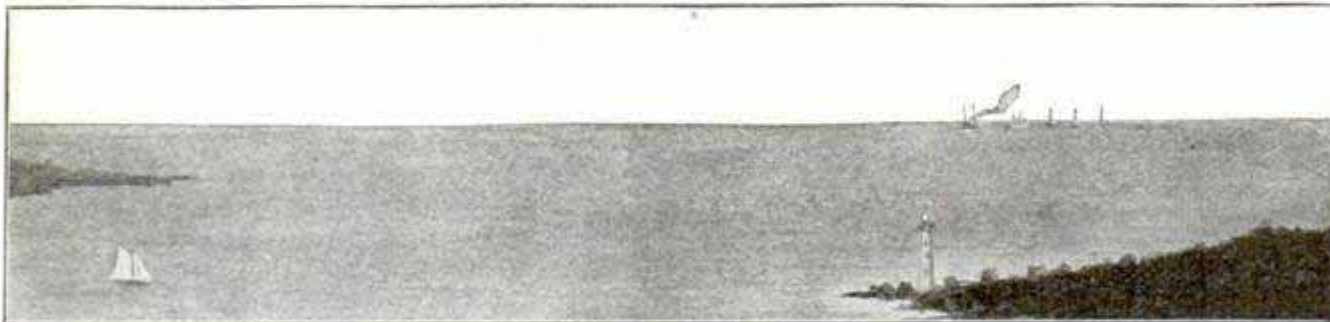
## ALCOHOL FOR INDUSTRIAL PURPOSES

Wherever the cost of alcohol is not prohibitive by reason of excise duties, its use for industrial purposes is markedly on the increase. England made a good beginning in adapting alcohol to industrial uses, but Germany came into the field and the internal

## AERIAL CAMERA UNFAILING SPY

### Reveals an Enemy 30 Miles Away

A new camera has been produced, which, suspended from a small war balloon at an elevation of 3,000 ft., makes it possible to ascertain the strength of the enemy's ships or fortifications at a distance of 30 miles.



Wide Angle View at Comparatively Short Distance

revenue restrictions were so great in England that she could not compete with Germany, where the cost of alcohol is so much less. Consequently many of the British factories were abandoned, for, while alcohol can be produced there at from 16 to 18 cents per gallon, the conditions existing raise the price to \$3.04 per gallon. A committee has been appointed by the chancellor of the exchequer to inquire into the matter in this relation, and determine the advisability of readjusting it. Alcohol is now produced from grain, beet root, and potatoes. Germany grows many tons of potatoes especially for this purpose, annually, and the potatoes from which alcohol has been made are afterward fed to cattle, which, it is said, eat them with great avidity. France used 3,000,000 tons of beets in 1903 for making alcohol, spoiled beets serving the purpose as well as good ones.

In connection with industrial purposes alcohol is annually assuming greater importance. In the chemical trades it is for many purposes indispensable; as an illuminant it is said to vitiate the atmosphere less than any other save incandescent lights, and in Europe alcohol lamps of 1,000 candle power are manufactured, while 200 and 250 candle power lamps are commonly obtained. Many dyes cannot be manufactured without the use of alcohol. In Germany 3,000 spirit engines are at work, says United States Consul Halstead of Birmingham, England, while 50,000 alcohol lamps were sold by one Berlin firm in a single season.

In France, alcohol for the propulsion of motor vehicles has made great progress and is now in a successful stage.

The balloon is large enough to carry a 20 in. by 48 in. camera, but is smaller than the old style war balloon, in which the photographer had to ascend in order to operate the instrument. It is not as expensive or dangerous as the former method and by means of electric wires the camera is under full control of the operator while standing on the ground. The use of the smaller balloon saves gas, enables a much quicker ascension, and makes its use practical from the deck of a battleship. Demonstrations have already determined this fact. While the large balloons are difficult or impossible to operate in a wind, the small balloon can still be worked, and in event of accident to the balloons or their gas generators, the new camera can be sent up by means of box kites.

The camera is equipped with two lenses. One is a wide angle lens ( $180^\circ$ ) and is used with a 20 in. by 48 in. plate. The other is a narrow angle lens ( $10^\circ$ ) and is used with a 16 in. by 20 in. plate. The lenses are always used with the focus set at infinity.

In operation the balloon is first sent up with the wide angle lens and an exposure made of half the horizon. It is then brought down and the plate is developed by a special



Narrow Angle Effect

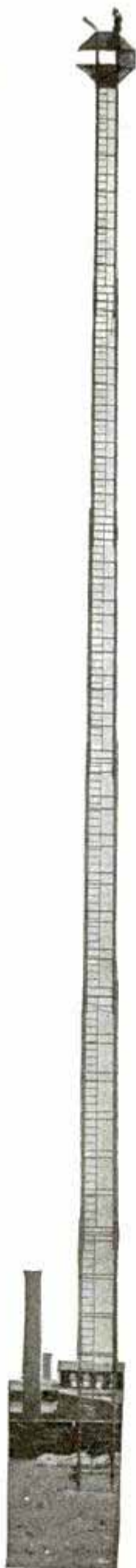


and rapid process. If nothing of interest is seen on the developed plate the camera is sent up again and the other half of the horizon is taken; but if there is any indication of the enemy's fortifications or forces the camera is sent up with the narrow angle lens. This lens takes only one-thirty-sixth of the horizon, but makes a picture very much larger than the wide angle lens. A picture taken with the narrow angle lens will plainly show a fort or battleship which appears as a mere speck on the wide angle picture.

The inventor of this device, Prof. George R. Lawrence, of Chicago, in a recent interview with President Roosevelt and former Commissioner of Patents Chamberlain, has decided to keep the invention a government secret, at least for the present, hence the most essential details will not be given out, as the process is most carefully guarded.

Actual tests of the apparatus have exceeded the expectations of the inventor and have so interested the President that he called for a special report of the Army and Navy boards. If the report is favorable the government will doubtless secure the exclusive rights, in which case the inventor will realize an independent fortune.

The camera is a never-failing mechanical eye which takes in every detail, where the most highly trained human eye with the aid of the strongest field glasses can discern only the largest and most prominent features. There is no possible way to enlarge the vision of man beyond certain limitations, while the impression of the camera on the negative can be enlarged several hundred times. The superior advantage in time of war to the nation



192 Feet

possessed of this secret and equipped with such a spy can scarcely be estimated.

Mr. Lawrence has for years made a study of photographing from lofty standpoints, and making bird's-eye views of manufacturing plants, towns and cities. It was because of the difficulty he experienced in finding a suitable elevation on which to rest his camera, that he invented and constructed a novel tower for this express purpose;



G. R. Lawrence

a construction the most remarkable of its kind.

When raised to its full height the little platform on which the photographer and his camera stand, is 192 ft. above the ground. The tower is steadied by steel wires to hold it from falling and the structure is so light the observer expects each moment it will break like a pipe stem.

In fact no one but the intrepid inventor has ever dared to go to the top to work the camera. The tower is made of sections of fir wood which slide into each other, closing like a telescope. The tower can be taken anywhere a wagon can go, and when unloaded and set up on end is 20 ft. high.

It is then raised, one section at a time, by turning the crank at the bottom, after the manner of the extension ladders used by firemen. As each section reaches its extreme height it is locked in position and connected to four guy wires. These wires are attached to posts, trees, or other fixtures if available, and if not may be fastened to screw anchors set in the ground. The camera is strapped to the platform before it is elevated, and is carried up with the tower, but the operator must climb the full 192 ft. hand over hand on a ladder which is so slender the slightest misstep would be fatal.

## CROSSING THE ENGLISH CHANNEL BY AIRSHIP

A balloon of the Aero Club of England, occupied by two of the club members, crossed the English channel and landed 20 miles inland in France in just four hours and ten minutes recently. At one time the balloon ascended to a height of 10,000 ft. where it encountered a snowstorm and was incrustated with frost.



## FINEST RIVER STEAMER EVER BUILT

### New Boat on the Hudson Queen of Inland Craft

By E. E. Olcott, President Hudson River Day Line

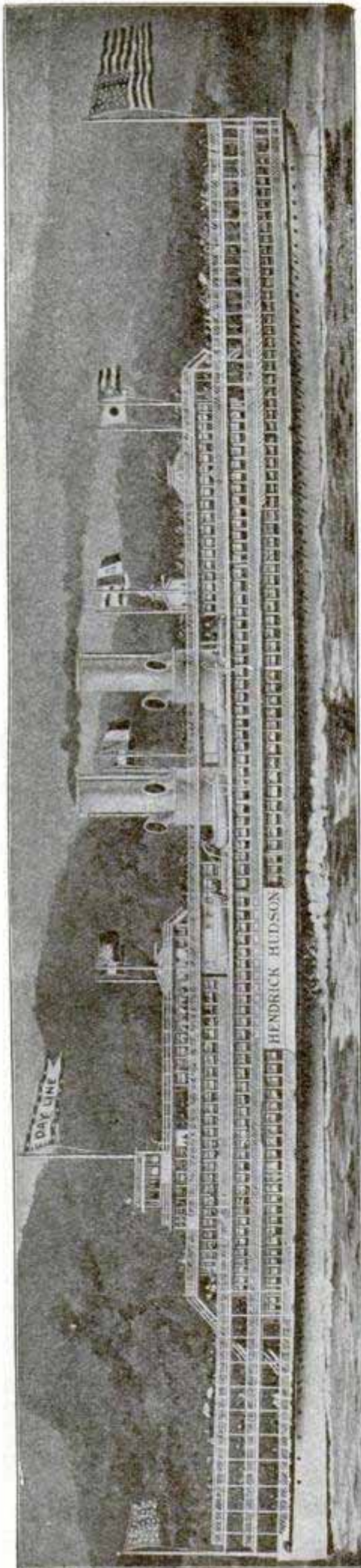
It is a pleasure to comply with the request for brief details of our new steamer, and to present to the readers of Popular Mechanics a picture—taken from the model—of what will be the finest boat on any inland waters in the world. It is a long way from Fulton's "Clermont" of 1807 to the "Hendrick Hudson" of 1906, and in the creation of this latest queen of river craft there has been embodied all the best improvements which have followed in the wake of that first crude effort from that day to the present moment.

Great care has been taken in the new boat to provide every conceivable advantage, comfort and safeguard to the passenger. No freight will be carried.

Every place on the new steamer from which it is possible to get a good view of the Hudson is given up for the passenger's pleasure. The large observation rooms on the hurricane deck, and the shade deck over it, and the bridge deck above that, are all open; this is very largely a new feature or departure in super-structure designing and we think is sure to meet with popular approbation. We figure on a comfortable carrying capacity of 5,000 people.

In the planning and making of this boat we have employed the highest skill known to us in this or any other country. The interior decorations are varied and elaborate; no expense has been spared in the use of expensive woods from all parts of the world, and the best artists obtainable have lent their skill to secure effects of color-blending not hitherto known in steamboating. The boat will be almost a continuous sheet of plate-glass, so that the traveler can from any point look out upon the beautiful and ever-changing scenery as the vessel glides over the bosom of the placid river. Rich carpets will cover the decks.

The hull is steel, 390 ft. long and 82 ft. wide; paddle-wheels 24 ft. diameter with paddles 14 ft. 6 in. long, and making 40 revolutions per minute. The main engine is of the incline double expansion type, with three cranks, having one high-pressure cylinder, 45 in. in diameter, and two



The Gorgeous Furnishings and Decorations of this Boat Have No Equal in the World



low-pressure cylinders, each 70-in. bore, the stroke of all being 7 ft. Two huge steel stacks rise 70 ft. Five years were spent in perfecting the plans, and the steamer is expected to go into service during the coming summer.

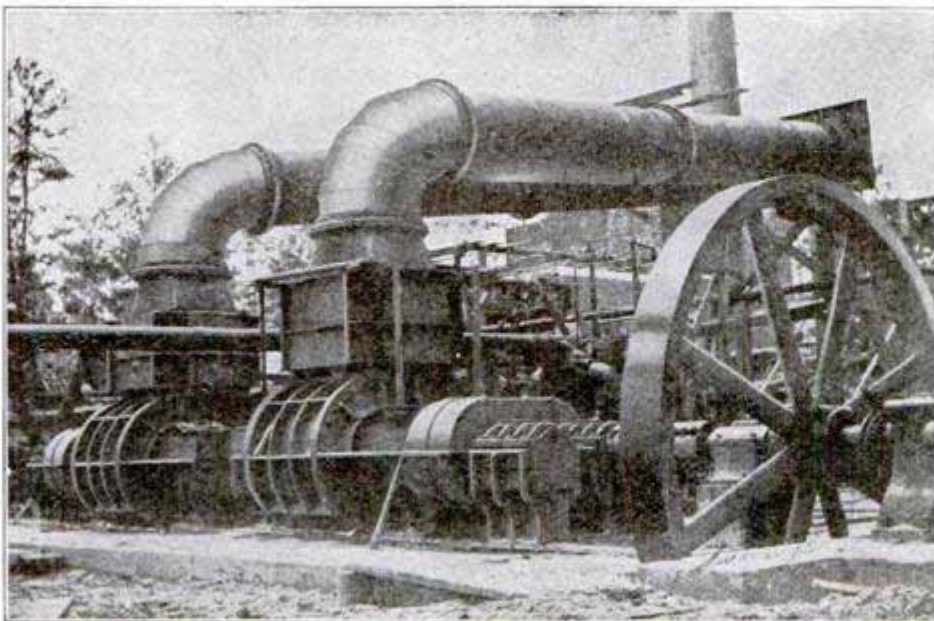
### GUIDE POSTS IN THE DESERT

Stone guide-posts are being placed in the deserts of California to direct lost travelers to springs, wells and small streams. Every year large numbers of prospectors risk the dangers of the desert in their eager search for gold. Many of these wander about until they become bewildered and after searching for water for hours and days, perish, miserably, of thirst. The legislature of California has appropriated \$5,000 for placing the guide-posts and several counties have already undertaken the work. Thousands of posts will be erected during the spring and it is expected that the number of deaths will be greatly decreased by this means.



ed that the number of deaths will be greatly decreased by this means.

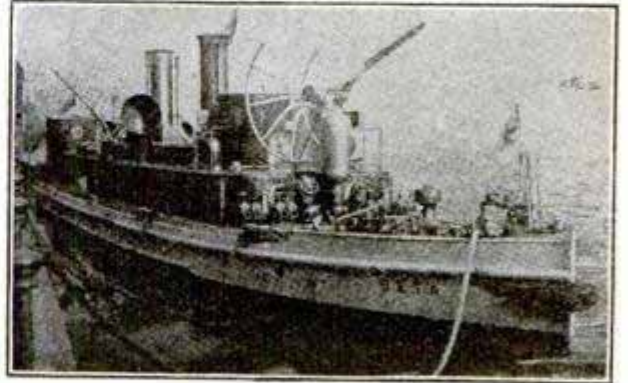
Victor Wheeler, and several other boys at Great Falls, Montana, have built and are operating a wireless telegraph for a distance of about 2,000 ft.



**Pumps 2,300 Gallons a Second**

### NEW FIRE-FLOAT FOR LONDON

A new fire-float, the "Beta," has been added to the fire protection facilities of London. The vessel is 100 ft. long, with a beam of 16 ft. 6 in. and a water draught of 40 in. The low draught enables her to pass under bridges at all states of the tide. The vessel



**London Fire Boat**

is fitted with twin-screw engines, two water-tube boilers and four fire pumps with a discharge of 4,000 gals. of water per minute at 140 lb. pressure per sq. in. On her trials she steamed 12 miles per hour.

London is far behind other large cities of the world in her fire protection equipment, but of late she has been adopting American methods.

### PUMPS 140,000 GALLONS A MINUTE

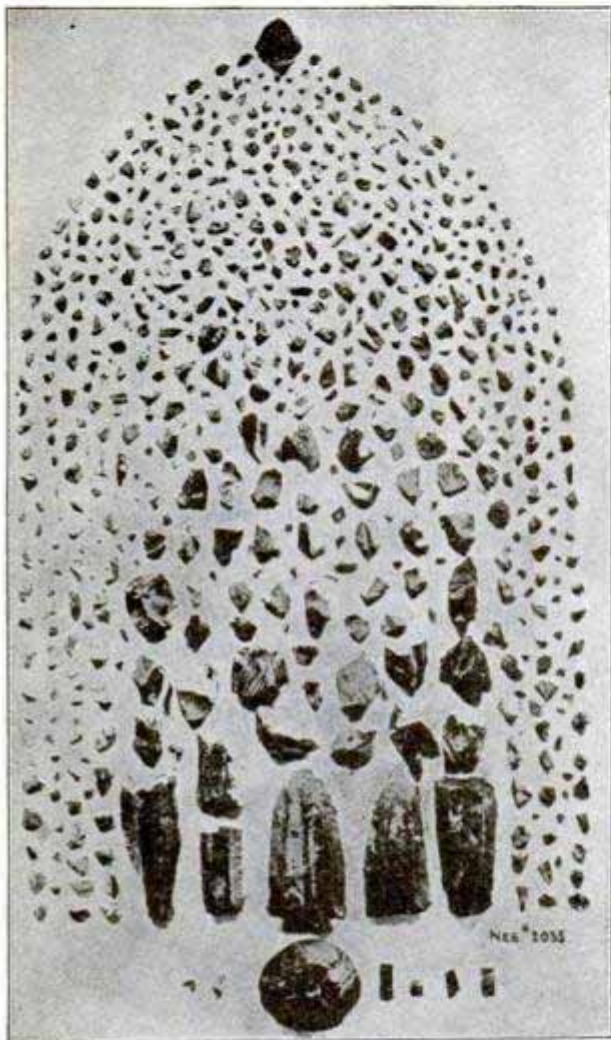
One of the largest rotary pump plants in the world has been erected for the Neches Canal Company, of Beaumont, Texas. This plant, which will be used for irrigating purposes, will discharge at the rate of 140,000 gals. a minute or 23 gals. in one-hundredth of a second. The impellers are 58½ in. in diameter and displace 2,512 gals. at each revolution.

The pumps are direct connected to an 18 by 38 by 48 in. compound condensing corliss engine by a shaft 11 in. in diameter with bearings 30 in. long. The keys in the couplings are made of babbitt instead of steel, to prevent breaking should a piece of wood be drawn into the pump.



## WHAT HAPPENS WHEN A SHELL BURSTS

The average citizen who is accustomed to reading of shells and other munitions of war rarely has the faintest conception of the fearfully devastating effect that results when a shell explodes. The accompanying



Fragments of Bursted Shell

picture, for the original of which we are indebted to the Journal of the United States Artillery, gives a vivid account of a test shot recently fired at one of the proving grounds.

The shell, which was known as a 6-in. A. P. shell, originally weighed 102½ lbs.; the recovered fragments aggregated 94 3-16 lbs., of which the largest piece weighed 10¼ lbs. The average weight of the pieces was 2 5-16 ozs. The shell which was loaded with black powder on being fired from the gun passed through six inches of hard-faced Krupp plate, and burst when about 8 ft. beyond. Arrangements had previously been made for the recovery of as large a number of the fragments as possible.

When the count was made there were

almost 650 pieces. Had the projectile burst in a group of men the fatal results can easily be imagined.

## AEROPLANE PLUNGES 1,800 FEET TO EARTH

At a height of 1,800 ft. and with a daring aeronaut clinging to the frail framework. Prof. John J. Montgomery's aeroplane took a sudden downward plunge to the earth, during a recent trial at Oakland, Cal. Horror-stricken crowds, remembering the fatality of last summer, watched the erratic descent of the air machine, which described short circles as it fell and twice righted itself. The aeronaut strove frantically to control the craft and when near the earth it floated on even keel; then fell again. The machine was wrecked, but the rider was uninjured beyond a few bruises and cuts.

## LONG DISTANCE SEARCHLIGHT

A powerful searchlight that throws its rays 7½ miles, so that objects at a distance of 6½ miles can be plainly seen is being tested in Switzerland. The light is placed at an altitude of 3,600 ft. and is of 1,000,000 candle power, being run by 24 hp. The diameter of the projector is 3.28 ft. The light can be handled by wire from a distance of 656 ft. from a motor car which is used to transport it.

## HOW BROKEN BONES LOOK

The old saying that nobody knows what is inside of him no longer holds good, and surgeons now make frequent use of the X-ray in making a photograph of broken bones before setting the fracture.

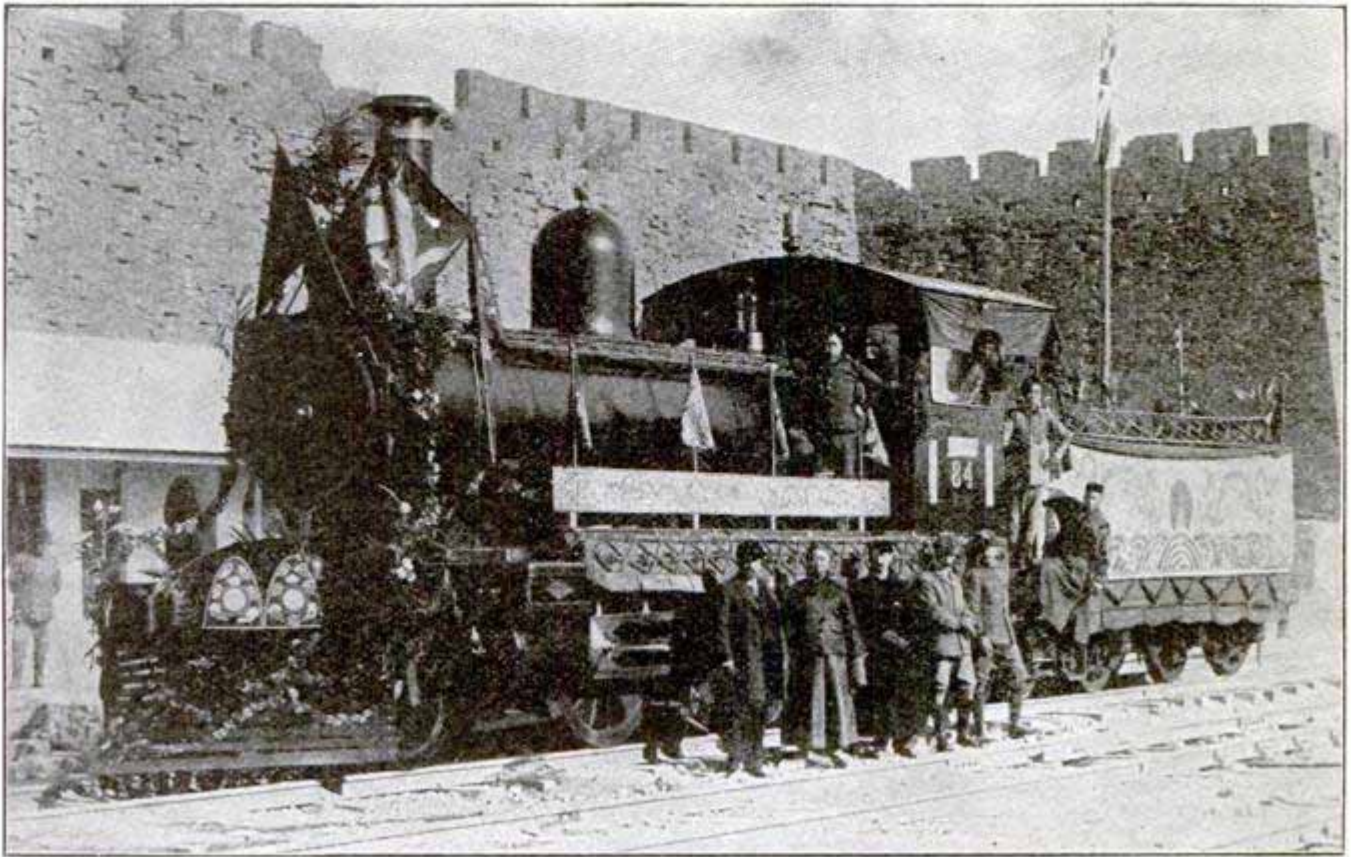
The accompanying skiagraph shows both bones of the leg between the knee and ankle as they looked when broken. Not all fractures require X-ray photographs; in this case the bones had broken a second time.

The illustration is reproduced from the Journal of the American Medical Association.





## NOTABLE FOREIGN LOCOMOTIVES--No. 3



**ROYAL ENGINE--CHINESE IMPERIAL RAILWAY--**This locomotive was built in America and is used on state occasions. When the photograph was taken it was attached to a special train which was used by the Empress of China. The decorations of flags and trimmings were of the finest silk woven in the most exquisite texture, and showing the royal colors. The passage of the train throughout the trip was regarded with great awe by the people, who prostrated themselves on the ground as it passed.

### “NON-SINKABLE” BATTLESHIP PROPOSED

An American battleship of 24,000 tons, which shall be not only the greatest fighting machine afloat, but actually “non-sinkable” is proposed in a Senate bill introduced by Chairman Hale of the committee on naval affairs. The new ship would be named the “Constitution,” have a speed of 20 knots, and “have a lighter draft of water than any other ship of her size in the world, thus enabling the vessel to enter any port with practicable commercial depth of water, and with impunity smash everything within distance of her guns.” The cost is estimated at \$10,000,000.

The stern-frame for the new 25-knot turbine Cunarder, now being built in England, weighs, including the rudder, 220 tons. The cast is one of the largest ever made in the history of shipbuilding and has attracted considerable attention.

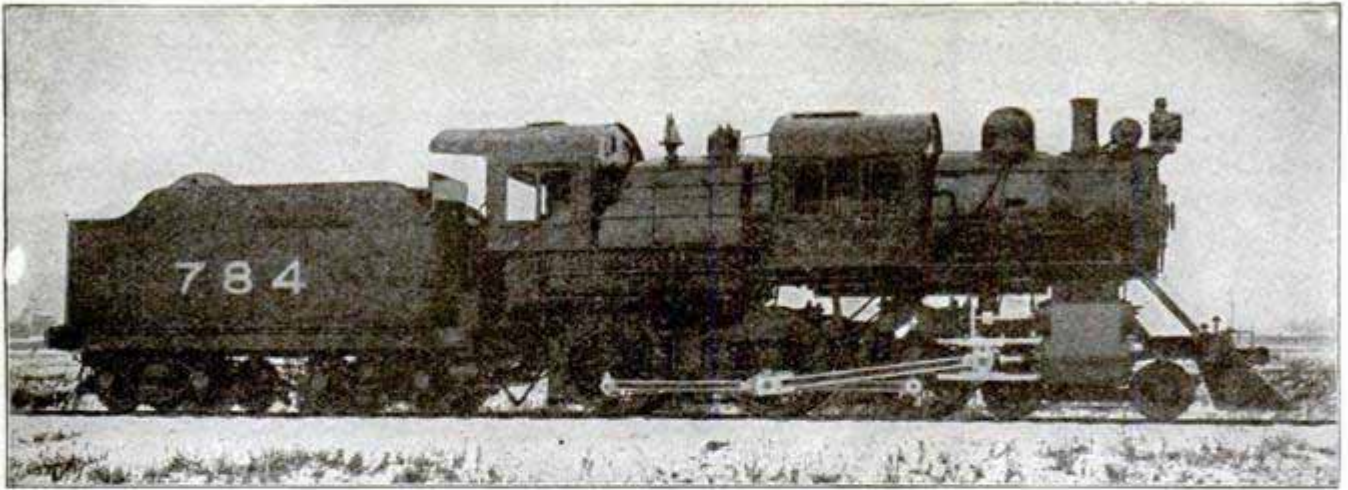
### LARGEST LAKE CRAFT EVER BUILT

The four largest fresh water boats in the world are under process of construction at the yards of the Chicago Shipbuilding Company, South Chicago. These boats will be ready to launch in the spring and will be used for carrying ore on the great lakes. They are constructed of steel, are 600 ft. long, 58 ft. beam and 32 ft. high. They will be equipped with Scotch boilers and triple expansion engines.

Instead of having a number of hatches, each boat has one immense hatch extending nearly the whole length of the boat. This arrangement, which has recently proved to be a success, will greatly facilitate loading and will make it possible to put 10,000 tons of iron ore in one of these boats in one and a half hours.

The cost of carrying the ore will be reduced to 1 mill per ton per mile. The cheapest railroad rate is 3 mills per ton per mile.





### LATEST CANADIAN-BUILT LOCOMOTIVE

The Canadian Pacific railway has turned out the first locomotives at its new shops in Montreal. The illustration shows the first engine, intended for either freight or passenger service. It is a simple engine using superheated steam; weighs 192,000 lbs.; cylinders 21 in. by 28 in.; with engineer's cab placed well forward. We are indebted to H. H. Vaughan, superintendent of motive power, for the photograph.

### HARNESSED FERRETS CARRY LEAD LINES

The telephone company that uses jointed rods to put the lead lines through underground conduit systems is behind the times. The modern, approved and inexpensive method is to put a tiny harness on a ferret, attach a light fishing line and lure the little animal through by means of a piece of meat hung at the next manhole. One company starts a rat through ahead of the ferret, instead of using bait.

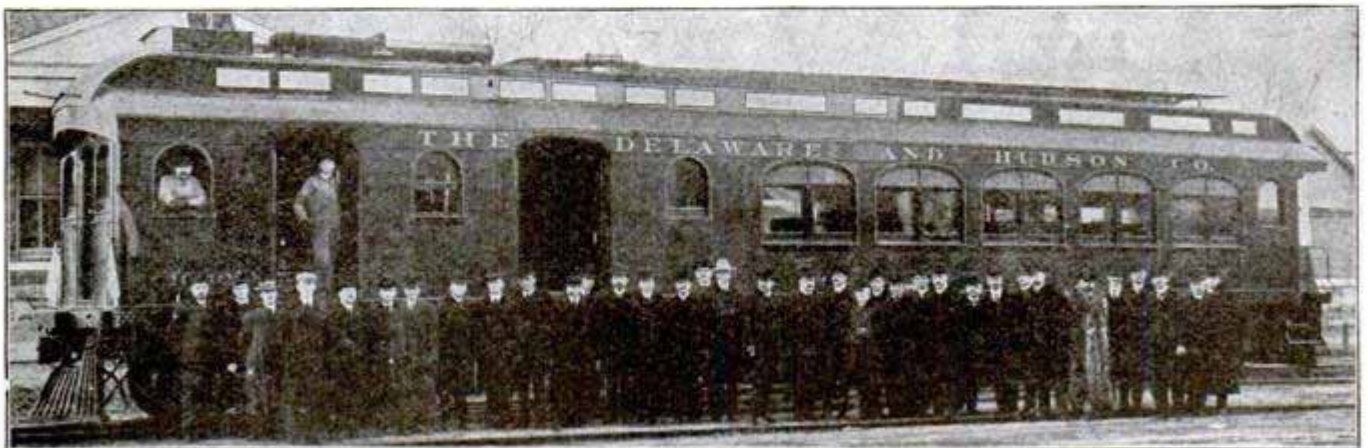
## NEW GASOLINE-ELECTRIC MOTOR FOR STEAM ROADS

*"Ready, Fire!"*

It was the chief engineer who spoke, and his assistant who pulled a trigger which looked as if it might be part of a shot gun: In fact it did belong to a gun, which was loaded with a blank cartridge of black powder. The explosion which occurred was immediately followed by the springing into action of a great mass of what appeared to

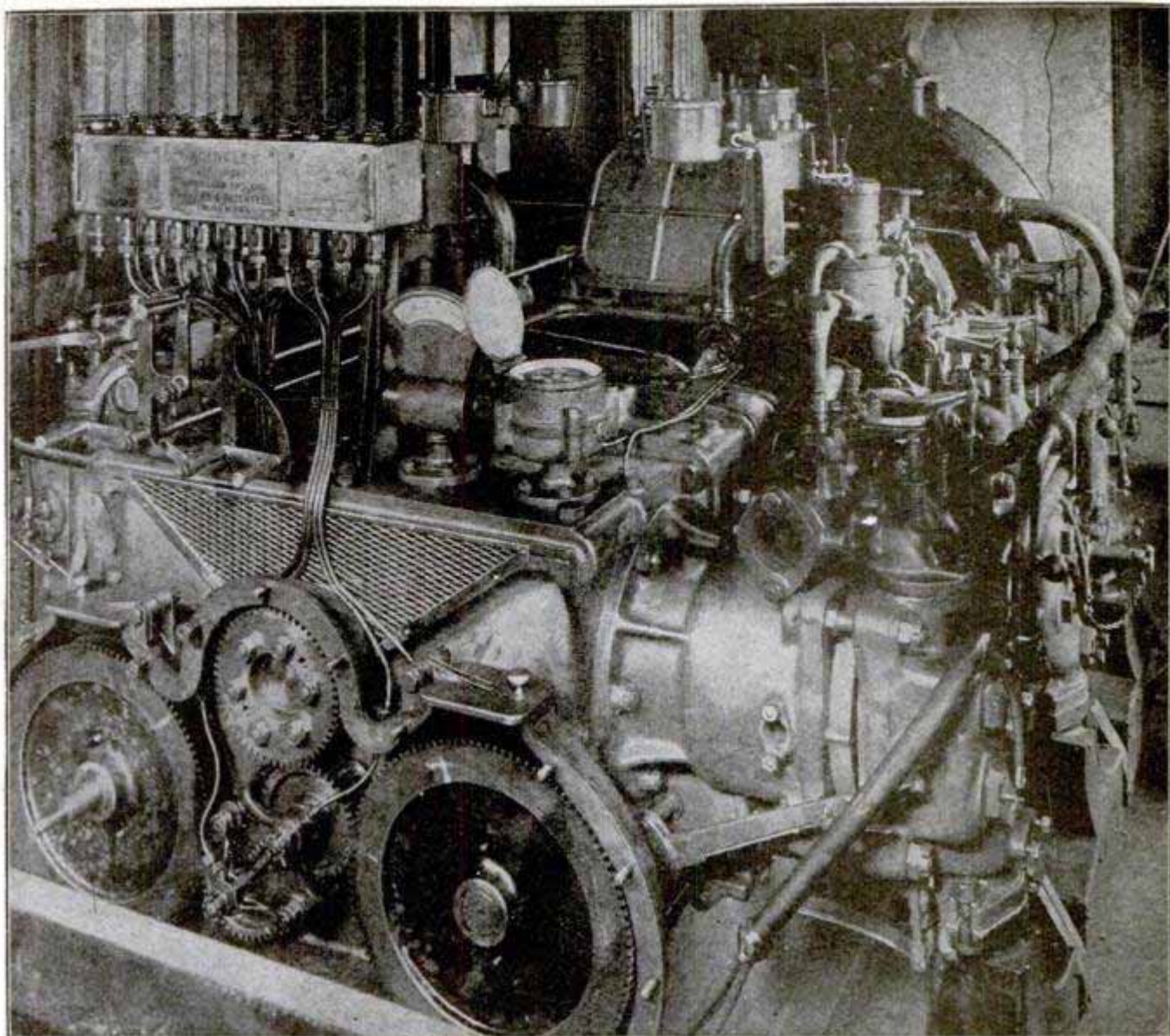
be complicated machinery; at the same time the car with its load of guests moved gracefully along the track.

The occasion was a demonstration of a new gasoline-electric car designed for use on steam roads. The car itself is a combination passenger and baggage, 65 ft. long, weighing 65 tons, and, including the smoking room, seats 52 passengers. The engine



Gasoline-Electric Car, 65 Ft. Long, Four Compartments





**Gas Engines and Electric Generator of New Car**

room is at one end of the car with a fair-sized baggage room separating it from the passenger compartment.

The gasoline engine is considered the most powerful unit yet constructed for this kind of work, and develops 160 hp. at 450 revolutions per minute. The six cylinders are horizontal, opposed, 9 in. diameter with 10-in. stroke, and water cooled. The gasoline tank is beneath the car, and a mixing device heats the gas before it passes into the cylinders. The generator is a direct connected, 120-kw., 600-volt, six-pole machine. One standard electric railway motor is placed on each truck. The movement of the car can be controlled from either end. The gas engines were built in Birmingham, England; the electrical equipment and the installation was made by the General Electric Company. The trial trip was from Schenectady to Saratoga at an average speed of 35 miles an hour.

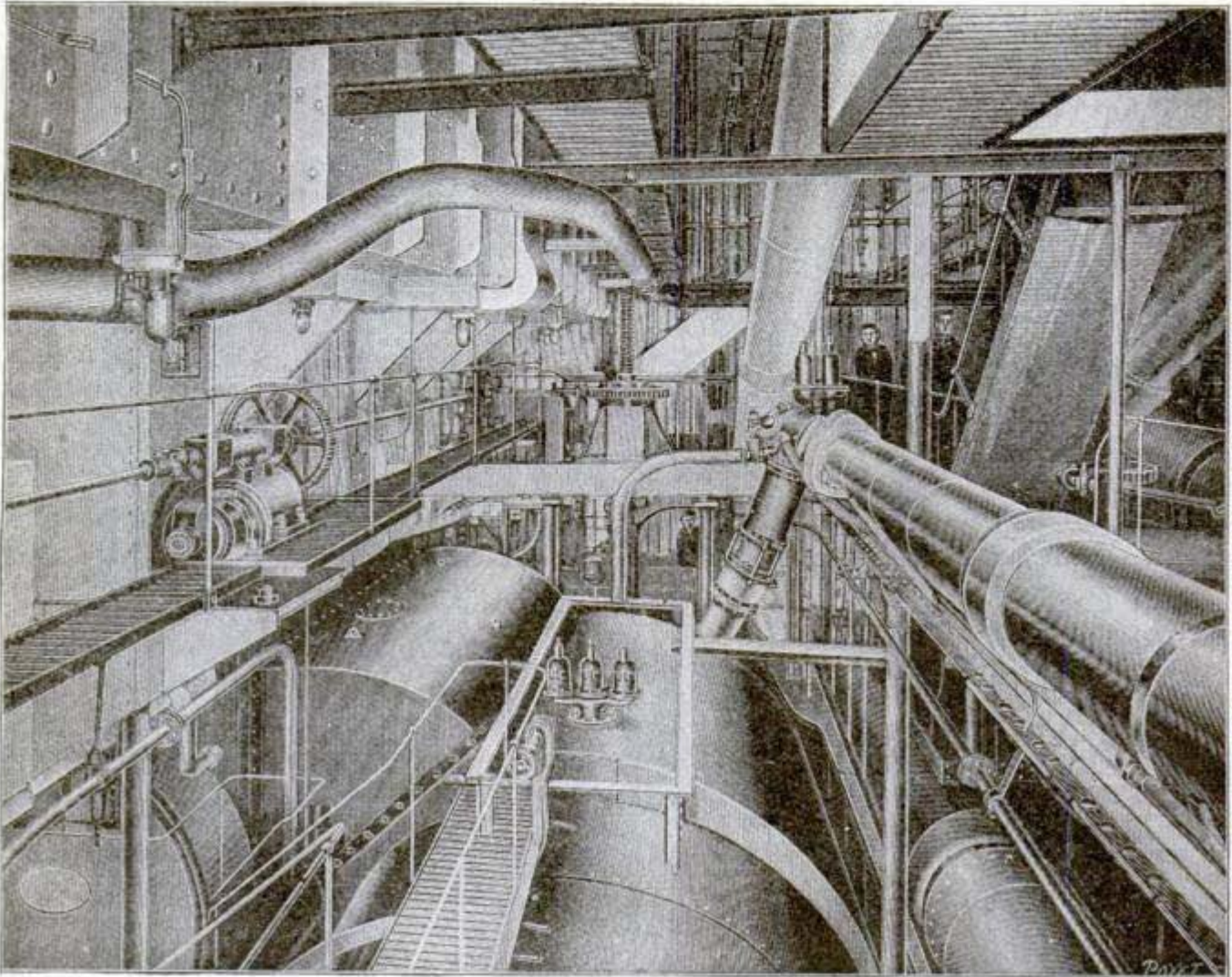
### **CEMENT-COVERED TELEGRAPH POLES**

Between the climate and the ants wooden poles for carrying electric wires have had a short life in parts of India. Three years ago the experiment was made of covering the pole with cement which is held in place by means of wire netting fastened to the pole. The test has been very satisfactory, and the cement coating has been applied to poles as long as 46 ft. It is hoped the life of the cement covered pole will be as long as that of an iron one, in which case the cement process will displace iron on account of the great difference in cost.

Many railroad men predict cement railway construction: a line of cement telegraph and telephone poles extending from New York to San Francisco; cement ties in place of the present wooden sleepers; and cement bridges; already in use.



# ENGINE ROOM OF A TURBINE STEAMER



## Through these Metal Tunnels the Steam is Roaring

The engine room of a great turbine steamer presents a striking contrast to the action of the old type marine engines. Instead of rapidly moving masses of tons of shining steel and brass, with the throb and jar of the massive engines and whirling shafts, there is no visible evidence of motion. Instead there are great steel cylinders

placed lengthwise of the ship, side by side. Through these metal tunnels the steam is roaring as it moves constantly in one direction in its effort to escape, while a heat more intense than any desert at noonday pours from every inch of the iron shells. The illustration shows one of the three turbines of the "Carmania," with its condenser.

Near Leesville, La., a land company locomotive recently found itself in an odd predicament. While passing a point where the tracks are close to the ordinary level of the water in the river, the locomotive became derailed. Before it could be gotten back upon the rails the river rose with the result illustrated.





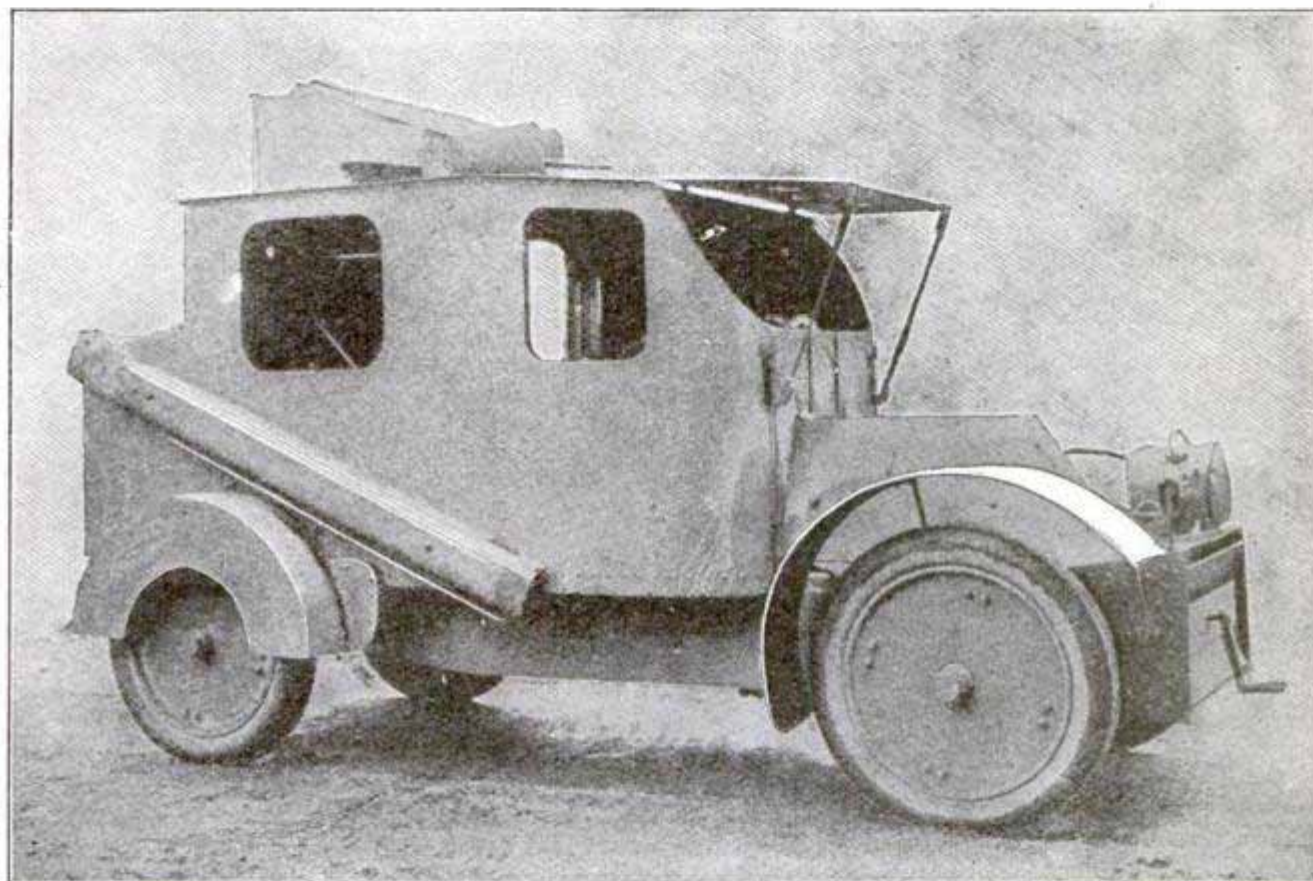
# AUTOMOBILE FIGHTING ENGINES FOR RUSSIA

Twelve huge fighting engines of an entirely new type are being built at Puteaux, France, for the Russian government. The machines are armored automobiles with a Hotchkiss gun projecting formidably from a turret on top of the rear of the body and with portable steel bridges for crossing ditches and small sloughs slung at the sides.

As an early step in the practical adapta-

tion of the motor car to the purposes of warfare these machines are engaging the interest of military experts everywhere. The chassis is of the standard 30-hp. type with springs and axles specially strengthened. The wheels are covered with sheet steel, have leather-covered tires and are interchangeable. Two spare wheels are carried at the rear of the car. By means of a special solution in the air chambers the car can be run for about 15 minutes after the wheels have been riddled with bullets. The driver's and mechanic's seats are in the usual position behind the engine and the engines can be started automatically from the driver's seat.

outlook on the enemy through loopholes in the turret and front of the car, and the gun which fires 500 shots per minute can be trained in any direction. The firing angle varies from 10° to 30° and the effective distance is 2,150 yds. Special steel that offers great resistance to bullets is used for casing the war-car. It is painted in khaki and with all passengers on board and full supply of gasoline and oil weighs only 7,040



**Armored War Car with Portable Bridges**

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Completely hidden from view within the vehicle, driver and gunner have a good

lbs. Ponderous as the machine is, it is capable of making 30 miles an hour on level roads and an average of 19 miles an hour across country. The facility with which it can be handled, backward, forward, up hills and across ditches, is astonishing. The portable rails or bridges are an important and interesting feature; they can be unshipped and placed readily and with ease. Each car cost \$16,000 and Russia has ordered twelve more built during 1907 and the same number in 1908.

The cars were inspected by the French minister of war, M. Etienne, and a body of journalists before being turned over to the Russian authorities, and interesting tests were made in their presence, in all of which the machine was under perfect control.



# HOW TO MAKE A SKY-BANNER KITE

The use of sky-banners to announce the location of picnics, fairs and other outdoor occasions, as well as to advertise theatres and local stores will be a common sight this summer. Some of the kite operators show performing dummies of men and animals, which at a height of several hundred feet appear to be a genuine performance. These are alternated at short intervals by pulling in the dummy and running up the banner. Such a display made recently over the principal retail street in Chicago so congested the street that in five minutes street cars and teams had to stop and the police ordered the dummy pulled down until they could open the street again.

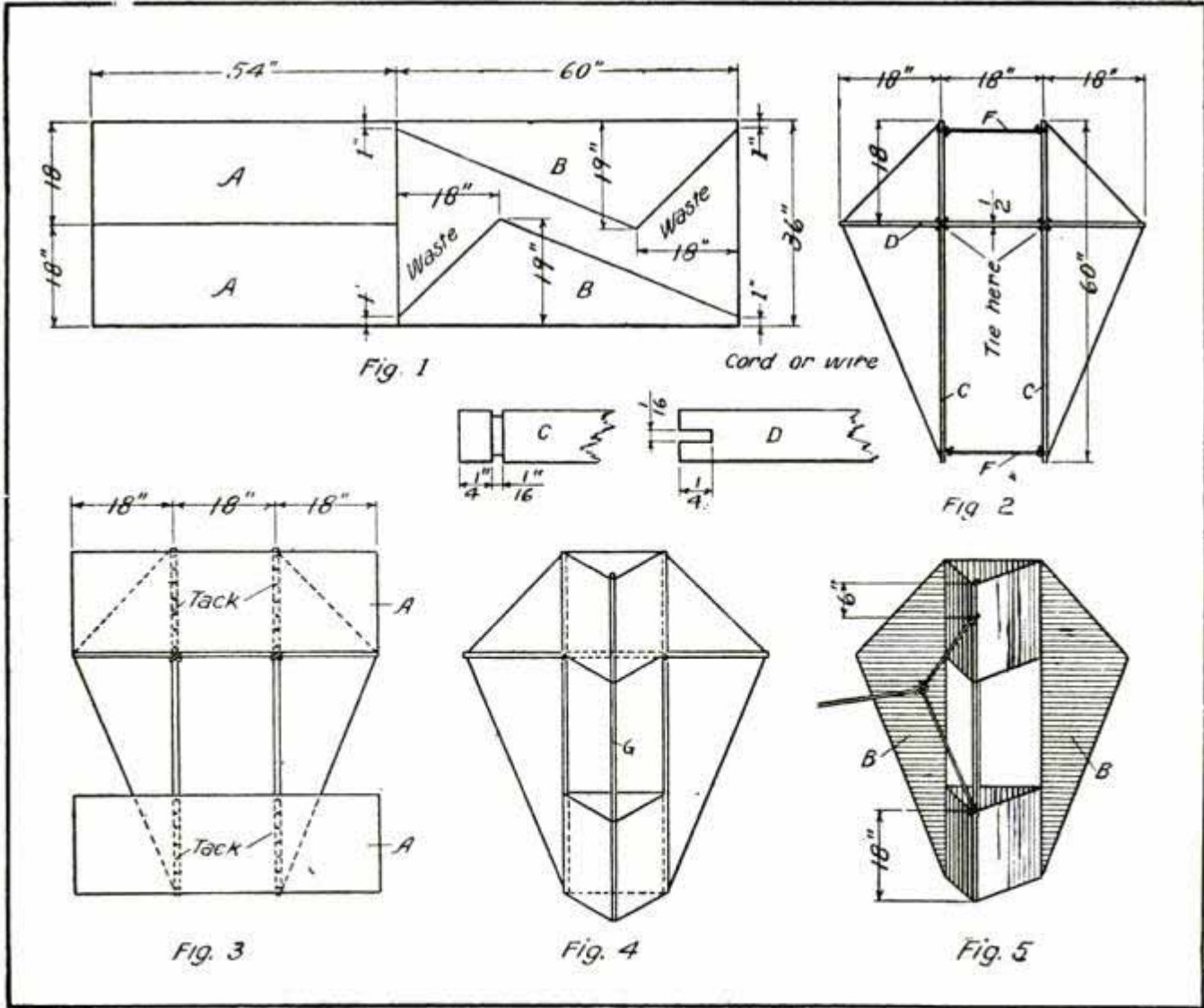
The kites may be bought or rented, or easily made by any one of ordinary mechanical ability, from the directions given below. The kite described is that used by E. E. Harbert, an expert in kite-flying. He calls it his triangular cellular kite.

The materials required for a 5-ft. kite are as follows: 3¼ yds. No. 40 Berkley cambric or a good grade of percaline 1 yd. wide; 20 ft. of strong cord or picture wire; a quantity of the smallest size tacks and 4 strips of basswood or spruce having the following dimensions:

- 2 strips 3/8x3/8x5 ft. ....part C
- 1 strip 3/8x1/2x5 ft. ....part G
- 1 strip 3/8x1/2x4 ft. 6 in.....part D

From the cloth cut two strips AA, and two wings BB as shown in Fig. 1 and hem all the edges of strips AA.

To make the frame place the 1/2-in. side of strip D on strips CC and tie securely with strong cord as shown in Fig. 2. Strips C and D should be notched at their junctions to prevent slipping and should be notched at the ends as shown in detail. Tie temporary cords FF at top and bottom to hold frame in position when attaching cloth. Fasten a piece of strong cord or picture wire



Details of Sky-Banner Kite



at the top of strip C and pass it through the groove in the end of strip D, and fasten again at the bottom of strip C. When this is done on both sides the frame is ready to be covered.

Tack strips BB on frame as shown in Fig. 3, using the smallest size tacks. Pass the ends of both strips through the frame and tack to bridle strip G as shown in Fig. 4. Then remove temporary cords FF.

To the back of the kite tack the 5-ft. wings BB on the strips CC and turn the edges of the cloth over the wire or cord and paste down neatly.

Fasten the bridle on the bridle stick G as shown in Fig. 5 and the kite is complete.

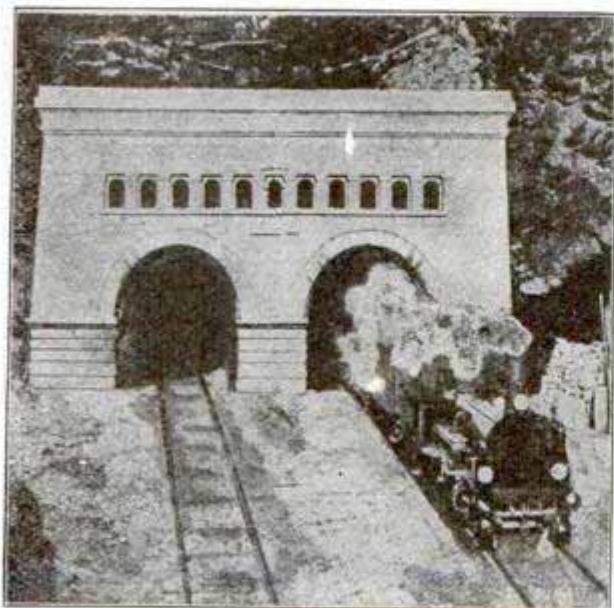
For flying in a light wind use No. 18 cable laid cord and for a strong wind use No. 36.

A kite of these dimensions will easily carry a 3 ft. x 12 ft. banner, but should not be used when the velocity of the wind exceeds 12 miles an hour.

This is the kite that has attracted so much attention in the down town district of Chicago, with large sky banners and performing dummy acrobats.

## FIRST TRAIN PASSES THROUGH THE SIMPLON

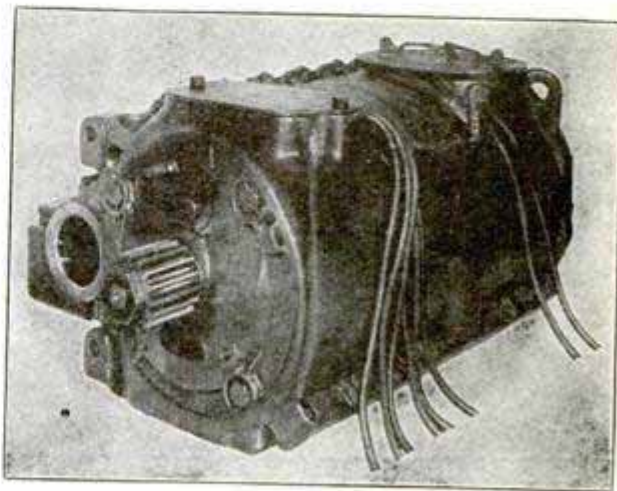
The first train passed through the Simplon tunnel on January 25th, 1906. It entered from the north at 8:56 a. m. and left it at 9:33 a. m. As it emerged salutes were fired and crowds of spectators cheered. The train consisted of an engine and four passenger coaches containing a number of eminent persons and journalists.



First Train Through

## SINGLE PHASE ALTERNATING CURRENT RAILWAY MOTOR

Electrical experts recently worked out a successful alternating current motor for street railway work. This system is specially desirable for use on long distance in-



New Railway Motor

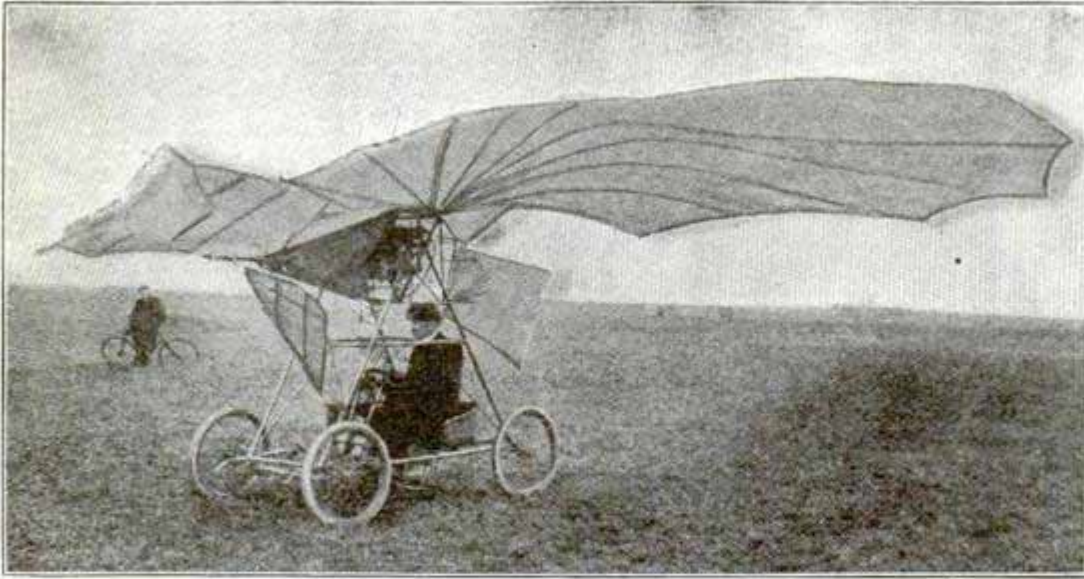
terurban lines, and is expected to be the type which steam railroads will adopt when the change comes from steam locomotives to electric motors. One trolley line near Milwaukee, 20 miles long, and another 16 miles in length, have decided to use the motor shown in the cut. It will operate with a potential of 3,300 volts, alternating current, but will also work under the 550-volt direct current employed on the city lines in Milwaukee. Each car will use four 75-hp. motors, making 300 hp. to a car. Current will be distributed to the substations at 33,000 volts and there reduced to 3,300 for the trolley wires.

## WALLACE URGES PANAMA CONTRACT

Former Chief Engineer Wallace recommends letting the Panama construction to some good contractor, or putting the entire work in the hands of a competent government official who shall be on the ground, and have authority to do things. He states the necessity of submitting so many questions for decision at Washington, 2,000 miles away, makes it impossible to either work satisfactorily or expeditiously. In other words, do as railroad companies do; decide on the general plan and policy and then trust some good man to do the best he can and get results.



# FLYING AUTO THE LATEST MOTOR CAR



A new Paris aeroplane and automobile combined has the aeroplane mounted on a chassis motor worked by liquid gas. When the apparatus is well launched on its way, the force of propulsion and the resistance of the wind to the aeroplane, causes it to rise. The machine was designed by M. Vina of Paris.

## SLEEPING CAR TO HAVANA

A car ferry is proposed, and will doubtless be in operation in less than two years, between Key West and Havana. When this service is inaugurated one will be able to take a sleeping car in New York or Chicago and without once leaving the car be landed in Havana. Forty hours is the contemplated time, New York to Havana.

## EXPERIENCE OF A "TROUBLE" MAN

"My first experience on the road was as a 'trouble' man," writes W. F. Lamme in the *Electrical Journal*. He describes the cool reception he received at plants where the apparatus furnished by his company was not giving satisfaction, and how difficult it was to get any information from the purchasers; and how, also, the trouble was more often found to be outside the apparatus than in it. He says:

"One of our salesmen sold an alternator. Of the operation of this alternator evidently a very glowing description had been given to the purchaser. The alternator was of the well known compound type, belted to a high-speed engine, with a flywheel governor. The alternator was of standard make and all its characteristics were well known. The load was lighting, therefore nominally non-inductive. The exciter was of ample capacity.

"The report on this installation stated

that at times great difficulty was experienced in keeping up the voltage; the exciter was much overloaded and two exciter armatures had been damaged; several electrical engineers had experimented upon the case and had secured no satisfactory results, therefore it was not welcome news to be designated for the job. However, the salesman and myself visited the plant and, as usual, met with a chill. The plant was started and everything ran well; the alternator held voltage with a large margin on the rheostats and the exciter was quite cool to the hand. The alternations were about correct, the engine running at, approximately, 250 r.p.m.

"Retiring to await developments, we returned in about an hour. Conditions had now changed. The alternator could barely hold voltage, with all the rheostats out and the exciter, laboring under a heavy overload, was quite hot, but I noticed a different hum from that at the start of the machinery. This led me to take speed. I found the engine now running not at 250 but at 217 r.p.m. This explained everything. There was a defect in the engine governor which caused the speed to drop at a certain load and to remain there. After this defect was remedied the engine held speed and the electrical apparatus proved to be in every way satisfactory."

The late Prof. Langley, head of the Smithsonian Institute since 1887, began life as an architect and civil engineer in Boston.



## HOME-MADE WINDMILLS FOR PUMPING AND POWER

[The editor is indebted to the State Agricultural Experiment Station, of Nebraska, for much of the data used in the preparation of this series of articles.]

## PART III

## THE BATTLE-AX WINDMILL

The battle-ax mill is another type which may be constructed of scrap material and entirely by home labor, and under these conditions costs the

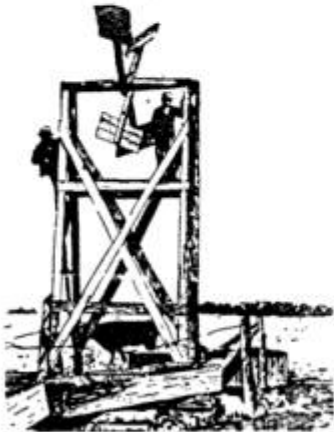


Fig. 13

farmer no expenditure of cash. A tower of lumber or poles supports an axis to which the arms with their blades are attached. This type of mill is set in a fixed position with its axis north and south, consequently when the wind blows from the east or west it does not operate. This is not a serious objection, however, as our winds are nearly constant.

The most important part is the axis. Wood, gas pipe, shafting, an iron rod, or a section of a straight pole may serve for this part, but the best way of all is to use the axle and hub of an old wagon or buggy. These bearings when oiled are practically frictionless. The arms are bolted to the axis and, for greater strength, are sometimes tied together with twisted fencing wire. The limit in size for the battle-ax mill is about 20 ft. in diameter; mills 8 or 10 ft. in diameter are more generally in use for pumping and irrigation purposes.

A mill with a 12-ft. wheel is shown in Fig. 13. This mill pumps water for 125 head of cattle. The axis is of wood, 8 ft. long, with four fans having blades 3 ft. square. The tower is well built and sightly.

This mill cost \$10, but one like it and quite as efficient could be built at no expense save labor, by using poles and scrap material. Two home-made mills on a 160-acre estate near Overton, Neb., where there are several fine shop-made mills in operation, were built for \$1.50

each and each pumps water for 50 cattle while one waters a garden patch in addition. Poles cut from the timber claim were used to build the towers and an old buggy axle was used for the axis. The thimbles were taken out of the hub and fitted to the tower, and the spindles run in the thimbles. One nut was removed and a crank screwed on in its place, then the blades were nailed on the arms and the arms bolted to the axis. Cottonwood poles set in the form of a tripod were used for the tower. The wheel of this mill is 8 ft. in diameter, the blades 2½ ft. by 2 ft.

Some battle-ax mills have six, eight, or many fans, usually paddle-shaped, as in Fig. 14. This mill was built up of old lumber, boxes, rails, wire, parts of the frame and gearing of an old thresher and the brake of an old wagon. The diameter of the wheel is 12 ft. The mill cost between \$6 and \$8, and has a large tank, bringing the total cost up to \$14.

A battle-ax with a 10-ft. wheel built entirely of new lumber, furnished with a tank and painted cost just \$15. Fig. 15 shows a battle-ax having blades made of barrel staves. This gives an idea of the extent to which waste lumber can be utilized.

A mill that saws wood is shown in Fig. 16. It is located at Verdon, Neb., and will saw 30-in. logs. The diameter of the wheel is 10 ft. The sketch shows how the wooden drum and brake work. A plan of the brake is shown at the left. The handle, A, cramps upon the wooden drum, B.

An unusual, but efficient mill, is shown in Fig. 17. The fans turn upon short arms and when they are turned so as to form a circle with edge to the wind, the mill is out of gear, turned slightly oblique, the fans catch the force of the wind and the mill starts. This mill is mounted on a shed which stands

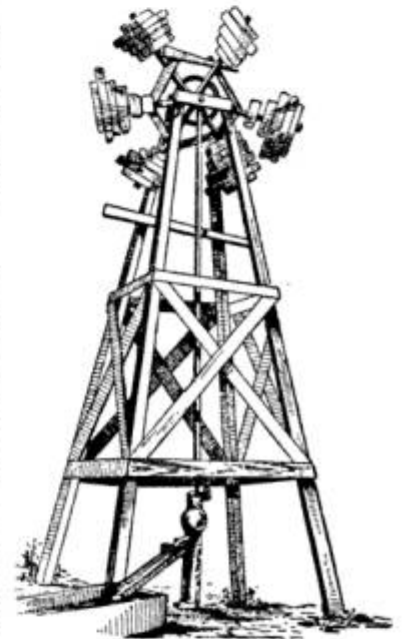


Fig. 15



Fig. 14



north and south. The diameter of the wheel is 10 ft. and the cost of the mill was \$11. It runs a two-hole corn sheller, a feed

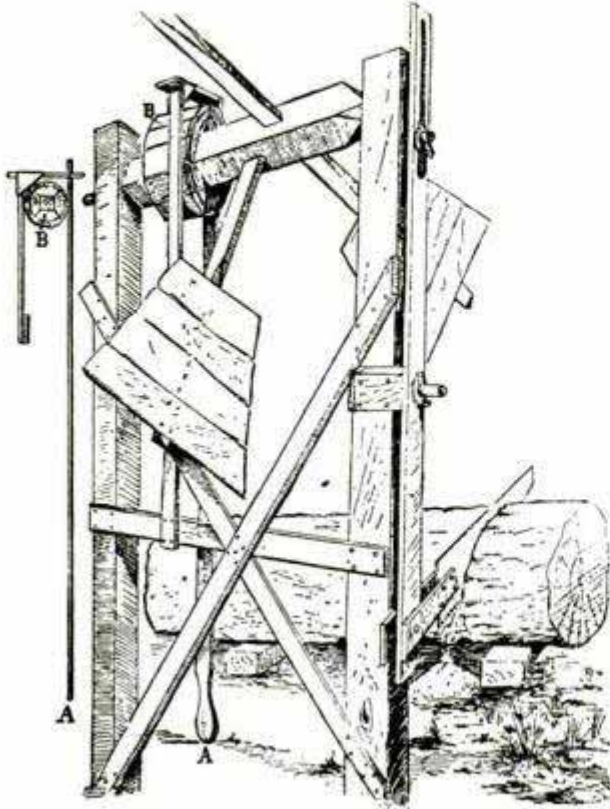


Fig. 16

grinder, and the grindstone. Power is transmitted by means of sprocket wheels and chain.

This mill, like which there is only one other in existence, is located near Ashland, Neb., and its owner was awarded a prize for the originality and ingenuity of its construction.

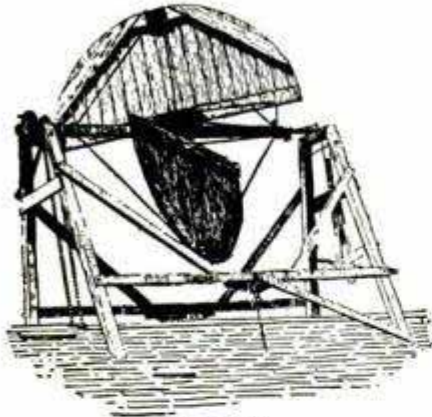


Fig. 17

bersome structure when his requirements are less; nor to model his mill after some other which may be efficient for his neighbor, but wholly inadequate for him; but to decide about what power will be required to perform his work and then take an inventory of the waste material on hand that can be adapted to the purpose. This method will tend toward economy of time, labor and money.

(To be continued.)

## QUENCHING RIOTS IN PARIS

When the Paris police found themselves unable to quell the recent religious riots, the fire department tried quenching them. At one church, when the government officials came to take an inventory of the property, they found three thousand people barricaded within and determined to keep out



Sousing the Rioters

the inspectors. The force of guards and policemen failed to move the mob, and water was pumped in on the people by a fire engine. The drenching and the unpleasant force of the water proved effective. Our illustration is by courtesy of the Graphic, London.

## WIRELESS MESSAGE 3,000 MILES

What is said to be the longest transmission of a wireless message yet made came from the dry dock "Dewey," a distance of 3,000 miles. The "Dewey" reported everything in good order and making 4½ miles an hour.



## CAUSES OF FAILURE IN THE CONCRETE BLOCK BUSINESS

The chief causes of failure in concrete block manufacture were described by O. U. Miracle, in an address before a convention of cement products men. The following is condensed from his address:

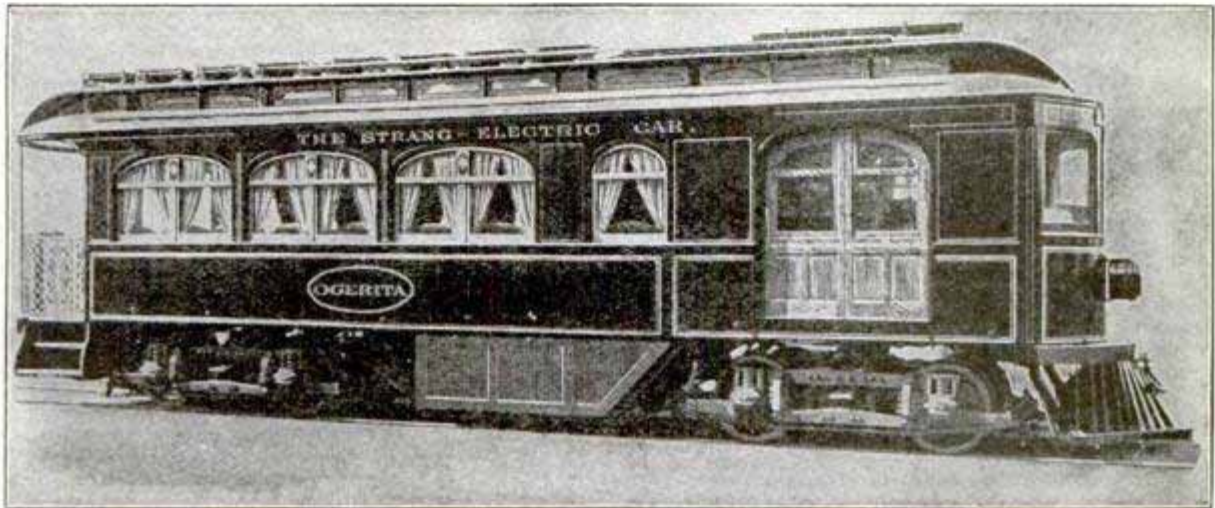
Architects as a rule are opposed to the use of concrete blocks for building purposes, and they, no doubt, have some grounds for being prejudiced. The material manufactured is often of inferior quality, poor workmanship and ugly design. There is no excuse for treating a material so shamefully when it has such great possibilities.

Probably the greatest detriment to the concrete block industry is the attempt to

artistic designs as cement, but still the manufacturers cling to the imitation stone design. This material should be entitled to a distinct classification of its own and should not be designated as an artificial or imitation stone. It is to be hoped that the objections to the concrete block will be overcome in the near future and give humanity the advantage of its great possibilities.

## GASOLINE-ELECTRIC CAR CROSSING THE CONTINENT

An electric-gasoline car passed through Chicago on March 5th on its way from New York to San Francisco. This is the first attempt to make a transcontinental trip with a car of this kind. The car is 52 ft. long,



Car that is Crossing the Continent

produce a cheap article by using too small a percentage of cement. This results in a porous material which easily crumbles and is entirely unfit for building purposes. The proper amount of cement to be used is easily determined for any given sand by pouring water on it. The amount of water required to fill the spaces between the grains, gives the proper percentage of cement, and for most sand varies from 25 to 35 per cent. If crushed stone is used the same test is applied to the stone to find out how much sand and cement mixture to use.

Concrete blocks are often not thoroughly cured. Blocks should be kept moist for at least seven days after making. The water should be applied with a spray or sprinkler immediately after the first set has taken place or as soon as it can be applied without washing out the cement.

No material is so easily susceptible to

is mounted on two 4-wheel trucks, and has two compartments: The forward one for the generating machinery, and a larger one capable of seating 20 passengers in parlor car chairs.

The gas engine is a six cylinder opposed type of 75 hp. direct connected to a 250 kw. generator. Current is carried to ordinary street car motors and when an excess of power is being made the surplus passes into storage batteries, which automatically feed the motors as auxiliary to the generator when required.

Between New York and Chicago the speed made was 35 miles an hour. The system employed is quite similar to others recently constructed.

One-fourth the water passing through the city mains of New York is wasted. This loss has made necessary the expenditure of \$150,000,000 for additional supply.



## QUARRYING CARRARA MARBLE

At Carrara, Italy, whence comes the world-famous marble of that name, there are no less than 400 quarries, located on the sides of the Apennine range. The mountains vary in height at this point from 500 to 3,500 ft., jagged and glittering white in the sunshine; beautiful in the extreme.

About 5,000 men are employed in the



quarries, while hundreds of marble cutters and some sculptors earn a living there. The quarries have been worked for over 2,000 years, but primitive methods are still in use. Blasting occasions a great waste as the fragments are too small to be of value.

## PRESIDENT DECIDES IN FAVOR OF LOCK SYSTEM FOR PANAMA CANAL

President Roosevelt will direct the Isthmian Canal Commission to proceed with the construction of a lock type of canal unless congress decides in favor of a sea level waterway and instructs him accordingly. The foreign consulting engineers favor a sea level canal; a majority of the American engineers recommend the lock system. The foreigners have been guided by Suez canal history; the Americans by the Sault Ste. Marie canal.

The President says: "It will be noticed that the American engineers on the consulting board and on the commission by a more than 2 to 1 majority favor the lock canal, whereas the foreign engineers are a unit against it. I think this is partly to be explained by the fact that the great traffic canal of the old world is the Suez canal, a

sea level canal, whereas the great traffic canal of the new world is the Sault Ste. Marie canal, a lock canal. Although the latter, the Soo, is closed to navigation during winter months, it carries annually three times the traffic of the Suez canal.

"A careful study of the reports seems to establish a strong probability that the following are the facts: The sea level canal would be slightly less exposed to damage in the event of war; the running expenses, apart from the heavy cost of interest on the amount employed to build it would be less; and for small ships the time of transit probably would be less.

"On the other hand, the lock canal at a level of eighty feet or thereabouts would not cost much more than half as much to build, and could be built in about half the time, while there would be much less risk connected with building it, and for large ships the transit would be quicker; while, taking into account the interest on the



Primitive Methods Prevail

amount saved in building, the actual cost of maintenance would be less.

"After being built, it would be easier to enlarge the lock canal than the sea level canal."

## WORLD'S FAIR FOR NEW ZEALAND

An international exhibition will be held in Christchurch, New Zealand, from November, 1906, to the middle of April, 1907. New Zealand buys in the United States annually manufactured goods to the value of \$7,500,000. Its climate is said to be the finest in the world. Details regarding exhibits may be had by addressing the editor of this magazine, or the Secretary, New Zealand International Exhibition, Christchurch, N. Z.



# GREAT IMPROVEMENT IN FOUNDRY WORK

## Molds Carried to the Cupola to be Poured--Large Economy in Continuous Process

For centuries swarthy men have laboriously carried ladles filled with liquid metal to the most distant parts of a foundry. The new method is a complete reversal, for now the molds come to the cupola in an endless procession from morning to night. The result is, for small castings, a largely increased output at a great saving in cost.

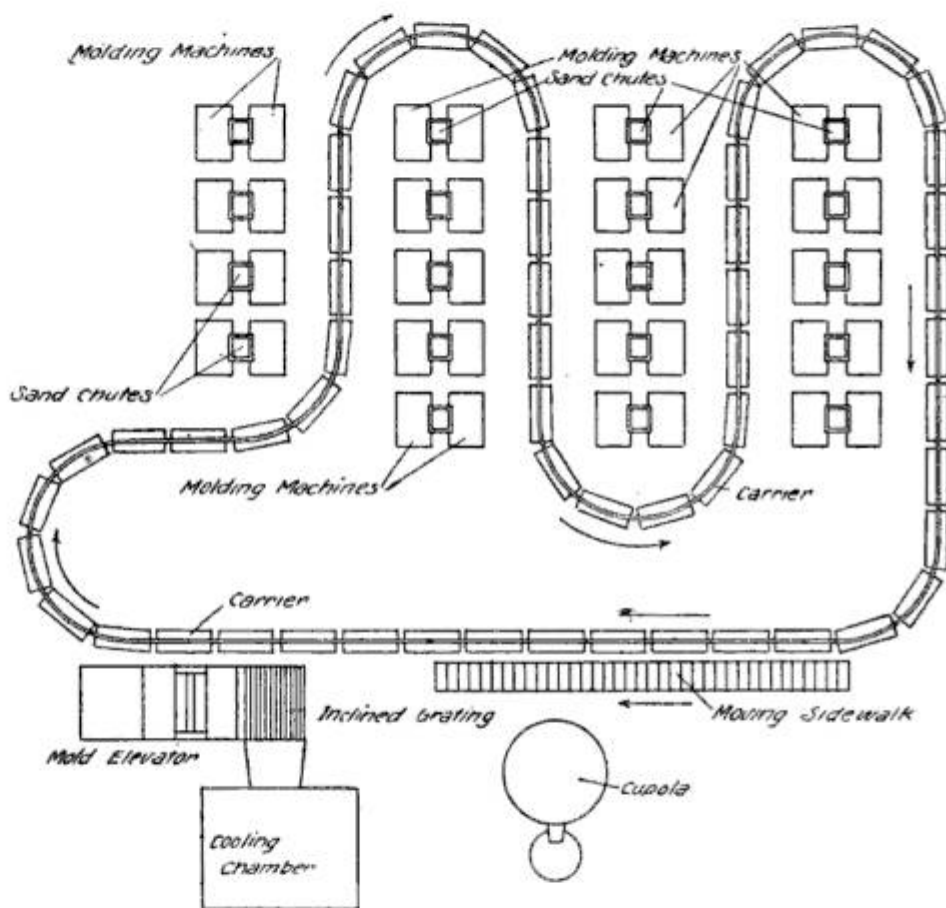
The usual system in a foundry is an intermittent process. The greater part of the day is spent in making molds which are poured later on. This system works very well for large castings, but small castings can be made much quicker in a foundry equipped with the carrier system. In this method the melted iron is not carried to the molds, but instead the molds are brought to the cupola by the carrier shown in the diagram (Fig. 1). This method not only saves time but also prevents the molten iron from cooling before it is poured.

The operation of the new process is as follows: One of the molding machine operators opens the sand chute at the back of his machine and allows enough sand to fall into his machine to make one mold. He then turns on the compressed air which rams the sand better and quicker than can be done by hand. Then he turns another air valve which starts a pneumatic rapper constructed exactly like a pneumatic hammer. This causes the mold to vibrate and enables him to draw the pattern from the mold without any sand sticking.

The mold is then placed on the carrier which consists of a number of swinging shelves suspended from a track overhead. These shelves are all connected to a chain which moves constantly in the direction indicated by the arrows in the diagram. When a mold reaches the moving sidewalk

one of the pourers steps on the sidewalk with his ladle of iron and pours the mold. The moving sidewalk and carrier have the same speed making it just as easy to pour as a stationary mold.

After it travels a little farther, during which the casting has set, it is removed to the elevator which carries it up and dumps

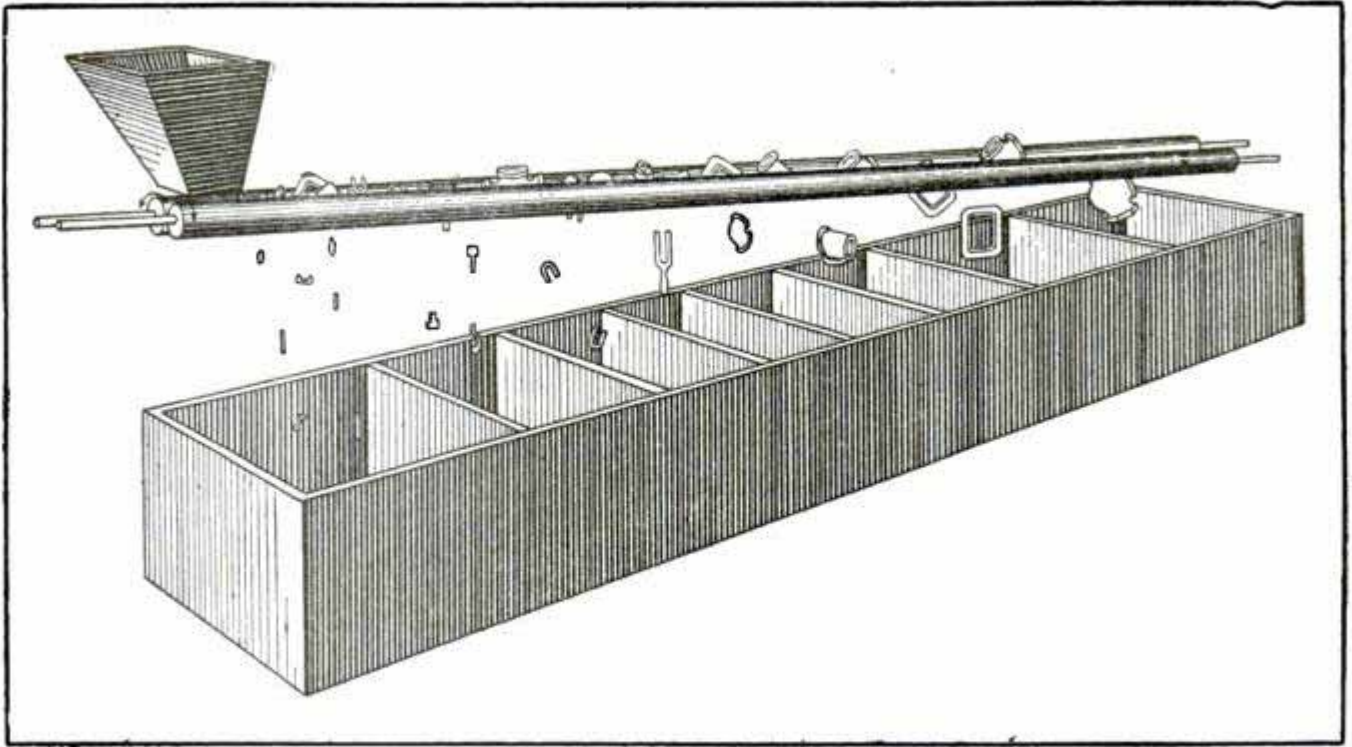


Floor Plan of the Foundry

it on an inclined grating. This grating has a shaking motion which causes the sand to drop down through the bars, and passing through a hopper it lands on a rubber belt conveyer. It is here moistened with a spray and then discharged into a rotary sieve after which it is automatically conveyed to the sand chutes to be used over again.

The castings are too large to go through the inclined grating but roll off the edge into the cooling chamber. After cooling they are tumbled and then separated in the automatic separator.





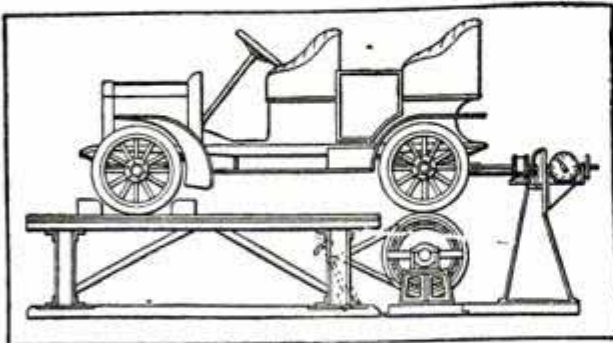
Simple Automatic Device for Sorting the Castings

This device is as simple as it is effective. The castings fall through the hopper (Fig. 2) and slowly slide down between two inclined revolving pipes which diverge at the lower end. This allows the small castings to drop through at the hopper end and the large castings to drop at the opposite end. Thus by placing partitions underneath in the right positions all the castings of one kind will fall into the same box.

The advantage of this device is more apparent in duplicate work where all similar castings can be readily separated.

### AUTOMOBILE TESTING MACHINE

An automobile testing plant has been installed at Purdue University. The front wheels of the automobile rest on a plat-



Testing Outfit

form, while the driving wheels are on a pair of wide pulleys fastened to a shaft. A prony friction brake is attached to the shaft, Motor Way says: "The prony brake used consists of a cast iron wheel with a

wide flanged rim. Two iron straps, fitted with strips of wood forming the friction band, extend around the pulley rim and this may be tightened or loosened by means of a screw clamp, thus increasing or decreasing the friction on the pulley rim. The pulley is prevented from heating by running water into the flanged rim where it takes up heat from the rim and is evaporated.

"With the machine mounted in this manner the draw bar pull is measured by a spring balance attached to the driving axle of the automobile by means of the draw bar, and to the frame of the testing machine."

### MECHANICAL REFRIGERATOR CAR

Much is hoped for in the tests being made with a mechanical refrigerator car. The car itself is of the ordinary refrigerator type; the system can be applied to any such car at present in service. The operating plant is placed in a small room at one end of the car; power is taken from the car axle when traveling, or from a small gasoline engine at other times. A fan maintains a constant circulation of air around the car, during which it passes over the cooling pipes. Ethyl chloride is the chemical used. The system is quite like that described in this magazine as being tried by the Russian government just previous to the war with Japan.



# WHAT HAPPENS AT 60° BELOW ZERO

Where Food Freezes While Cooking and Steel Tools Snap Like Pipestems

By Chester W. Tennant, Dawson, Y. T.

"Look out, or you will drop that chisel!"

Before the sentence was finished the tool had slipped from the hand of my assistant, and striking upon some bar iron flew into pieces as if it had been glass instead of steel. This is no uncommon occurrence when our thermometer is around 60° below.

Some of the other experiences of 60° below zero may interest Popular Mechanics readers. I am writing this on January 25; for two weeks we have had a "cold spell." Temperature has ranged from 44° below zero (the warmest) down to 68° below. Some of the outlying Yukon police stations report 80° below. These cold waves alternate with warmer periods of 10° below.

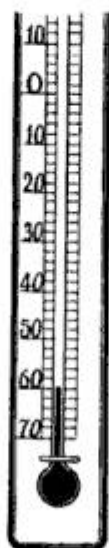
Strange manifestations appear as a result of the extreme cold; one is the way a fire burns in the stove. It roars and crackles like a great forge and wood in the stove seems to dissolve in the flames like a chunk of ice; the wood is gone and we wonder where the heat went.

At 60° below, every stovepipe throws out a great white cloud of smoke and vapor, resembling a steamboat in its whiteness and this cloud streams away for 50 to 100 ft., mingling with the other white-grey mist or haze that remains permanent in the atmosphere of the town like a great fog, when it is 40° or more below zero. This white-grey fog is not fog as you know it, but is frozen fog, and every man, woman, child, animal and even the fire that burns is throwing out moisture into the air which is immediately turned into a cloud of frozen vapor which floats away and remains visibly suspended in the air. Very slowly this settles to earth and in the morning about the steps and any protected place, one can see a very fine film of flour-like dust deposited, which is composed of frozen vapor.

At 60° below, the exposed ears, hands or nose freeze in going the distance of about one block under ordinary circumstances, but the children go to school with face and hands well protected. The breath, if blown out into the cold air, roars like a mild jet of steam escaping. A dipper of boiling water taken from the stove and thrown out

into the air at this temperature, gives out a peculiar whistling hiss as its drops circle through the frosty air.

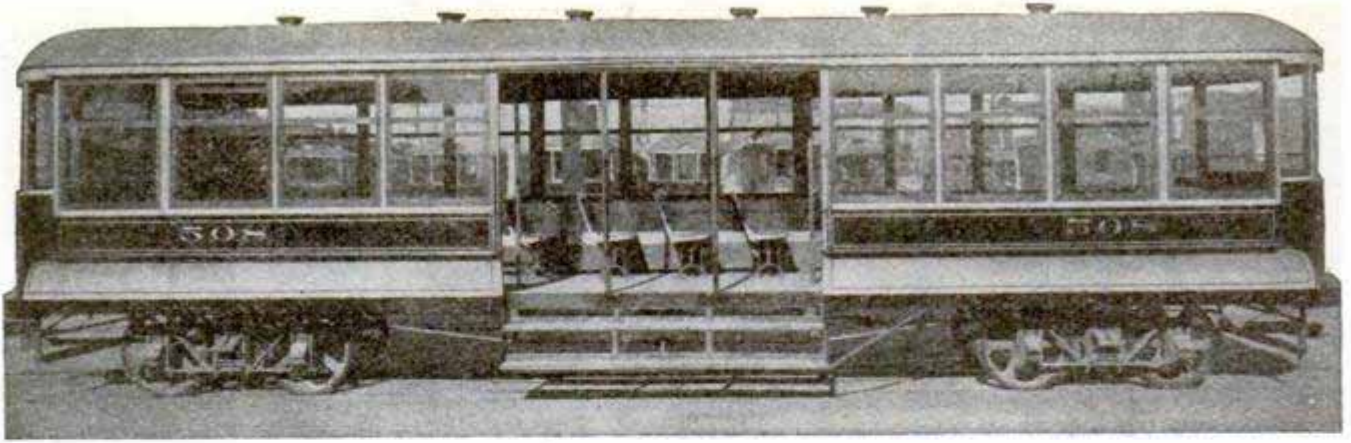
Prospectors in attempting to boil a dish of rice or beans upon a camp fire unprotected from the weather, find that the side of the dish which is in the fire will boil while the part of the dish exposed to the weather has frozen. To remedy this, the dish is set completely into the fire. Edged tools subjected to this temperature become as hard and brittle as glass and will break as readily under strain. I have seen a pop safety valve blowing off steam when weather was below 60°, with icicles which had formed by the condensation while it



was blowing off hanging from the outer rim of the valve. The icicles were not melted by the outrushing steam but remained there for days, through many blow-offs, as I passed this station every day and watched the operation. All vegetables, potatoes, apples, fruit, eggs, etc., can be allowed to freeze until they become like bullets. To make ready for use, place them in cold water half a day before using and the frost will slowly withdraw without injury to the article. To attempt to thaw them out by more rapid process by fire or hot water, spoils them for use.

A frozen member of the human body, foot, ear or hand, can be safely thawed out by immersing the member in coal oil and keeping it there until the frost is all drawn out of the member into the oil. This may require several hours if it be a frozen ankle, or a hand frozen to the wrist; it takes about as long to draw out the frost into the oil as it took the member to freeze. This is absolutely a safe remedy and one thus escapes the surgeon's knife, as no bad results follow. This is not hearsay, as a man was saved a few years ago at our office by the night watchman who found him in the snow (45° below zero) and both hands frozen to the wrists. He was taken into the office and treated as above for about five hours when all the frost was drawn out without so much as losing a finger tip. The physicians were amazed as they thought amputation would have to be resorted to. His





**In Denver many of the street cars have no end doors and platforms, and passengers enter and depart from a large opening at the middle of the car. The climate is such that open or semi-open cars are used nearly every day in the year. The car shown is one on the lines of the Denver City Tramway.**

hands were as white and hard as marble and when placed in the oil they snapped and crackled as the oil began to act upon the ice crystals. This remedy should be remembered by all residents of cold climates as it would save many a limb. The temperature of the oil should be about the same as that of the living room (about 60° above zero). Had I not instructed the watchman in this matter, the unfortunate man would without doubt have lost both hands. Great caution must be exercised during extreme cold weather so as not to frost the lungs, which one will quickly do if he hustles about at ordinary pace. Quick and fatal pneumonia can be contracted in a few minutes. Many a fine team of horses has been lost in this way, by attempting to haul as heavy loads, or as rapidly, as during warmer weather. The result is the team is forced to breathe fast for the same load draws much harder at 60° below zero than at 10° or 20° below, as the snow becomes chalky and clings to the runners. Two years ago a team of mules dropped dead at the Forks from this cause and a few days ago a woodman lost a fine horse out of a team from the same cause. Some men are cautious and provide breathing bags for their horses, which is a bag placed over the nose of the animal and extending down 18 in. below the nose with an opening at the bottom. This last week the Northwest mounted police have given orders for all teams to be kept in the stables and this includes the freight and stage lines. The wood teams have stopped hauling and the shortage in wood has run the price up to \$20 a cord.

One has to be careful about touching things with unprotected hands. It is dangerous to take hold of a door knob when it is 60° below zero or thereabouts with the

uncovered hand, unless you are careful to instantly release your hold, for if you do it will freeze your inner palm in five seconds, be very painful thereafter, and the result is the same as from touching a red-hot stove.

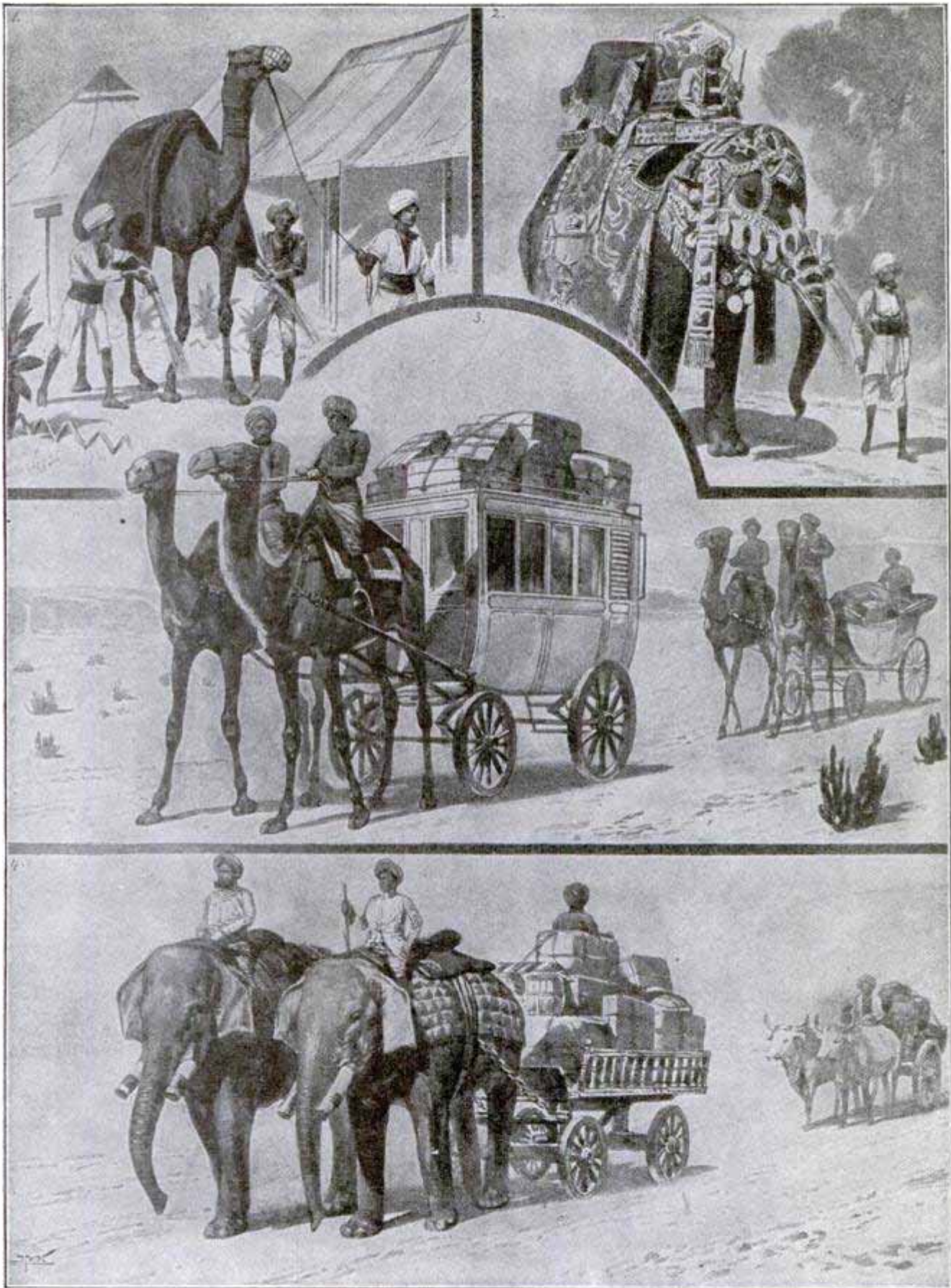
Canned goods undergo frightful contraction during extreme cold, and suck in air; in summer with a temperature of 90° the reverse condition occurs, causing leakage and loss.

Great spikes used in constructing the frames of buildings when subjected to this frigid temperature contract where imbedded in the wood, (they become shorter by contraction) and when the clinging fiber of the wood can no longer control the contraction, the shrinking spikes give a great jump in the wood and this is accompanied by a loud booming noise which sounds like the firing of a heavy gun, or as if some one had struck the building with a sledge hammer. As there happens to be more than one spike in the structure, there is therefore not one, but many of these explosions which resemble the sounds from a target range. The same is true of the sidewalks.

Coal oil begins to thicken at 40° below and at 60° and 70° below becomes as thick as lard and looks very much like lard, or but a very little darker and can be cut out of the can with a knife the same as you would cut lard or butter. A lighted lamp or lantern left exposed in this temperature will freeze up and go out in about 80 minutes. I have not seen gasoline become stiff yet from any of the low temperatures that we have yet experienced. The extreme cold seldom lasts more than three weeks at a stretch, and a good part of the year the climate is fine, especially the summers, with continuous daylight throughout the 24 hours.



## ROYAL TRANSPORTATION IN INDIA



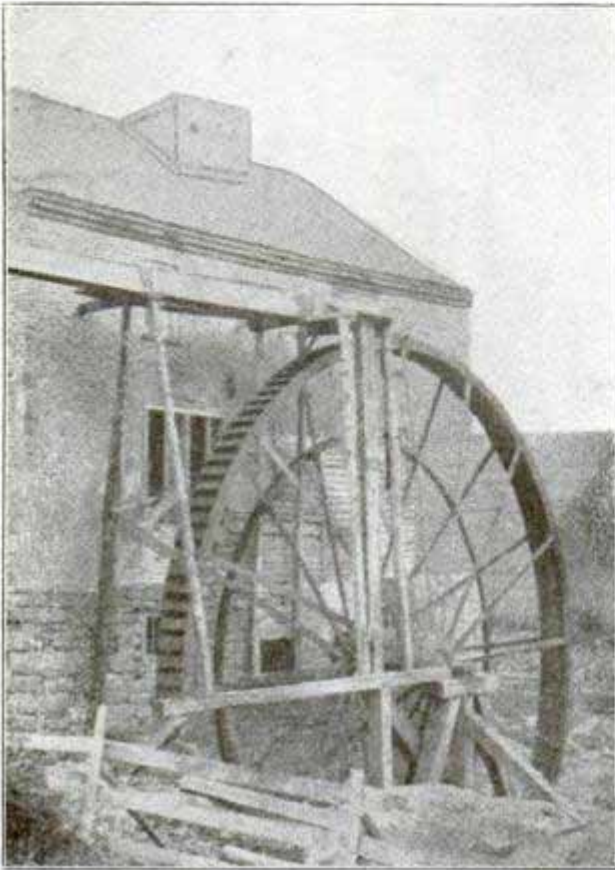
Elephants carrying burnished howdahs, and wearing rich trappings of gold-embroidered velvet are furnished the Prince of Wales by Indian potentates for local transportation. The illustration shows several Indian

uses for the camel and the elephant: 1, Indian substitute for water-cart; 2, Elephant candelabrum and fountain (candelabrum on elephant's tusks); 3, Camel-omnibus carrying Prince's luggage; 4, Elephant transport.



## OVERSHOT WATER WHEELS

Water powers which once were considered of no commercial value are now being utilized. Power has a commerce value and can be made to earn money; the larger the



**Steel Overshot Wheel**

power the more it is worth, of course, but many small powers now going to waste can, at small expense, be made to pay big returns in grinding, sawing and other work.

Many a farmer could light his house and premises brilliantly with electric light at no cost, except the putting in of a turbine or overshoot wheel, and a small generator, with a small allowance for wire and fixtures. If the power is some distance from the house electric motors will churn, saw and grind, and motors and generators are so simply made in these days, almost any bright young man of eighteen can do all the installing from the printed directions. A water power, where an expensive dam is not required—and there are thousands of this kind—is a very profitable possession.

Overshot water wheels are now made of steel, which has many advantages over the old wooden wheels. The steel wheels do not swell and warp, they carry more water, which means more power, and are made in all sizes from a few feet diameter up. The illustration shows a steel wheel 40 ft. high and 2 ft. wide; it runs a mill at Springwood, Va.

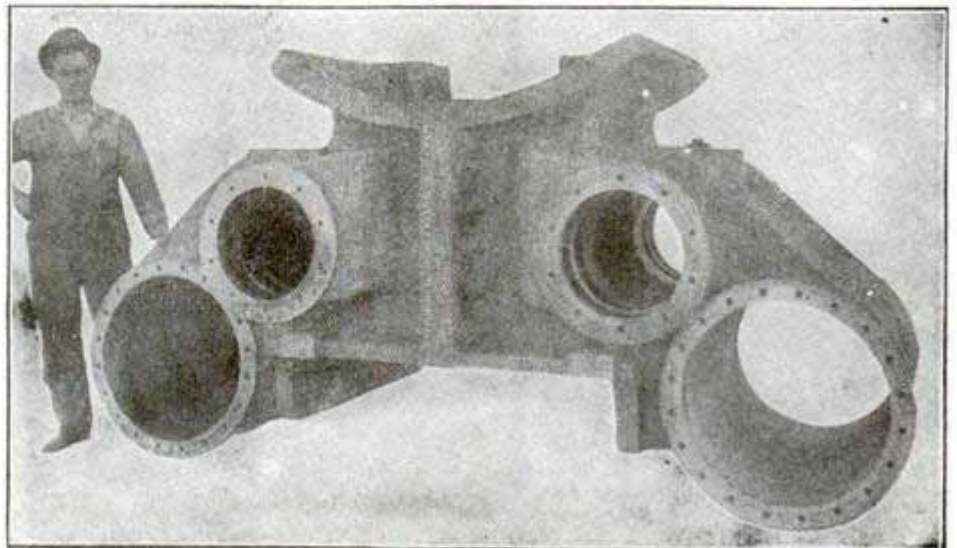
## MILKING BY BULL POWER

In many dairies a horse is used in connection with a tread-power to run the separator and churns. Hoard's Dairyman is authority for a most unusual application of this power, which however has proved so successful as to indicate a general adoption of the plan.

In one of the largest dairies on the Pacific coast, eight milking machines are in use, and the power to operate the machines comes from a tread driven by a bull. The use of the milking machine is said to secure the milk absolutely free from dirt and outside contamination.

## CAST STEEL LOCOMOTIVE CYLINDERS

Cast iron has always been the metal used for locomotive cylinders. Railroad men have long desired a lighter material with greater tensile strength, but the foundrymen, realizing the difficulty of casting steel in such shape and size have declared against the use of steel. The Railway Age states successful steel castings have now been made, and tests show tensile strength 72,400 lbs.; elastic limit 34,000 lbs.



**Locomotive Cylinders of Cast Steel**



# THE AERIAL ROWBOAT

New Air Boat Propelled by Oars which Imitate Motion of a Bird

By Alva L. Reynolds, Los Angeles, Cal.

I am happy to comply with your request and tell the readers of Popular Mechanics something of my aircraft. The illustration shown in Fig. 1 is a fair representation of my "Man-Angel" flying-machine in the act of flight. It has been given the name of "Aerial Rowboat" by those who have judged it simply from the standpoint of appearances. I have been frequently asked why I gave my invention the name "Man-Angel," many people seeming to think it bordered on the sacrilegious. I gave it that name as symbolical of my home city, Los Angeles—*Ciudad de Los Angeles* (the original Spanish name), which translated is "City of the

the cost incurred in building other machines.

It is the only machine in the world that flies heavier than air, or lighter at the will of the operator, and can ascend or descend without discharging ballast or gas. My gas-bag is an ovoid in form and has its equator forward of the middle. This is not a matter of taste as may be supposed, but is one of the scientific and essential features of my machine. Any object of this form if thrown through the air will always go *big end first*. It is this feature that renders my machine self-dirigible and self-balanced, and is one of the reasons why it requires no rudder. It has no motor or other unnecessary machin-

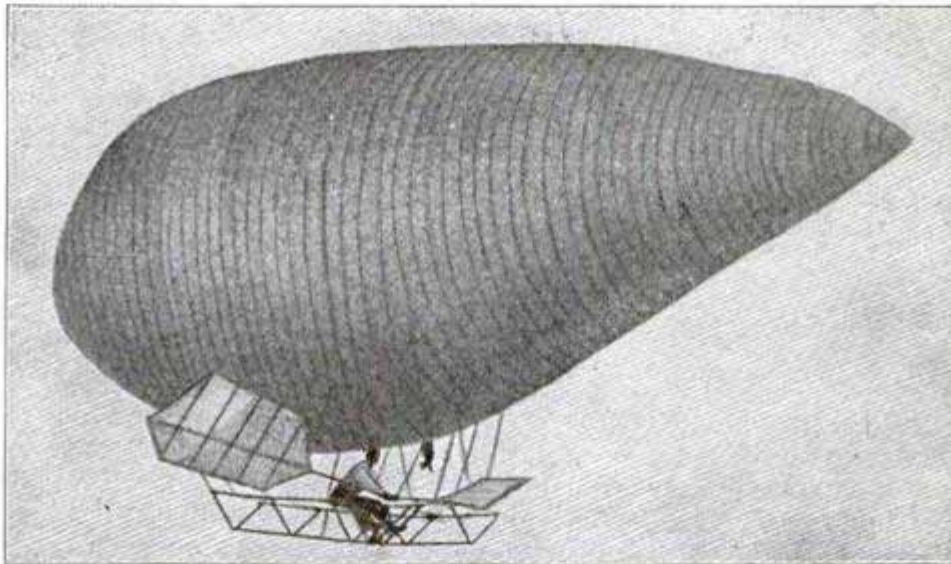


Fig. 1--Rowing in the Air

Angels" where the idea was born and perfected.

Figure 2 shows "Man-Angel" as it is leaving Chutes Park, Los Angeles, on August 10th, 1905. The position of the wings shows the operator in the act of turning the machine around, while the picture in Fig. 1 is caught while rowing ahead. From the two pictures one can gain a fair idea of the simplicity of the means by which I accomplish aerial navigation full and complete. With this simple and infallible device I challenge any airship in the world to follow my machine, and I do not base my challenge on what I expect to do, nor what I can do, but upon what has already been done. Not only have greater feats been accomplished with the "Man-Angel" than with any other air device, but it has been done at a fraction of

ery; simply two horizontal propellers, commonly called wings, under separate control and attached to the car by a combination joint which enables the operator to produce all the motions of the bird's wing.

The exertion of the operator is very much the same as that of rowing a boat on the water, but the principle is really that of natural flight to the extent that it can be imitated with the aid of gas. It can be operated close to the ground or high in the air, absolutely at the will of the operator. In other words, the operator has the balance of power between gravity and the buoyant power of gas *in his own hands*, but let it be understood that I do not claim to do anything unnatural or impossible.

While the "Man-Angel" can do anything that the modern airship can do, and many



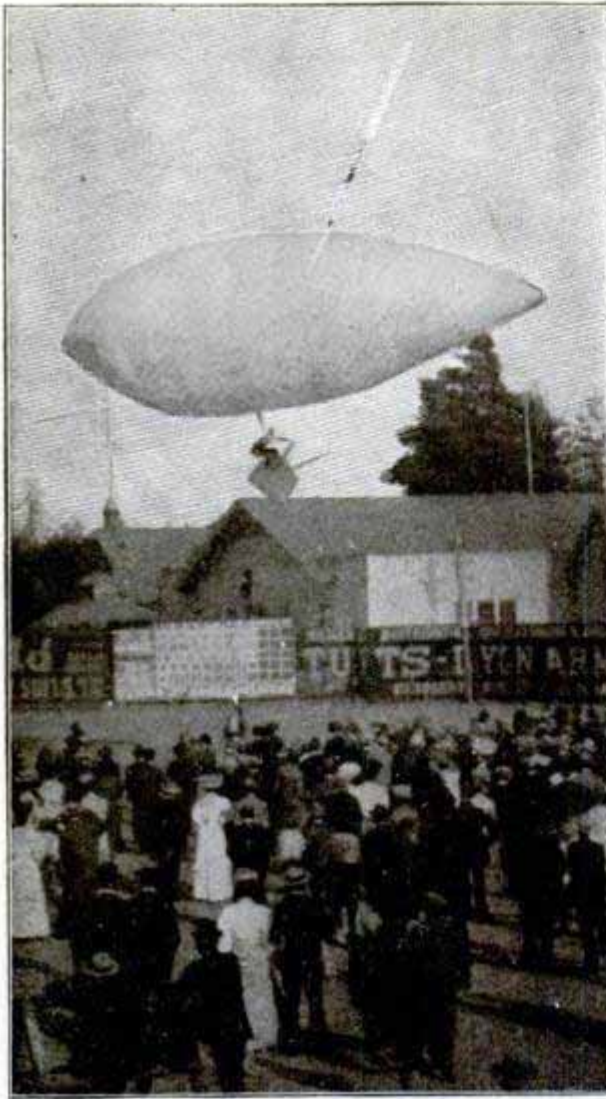


Fig. 2--Ascent on August 10

things it cannot, it has performed no miracles. In my invention I have simply followed natural laws and accomplished aerial navigation in the most primitive and natural way possible. I do it with two wings, and use less than half the gas of any airship on record, and am working toward the elimination of gas as fast as possible. That is, the more expert the operator becomes the smaller will be the gas-bag he will need to aid him in his flights.

For military or observation purposes it has the following points of superiority, viz., it is noiseless, infallible, economical and simple, and anybody of ordinary intelligence and physical ability can learn to operate it. In order to protect my rights it will be necessary for you to state in connection with the above description that I have patents pending in the United States and principal foreign countries.

Place your electric light meter where it will not be jarred. A store meter which greatly over registered was found to receive a jolt every time the front door was closed.

## COOKING WITH CRUDE OIL

One of the finest hotels on the Pacific coast is cooking by means of thick, crude oil which is burned with the aid of superheated steam. The burners were placed in the hard coal ranges previously in use and also in twelve large ovens. The oil has been used for three months past, says the Hotel World, with highly satisfactory results, and at a saving over coal which will amount to \$5,000 a year.

## GASOLINE-STEAM FIRE BOAT FOR VENICE

That the city of Venice should use fire boats will cause no surprise, but the latest addition to its fire department is something unique in fire fighting craft. The new boat, which was built in England, is 39 ft. long, 7 ft. 6 in. beam, and draws 2 ft. 4 in. The propelling power is a 20-hp. four-cylinder gasoline engine, water cooled. While the boat is going to a fire, steam is generated in the boilers for operating the pumps. Fresh water for steaming is carried in tanks; the water pumped to the fire is taken from the canal. Steam can be brought up to working pressure in from 6 to 8 minutes; the pumps throw 300 gals. per minute.

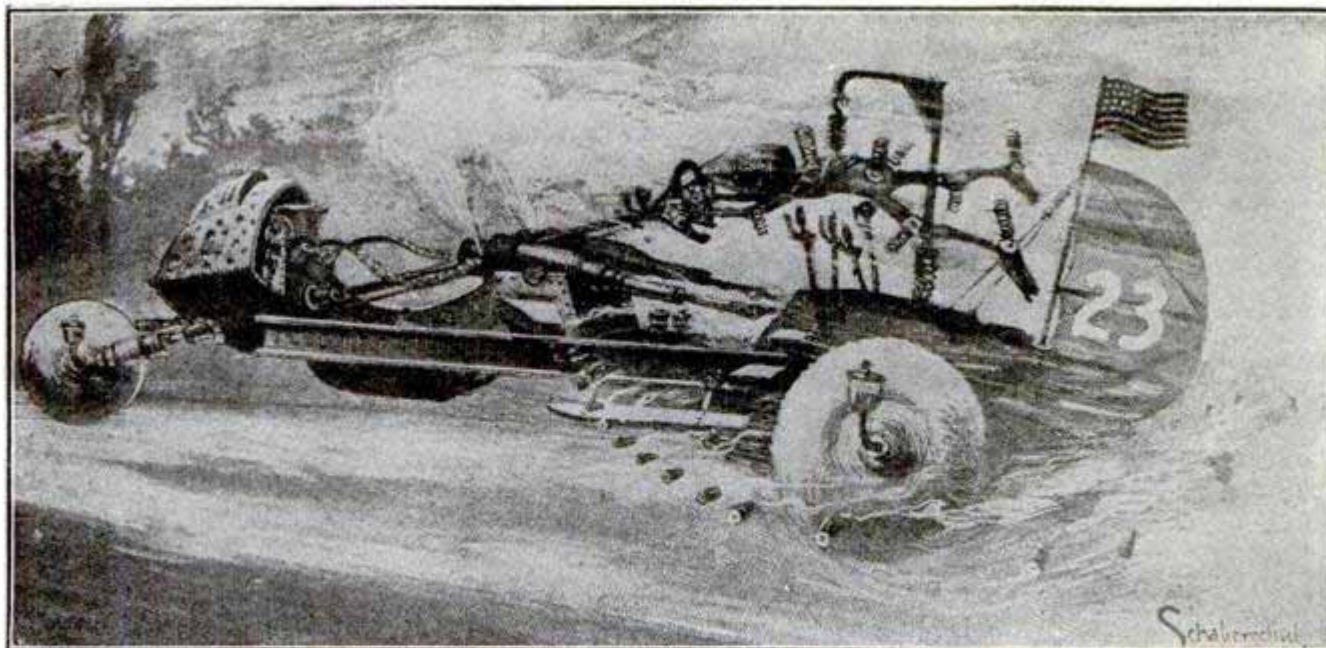
## HORSE PROTECTION ON FERRY BOATS

The society for the prevention of cruelty to animals has finally succeeded in getting the ferryboat companies at New York city to provide the boats with wind shields. Horses heated with fast driving have been exposed to cutting winds while crossing on the ferries. The shields are canvas fastened to gas-pipe frames which swing back out of the way when not in use.



The Shields are Canvas





THE RACING MOTOR CAR OF THE FUTURE

## REPORTING BY TELEPHONE

In reporting news to the big city dailies accurately and in the shortest time possible, the telephone has assumed an important place. In matters of large interest, the paper publishing the story even a few minutes ahead of its rivals has the selling advantage and to accomplish this is the aim of every good reporter.

It is now possible to get in touch with the home office from almost any region by telephone, instead of rushing away to the telegraph office to report, and with this convenience the reporter is enabled to remain at the scene of interest, or the seat of information, until all chance of further developments is past. In many offices an expert at the typewriter wearing a head receiver rattles off the story as the reporter tells it and by the time it is told the copy is ready and is being rushed away to the machines. Frequently the farmers' telephone lines are put to service, as in the case of a sheriff's posse following a fugitive from justice, where the scene of interest would constantly shift. Again, in obtaining local news in the larger cities, the reporter starts out with one assignment, gathers all the information about that, reports it and while still at the 'phone receives another assignment. This avoids loss of time.

But the importance of the telephone in this line is not limited to the large cities. The American Telephone Journal says:

"Papers in smaller towns are extending the scope of their news in a manner which

will do much to assist in their competition with the newspapers in the large cities which have an extensive outside circulation. A long distance company in Indiana is permitting the use of its line for the transmission to papers in this class of news of national interest, embodied in a special service derived from one of the great central bureaus. In this way the local paper which receives this service is enabled to place in the hands of its readers, some hours before the arrival of the paper from a large city, the news of distant events which it could afford to obtain in no other way than by telephone."

## GREAT TRANSCONTINENTAL RAILWAY FOR AUSTRALIA

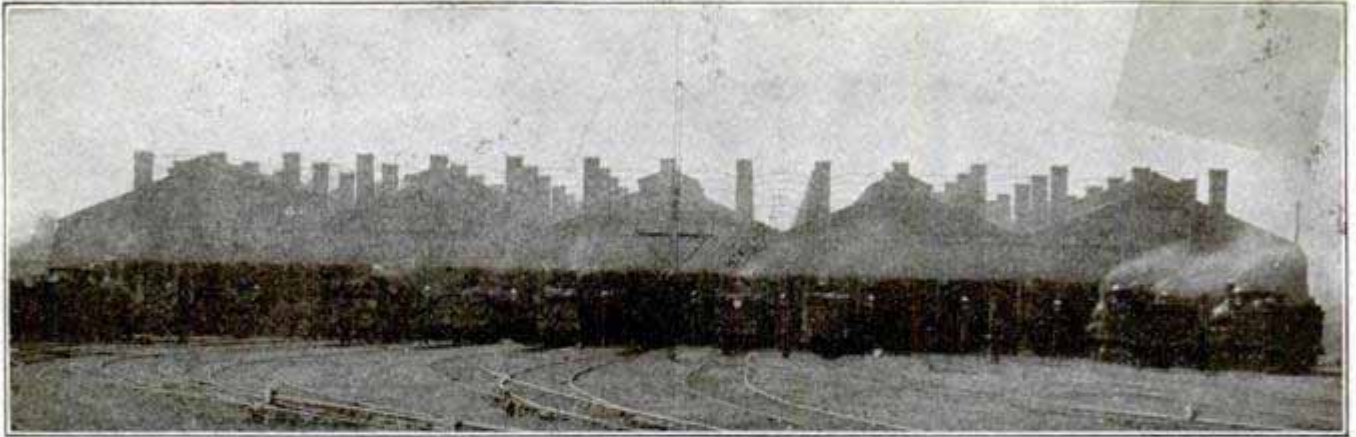
A great transcontinental railway is planned to connect the west and east coasts of Australia. From Brisbane to Freemantle, 2,500 miles, now takes 12 days by steamer. The proposed road would shorten this time seven days and develop a vast territory, and increase the export trade enormously.

## AIR BRAKES FOR AUTOS

What with headlights, whistles and now air brakes, the automobile operator has become quite an engineer. Air brakes are the latest of the new features and are operated by means of an air compressor attached to the engine. A storage tank with a pressure of 65 to 75 lbs. maintains a constant supply.



## LARGEST "ROUND HOUSE" IN THE WORLD



**Locomotive Depot Which Accommodates 600 Engines at one Time**

In this country locomotives when not in service are always universally sheltered in buildings called "round houses" on account of their shape. In England the shelters are built like long train sheds, but close with doors at each end. "Running Shed" is the

railroad name. One of these, said to be the largest in the world, accommodates over 600 locomotives. The express, freight and suburban engines each have their own place. The building belongs to the London & South Western Ry., and is located at Nine Elms.

### RESERVATION SIGNS ON FRENCH CARS

On the French railways compartment cars are used, and it is customary for the station master to hang signs on certain compartments when a train enters the station, reserving such cars or compartments.

Experienced travelers frequently take advantage of the system to secure for a party of two or three a compartment intended for six persons. A suitable tip will

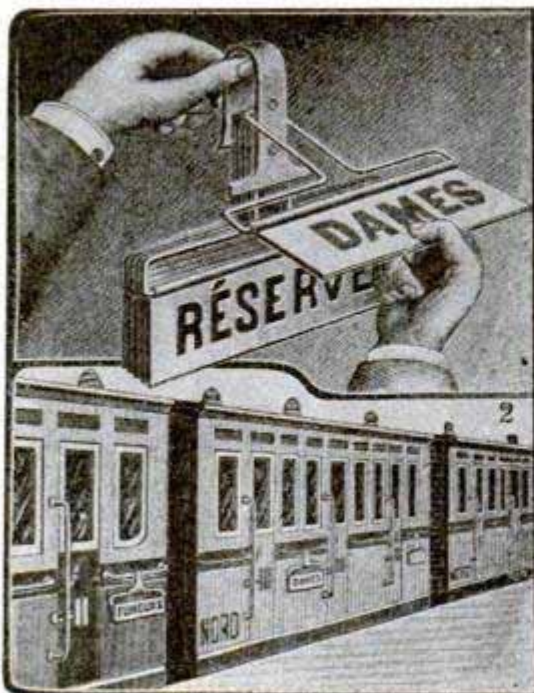
induce the station master to hang a "reserved" sign on the compartment as soon as the favored party has entered the compartment and drawn down the curtains.

### CONTRACTING PANAMA CANAL CONSTRUCTION

Large public works are usually built by contractors, and the question is often asked why an exception should be made in the construction of the Panama canal. The explanation given is that the location and conditions are such that contractors would necessarily have so large an element of uncertainty as to the work, they would be obliged to bid at prohibitive figures, in order to be on the safe side. The problem of sanitation also is so closely interwoven with the construction work as to be difficult of separation, and yet this is a feature which the government alone can handle.

### LONG TRIP ON TROLLEY

A party of owners and managers of electric interurban lines recently made a tour of inspection starting from Detroit and returning to that city in a special trolley car. The trip included lines in Michigan, Ohio and Indiana, with stops at scores of cities and large towns. The distance covered was 720 miles which is said to be the longest trip ever made in an electric car.



**Reservation Signs**



## FIRE GONG ON BRIDGE

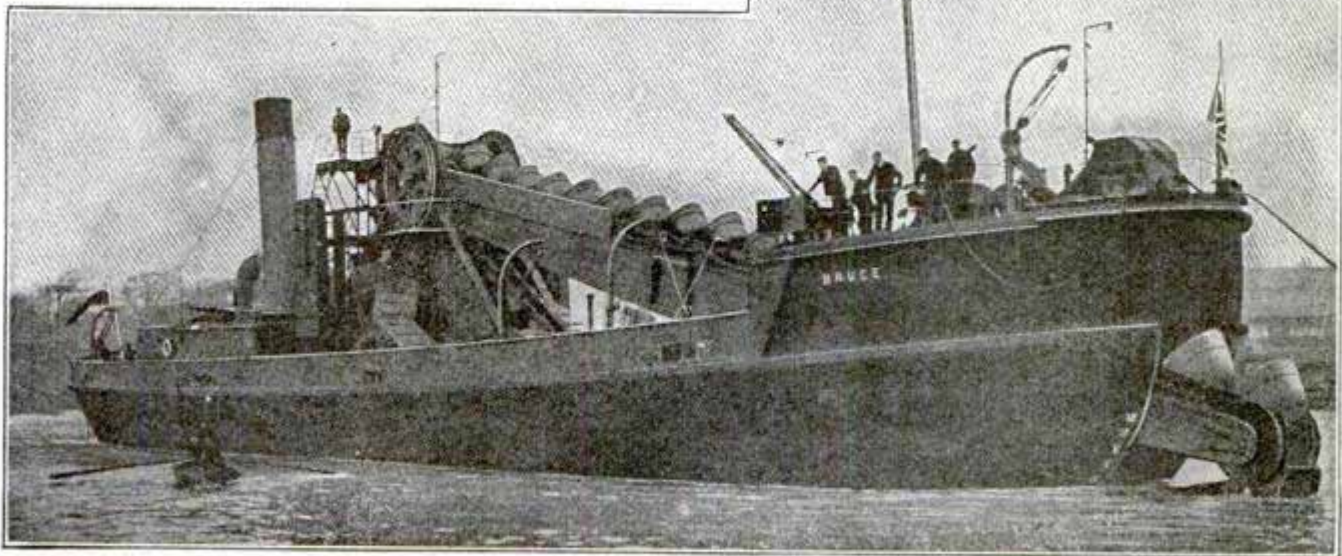
In the city of Washington an 18-in. fire gong has been installed in the bridge tender's cabin and connected to the fire alarm circuit. When an alarm is turned in the location is sounded on the gong, and if the department will cross the bridge in going to the fire the bridge tender has ample time to clear the bridge of other vehicles and to signal any approaching vessels that the bridge will not open for their passage. The idea is an excellent one and deserving of introduction on all city swing bridges.

## AUTOMOBILE MORGUE WAGON

"Rattle his bones over the stones, he's only a pauper whom nobody owns," is rapidly going out of date. Fresno, Calif., has a fine new automobile morgue wagon, with rubber tires and all the latest improvements. Some people who never in life had a ride in a motor car now enjoy the latest and best transportation when dead.

## LARGE ENGLISH DREDGER

The illustration shows the big English dredge the "Bruce." This vessel will excavate to a depth of 48 ft. below the water line. When in operation the buckets are in continuous motion, the forward end of the bucket frame being lowered as the work progresses. This dredge will excavate and deliver 900 tons per hour. As the buckets pass the highest point and start on the return, they automatically empty, the material being conducted through chutes to scows fastened alongside. The dredge will hold 750 tons.

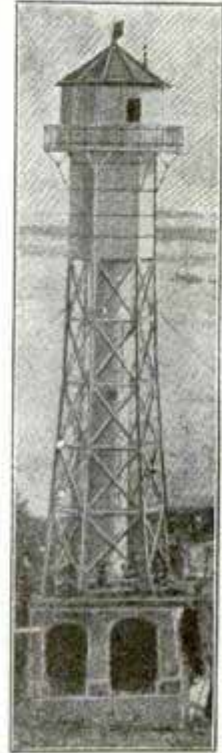


This Dredge will Excavate 900 Tons per Hour

## MOVED A LIGHTHOUSE 30 FEET

In order to widen a channel the German lighthouse at Wittenbergen was moved to a new foundation on the same level, a distance of 30 ft. Iron girders were laid for the track, and steel rollers served as wheels, while hand-operated windlasses did the pulling. Steel guy ropes were run from the top of the lighthouse to frames on the ground, which moved with the cribwork on which the structure rested. The Scientific American says: "The actual work of removal occupied 32 minutes; the lighthouse weighs 60 tons and is 115 ft. high."

Experts declare the structure as strong as before.



The production of cement in this country increased from 335,000 bbl. in 1890 to 27,000,000 bbl. in 1905. Cement is supposed to have originated with the Egyptians 6,000 years ago.



## PORTABLE HOUSE WITH STOVE OVERHEAD

One of the strangest houses ever built is in use at a brick works at Menominee, Wis. This house has sides, roof and chimney, but instead of the usual foundation it rests upon wheels, which enables it to be moved about as desired. As there is no floor the stove is suspended from big beams in the roof and not only keeps the workmen beneath warm, but thaws the ground so they can dig the clay in even the coldest weather. By this means the works is enabled to keep right on making brick when other plants are frozen up and shut down.

## WHY THE NAVY IS SO EFFICIENT AND POPULAR

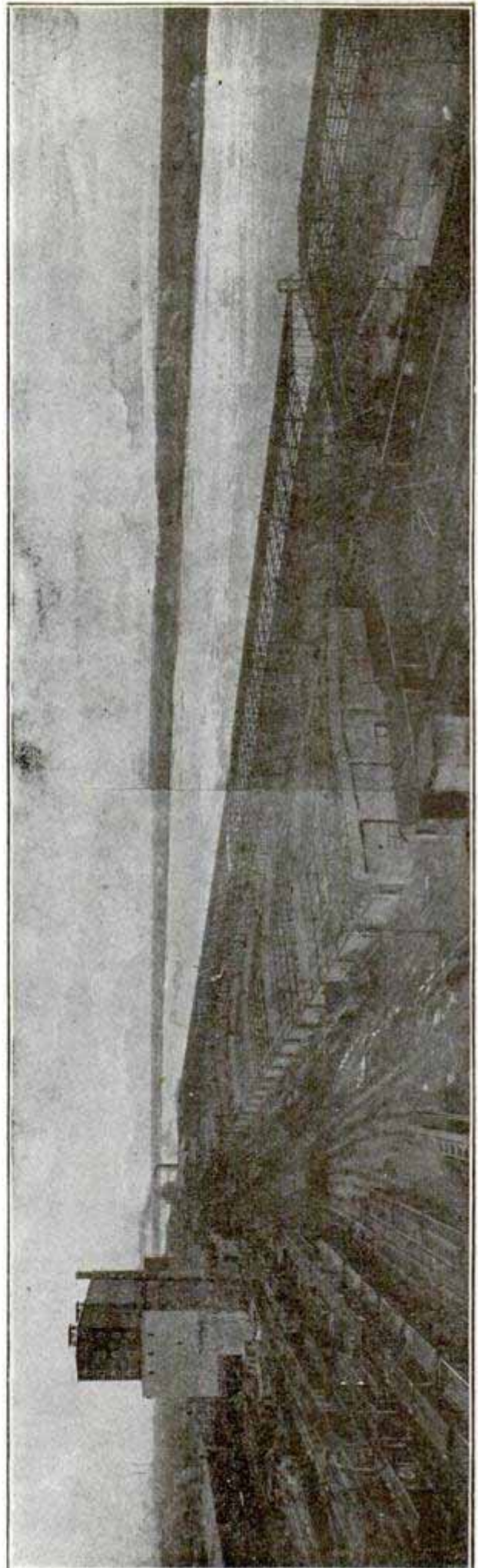
A writer in the Sailor's Magazine, in speaking of the naval recruiting station at Seattle, says: "Out of the almost 500 men examined here since June 26th, less than a dozen sought to be one of the 'men behind the guns' because they were penniless, could not find suitable work, and sought the navy as a last resort. A fair percentage of the men who enlisted made their debut into the Navy by opening bank accounts with Uncle Sam, the sums ranging from \$400 down to a few loose dollars."

The young men of the country are waking up to the fact that during a three-years' cruise in the United States Navy the educational advantages which come from foreign travel are alone worth the time and work, while the life is one devoid of hardships and the pay sure and good.

## COOKING BY ELECTRICITY

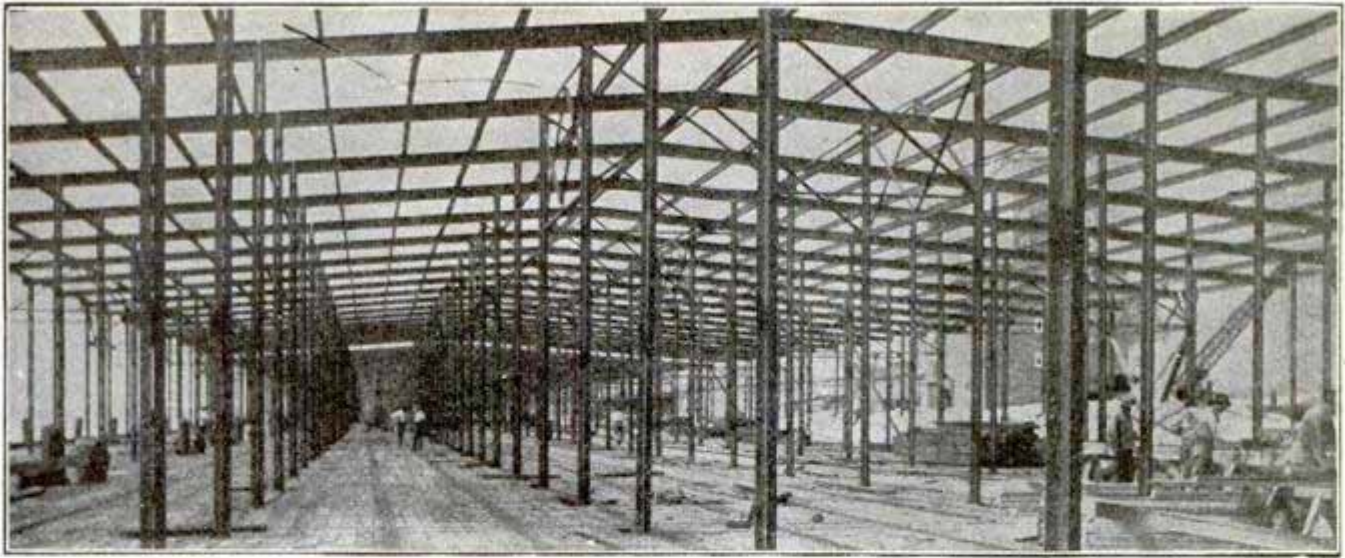
Cooking by electricity has received a great stimulus in England as a result of the demonstration made at the recent electrical exhibition at London. Sixty-five guests sat down to a five-course dinner, all of which was cooked after the diners were seated at the table, and in their presence. A meter was set up where it could be constantly read, and at the completion of the dinner was found to have registered 56 kw. hours, which at 2 cents, the prevailing price in London, amounted to \$1.12 for current.

The Swiss government has decided to use electric locomotives in the Simplon tunnel.



Covered Wharves and Freight House Occupy Nearly a Mile of Water Front





A Forest of Iron Girders Supports the Roof

## GREAT DOCKS AT NEW ORLEANS

Freight House 2,200 Ft. Long; Cotton Warehouse 2,400 Ft. in Length

The most extensive dock facilities of any railroad in the world have been completed at New Orleans by the Illinois Central railroad. The great wharf extending along the Mississippi river is 3,500 ft. in length and 150 ft. wide. It rests on thousands of creosoted pine piles, the framework is steel, and the roof concrete. Brick fire walls 17 in. thick divide it into sections of 500 ft. each. Two freight houses measure 2,200 ft. in length by 100 ft. wide, while the cotton warehouse, by far the largest ever built anywhere, is 2,391 ft. long and from 100 ft. to 160 ft. wide.

The structural iron pillars in these buildings are surrounded with concrete, and the roof construction is equally fireproof, consisting of several inches of concrete. Everything possible has been done to make all these buildings non-combustible, in view of the vast quantities of cotton which is handled.

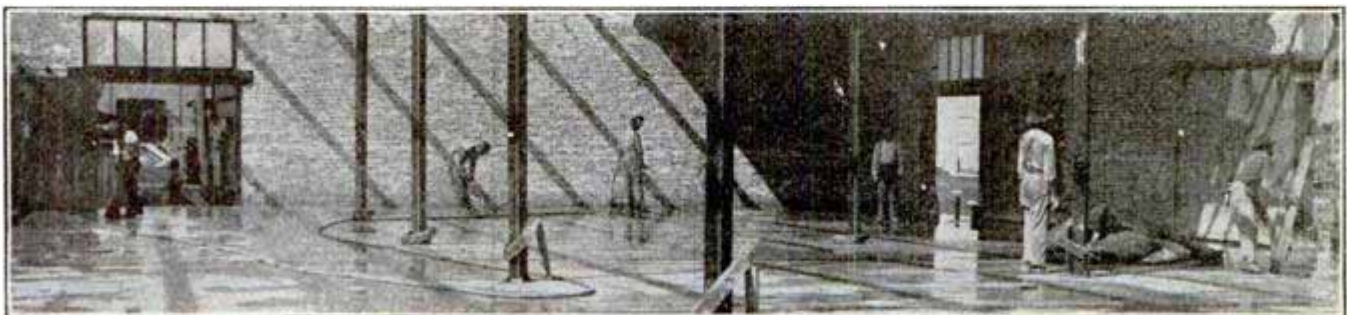
The transfer of grain, cotton, sugar, rice

and tobacco between rail and water transportation is enormous, and constantly increasing.



Laying the Concrete Roof

These new docks and buildings are erected on the site of those destroyed a year ago in the great fire which raged for hours and caused immense loss.



Concrete Floor in Cotton Warehouse



# WHAT OCCUPATION SHALL I FOLLOW?

A Symposium on the Necessary Qualifications for, and the Inducements Offered by the many Mechanical, Engineering, and Industrial Lines of Work and Business. These Articles are Contributed by the Managing Editors of Publications which are Recognized as Leading Papers in their Respective Fields.

*The Old Professions are Overcrowded; the Whole World is Calling for Educated Mechanics and Engineers.*

## PART IV.—WHY A YOUNG MAN SHOULD BECOME A PLUMBER

By Sid. Rosenberg, Editor of the Plumbing Weekly News, New York

Building operations throughout America, today, are held up by the shortage of men familiar with some of the building trades. Of these, the demand for plumbers is greater than all others combined. The astonishing shortage of men in this trade cannot be



S. Rosenberg

better shown than by the fact that in that portion of New York City, south of Eighth street, the most densely populated part of the city, there is only one bathroom for every 1,000 people. These startling figures are absolute facts, being taken from a recent article published in Sanitation; this article stating that the

lack of men able to install a sanitary system is such that building operations are carried on at such great speed that the men who can do that part of the work cannot be obtained to handle it all.

When the demand for men in a certain trade becomes greater than the supply, it stands to reason that the wages for men in that particular trade increase in relative value. Therefore today there is no trade that offers greater opportunities to a young man, or pays better, than the plumbing trade. It does not require a genius or a well-educated man to become a plumber, and the chances for success are greater and more easily accomplished in this trade than any other. The work is pleasant; it is not work that injures a man physically, nor is it work where his surroundings are liable to cause him to contract disease.

If the young man decides to become a plumber, and his ambition does not stimulate him to go above the grade of a journeyman plumber, he is assured from the beginning that he will be employed all the year around and earn big wages. A man engaged as a journeyman plumber can start on a capital of from \$25 to \$100, and engage in a profitable business of his own. Mr. W. H. Thompson, the late president of the National Bank of Commerce, in St. Louis, and one of the richest men in the west, started in life as a plumber. He served a hard apprenticeship and then, as he became a competent journeyman saved up his money to start a business of his own. This business, by hard work, he increased until finally, he ranked as one of the richest men in America. It does not stand to reason that every young man who will take up the trade of plumbing will eventually be a bank president, but his chances, by conducting a shop of his own, are certainly greater for him to become independent than in any other business in America today.

From years past, the learning of the plumbing trade, by a young man having to serve a six years' apprenticeship was limited, more on account of the unjust restrictions placed in his way than for any other; and the lack of apprentices in the plumbing trade has been the main cause for creating the present shortage of plumbers in this country. Even this condition is now changed, for an excellent course can be taken in correspondence schools. At first, the idea that anyone could learn this trade in the school was ridiculed, but as many young men were turned out competent workmen the feeling against this trade school rapidly passed away. This opens the field of plumbing to thousands of men, and with these many advantages it can be easily seen that a young man's success in the plumbing trade is assured from the very beginning, if he possesses fair ability and will work diligently to perfect himself.

A good furniture varnish is: Shellac, 1 $\frac{3}{4}$  lb.; sandarac, 4 oz.; mastic, 4 oz.; spirits, 1 gal.



All the articles appearing in this department are reprinted in book form at the end of each year.

# SHOP NOTES

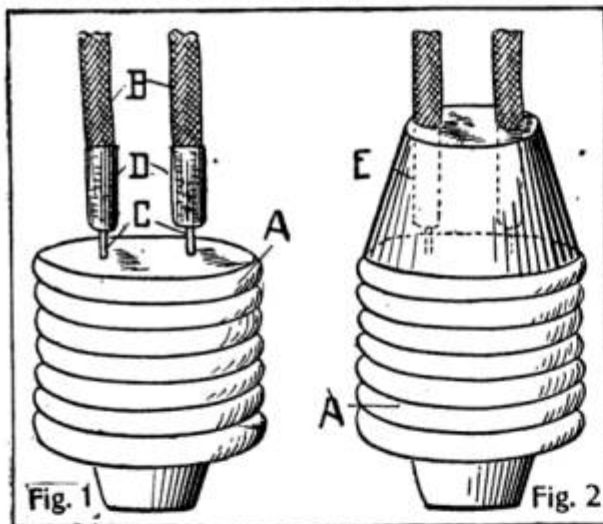
Contributions to this department are invited. If you have worked out a good idea or know of one, please send it in.

## SCREW-PLUGS MADE OF OLD BULBS

Screw-plugs, though not expensive, can be made of old burned-out bulbs, in the following way:

Break the glass off even with the screw base (A) and also the little cap through which the wires are admitted to the lamp. Be sure to leave the wad of felt in to prevent short-circuiting. Connect the wires or cord (B) to the wires on the base (C) securely. Wrap some rubber tape (D) around the connection to keep the wires from touching.

Mix a little plaster of paris and water to



Inexpensive Screw-Plugs

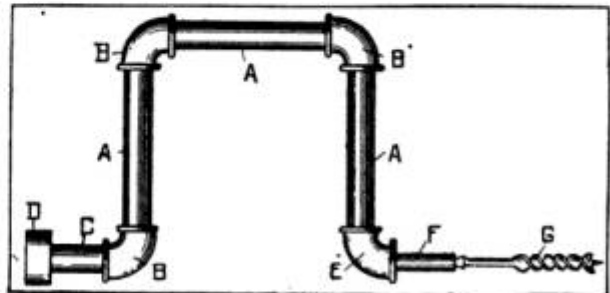
the consistency of putty and fill in the hollow of the base and just high enough to cover well the connections (E, Fig. 2). Round off the top smoothly and leave until perfectly hard.—Contributed by Leslie Peto, Carmi, Ill.

## PASTE FOR PAPERING PAINTED WALLS

To make wall paper stick to painted walls, prepare a batter of flour and water in the usual manner, only a little thinner, and for each gallon of batter add 1 oz. powdered rosin. Set the kettle on a moderate fire and stir until it boils and thickens, and the rosin is melted into the paste. When cool, thin down with a weak solution of gum arabic.

## HOW TO MAKE A BENCH BRACE

To make a handy brace and a cheap one take 3 pieces of  $\frac{3}{8}$ -in. pipe 5 in. long (AAA); three  $\frac{3}{8}$ -in. ells (BBB); one  $\frac{3}{8}$ -in. nipple 3

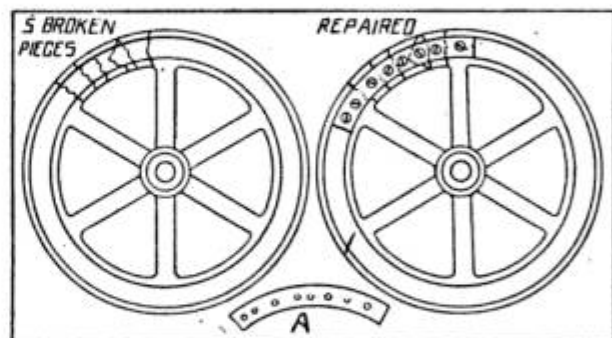


Brace Made of Pipe Fittings

in. long (C); one  $\frac{3}{8}$ -in. cap (D); one ell  $\frac{3}{8}$  in. by  $\frac{1}{4}$  in. (E) and one nipple 3 in. long by  $\frac{1}{4}$  in. square (F) to fit the shank of the bit (G). Screw all these parts together as illustrated.—Contributed by Scott H. Phillips, Fairmont, W. Va.

## HOW TO REPAIR A 20-IN. CAST-IRON PULLEY

One day whilst a large planer was running, a fellow workman threw an 18-lb. sledge hammer across the shop as he thought, but instead it struck the belt and



Mended Pulley

falling, knocked five small pieces out of a 20-in. cast-iron pulley. We could not get another pulley of the same size for the planer in less than a week, so I mended the broken one.

I drilled a hole in each of the small pieces

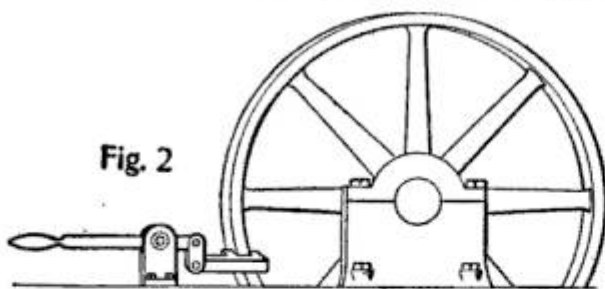
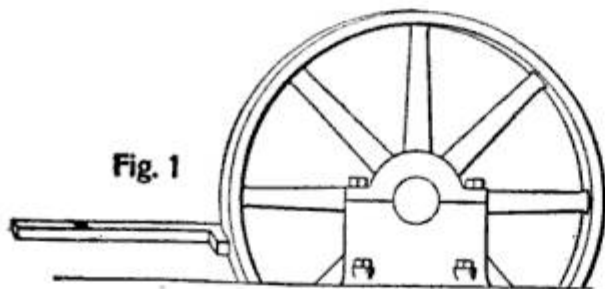


and two or three in the large pieces. Then in a piece of iron, A, 4 in. wide and the length of the opening between the spokes of the pulley, I drilled holes to correspond with those in the pieces. Then with some flathead stove bolts with nuts and washers bolted the parts together through the holes and tightened all up. The pulley ran all right for that week until we could get a new one.—Contributed by Thomas McGuire, Baltimore, Md.

## DEVICES FOR GETTING ENGINES OFF OF CENTER

In Fig. 1 is shown a starting bar for getting engines of 100 to 300-hp. off the center. This is a simpler method than the old way of getting a block and piece of timber and prying the engine over a little at a time, says a correspondent of the Engineers' Review. On a large engine, however, even this wrench will not work.

For engines not too large, try the device



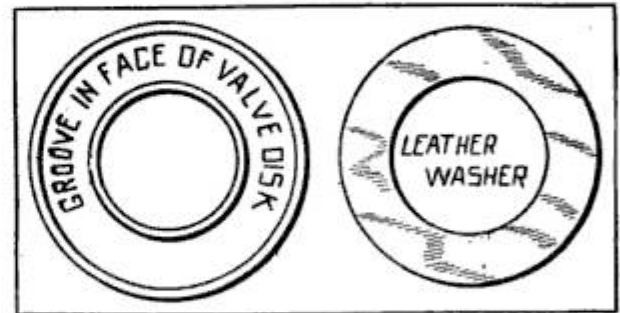
shown in Fig. 2. A clamp grips the rim of the wheel and is connected to a long lever by a short link. The long lever is supported by a stand. When the engineer forces the long lever down at the end, the clamp grips the rim of the wheel and the engine is turned from center.

## TEMPLATES FOR PATTERN WORK

Use sheet aluminum, the thinnest hard stock made; lay out the template with a sharp knife. For circular work use a pair of dividers with sharp points, then by working the sheet back and forth, it will break sharp and clean on the line.—A Reader.

## REPAIR FOR LEAKY VALVE

We had a 2-in. valve on a line of pipe, carrying a pressure of 40 lb. The valve was practically new, but dripped all the time. We faced up the original disk and poured an old disk with babbitt, but to no purpose,



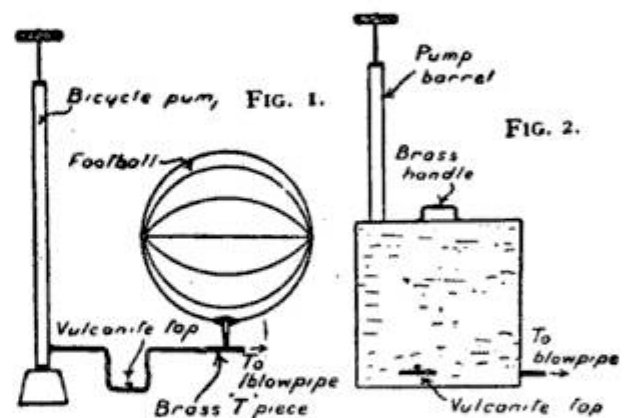
Mending a Leaky Valve

as I suppose there was some roughness on the inside of the valve.

We then burned out the original composition in the disk and replaced it with a leather washer, marked by clamping disk and leather together in a vise, cutting to a driving fit and driving the washer into the groove with a small hammer. Now the valve holds, without any leak whatever, against a cold water pressure of from 40 to 60 lb.—Contributed by Stoke Richards, Santa Clara, Cal.

## HOW TO MAKE A BLOWPIPE BELLOWS

A good blowpipe is made of a foot-ball and a bicycle pump connected up as illustrated. The whole apparatus is carefully packed in a 10-in. wooden box in the shape



Foot-Ball Blowpipe Bellows

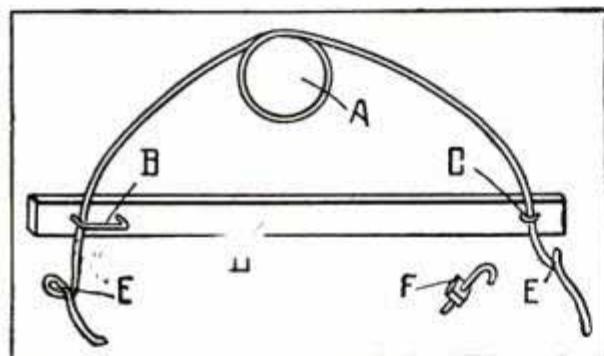
of a cube (Fig. 2). A hole is bored in the top to exactly fit the pump barrel, and the pump is wired down to the bottom of the box. The tube leading from the pump is fitted with a small vulcanite tap, brought



outside the front of the box. When a very small pointed flame is being used, as in certain glass-working operations, a sufficient pressure can be easily stored in the football to last a considerable time without further pumping. The tap is then turned off, and none of the air can leak out through the pump (for, however good the pump may be, under the great pressure a slight quantity of air tends to work out backwards through it). Good thick rubber must be used for connections. A correspondent of the Model Engineer, London, uses a blowpipe like this for soldering and melting metals for glass working and for chemical experiments, requiring a higher temperature than a Bunsen burner will give.

### SACK HOLDER MADE OF A HORSE RAKE TOOTH

A handy sack holder can be made of a horse rake tooth. Make one full turn as at



Handy Sack Holder

A to form a spring and bend each end like a pig tail (EE) about  $4\frac{1}{2}$  in. from the end; then flatten and shape. Place a strip of hardwood (D) on one side of the spring, and fasten it stationary at one end with a hook (C) having a threaded burr as at F on the other side. Make a strong wire loop about 2 in. wide to fasten the hardwood strip at B and to give the spring play for adjustment.

One of these holders can be hung on a nail in the granary while filling the sack and, as they are very light, it can be hooked or unhooked readily without removing the sack until it is full.—Contributed by Nathan Syverson, Stewartville, Minn.

To lace a driving belt for a high-speed machine, hold the ends together and sew them with tough, strong wire, using the shortest stitches possible. This method is recommended in Practical Pattern Making, as excellent for fast-running belts.

### SIMPLE GATE HINGE

To make this hinge two pieces of round iron will be required. Heat the pieces and twist them around twice as illustrated, then bend the ends out and flatten them for



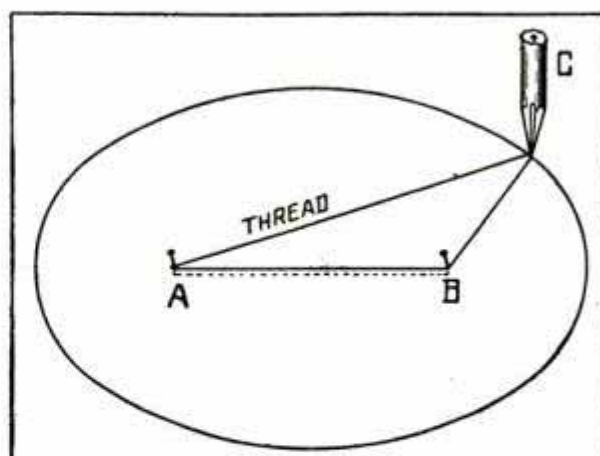
Made of Round Iron

screw holes as at A and B. The twisted part will act as a screw, says a correspondent of the Blacksmith and Wheelwright, and the weight of the gate will cause it to close itself.

### TO DRAW A PERFECT ELLIPSE

The following is a very easy way to draw a perfect ellipse 3 in. long, using a pencil, two pins and a piece of thread.

Draw A-B 2 in. long and place a pin upright in the drawing board at each end of A-B. Double a strong thread and tie the loose ends together to form a loop exactly  $2\frac{1}{2}$  in. long. This may necessitate several trials. Place the looped thread over the pins and with the pencil point draw the string straight as at C. Then move the pencil around in the direction indicated by the arrow, always keeping the thread tight. The

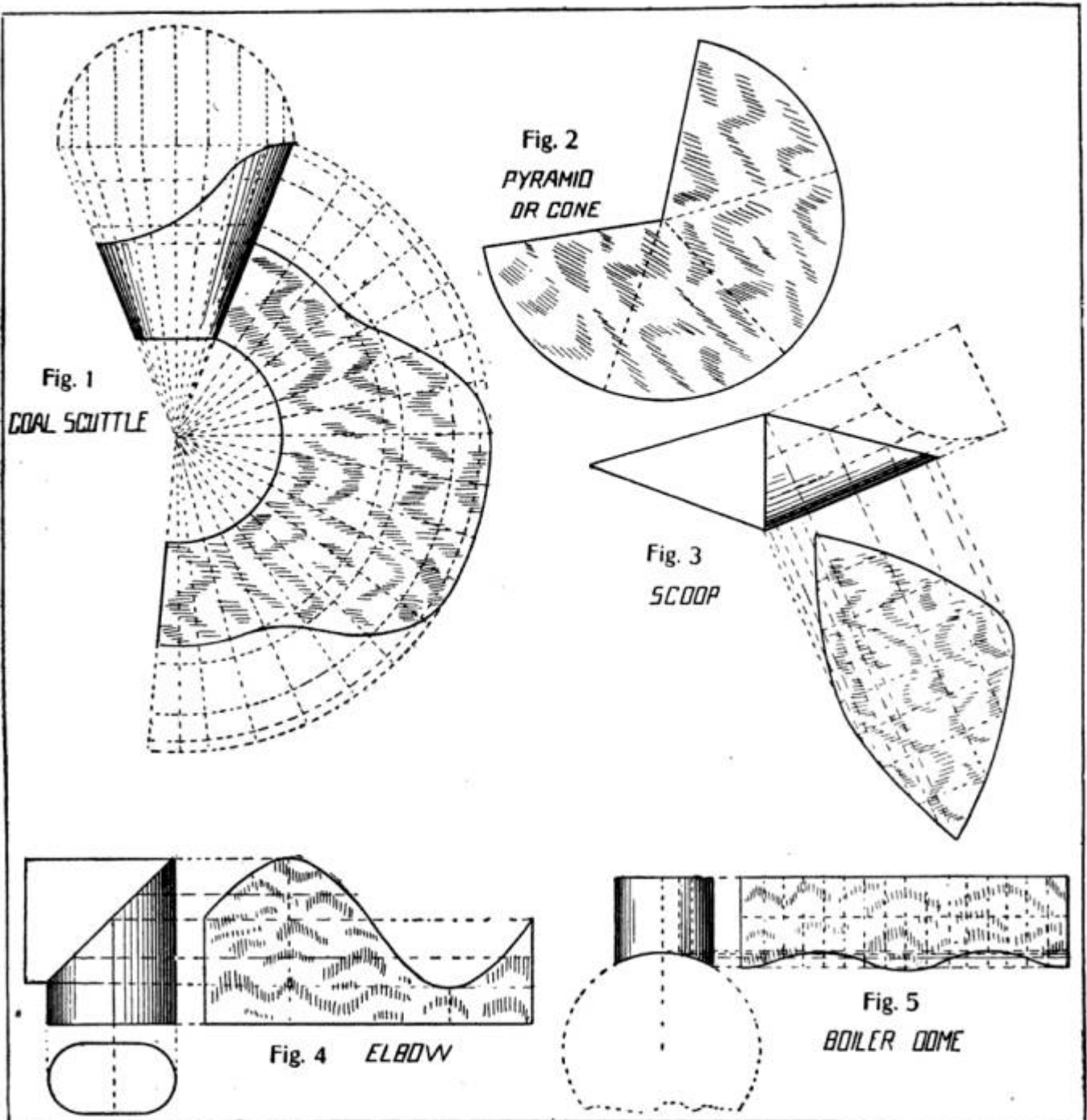


Easy Way to Draw an Ellipse

curve traced by the pencil will be a perfect ellipse.—Contributed by Harry E. Hoyt, 109 Cross St., Malden, Mass.

Contributions to this department invited. If you have a good kink, send it in.





## IMAGINATION AND MECHANICS

In the accompanying illustration the figures correspond with those in the March number under the title "The Power of Imagination as Applied to Mechanics," and answer the question propounded therein. How many had it worked out right?—Contributed by Paul S. Baker, Muscatine, Iowa.

### CHIPPING LARGE KEYWAYS

Some time ago I had the opportunity of bidding on a job of removing a wood split pulley, 5 ft. diameter, 20 in. face, from a 6-in. jack shaft and cutting a keyway 24 in. long by 1 in. wide by  $\frac{1}{2}$  in. deep, and plac-

ing a large 4-ton pulley on same. Several different shops figured on the job, the offers ranging for from two to four days' work on the same. I was given the job to complete in 15 hours and the general opinion was that the keyway alone would take 10 hours.

I rigged up an old man and after laying out my keyway, took a 15-16-in. drill and drilled 24 holes along the keyway, each about 7-16 in. deep, leaving 1-16 in. in sides and bottom to clean up in. In this manner the keyway was cut and key fitted in seven hours, where if I had chipped all of it, it would have taken all of the 15 hours. This is not a new kink, but it goes to show how easy we can forget the simplest things and sometimes to our disadvantage.—Contributed by Norman Baker, Hoopetown, Ill.



## HOW ONE MAN BECAME A SIGN PAINTER

It takes incessant practice to become a good sign painter and no inconsiderable part of the training comes from watching signs and advertisements, picking out their good and bad points and deciding where you would improve them. Effects and wording are important particulars to watch. It is also well to watch sign painters work, when one has opportunity. A correspondent of the *Master Painter* tells how he began in this way while on the rounds of his daily occupation, not having opportunity to learn in a shop.

At last he secured a good plate of the Roman letters and numerals and began practicing, formulating rules for himself from measurements made by himself. After mastering this, which took a long while, he advanced to the Egyptian alphabet, and so through patient toil worked his way on to the fancy letters he had admiringly watched others make, and at last felt himself competent to tackle a billboard. He finds his occupation agreeable and well paying and names perseverance as his ladder to success.

## DEVELOPER FOR SNOW SCENES

A good single-solution developer for snow scenes, says a writer in the *Queen*, is as follows: Soda sulphite, 90 g.; potassium carbonate, 15 g.; soda carbonate, 45 g.; hydroquinone, 7 g.; metol, 5 g. Dissolve these ingredients in the order given in one litre of boiling distilled water and then put the mixture in two half-litre bottles, labeling one "old" and the other "new." Use the "old" over and over again for developing, and as it is used up add some of the solution marked "new."

## SEWER CLEANING DEVICE

The sewer cleaning device illustrated can be used successfully up to 150 ft., says the *Metal Worker*. When once the device is in

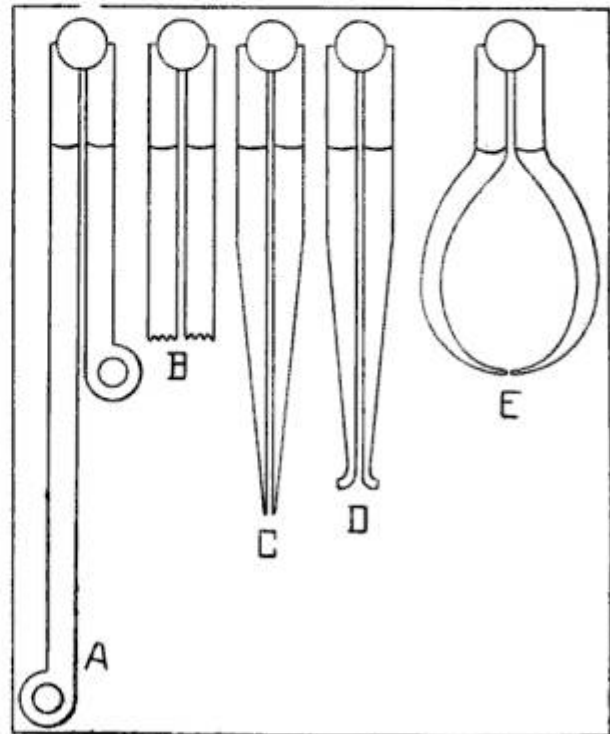


For Cleaning Pipe Sewers

the pipe the joints cannot unlock. The construction is clearly shown in the sketch.

## TOOLS MADE OF OLD BUGGY TOP JOINTS

A number of useful tools can be made from the long joints of a discarded buggy top. Any amateur blacksmith can hammer out the tools to suit himself. In the illustra-



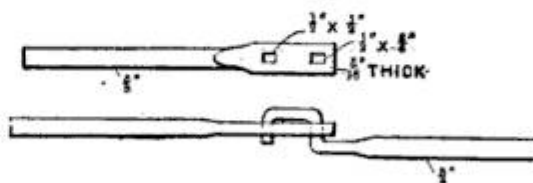
Made of Buggy Top Joints

tion, A shows one of the joints; B, joint after it is cut off; C, dividers made of joint; D, inside calipers; E, outside calipers.—Contributed by John R. Black, Jefferson, Iowa.

## CEMENTS FOR MENDING CELLULOID

Broken celluloid articles, such as triangles, etc., can be mended with a cement consisting of 3 parts alcohol and 4 parts ether mixed together. Apply to the fracture with a brush until the edges become warm, then stick the edges together and leave to dry for 24 hours.

Another cement, recommended by *Machinery*, is: Camphor, 1 part; alcohol, 4 parts.

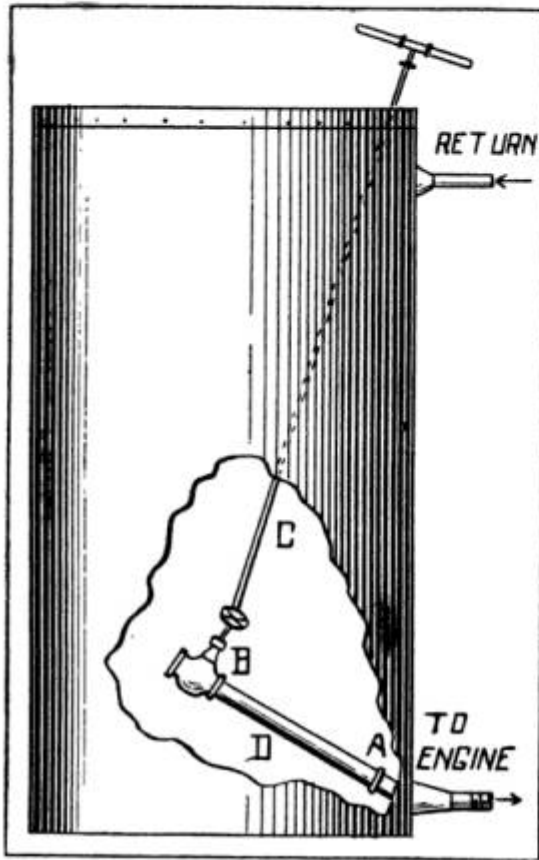


Dissolve and add equal quantity (by weight) of shellac to the solution.



## CONNECTING WATER SUPPLY TANK TO GASOLINE ENGINE

There will be no more trouble from freezing if the water supply tank is connected up to the gasoline engine as shown in the dia-



Non-Freezable Tank Connection

gram. Extend the intake pipe, D, to the center of the tank and use a 45° ell at A, in order to raise the pipe from the bottom. Use a good brass valve at B. The operating lever, C, can be made of  $\frac{3}{8}$ -in. pipe. Ice may form on all sides without closing the water supply. When running in the day time the warm water will melt most of the ice that forms during the night.—Contributed by Paul S. Baker, Muscatine, Iowa.

## CAUSE OF FAILURE OF BOILER FURNACES

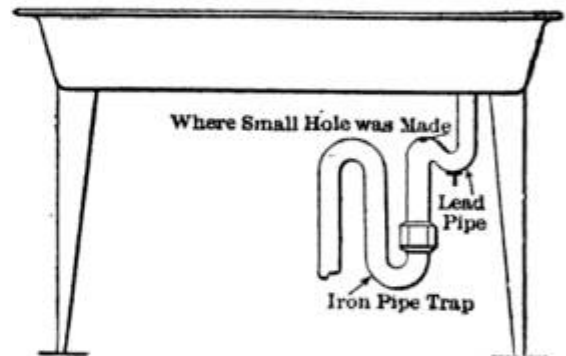
The collapsing of boiler furnaces is almost always the direct result of scale or of oil in the feed water, the latter being a particularly prolific source of trouble, according to a recent paper before the Northeast Coast Institution of Engineers. No ordinary furnace fails for lack of strength if clean and covered with clean water, says the Journal of the Franklin Institute. A very thin smear of oil, however, has an effect totally

out of proportion to what might be expected. In a furnace having a normal factor of safety of five, this factor rapidly decreases after the temperature reaches 650 degrees F., and entirely vanishes at a red heat. Steam at a pressure of 200 pounds has a temperature of about 380 degrees, or 270 below the point at which the tenacity of the steel begins to be affected, but a clean furnace, rubbed over with a very clean and thin coat of mineral oil, will soon rise above 650 degrees even under light duty, and often reach 1,200 degrees, at which point 75 per cent of the strength has departed. With the use of high-grade mineral oils the danger is less than with low-grade oils, due to the fact that the latter emulsify and hence cannot be removed from the feed water except by chemical treatment.

## DIFFICULTY IN WASTE-PIPE TRAPS

In a factory where the boiler feed facilities consisted of a feed-pump, an ordinary injector and an exhaust injector (which last did the feeding) a new sink was installed so as to catch the overflow from the injector, caused by variation of load. Both injectors were put together and the sink placed under them. The waste-pipe from the sink was connected to a pipe that received the drips from the engines, pumps, heater, etc., and provided with the usual trap under the sink.

After everything was piped up, it was found that the steam pressure in the main drip-pipe forced the water out of the trap under the sink, thereby breaking the seal and allowing the steam to back up into the engine-room. In order to overcome this, a



Traps in Waste Pipe

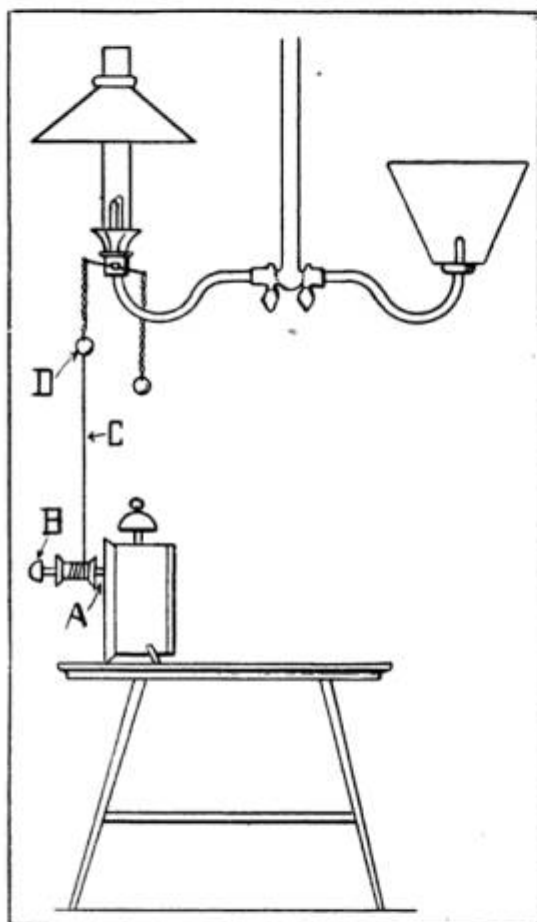
trap was placed in the iron pipe below the trap in the lead pipe. This arrangement was successful in holding back the steam, but after a few minutes' operation the water in the sink refused to run off. A  $\frac{3}{4}$ -in. hose with 30 lb. water pressure was run



down the pipe to force out any obstruction. As long as the hose was in operation the sink worked splendidly, says a correspondent of Power, but when the hose was removed the pipe instantly clogged. The suggestion was made that the trouble was due to air being trapped between the two traps in the waste pipe. A small hole the size of a pin was made, and the sink immediately emptied and worked all right.

### TIME GAS LIGHTER

This device can be used for either lighting or turning off the gas. Take the alarm

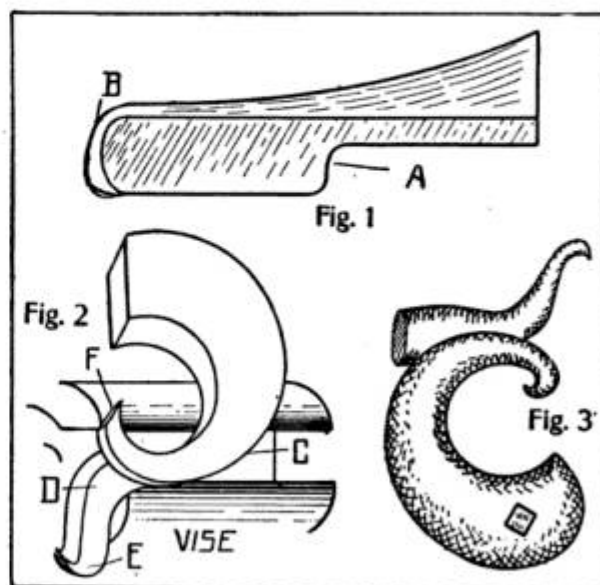


Lights the Gas at Any Hour

winding thumb screw off of an ordinary alarm clock as at A. Get a piece of  $\frac{3}{8}$ -in. round iron  $2\frac{1}{2}$  in. long; drill a hole in one end and tap it out to fit alarm winding screw. Fasten a spool to the rod so that the spool will not turn; at the opposite end to where the rod fits the alarm screw, fasten the alarm thumb screw, B, so the alarm may be wound. Run a stout string, C, from the spool to the chain of a self-lighting gas lamp, D. When the alarm goes off the gas will light or go out according to which chain the string is attached.—Contributed by Oliver H. Bradbury, Jr., 142 Grainger av., Knoxville, Tenn.

### HOW TO MAKE A CIRCULAR GUN HAMMER

A circular gun hammer may be made from  $\frac{1}{2}$ -in. round steel without welding. Fig. 1 shows the iron flattened two ways. At A it

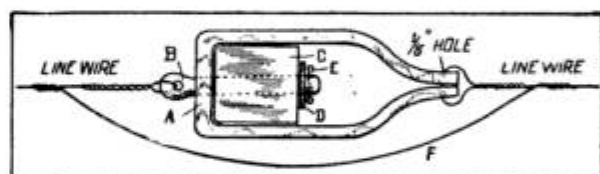


Circular Gun Hammer

is made thick enough to make the nose of the hammer; at B it is thinner. It is then placed in the vise (Fig. 2) and split with a chisel at C and D and the points are turned each way as at E and F. It is then filed to finish as in Fig. 3. This is left hand; to make the right hand work on the right side of the vise.—Contributed by Nathan Syver-son, Stewartville, Minn.

### ANTI-HUM DEVICE FOR TELEPHONE WIRES

To make the anti-hum device shown, take flat brass, A, 7 in. long,  $\frac{3}{4}$ -in. wide and  $\frac{1}{8}$ -in. thick, and hold it in a monkey wrench to bend it to shape. Then drill a  $\frac{3}{8}$ -in. hole in the back and pass a  $\frac{1}{4}$ -in. round brass rod, B,



Anti-Hum Device

through. Get a thick old rubber heel and cut out two pieces with the holes in the center and take the rubber washers out and cement them together. Take the  $\frac{1}{4}$ -in. round brass rod  $1\frac{1}{2}$  in. long, flatten it at one end and drill a hole large enough for telephone wire to pass through in each end. Put the rubber

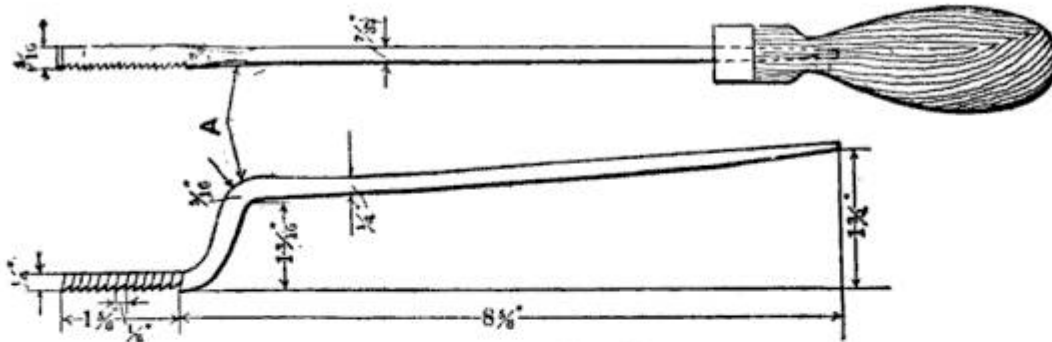


washer on the rod where it passes through the  $\frac{3}{8}$ -in. hole, then push the rod through the pieces of rubber heel, C. Put a brass washer, D, on that end of the rod and a wire pin, E, through the hole. Then put the device on the telephone line as shown in the illustration. I used electric light cord, F, to bridge across.—Contributed by Edward A. Pinkham, Kennebunkport, Maine.

## HOW TO MAKE A STEP GRAIL

Many different styles of grails, as well as three-cornered scrapers, flat scrapers and hand chisels, may be made from old files. The illustrations show a goose neck or step grail used to get into a cavity. The cutting end, shown square here, can be made in any shape to suit the need. The tool may have teeth on the bottom side only, or on two or more sides; the corners may be round or square, but round is best, says a correspondent of Wood Craft, because it leaves a fillet of solder on the pattern.

To make this grail, draw the temper out of an old square file, grind off the file teeth and forge it to the size of the largest part of the grail—5-16 in. Bend it to shape and at point A, flatten it out. This gives strength just where needed and prevents it breaking readily. In width the file is now 7-32 in. at the largest part, tapering to  $\frac{1}{8}$  in.; the step is 1 3-16 in. down; when the teeth are resting on a flat plate, the small end on which the handle fits is  $1\frac{3}{4}$  in. up.



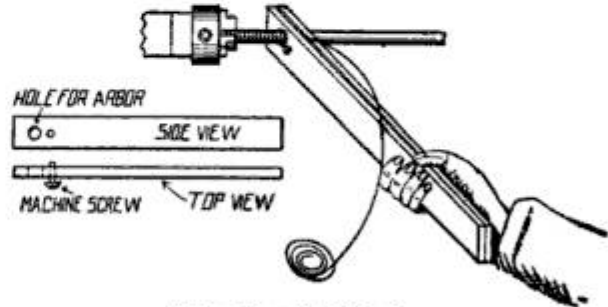
Step Grail Made of Old Files

After flattening out at A, forge out the long end to just a little larger than drawings call for and to the desired shape. Now make it very soft and file it up true and smooth. With a three-cornered file make the cutting teeth  $\frac{1}{8}$  in. apart and 1-16 in. deep. Harden it again and brighten it up with emery cloth. Using alcohol torch, draw the temper on the cutting edge to a dark straw color. Soften all other parts. Make a handle and carefully fit it on the pointed end. You then will have a tool that will last for years.

## A SIMPLE SPRING WINDER

The handy spring winder shown in the illustration can be made of almost any kind of flat stock. The hole should be of proper size to fit loosely on the mandrel; the screw must be heavy enough to hold the wire and be placed a distance equal to the diameter of the wire from the mandrel hole.

To wind closed springs, hold the bar or handle at right angles to the mandrel and to wind open springs, hold the mandrel to-



Winding Coil Springs

wards the rear end of the lathe. A little practice will make one expert at winding with this method. Springs of any length up to 100 ft., if the wire is long enough, can be wound in this way.

I have frequently used this method for winding springs to slide over rubber tubing used in laundries on gas irons for protecting the tubing and to keep it from kinking, the springs ranging from 25 to 30 ft. in length.—Contributed by W. J. Barber, North Adams, Mass.

## CUTTING WIRE CABLE WITH A HACK-SAW

To cut a wire cable or a thin pipe with a hack-saw without breaking the saw, it is only necessary to turn the blade end for end in its frame, so that the saw will cut when pulling it toward you.—Contributed by Thos. McIntyre, 407 Root St., Chicago, Ill.

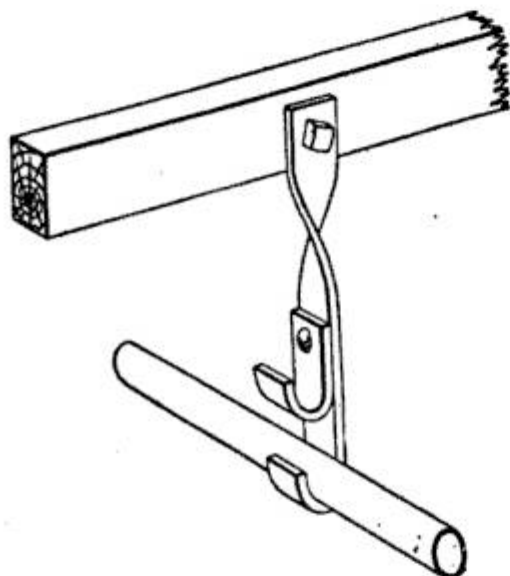
Two persons were electrocuted in New York recently by electric light wires that broke under the weight of sleet.



## HOW TO MAKE DOUBLE PIPE HANGERS

A hanger such as is used to support ammonia coils is shown in the illustration. The coils are hung at distances of, say, 7 and 14 in. from the ceiling, two coils in a row, one directly over the other, says a correspondent of the Engineer. This method saves space and makes the parts easy of access in case of accident. Two small hangers riveted together so as to form two hooks about 8 in. apart from the hanger, the remaining portion of which is straight, having a  $\frac{1}{2}$ -in. hole near the end to receive a lag screw. Good pipe hangers to fit any size pipe can be patterned after these.

Place one end of a piece of wrought iron 2 in. wide,  $\frac{1}{4}$  in. thick and 24 in. long in the fire until red, then bend it to receive, say, a



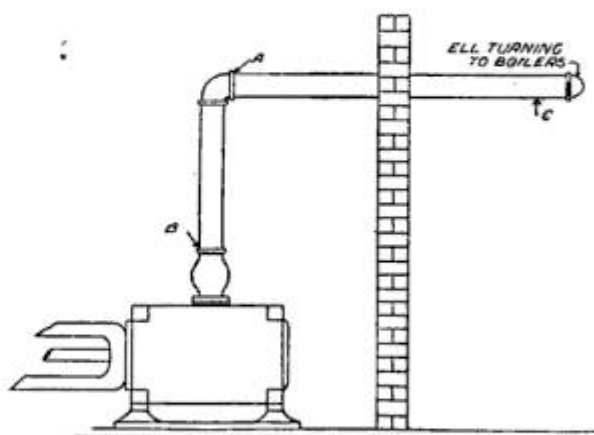
Double Pipe Hangers

2-in. pipe (grip the pipe in the vise and shape the iron around it with the hammer). When the bend is cool, place the straight end in the fire, heating it for about 6 in. from the end. Run the heated end through the vise for 6 or 7 in. and tighten the vise. Place a square wrench on the heated end and make a half twist. If the pipes run in an opposite direction to the beams, this half twist will cause the hanger to fit against the beam better, if not, the twist can be omitted. At a point 8 in. from the top of the hook place another hook of the same size and style, but not more than 4 in. long and with a hole 1 in. from the straight end. Cut another hole in the long hanger, 12 in. from the twisted end, then rivet the two together, one directly over and in a line with the other.

Any section of pipe can be removed without molesting the others.

## SETTLING WALL CAUSED LEAKY PIPE JOINTS

A leak occurred in joints A and B in a supply pipe, which with the cylinder of a steam engine is shown in the illustration. After the joints had been taken apart, says

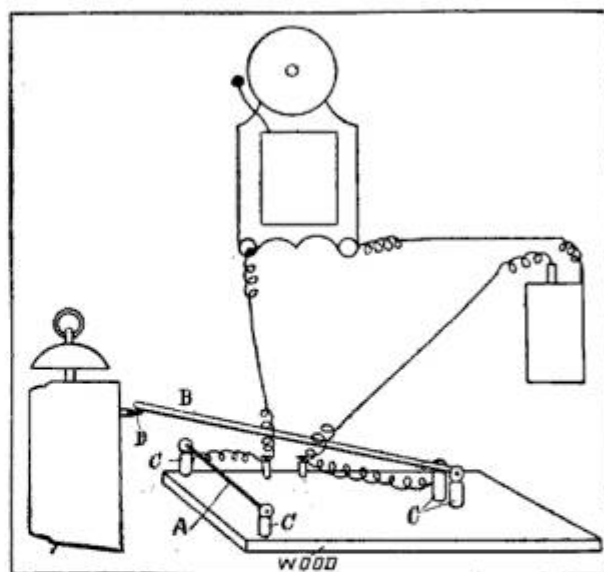


Settling Wall Causes Pipe to Leak

a correspondent of the National Engineer, it was found that the trouble was caused by the settling of the wall separating the engine and boiler rooms and which originally had supported the pipe. When a hanger was placed at C to support the weight of the pipe, there was no further difficulty.

## ALARM FOR A SOUND SLEEPER

Referring to the sketch: A is a copper wire; B, brass or copper rod; C, standards;



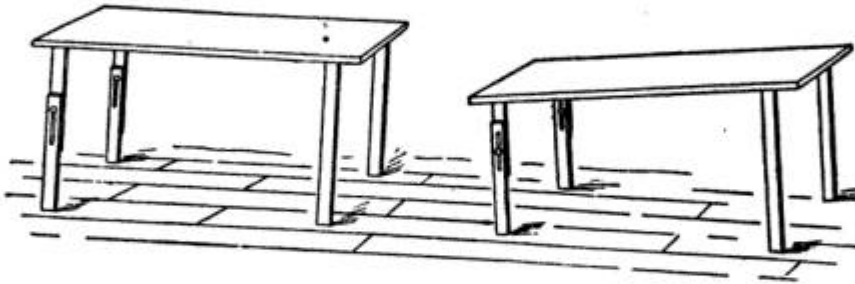
Electric Alarm

D, alarm key. When the alarm key, D, turns, the brass or copper rod, B, drops on copper wire, A, and so completes the circuit, ringing the bell.—Contributed by Eddie Evans, Hudson, S. D.



## COMBINATION BACK TABLE FOR BOX SHOPS

A handy back table for use in box shops is shown in the sketch. It may be either level or tilted. The front legs are 1 in. by 4 in., with the lower halves a little longer



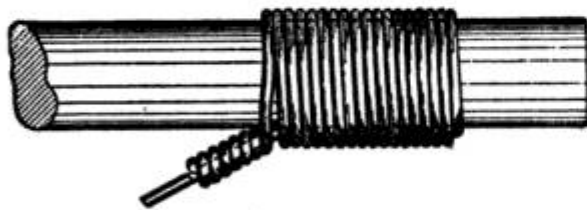
Adjustable Back Tables

than the upper ones and slotted about 10 in. A bolt, with a thumb screw, passes through a single hole in the upper leg into the slot of the lower one and a couple of large washers on each side permits of great strain in tightening. The lower leg may be vertical or slanting.

The back table is used behind the pony planer to receive the stock as it comes through. This saves rehandling the pieces so many times. When there is no one behind the planer to take away, says the Wood-Worker, the table described may be tilted so that boards, fed one behind the other, in a single or double line, will pile themselves.

## ATTACHING WIRES TO GROUND RODS

To solder a heavy wire on a half-inch ground rod is not an easy matter to one who does not know the right way to go about it. Either steel or copper wire may be used for the ground, and should not be smaller than No. 14 gauge (.080 in.). Heat the rod red hot for about 1 ft. at the top end. A



The Proper Method

combination of blow torches, a coal stove, or a forge may be used for heating, says Telephony. Scrape the heated portion quickly with a file, and wrap the wire on it as in the illustration. The end of the

wire is first laid lengthwise of the rod, and each turn of the wire goes around both wire and rod. Let the wrapping proceed away from the top end of the rod. Make not fewer than twelve turns, then twist together the end of the wire laid against the rod and the main length.

The wire will have become somewhat heated by this time. Bend it down along the rod, out of the way, and lay the heated end, joint and all, in a box of granulated sal ammoniac, rolling the entire joint in it. Dense white fumes will rise, and when a stick of solder is held against the rod it will melt in a pool in the sal ammoniac. The sal ammoniac will clean both wire and rod, and the solder will flow smoothly on both. When the joint is filled smooth with solder, shake it free of any excess metal and allow to cool. Cooling suddenly in water does no harm, but washes away excess sal ammoniac that would cause wire and rod to corrode. The joint should be made a few inches from the end of the rod, so that the end will not break off when the rod is driven. No ground rod should be less than 7 ft. long.

## TO REMOVE OLD PAINT AND VARNISH

The following method is good, if the surface is to be repainted, says the Painters' Magazine.

Dissolve 4 lb. caustic soda, 98 per cent, or as many pounds concentrated lye, in 1 gal. boiling water and allow it to cool. In another vessel mix  $\frac{1}{2}$  lb. each of starch and china clay in 1 gal. of hot water. Beat this well, so as to have no lumps, and when cooled off some add it to the soda or lye solution, stirring well in the meantime, when it forms a thick, smooth paste. Apply this paste with a fiber (not bristle) brush to the surface in a heavy film, and when the paint or varnish is raised wash with warm water. To remove any traces of causticity give the surface a coat of vinegar and



allow to dry before repainting. This method will raise the grain slightly, but that is not objectionable where the surface is to be repainted.

For removing varnish from wood that is to be refinished in the natural, a mixture of  $3\frac{1}{2}$  pints American fusel oil and  $\frac{1}{2}$  pint turpentine will lift the varnish without raising the grain or discoloring the wood.

### WHEN DRILL STICKS IN ROCK

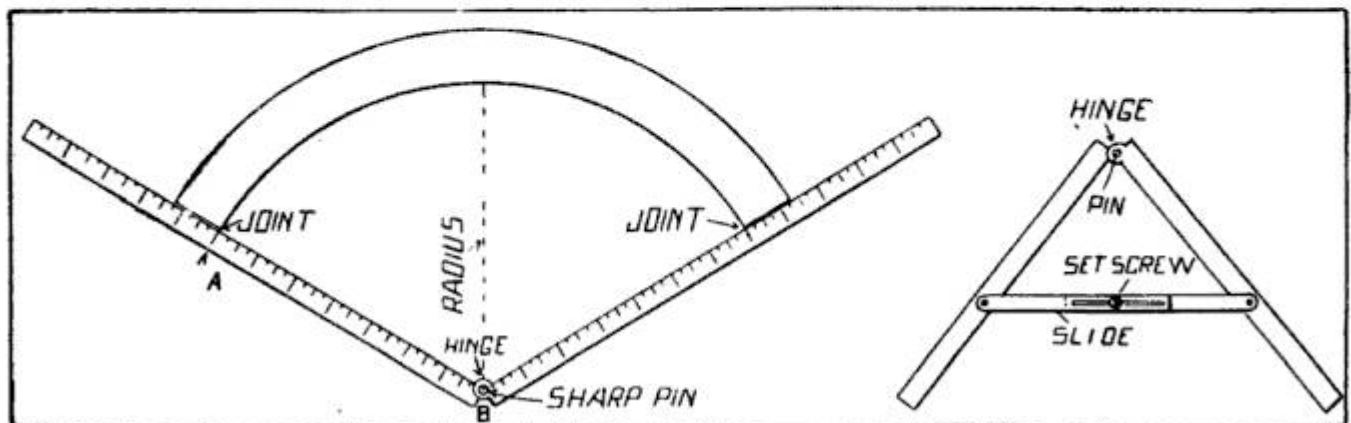
When a drill-bit sticks in a hole, the usual remedy is to strike the shank violently with a sledge until the bit is loosened. It is better to strike a moderate blow on the shank, near the hole, and never so high up as to strike the chuck, because then a bent piston or a broken chuck is likely to result. Small pieces of cast-iron, nuts or other fragments are used to keep the drill straight and prevent sticking or "running off."

### TO MAKE HARD PUTTY

A little red lead added to oil-whiting putty will make it hard but not brittle, says the Master Painter. Rub varnish makes putty both tough and hard.

### TOOL FOR CUTTING JOINTS ON CIRCLES

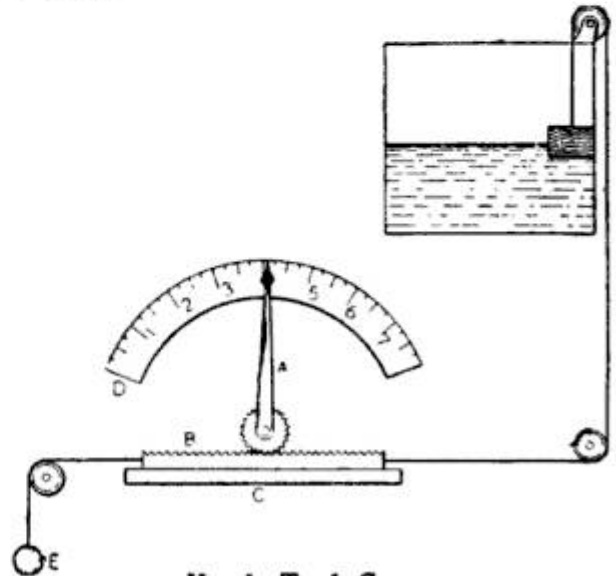
The tool illustrated does away with the necessity for drawing so many lines in order to find a joint on a circle. The device will cut any circle by placing the pin on the radius. It is marked off like a rule in inches and twelfths on the inner edges and may be provided with the slide or not, as liked. The pin runs through the hinge about  $\frac{1}{8}$ -in. to hold the instrument in place while measuring the distance from A to B.—Contributed by Chas. Walters, Mt. Vernon, Ohio.



For Cutting Joints on Circles

### SIMPLE TANK GAUGE

A handy tank gauge consists of a gear wheel set on a pinion to which is attached the hand A. A rack gear, B, meshes into the gear wheel and slides on the seat C. The hand A moves around a dial, D, with as many inches marked on it as it is desirable to let the water fluctuate up and down in the tank.



Handy Tank Gauge

When the float in the tank falls, the rack gear is drawn toward the right, causing hand A to move to the left. When the float rises with the water in the tank, weight E draws the rack toward the left and the hand moves in the opposite direction till it reaches 7, or whatever the number may be, indicating that the tank is full. This device is recommended by a correspondent of the Engineers' Review.

Heavy manila paper coated with shellac on one side makes an excellent substitute for glass for the sign painter, says the Master Painter. The prepared paper can be carried in the kit easily, does not break and is cheaper than the glass.



## DRILLING MACHINE MADE OF SCRAP

A small drilling machine may be made of scrap material by any one with a little ingenuity. For the one illustrated a piece of an old fret machine was used for the head (A). An old lathe head stock will do as well. Screw the part to a piece of wood 1 in. thick and then screw the wood to the workshop wall. Take a band over pulley B at the end and over the small pulleys, C, C<sub>1</sub>, C<sub>2</sub>, and over flywheel D at the bottom.

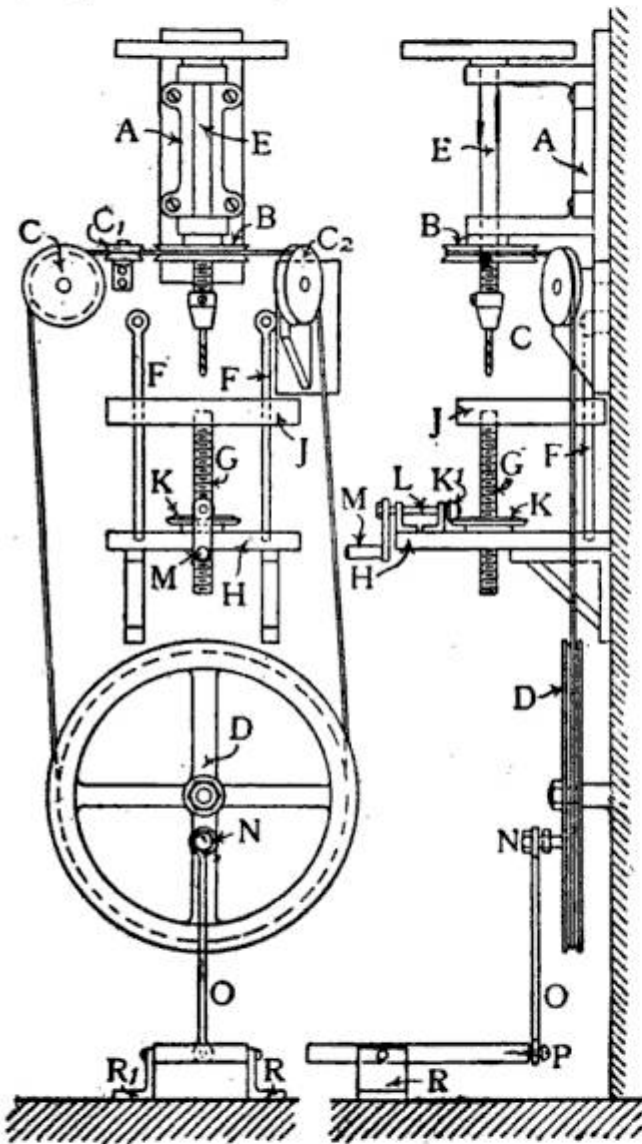


FIG. 1.—FRONT ELEVATION.

FIG. 2.—SIDE ELEVATION.

Place the small pulley C<sub>1</sub> horizontally to give the band a good grip on pulley B. Tap the end of spindle E to fit a drill chuck off of a small level-wheel drill. Arrange the table feed of the drill as follows:

Procure a piece of hard wood to project about 3 in. beyond spindle E, which may be of any convenient length; also, procure three pieces of 1/4-in. iron—two to form the guides, FF, and the other to form the feed-screw, G. Screw a small bracket to the wall,

midway between the end of spindle E and the top of the flywheel. Drill a hole through one end of each of the guide-bars, and let the other end into bracket H about 1/2 in. from the wall. Do not let them go quite through. Bore two holes through table J, 1/2 in. from the edge, and put a brass plate each side of each hole to allow the 1/4 in. guide-bars to slide through easily.

Tap the third 1/4-in. bar and make two nuts to fit it. Screw one nut up to within 3/4 in. of the top; square the end above this nut and drive it into the table J, so that when the table is put on to the guide-bars and they are in their places, screwed to the wall by a screw through the hole before mentioned, in one end, the feed-screw G comes exactly under the end of the spindle E. Before putting the table in its place get an egg-beater (one of the bevel wheel kind) and take off the large cog-wheel and one of the small ones. Bore a hole through the large wheel so that it will slide easily over the screw G. Now turn a wooden disk the same size as the large wheel and cut a hole in it to fit the nut on the feed-screw.

Screw the large wheel on top of this disk (cogs upward) and put the nut into the square hole in the wooden disk, and screw a small brass plate on the opposite side of the cog-wheel to keep the nut in its place. Bore a hole in the bracket at the same distance from the wall as the hole for the feed-screw in the table J. Screw the cog-wheel and disk on to the feed-screw G, and pass the guide-bars through the hole in the table J, and pass the feed-screw through the hole in the bracket and screw the guide-bars to the workshop wall, but put a 1/2-in. washer on the screw between the wall and guide-bar. Take the small cog-wheel off the egg-beater and fit it to an axle. The best way of doing this is to get a piece of wire slightly larger than the hole in the cog-wheel. Tap this for 1 in., so that it will screw into the cog-wheel, and make two nuts the same thread. These nuts must be slightly smaller than the cog-wheel. Screw one as far as it will go.

Next screw on the cog-wheel and a nut outside that. These nuts must be screwed up fairly tight to keep the cog-wheel from revolving on the axle. Now cut off the axle about 2 in. from the small cog-wheel and fix a piece of brass about 1/8 in. by 1/2 in. by 2 in. This should be fixed as follows:

Square the end of the axle and drill two holes in the brass plate about 1/4 in. from each end. Into one of these secure a small handle; drive the other end on to the square



end of the axle and screw on a small nut outside it. Get two small brass plates, and bend over the bottom about  $\frac{1}{2}$  in., L-shaped, and drill two small holes through the bottom of the L to screw down to the bracket H. Drill another hole on the other side of the angle to take the axle L. These holes should be drilled so that when the brackets are screwed down the small cog-wheel meshes with the large one K. Put a small washer outside the plate between the handle and plate, and cog-wheel plate. Now screw these plates to the bracket so that one comes up against the small cog-wheel and keeps it in place. Screw the other one up against the handle, so that axle L has no end play.

If, when handle M is turned to the left, table J will not come down of its own accord, pass a piece of brass over the large cog-wheel, K, and screw down at each end. The flywheel may be taken from an old sewing-machine, and if it is not quite heavy enough, put a lead weight on it. Pass a bolt through the center of the flywheel with a shoulder on behind. This bolt should run through the workshop wall and a nut put on from the outside.

Put a bolt, N, into one of the spokes of the wheel and put a piece of thick iron wire around this and connect it to the end of the treadle by a screw at P. Make the treadle of wood, 9 in. by 4 in. by 1 in. Screw the iron wire on at one end, not tightly, but so it can move a little each way. Swing the treadle in the middle by two screws, passing through small metal plates, R, R<sub>1</sub>, at each side. A machine like this was rigged up by a correspondent of the Model Engineer, London, and worked very satisfactorily.

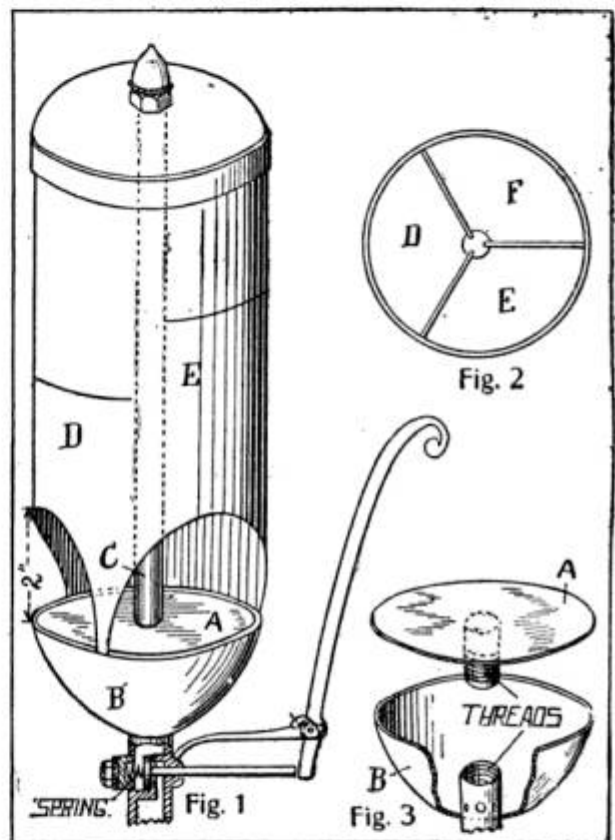
## TO GILD ON GLASS

Thinly coat the places to be gilded with a saturated borax solution on which lay the gold leaf and press down well and uniformly with cotton wool. Heat the glass over a spirit flame until the borax melts and allow to cool off.

If the glass is to be decorated with gilt letters or designs, paint the places to be gilded with water-glass solution of 40 degrees, lay on the gold leaf and press down uniformly. Then heat the object to 86 degrees Fahrenheit, so that it dries a little; sketch the letters or figures on with a lead pencil, erase the superfluous gold and allow the article to dry completely at a higher temperature.

## HOW TO MAKE A CHIME STEAM WHISTLE

Procure a piece of seamless brass tubing 8 in. long, 4 in. in diameter and  $\frac{1}{16}$  in. or less, thick. Have cast a bowl, B, 4 in. in diameter, and with a place in the bottom for inserting a 1-in. pipe. Also have cast, or make yourself, a disk, A,  $3\frac{3}{8}$ -in. in diameter, allowing  $\frac{1}{16}$  in. between the edge of the disk and the bowl for the escape of the steam that strikes the bell. Then get a  $\frac{1}{2}$ -in. bolt, C, 10 in. long, threaded on both ends and with three slots, just wide enough to



Home-Made Steam Whistle

fit sheet brass partitions for cells running its entire length into.

Cut the tubing into thirds by dividing it up as indicated in the sketch, and use sheet brass for forming the cells, soldering it in. Let one cell be  $4\frac{1}{2}$  in. high, D; one  $5\frac{3}{4}$  in. high, E; and the other 8 in. high. Put a brass cap  $4\frac{1}{16}$  in. in diameter, threaded, on the top and use an acorn or other ornament to finish it.

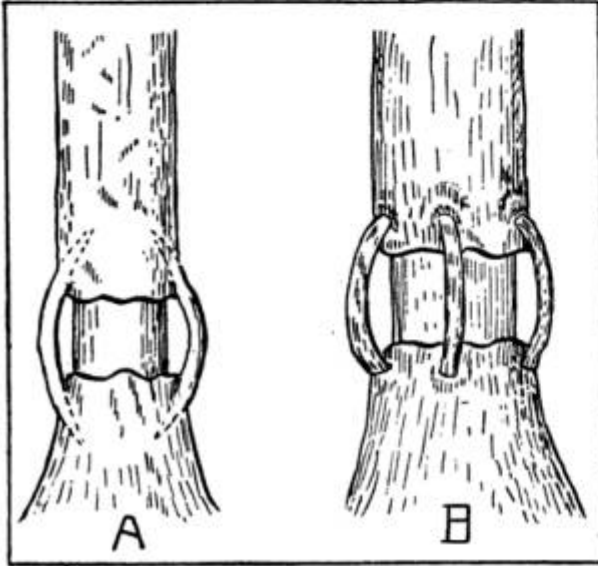
To make the valve drill a hole through the bottom of a 1-in. check valve, and stick the stem of check through the hole, as shown in the sketch. Put a brass spring in behind seat or valve disk to force it closed after using, then fasten the lever around the valve, as shown, and your single bell



chime whistle is complete. This whistle makes a beautiful sound and can be heard much farther than the ordinary whistle. Fig. 2 is an inside view of the bell, looking down from the top; Fig. 3 shows how the disk is fastened into the bowl.—Contributed by Thos. McGuire, Baltimore, Md.

### TO SAVE A GIRDLED TREE

When a valuable tree is girdled it may pay to try to save it. The following method has been successful. When, in the spring,



Saving a Girdled Tree

the tree is found girdled, drive a small chisel into the bark above and below the girdled portion as shown by the dotted lines in A. Then cut some large healthy twigs of the preceding year's growth from the top of the tree, each a little longer than the distance between the opposite cuts in the tree. Sharpen both ends of the twigs and bend them until the ends can be placed in the cuts as shown at B. Press the twigs in until they are as near straight as possible, so that there is a perfect union between the inner bark of both twig and tree. Four or more twigs, according to the size of the tree, should be placed around it. Then cover the whole with grafting wax. If the work is skilfully done, says the Rural New-Yorker, the tree will be completely cured in a few years.

To render ivory flexible, immerse in a solution of pure phosphoric acid, sp. gr. 1.13, until it partially loses its opacity; wash in cold soft water and dry. It will harden again if exposed to air, but may again be made pliable by immersing in hot water.

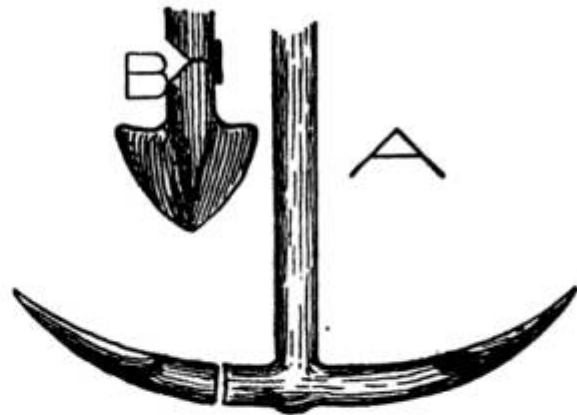
### TANK TO KEEP WATER FROM FREEZING

To keep water from freezing make a tank of galvanized iron two or three inches narrower at the bottom than at the top, says the Rural New-Yorker. Set the iron tank in a bottomless wooden box and place the whole directly on the stringers of the well and plank up to it on each side. Provide a cover to the box. Warm air from the well striking the bottom and sides of the tank will keep the water warm.

### WELDING A PALM ON AN ANCHOR

Sometimes an anchor with the palm broken off as shown at A, comes into the shop for a new palm or the old one to be welded on. If the break is not even, trim it a little with the chisel, fit a good pair of tongs to the palm, swing the anchor in the crane (this applies only to heavy anchors 500 lb. and up) and put both ends of the break in the fire and heat them up.

Have a piece of iron or any old metal about 4 in. by 1 in. heated in another fire, and when ready bring them all out, place the anchor and the palm together and weld the flat piece across the break. This saves lap-scarfing or rigging. Turn the anchor over and cut out a V-piece as shown at B. Now place the anchor in a clean fire (not a hollow fire), get a good heat, fill in with



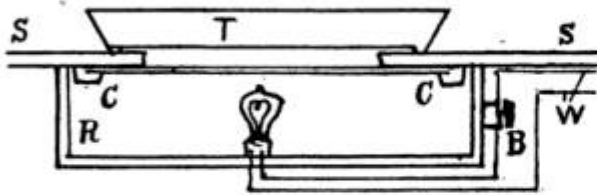
To Repair an Anchor

the V-piece and finish off that side. Then turn your piece over, cut away the flat piece and cut a V into this side. You now proceed the same as on the other side, says the American Blacksmith, heating the part where V was cut, placing a wedge in and welding and finishing. You will have a good job by this method if the heats are right.



## HANDY DARK-ROOM LAMP

For those who use glass trays the diagram shows a convenient way to rig up a dark-room lamp. S is a shelf with a



Ruby Lamp for Dark Room

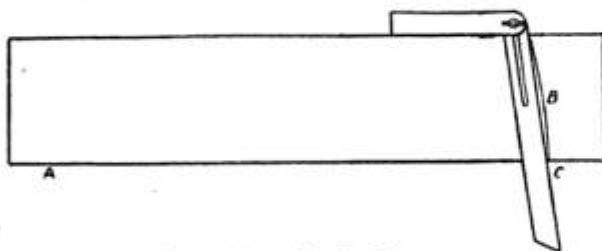
square hole about 1 in. smaller each way than the tray cut in it; C is a piece of ruby glass held by clamps to the shelf; R is a box which encloses the electric light; B is a switch, which may be placed anywhere convenient; W are wires leading to the light. When the light is turned on the negative will show up plainly.—Contributed by Harold W. Moffat, 476 Main St., Orange, N. J.

## TO MEND A GRINDSTONE

A piece broken out of a grindstone can be replaced by covering the surface of the piece and the broken surface of the grindstone with a strong solution of pure Portland cement and water, then pressing the piece firmly in position. Give plenty of time to dry.—Contributed by G. W. Gander, Nappanee, Ind.

## BEVELING STAVES FOR ROUND TANKS

Many workmen make an elaborate process of getting the bevel of staves for round tanks. Much of their work is unnecessary, says a correspondent of the Wood-Worker. A simple method is illustrated. Take one of the pieces intended for a stave, set the



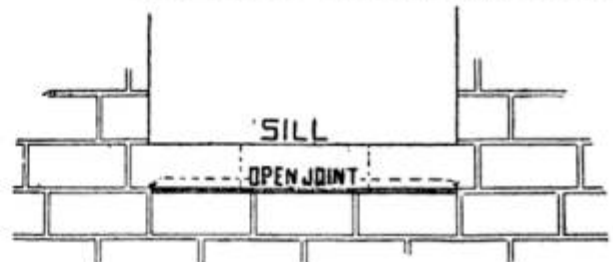
Beveling Tank Staves

trammel to the radius used in striking the bottom, or to be absolutely accurate, to that of the outside of the tank and from a point A at one edge of the stave strike curve B. Set the bevel to touch the two ends of this curve and it will be correct; the usual

practice is to set it back a little at C, so the staves will be slightly open on the outside. When the tank is wet the openings close and the staves spring to the curve of the bottom.

## TO PREVENT CRACKS UNDER WINDOW SILLS IN CEMENT BLOCK BUILDINGS

In erecting buildings of cement blocks, the blocks under window sills frequently crack. This is because proper provision for settlement has not been made, says Municipal Engineering. In most cases the trouble is probably due to the settling of the sills in full bed of mortar when they are first set. To prevent the cracking, in either brick or concrete construction, set the sills at first with joint full of mortar only at the ends, leaving a space under the sill for the whole width of the window space. The settlement of the



Sill with Open Joints

wall can then occur during the construction without bringing the breaking strain upon the sills. After the work is completed and the settlement is presumably all done fill the open joints under the sills with mortar and thus finish the wall. No cracks will then appear in either blocks, bricks, wall or sills under ordinary circumstances, and unless there is a great settlement, such as would come from insufficient foundation and bad design.

## TO KEEP WATER PIPES FROM SWEATING

Wipe the pipe dry with an old cloth, then wind it with two or three thicknesses of good heavy paper. Cover this wrapping with 4-in. strips of heavy cotton cloth. This kink was tried on 100 ft. of pipe and there was no further trouble from dripping.—Contributed by Fred Connor, Hydeville, Vt.

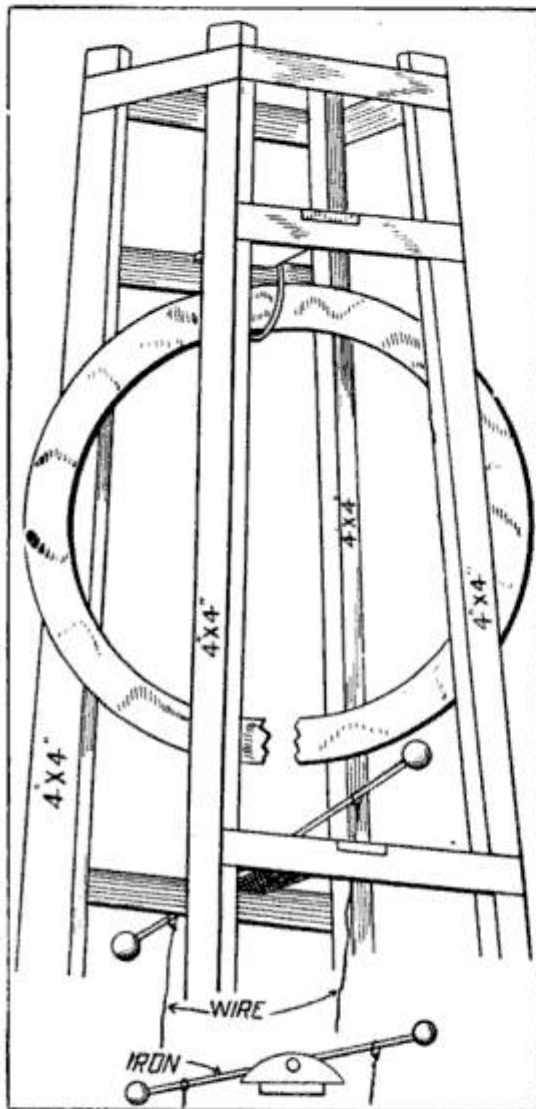
To prevent the annealing of metal above the place where heat is to be applied, stick the rod or band iron in a potato.—Contributed by E. M. Atkinson, Portland, Ore.



## LOCOMOTIVE TIRE AS FIRE ALARM

Inexpensive--Effective

In many of the smaller cities where an electric fire alarm has not yet been installed worn out or cracked tires from the driving



Novel Fire Alarm

wheels of locomotives are used in place of fire bells. The cost is less, the sound is very penetrating and is unlike a bell. For many years Marengo, Ill., used one of these tires before alarm boxes were put in. W. F. Mead of that place furnishes a sketch which will indicate the manner of erecting the tower, which in this case was on top the fire engine house. The tire was hung by an iron ring from a cross piece, but some towns erect a 20 or 30 ft. tower on the ground. The striker has an iron ball at each end, with two wires passing down to the ground floor one of which is grasped by each hand. By this means more rapid strokes can be sounded than on a bell.

Shop Notes for 1905 and 1906 are a gold mine of information to any mechanic.

## PRESERVING OLD SCREWS

Do not place old nuts, screws, etc., which you save in tin boxes. They will soon become rusty and unfit for use. A better way is to keep them in small large-neck bottles, says Machinery. Always sort the screws, etc., according to size and provide the bottles with corks and labels.

## WHEN TO VARNISH GOLD LETTERS

When gold leaf is very thin or largely alloyed varnish will protect it and make it wear longer, says the Master Painter. But for leaf of good quality and stout the varnish is undesirable. It impairs the lustre and is apt to crack.

## WHEN THE HANDS OF A CLOCK COME TOGETHER

Having worked out the little problem involved in ascertaining the exact time at which the two hands of a clock come together in making their respective circuits, and thinking the information might be sufficiently novel to merit space in your columns, I submit the following table.

I say this seems novel, because I do not remember ever having seen it in print, or heard the matter discussed.

5 min.	27 <sup>3</sup> / <sub>11</sub>	sec. past	12 o'clock
10 "	54 <sup>6</sup> / <sub>11</sub>	" "	1 "
16 "	21 <sup>9</sup> / <sub>11</sub>	" "	2 "
21 "	49 <sup>12</sup> / <sub>11</sub>	" "	3 "
27 "	16 <sup>15</sup> / <sub>11</sub>	" "	4 "
32 "	43 <sup>18</sup> / <sub>11</sub>	" "	5 "
38 "	10 <sup>21</sup> / <sub>11</sub>	" "	6 "
43 "	38 <sup>24</sup> / <sub>11</sub>	" "	7 "
49 "	5 <sup>27</sup> / <sub>11</sub>	" "	8 "
54 "	32 <sup>30</sup> / <sub>11</sub>	" "	9 "
			10 "

Contributed by J. Raymond Campbell, Frick building, Pittsburg, Pa.

## LOCATING BEARINGS FOR SHAFTING

Every master mechanic knows how troublesome it often is to tell in advance the exact location of the bearings for a new line of shafting. To overcome this have the shafting keyseated the entire length and then fill the keyways where the bearings come with babbitt, after the line is in place. Another advantage in this is that additional pulleys can be placed at any time. Use babbitt of a different grade from that in the boxes.—Contributed by F. C. Perkins, Harkness, N. Y.

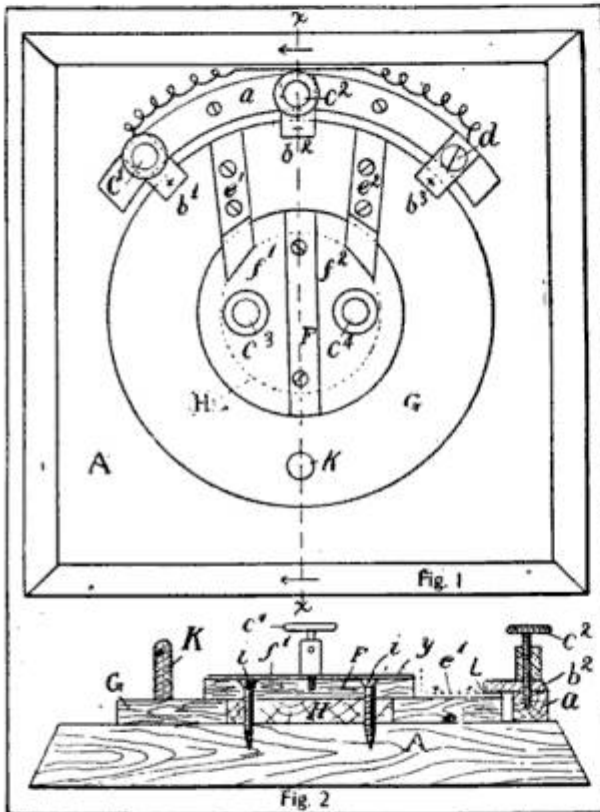




## REVERSING SWITCH FOR ELECTRICAL EXPERIMENTS

A home-made reversing switch, suitable for use by students of electrical and engineering courses in performing experiments, is shown in the diagram.

Referring to Fig. 1, A represents a pine board 4 in. by 4 in. and a is a circular piece of wood about  $\frac{1}{4}$  in. square, with three brass strips,  $b^1$ ,  $b^2$ ,  $b^3$ , held down on it by two



Suitable for Students' Use

terminals, or binding posts,  $c^1$ ,  $c^2$ , and a common screw,  $d$ . Post  $c^1$  is connected to  $d$  by means of an insulated wire, making them carry the same kind of current (+ in the sketch).

About the center piece,  $H$ , moves a disk, held down by another disk,  $F$  (Fig. 2), which is fastened through the center piece to the wooden base,  $A$ , by means of two wood screws. On the disk,  $G$ , are two brass strips,  $e^1$  and  $e^2$ , so arranged that, when handle  $K$  is turned to one side, their one end just slips under the strips  $b^1$ ,  $b^2$ , or  $b^3$ ,  $b^3$ , respectively, making contact with them, as shown in Fig. 2 at  $L$ , while their other ends slide in two half circular brass

plates  $f^1$ ,  $f^2$ , held down on disk  $F$  by two other terminals,  $c^3$ ,  $c^4$ , making contact with them as shown at  $y$ , Fig. 2.

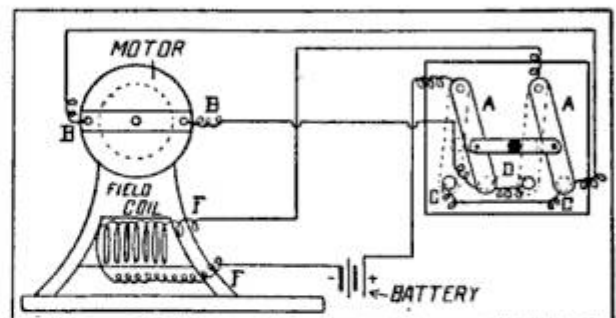
The action of the switch is shown in Fig. 1. Connect terminal  $c^1$  to the carbon of a battery, and  $c^2$  to the zinc. Then, if you turn handle  $K$  to the right, so that the strips,  $e^1$  and  $e^2$  touch  $b^1$  and  $b^2$ , respectively, terminal  $c^3$  will show + and  $c^4$  - electricity; vice versa, if you turn the handle to the left so that  $e^1$  and  $e^2$  touch  $b^3$  and  $b^2$ , respectively, terminal  $c^3$  will show - and  $c^4$ , + electricity.

The switch is easy to make and of very neat appearance. The wooden parts could be made of any insulating material, as fiber, for instance.—Contributed by Arthur Schulz, 1111 Rutledge St., Madison, Wis.

## REVERSING A SMALL MOTOR

All that is necessary for reversing the motor is a pole-changing switch. Connect the two middle posts of the switch with each other and the two outside posts with each other. Then connect one of the outside posts of the switch to one brush of the motor and one middle post to the other brush.

Connect one bar of the switch to one end of the field coil and the other bar to one pole of the battery and connect the other pole of the battery to the other field coil. To re-



Reverse for a Small Motor

verse the motor, simply change the switch.

Referring to the illustration, the letters indicate as follows: FF, field of motor; BB, brushes of motor; AA, bars of pole-changing switch; DD, center points of switch; CC, outside points of switch.—Contributed by Leonard E. Parker, Plymouth, Ind.



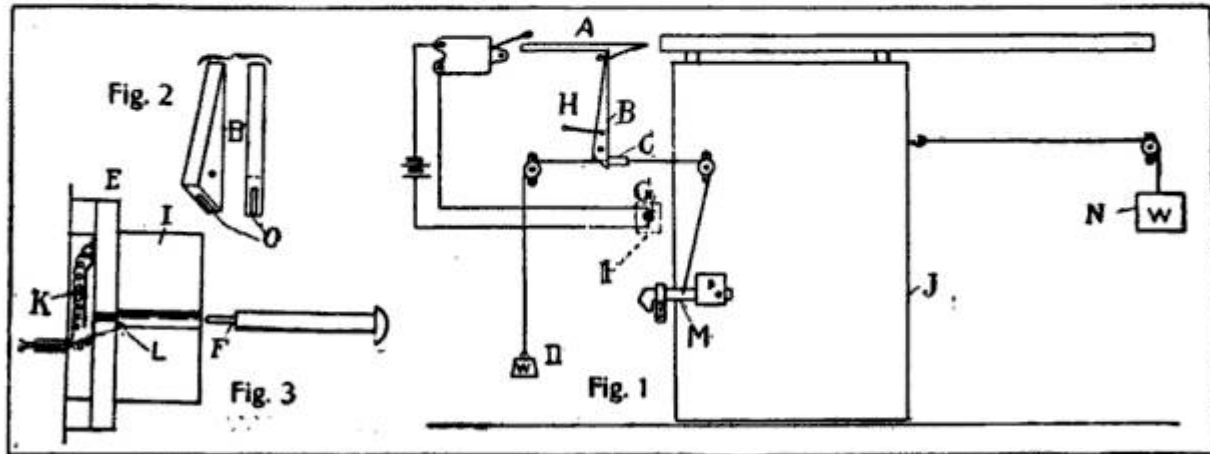
## AN INGENUOUS ELECTRIC LOCK FOR A SLIDING DOOR

The apparatus shown in Fig. 1 not only unlocks, but opens the door, also, by simply pressing the key in the keyhole.

In rigging it to a sliding door, the materials required are: Three flat pulleys, an old electric bell or buzzer, about 25 ft. of

the key, for the circuit cannot be closed with an ordinary nail or wire. B, Fig. 2, shows catch B, Fig. 1, enlarged; O, Fig. 2, is the cut through which the rope runs; H, Fig. 1, is an elastic that snaps the catch back into place, and at G the wires run outside to the keyhole.

This arrangement is very convenient when one is carrying something in one hand and can only use the other. Closing the door



Electric Lock for Sliding Door

clothesline rope and some No. 18 wire. The wooden catch, A (Fig. 1), must be about 1 in. thick and 8 in. long; B should be of the same wood, 10 in. long, with the pivot 2 in. from the lower end. The wooden block, C, which is held by catch B, can be made of a 2-in. piece of broomstick. Drill a hole through the center of this block for the rope to pass through, and fasten it to the rope with a little tire tape.

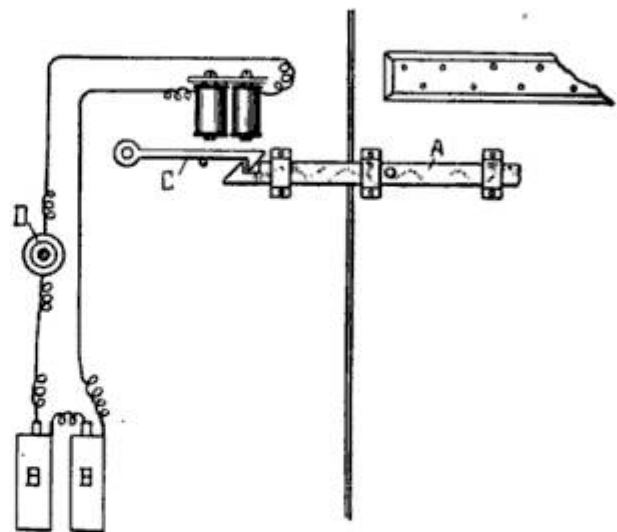
When all this is set up, as shown in Fig. 1, make a key and keyhole. A  $\frac{1}{4}$ -in. bolt or a large nail sharpened to a point, as at F, Fig. 3, will serve for the key. To provide the keyhole, saw a piece of wood, I, 1 in. thick by 3 in. square, and bore a hole to fit the key in the center. Make a somewhat larger block (E, Fig. 3) of thin wood with a  $\frac{1}{8}$ -in. hole in its center. On one side of this block tack a piece of tin (K, Fig. 3) directly over the hole. Screw the two blocks together, being careful to bring the holes opposite each other. Then, when the point of the key touches the tin, and the larger part (F, Fig. 3) strikes the bent wire, L, a circuit is completed; the buzzer knocks catch A (Fig. 1), which rises at the opposite end and allows catch B to fly forward and release the piece of broomstick, C. The weight, D, then falls and jerks up the hook-lock, M, which unlocks the door, and the heavier weight, N, immediately opens it.

Thus, with a switch as in Fig. 3, the door can only be opened by the person who has

winds the apparatus up again.—Contributed by E. H. Klipstein, 116 Prospect St., East Orange, New Jersey.

## ANOTHER ELECTRIC LOCK

The details of the construction of an electrically operated lock are shown in the illustration. When the door is closed and the bolt, A, pushed into position it automatically



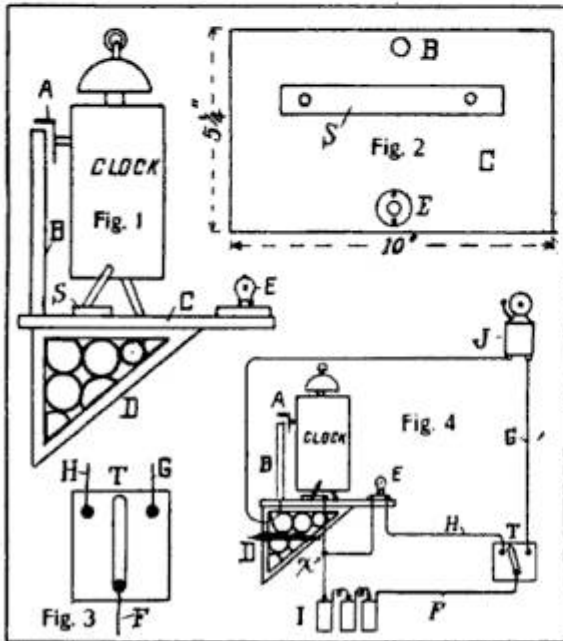
Simple Electric Lock

locks. To unlock, push the button, D, which act will cause the electro-magnet to raise the latch, C, when the bolt may be drawn and the door opened.—Contributed by A. D. Zimmerman, Boody, Ill.



## ELECTRIC ALARM THAT RINGS A BELL AND TURNS ON A LIGHT

The illustrations show an alarm clock connected up to ring an electric bell, and at the same time turn on an electric light to show the time. The parts indicated are as follows: A, key of alarm clock; B, contact post, 4 in. long; C, shelf, 5¼ by 10 in.; D,



Rings Bell and Turns on Light

bracket; E, electric bulb (3½ volts); S, brass strip, 4¼ in. long, ⅜ in. wide and 1/16 in. thick; T, switch; F, wire from batteries to switch; G, wire from bell to switch; H, wire from light to switch; I, dry batteries; J, bell; X, point where a splice is made from the light to wire leading to batteries from brass strip under clock. Push the switch lever to the right before retiring.

To operate this, set alarm key as shown in diagram, after two turns have been made

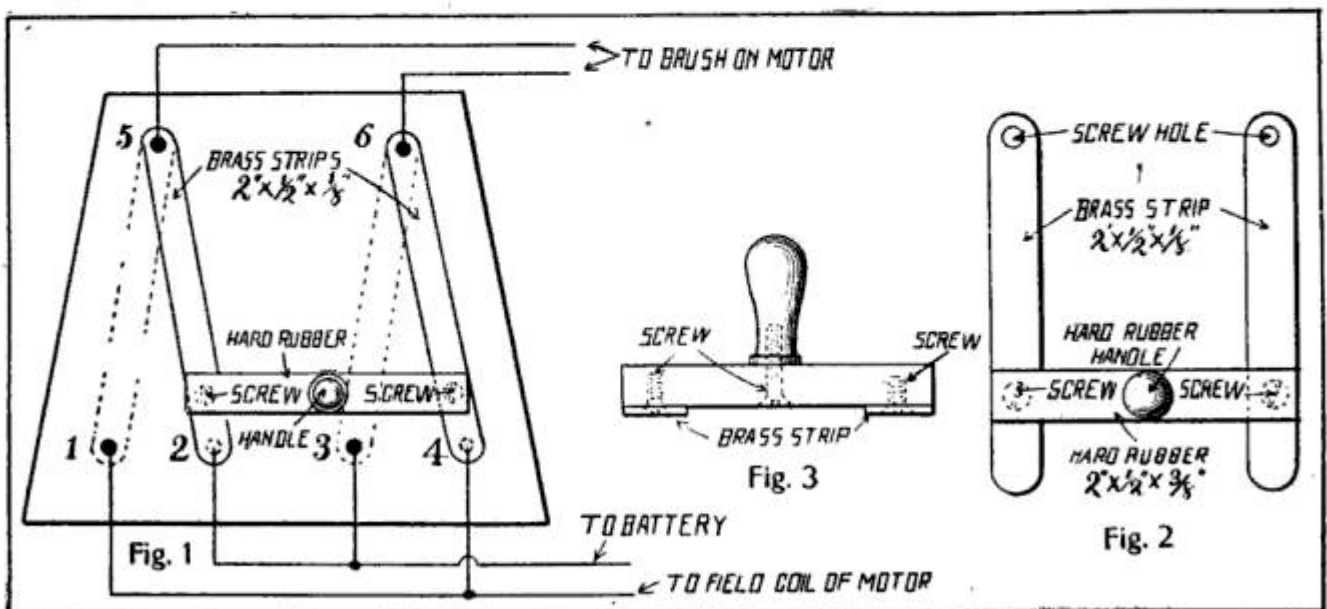
on the key. When alarm goes off, it turns till it forms a connection by striking the contact post and starts the electric bell ringing. Throw lever off from the right to center, which stops bell ringing. To throw on light throw levers to the left. The bell is then cut out but the light remains on till lever is again thrown in the center.

In placing clock on shelf, after setting alarm, be sure that the legs of clock are on the brass strip and that the alarm key is in position so it will come in contact with the contact post in back of clock. The contact post may be of ¼-in. copper tubing, or ¼-in. brass rod.

The advantage of this is that one can control the bell and light, while lying in bed, by having the switch on the baseboard, near the bed, so it can be reached without getting out of bed.—Contributed by Geo. C. Brinkerhoff, Swissvale, Pa.

## REVERSING SMALL BATTERY MOTOR

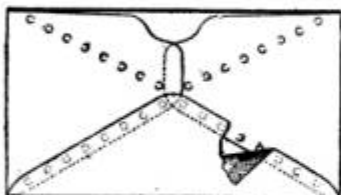
Make the switch out of a piece of slate (for the base) two strips of brass, a rubber strip and handle and some binding posts off of old dry batteries. Fasten the brass strips at 5 and 6, Fig. 1, so they can swing from 1 and 3 to 2 and 4. Hold the brass strips apart by means of the hard rubber strip and screws. Do not let the screws come all the way through the rubber strip or you are liable to get a shock in case you should touch both screws simultaneously. Screw a rubber handle onto the rubber strip to move the lever back and forth with. Fig. 2 shows the arrangement of strips, handle, screws, etc., in detail. Fig. 3 is an end view of the same.—Contributed by Eugene F. Tuttle, Jr., Newark, Ohio.





# What the Inventors are Doing

**SAFETY ENVELOPES.**—Yankee ingenuity is responsible for the safety envelope shown and the patent has been sold to a Boston manufacturer. The end flaps have small tongues attached near their edges and these tongues are gummed to the bottom flap when the envelope is made and to the top flap when it is sealed. It is difficult, though not impossible, to open this envelope without detection.



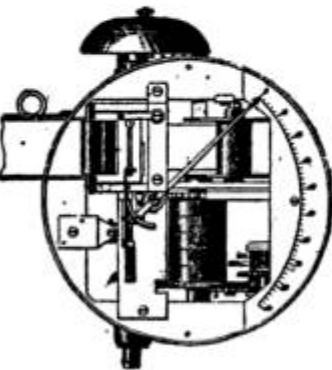
**CALCIUM STEEL** is not any form of steel or other metal, but a ceramic product made by baking in an oven a paste of pulverized feldspar, sand and lime. This produces a porcelain of great strength and hardness, acid proof and a poor conductor of heat and electricity. It can be bored, cut and polished, is not expensive and is specially adapted for making pipes for water, gas or acids.

**LAWN HORSE SHOES.**—This is a flat metal shoe designed to take the place of leather which is much more expensive. The shoes fasten with straps; one side is suitable for use on lawns or soft ground and the other side when snow is on the ground. The shoes will fit any size hoof.



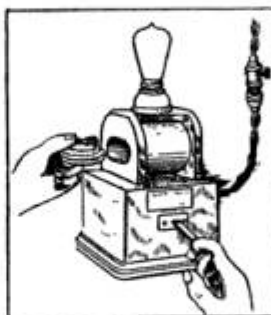
**SMALL BOYS AS INVENTORS.**—It may not be generally known that many of our greatest inventors began their work when mere lads in their early teens. Marconi, the famous inventor of wireless telegraphy, was but 14 when he set up his first crude apparatus, in which tin biscuit boxes held important places. At 16 Samuel Compton began work on the spinning mule, which he perfected before he was 19. Eli Whitney conceived the idea for the cotton gin when he was only 13. Sir John Brown was a lad of 16 when he invented in his mind the conical spring buffer for railway trucks, an invention which made him immensely rich in later years.

**LOCOMOTIVE SPEED INDICATOR.**—In Great Britain and on the continent thousands of locomotives are equipped with speed indicators which are placed in the cab directly in front of the engineer. These indicators show at all times when the locomotive is running the exact speed at which it is traveling and can be set to sound an alarm whenever the speed reaches the figure determined on. The cut shows the interior of the instrument.

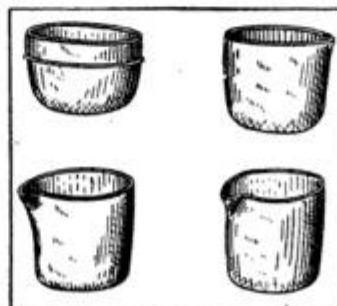


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**DEMAGNETIZES WATCHES.**—The large number of electric generators and motors in these days has greatly increased the number of watches which become magnetized. An electric demagnetizer is now on the market, which is easily operated. Connection is made by means of cord and socket to either direct or alternating current, and the watch placed in the opening in the instrument. A lever is then drawn out for a moment during which the watch is demagnetized.

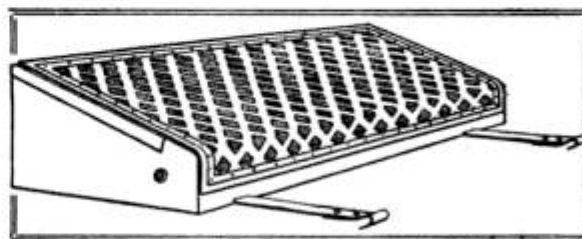


**HAND LADLE FOUNDRY BOWLS.**—For small castings hand ladle bowls for pouring are now made of thin steel and only weigh 3 lbs. against 8 to 12 lbs. for cast iron bowls. The bowls are stamped, will not crack or break, and are said to outlast the cast iron bowls.



**OIL BURNER.**—The constantly advancing price of coal as a result of strikes and the greed of coal barons, makes the burning of oil as fuel almost a necessity. The difficulty has been to get a burner that could be used in kitchen ranges or other stoves, and one that would be safe to handle. Ely Spencer, of Jacksonville, Florida, after extensive experiments, has designed a burner which has met the approval of the Board of Fire Underwriters and the persons who are using these burners. Patents have been taken out in the United States, Canada and England, and licenses are being granted to selling agents by the Spencer Oil Gas Burner Co., of Jacksonville, Florida. \* \* \*

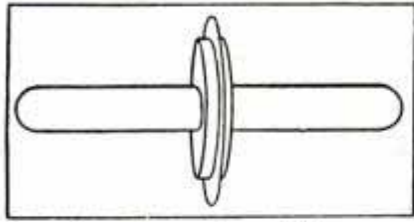
**FOOT REST AND TOOL BOX.**—A combined foot rest and tool box for automobiles. Easy for the



feet and convenient to get at tools. Fastens to the floor by means of leather straps. Box is made of wood and covered with matting.



**FLOOR OPENER.**—The illustration shows a new tool recently placed on the English market for the use of electricians and plumbers who have frequent occasion to take up flooring when installing wires or pipes. The knife edge is pushed between the



floor boards and on being moved back and forth a few times cuts the tongue of the board.

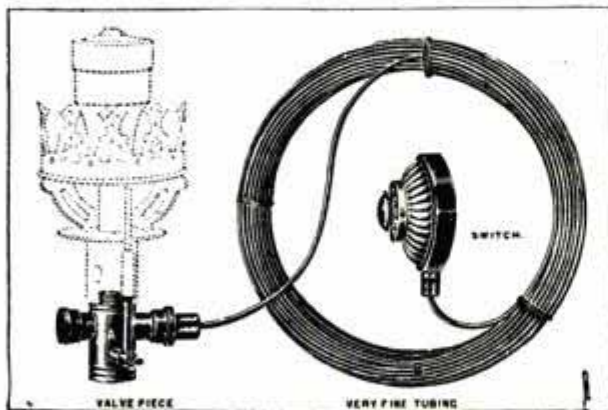
**STEEL SHAVINGS MATTRESS.**—A Chicago genius has invented a mattress comprising a core composed of fine long metal shavings. The terminals of an electric circuit are connected with opposite ends of this core so that when the current is switched on the metallic shavings are charged with electricity which reaches the body of the person reposing on the mattress. This invention is intended for use in treating invalids, but the patent covers the right to use a current strong enough to awaken a sound sleeper. If this invention is generally introduced the alarm clock will have to take a back seat.

**DECOY DUCK.**—W. W. Cram, of Sheldon, Iowa, is the patentee of this decoy duck. The decoy includes an anchor attached to one end of a cord which is wound on a spring-held reel arranged in a recess in the body of the decoy. Sufficient cord is unreeled to allow the anchor to rest in the mud at the bottom



of the river, so that the decoy cannot be blown away or carried by the current from its position. Now if some one will invent a diving decoy that can wag its tail, the real ducks will be in a bad way. \* \* \*

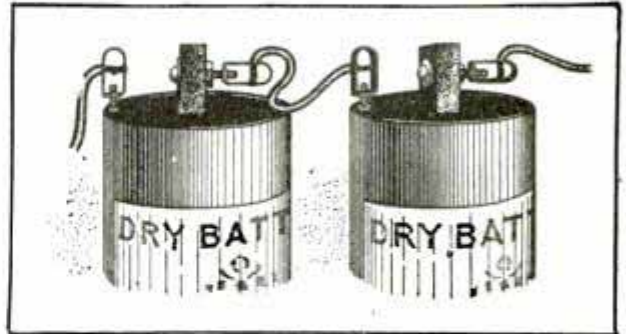
**PNEUMATIC DISTANCE GAS LIGHTER.**—Turns the gas up or down at any distance from the switch, which is operated by simply pushing a button. Pushing the button compresses air which is transmitted through fine metal tubing to the



valve piece attached to the burner. A very small pilot light burns constantly. One push turns on the gas; the next push turns it down. The action is quite similar to the working of a camera shutter by squeezing a bulb.

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**NEW BATTERY CONNECTOR.**—It consists of a piece of spring copper, bent in the form of a U, with the ends bent inward at right angles. Through the ends holes are drilled just large enough to admit the regular screw binding post. To place it in position, the ends are pressed together until the holes come in line, when it can be readily slipped over



the screw. Releasing the pressure the two arms grip the liberated portion of the post securely. With this arrangement no nuts are required, and at the same time, an excellent mechanical and electrical connection is secured. A short piece of insulated wire is soldered to each pair of connectors, so that they are available for immediate use at all times.

**STEEL SHELVES FOR STORES.**—Shelves or racks for stores or warehouses are now made of steel. The racks are shipped knocked down and quickly set up on receipt, as the parts readily go together. They are so made that racks of any desired length or height can be assembled. The advantages are freedom from collecting dust, lightness, strength and not obstructing the light.

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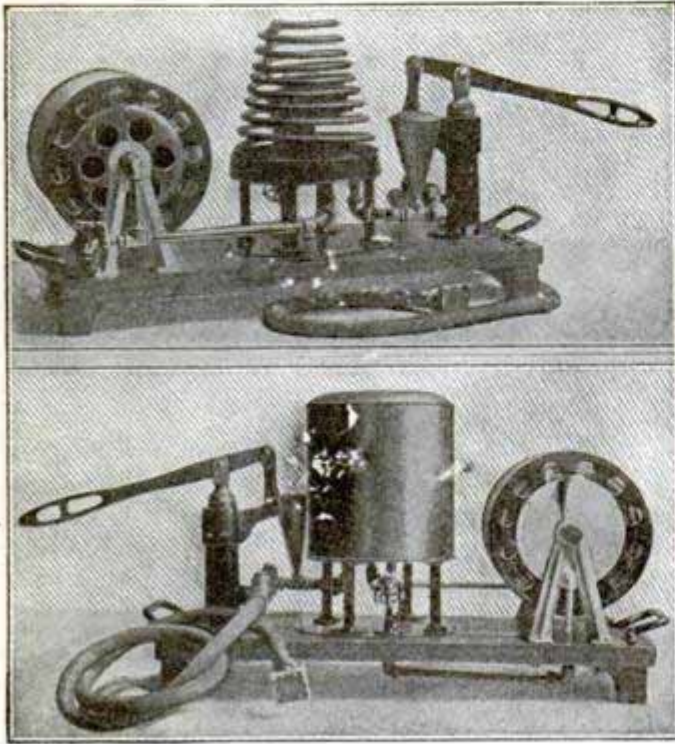
**SICKLE BAR REMOVER.**—Every farmer has experienced trouble in removing gummed or "sprung" sickle bars from mowing machines. Samuel M. Hill, of Sunnyside, Washington, wasn't satisfied to put up with such trouble and invented the



tool shown in the above cut. It is a short iron bar with a hollow head and claw at one end to fit the pitman head, and an eye at the other end to which a chain is attached. A few jerks on the chain and the sickle bar is pulled in a straight line from the guards. Popular Mechanics Patent Bureau secured the patent for Mr. Hill on this useful tool and is now negotiating the sale of the patent rights.



**GASOLINE PIPE THAWING MACHINE.**—A decidedly new apparatus for thawing frozen water pipes which can be operated by any plumber; no electricity required. The outfit is 28 in. long and weighs 125 lbs., complete. Gasoline for heating the pipe coil is supplied from a tank in the center



of the reel. A hand force pump forces water through the heated coil, which then passes through the 125 ft. of 3-16 in. block tin pipe. The other end of the tin pipe is thrust into the frozen water pipe discharging boiling water and rapidly thawing its way as the tin pipe is pushed along. Two men, one to pump and another to handle the flexible pipe have thawed 100 ft. of  $\frac{3}{4}$ -in. pipe in one hour. Sewer pipes, 6 in. diameter, have also been thawed. The flexible tin pipe is carried on the reel.

**LEAD EXPANSION SCREW.**—Made in any size required; for plumbers' use; has screw bolt of iron

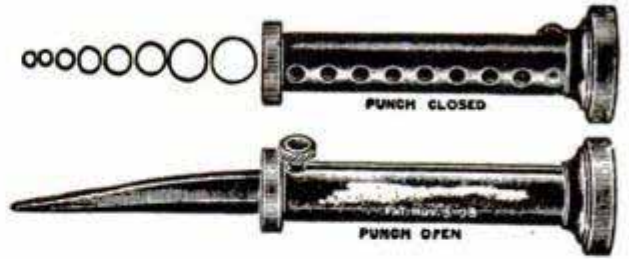


or brass, and flat or round head. The lead expansion shield is hard enough to hold, and sufficiently soft to expand easily, when the metal cone at the end is drawn into the shield.

**IMPROVED PAVEMENT STANDS TEST.**—A new and improved pavement which has been testing on the Brooklyn bridge, and on bridges in Chicago, has made a remarkable record. In Chicago, after 11 months under heaviest traffic, the city bridge engineer predicts it will last 5 years more. On the same bridge 3-in. oak plank lasted only three months. The new material, which is noiseless, is made in sections of any size up to 2 by 10 ft. and from 2 in. thickness up. It is laid like plank, can be cut with hand saws, and on previously improved streets, alleys and private driveways requires no special foundation. On bridges sub-planking can be dispensed with.

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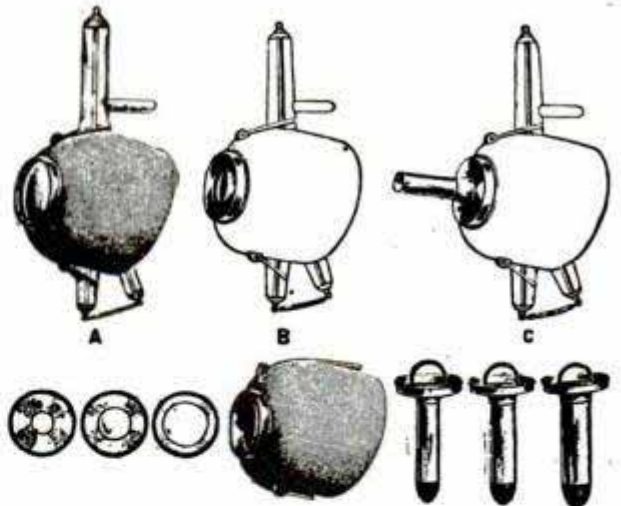
**ADJUSTABLE BELT PUNCH.**—This punch can be set in a moment to cut any size hole from 1-16 in. to  $\frac{3}{8}$  in., and is small enough to carry in the vest pocket. In using the punch, extend the blade



to the size hole desired, push the blade straight through the belt up to the handle, pressing the end of the handle firmly against the belt and turn it one-half around. This takes out the core of the size hole desired.

**PNEUMATIC WRENCH.**—Can be used with compressed air or electricity. Runs the nut down quickly, but wrench will not break at the finish, as the drive is an adjustable friction which allows the drill to keep on rotating while the wrench-chuck itself remains stationary. Will work satisfactorily on nuts up to  $\frac{3}{4}$  in.; above that the largest air drill is not sufficiently strong. The device can be attached to air or electric drills.

**PROTECTOR FOR X-RAY OPERATOR.**—Any doctor who took a dose of medicine himself every time he gave one to a patient would be sure to find trouble, providing there were many patients and his medicine was effective in any way. The same is true of giving patients doses of X-ray, and, unless the physician protects himself from the ray in giving X-ray treatments, he will be sure to find

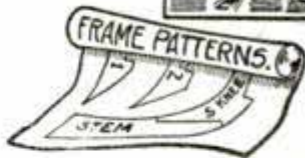


trouble in one form or another, says the Journal of the American Medical Association. Shields are now made of non-conducting material to cover the tube except at such point as it is desired to use the rays. The shield is so light it may be fastened to the tube, as shown in Fig. A, and the size of the opening may be governed by caps or diaphragms, as shown in Fig. B, or a speculum may be attached to the opening, as shown in Fig. C.

An expert railroad authority says the loss due to radiation of heat from a locomotive boiler is so great that the past mild winter has meant a saving of 20 per cent in fuel on some of the northern railroads.



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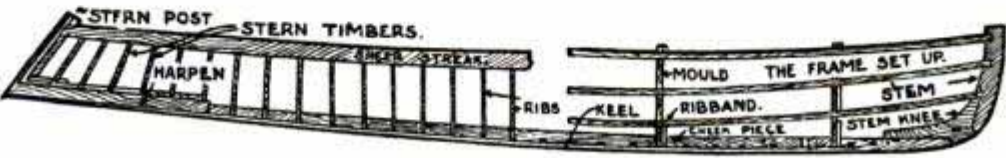
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**REGARDING MUNICIPAL OWNERSHIP.**—Much has been said in the public press concerning municipal ownership in Glasgow. The street railway is owned and operated by the city. It is maintained in excellent condition and the management is probably the abiest of any of the English cities.

Like all municipal undertakings of the kind, the track mileage is greatly restricted, and the cheap fares apply only to very limited areas. Hence there is a great congestion of resident population in the central parts of the city.

The last census showed that twelve per cent, or 91,500 of the population, in families of from three to twelve each, live in one room. Twenty-five per cent, or 194,284 persons, in families of from five to twelve live in two rooms.

The city employs an army of sanitary inspectors. It has been said that all the "profits" of municipal ownership are more than wiped out in the cost of

this service. These "profits" amount to but one-sixth of the taxes paid by the street railways of the single borough of Brooklyn.

Something more than sanitary inspectors are needed. A private corporation, operating the street railways as developed on American lines, would do more for the health of the city than the present sanitary force quadrupled. For these private companies would soon add enough of track mileage to get the people quickly and cheaply out into the neighboring suburbs.

In 1900 and 1901, outbreaks of the plague occurred; one hospital has 235 small-pox beds, 85 of which were added in 1901 to meet the prevailing increase of that disease. Since 1901 another small-pox hospital, Robroyston, accommodating 372 beds, has been opened. This is a feature of municipal ownership seldom dwelt upon.—Bulletin, N. Y. Edison Co.

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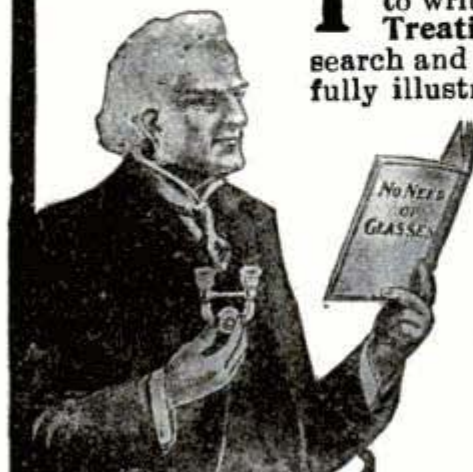
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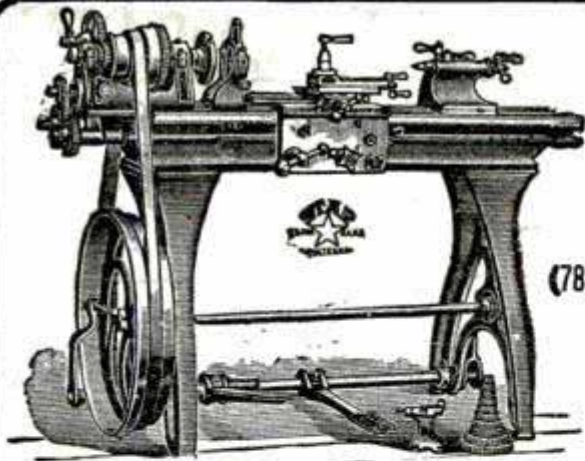
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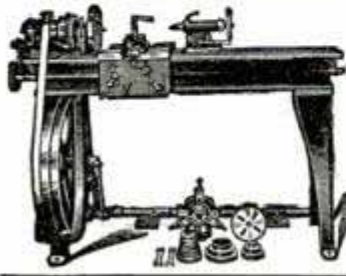
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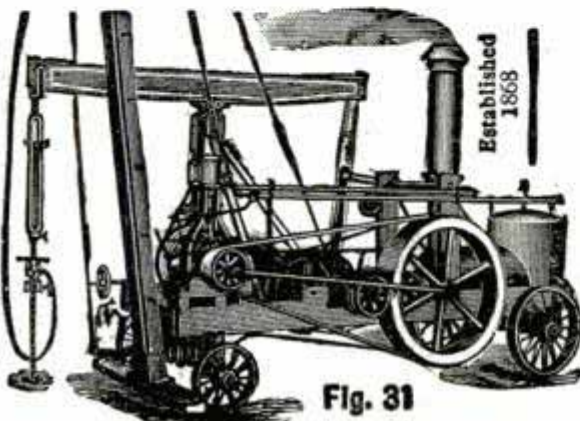


Fig. 31

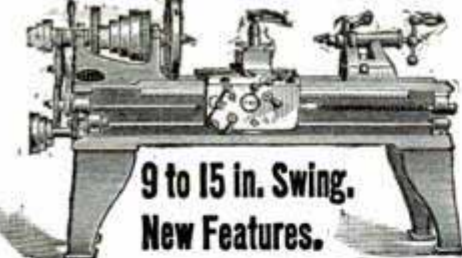


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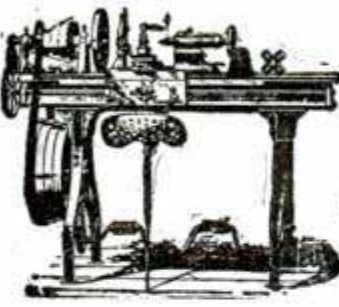
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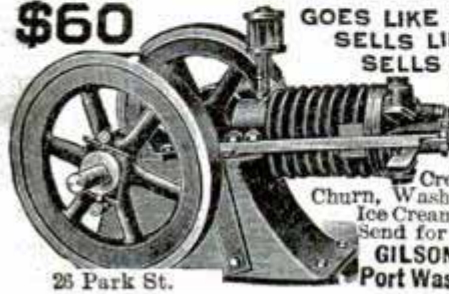


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MARINE. STATIONARY. PORTABLE.

No Danger, Maximum Power, Lightest Weight, Simple, Reliable, Economical No Batteries, Self-ignition by compression. Fully Guaranteed. Write for Catalogue P. M.

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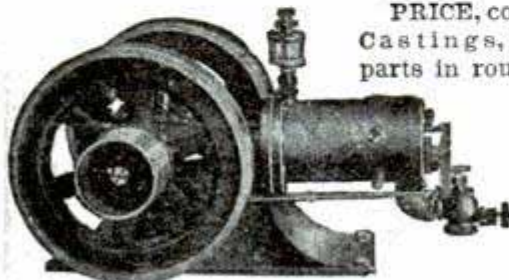


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PRICE, complete set of Castings, including all parts in rough with blue prints—

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THEY NEEDED IT.—Gen. Frederick D. Grant was praising the intelligence of a certain colonel.

"He it is," he said, "of whom they tell the church parade story. His men were drawn up for church parade one Sunday morning, but the church was undergoing repairs and could not accommodate all.

"Sergeant-Major," said the colonel, "tell all the men who don't want to go to church to fall out on the reverse flank."

"About 60 per cent of the men quickly and gladly fell out.

"Now, Sergeant-Major," said the colonel, dismiss the men who didn't fall out and march the others into church. They need it most."

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ABSOLUTELY THE  
FINEST  
ENGINE  
ON THE MARKET

Notice the neat design and the round base which insures higher base compression; higher base compression means more speed, and more speed certainly means more power.

Only three moving parts; so simple a child can run one at any time in any climate. **WE HAVE THEM—** From 1 1/2 H. P. to 16 H. P. Send for Catalogue P—it's FREE. Write for Agency.

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TELEPHONES IN CABOSES.—In order to doubly safeguard traffic on the Oregon Railroad and Navigation Company's line, a system of telephones will be established all over the line in connection with the telegraphic communication.

E. A. Klippel, superintendent of telegraph, is supervising the installation of the telephones, and the work will be completed as rapidly as possible. Telephone instruments and induction coils will be installed in each telegraph office along the line, and cabooses will be equipped with telephone instruments. When the telegraph line gets out of order between stations, or when a train meets with an accident or delay, a wire can immediately be attached from the caboose to the telegraph wire and communication established between the train, no matter where it is, and the nearest telegraph office.

In this way orders can be sent to conductors while on the road between stations, and many costly and annoying delays avoided.

It will require about one hundred phones for offices and a like number for cabooses to equip the entire system, and the cost will be considerable.—Jour. Elec. Power & Gas.

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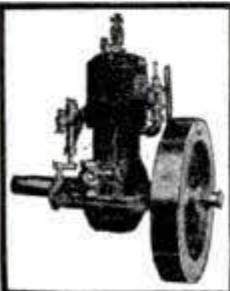
## We Build the "Otto" Engine

just as good as we know how after twenty-nine years of experience. We carefully figure the cost, add fixed charges and a reasonable profit, then sell at a price that is *fair* to both ourselves and our customers. The other way (more in vogue than you would suspect) is to fix the price first, then build the engine to fit the price. The former method results in quality, the latter—not. Over 100,000 users commend the "Otto" way.



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Are **FAR SUPERIOR** to all others. Built in 9 sizes.

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Model C,	1½ H. P.,	weight 70 lbs.,	Price, \$35.50	
" F,	2 "	" 95 "	" 47.75	
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Model H,	2½ H. P.,	weight 120 lbs.,	Price, \$71.00	
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The **JUNIOR MARINE ENGINES** are sold under an absolute guarantee for 2 years and a trial of 30 days. They are all of the 2-cycle type and reversible.

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## THE PRACTICAL GAS ENGINEER

Fifteen Pages of Index like this:

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Fluid battery  
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Feed more fuel  
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It is the **BIGGEST DOLLAR'S WORTH OF BOOK** ever offered for the Money

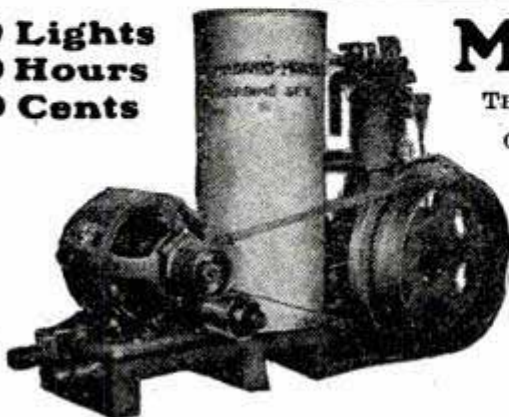
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Gas, Gasoline or Kerosene Engines for all purposes, from 2 h. p. up.  
Cut out complete advertisement and send to

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Monroe Street, Chicago, Ill.

Please send me illustrated Catalogue No. C 449 Gasoline Engines

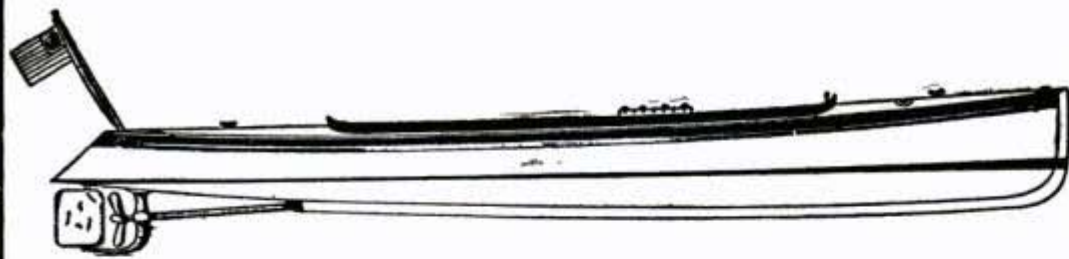
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Street No.....

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# 28 Ft. AUTO BOAT

3 Cylinder, 4 Cycle Engine, 12 H. P.

## \$600

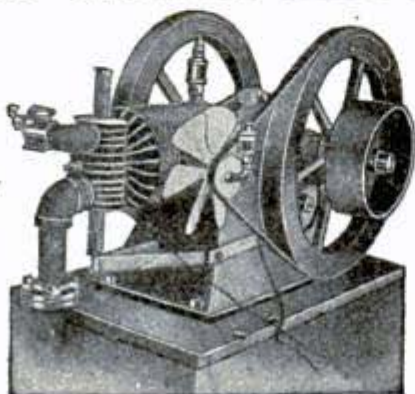
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ENGINES, PROPELLERS AND COMPLETE LAUNCHES

1253 N. Halsted St., CHICAGO, ILL.

### THE LARGEST AIR-COOLED MOTOR MADE 5 HORSE POWER

Bore 6x6 inches. Plenty of cooling surface. No engine ever constructed with so few working parts. You can hold your hand on the flanges after it has been working all day.



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Gasoline tank in base or outside.

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This Shows Our "Vim"

### Butt Spark Magneto

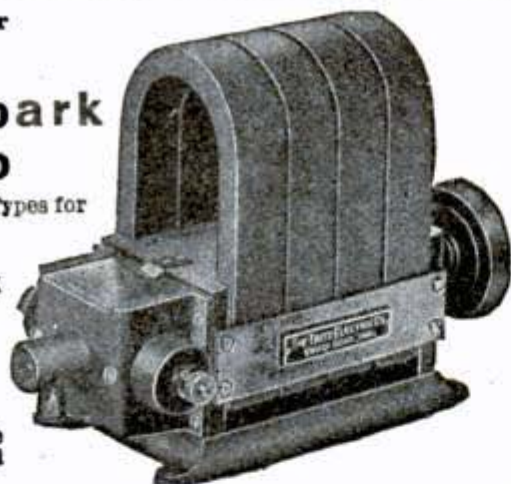
We make other Types for

Butt and Jump Spark Ignition

Also

**COILS**

of all kinds. Write for prices and full information



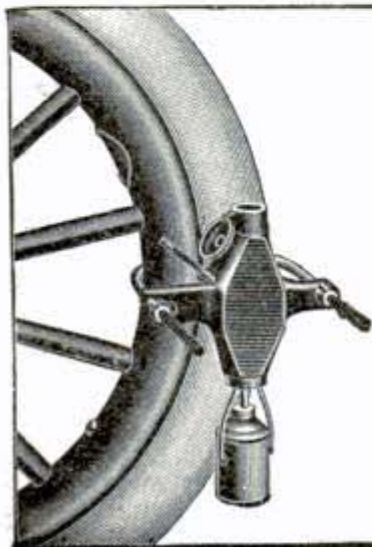
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Blowouts, sandboils, glass cuts or other damage spots on outer casings; torn off stems, split or punctures to inner tubes vulcanized as good as new with our Vulcanizers.

We want to send you circulars, and what others say.

"Stitch-in-Time" Vulcanizer Co. Topeka, Kan., U. S. A.



### THE MAN IN THE BLUE FLANNEL SHIRT

"Puff, puff!"

As he smokes in his big, easy chair,

"Puff, puff!"

We pass an' we call him a shirk,

"While there's many a trade

Where there's cash to be made, It's a pity the beggar won't work."

"Puff, puff!"

"It's a pity the beggar won't work."

We envy him there at his ease,

As we're tramping along in the dirt,

An' a busy man's sneer is the best we can spare,

For the Man in the Blue Flannel Shirt.

"Click, click!"

For he sleeps with his ear to the wire,

"Click, click!"

An' if ever a one of us calls,

With a leg round the pole

An' his clothes in a roll,

He dresses himself as he falls.

"Click, click!"

He dresses himself as he falls.

He's away thro' the night like a flash,

Tho' the wind blow a hurricane spurt,

For the state of the weather's the least of the cares,

Of the Man in the Blue Flannel Shirt.

"Clang, clang!"

For the horses are plunging abreast,

"Clang, Clang!"

It's a twenty-ton bird on the fly,

With a runaway team,

An' hot metal an' steam,

The stack spitting sparks to the sky.

"Clang, clang!"

The stack spitting sparks to the sky.

For he's got a good hold with his toes,

An' he's ready to fight or to flirt.

[Continued on page 464]

### DYNAMO CASTINGS

Sets of Material or Finished Parts for the

**FRANKLIN MODEL DYNAMO**

PRICE \$3.50 AND UP

Will light six 6 c. p. lamps

Write for illustrated booklet 8

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Automatic Battery Charger



**1 1/4 H.P. Bike Motor, \$7.50**  
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We also have a 2 1/2 H. P. set of castings. Send stamp for catalogue and full particulars.

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ST. PAUL, - - - MINN.



**POCKET Battery Ammeter**  
0 to 30 Amperes

Indicates in any position and in either direction of current. In testing single cells, the cord is not necessary.

**Price \$3.50**  
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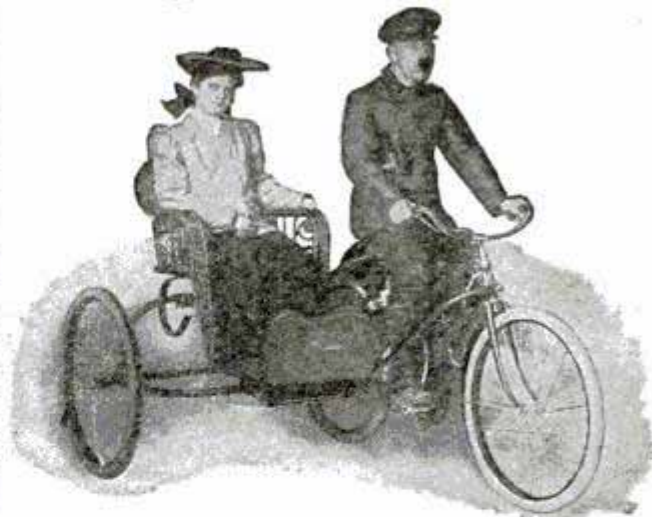


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at small cost by attaching the **ERIE 2 H. P. POWER-OUTFIT.** This includes all parts by which anyone can easily make a Powerful Durable Motorcycle. Weight, 48 lbs. Speed, 2 to 32 miles. Send stamp for catalog.

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**Faster than an Auto  
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**GET A MANSON**

It is speedy and reliable, adapted to all roads, and maintained at a moderate expense. Attachments designed for pleasure and utility

Write us

**Fowler - Manson - Sherman  
Cycle Mfg. Co.,**  
Clinton and Fulton Sts., Chicago, Ill.



**AUTOMOBILES \$100 AND UP**

We will mail our large Illustrated Bargain Sheet of new and slightly used Automobiles on receipt of your name and address. This sheet shows accurate photographic views of more than 50 Automobiles offered as low as \$100. Write plainly to

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Established 14 years. 601-603-605 Madison Street, CHICAGO, ILL

**WHY NOT STOP YOUR TROUBLES?**  
A "Wizard" Tubular Does It.

Armature incased in **WATER-PROOF** non-corroding brass tube.

All brass screws.  
Friction, Belt or Governor drive.

Brush-holders removed without loosening screws.

All parts polished brass.

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All the Standard Machines **SOLD** or **RENTED ANYWHERE** at 1/2 to 3/4 **MFR'S PRICES**, allowing **RENTAL TO APPLY ON PRICE.** Shipped with privilege of examination. Write for Illustrated Catalog

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Everybody's  
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Leather Pocket-Book, 4¼x3¼ inches, containing POCKET KNIFE, FILE, SAW, CHISEL, SCREW-DRIVER and REAMER.

Each tool firmly attached or detached to the Pocket Knife in a second.

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**WARRANTED**

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Use 5 days, and if not satisfactory, return to me and I will refund the money.

U. J. ULERY, 7 F Warren Street, New York City.

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A complete line from 1¼ to 10 h. p., for Bicycle, Automobile, Marine or Stationary. Also attachable motor outfits and Complete MOTOR-CYCLES. Send stamp for catalogue.

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### 6 VOLT PLUNGE BATTERY

COMPLETE \$1.50 PREPAID. With Switch, Wire and Chemicals. Nicely finished with good sized crystal glass jars. Just the thing for running motors and small lamps. Gives 6 volts and 5 amperes. Sent promptly prepaid anywhere on receipt of \$1.50. Send for descriptive circular.

RUSH ELECTRIC WORKS - MASONIC TEMPLE, CHICAGO

[Continued from page 462]

"One wheel on the ground is a plenty for me."  
Says the Man in the Blue Flannel Shirt.

"Up, up!"

For a woman cries "Help" from the roof.

"Up, up!"

An' he's climbing to answer her call.

Thro' the black vapor's choke,

'Till he's hid by the smoke,

Hanging on where a spider would fall.

"Up, up!"

Hanging on where a spider would fall.

Now he carries her down to the street

An' he says: "I don't think she is hurt."

"Your baby? Stop crying. I'll get it, just wait,"  
Says the Man in the Blue Flannel Shirt.

"Puff, puff!"

As he smokes in his big, easy chair,

"Puff, puff!"

It is easy to call him a shirk.

For there's many a trade

Where there's cash to be made—

But he gives his life for his work.

"Puff, puff!"

But he gives his life for his work.

We look at him there at his ease

As we're tramping along in the dirt,

An' a busy man's cheer is the least we can give,

To the Man in the Blue Flannel Shirt.

—Henry M. Hyde in Chicago Tribune.

**LIAR OR FOOL.**—"You say you're a plumber."

"Yes."

"And sell ice in the summer."

"Yes."

"And deal in coal during winter?"

"Yes."

"And yet you're only worth \$10,000,000,000,000?  
Bosh!"—Louisville Post.

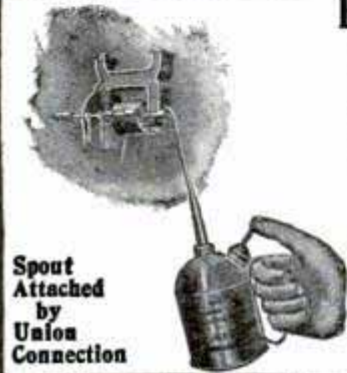
### EVERY MACHINIST

who reads this adv. should ask his dealer for a **Howland Pump Oiler**. Handiest thing around a lathe. Can keep flow of oil on cut off and threading tools.

Sample ¼ Pint Brass  
**\$1.25 Prepaid.**

We manufacture Pump, Valve, Drip and Spring Bottom Oilers. For sale by jobbers and dealers.

Free Catalogue.  
Maple City Manufacturing Co.  
MONMOUTH, ILL.



Spout Attached by Union Connection

Write to-day.

### Motsinger Auto-Sparker

Starts and runs

#### GAS ENGINES WITHOUT BATTERIES

No other machine can do it successfully for lack of original patents owned by us. No twist motion in our drive. No belt or switch necessary. No batteries whatever. for make and break or jump-spark. Water and dust-proof. Fully guaranteed.

MOTSINGER DEVICE MFG. CO.

146 Main St., Pendleton, Ind., U. S. A.

Catalog free with full information.



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Auto, Marine and Stationary. Booklet on Request

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**THE GEBHARDT MOTOR CO.**

2930 Hancock St., Phila., Pa.

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	per doz.	\$	Price each	8 cents
6 inch Mill Bastard		.80	" "	9 "
8 " " "		.98	" "	13 "
10 " " "		1.26	" "	17 "
12 " " "		1.70	" "	7 "
5 " Slim Taper Files		.57	" "	7 "
5½ " " "		.66	" "	7 "
6 " " "		.71	" "	7 "

LET US KNOW THE KIND YOU USE. OUR PRICES AND FILES WILL SATISFY.  
OVER 500 DIFFERENT CUTS AND SIZES IN STOCK.

**PERIOLAT BROS.,** CANAL AND RANDOLPH STS., CHICAGO, ILL.



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Westinghouse, Alternating Current Motors, each

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New, Direct Current, Shunt Wound Motors, each, . . . . .

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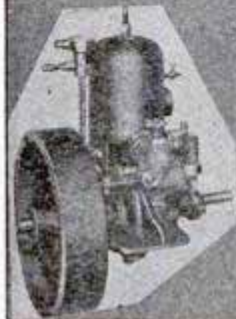


## New Catalogue

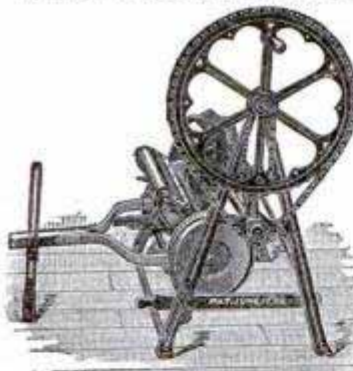
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ASSEMBLER . JOBBER . DEALER

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Sharpens any Lawnmower accurately in 10 to 15 minutes, makes the blades absolutely true, gives them a perfect clearance, does the work quicker and cheaper than it can be done by hand. Nothing like it on the market. Made for both hand and power use.

Write for full description and prices TODAY.

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Agents can make \$50 weekly selling LITTLE GIANT FAUCET WATER MOTORS. Outfit retails for \$4. Liberal discounts to the trade. Attaches to ANY faucet. Used for polishing silverware, sharpening knives, grinding, cleaning metal, buffing, etc. FREE POWER for sewing machine, lathe, dynamo. Easy seller. Profits over 100 per cent. Own a business of your own. Send \$2 for agents' sample and confidential terms. Experience unnecessary. Outfit consists of motor with scientific water buckets, emery wheel, polishing wheel, pulley wheel, 3-blade fan, belting and washers. Send \$2 for sample outfit TODAY, and begin work. Include 25c. extra, and we will deliver the motor outfit, carriage charge prepaid, to any part of the world. Whether you order or not, write for booklet and full information.

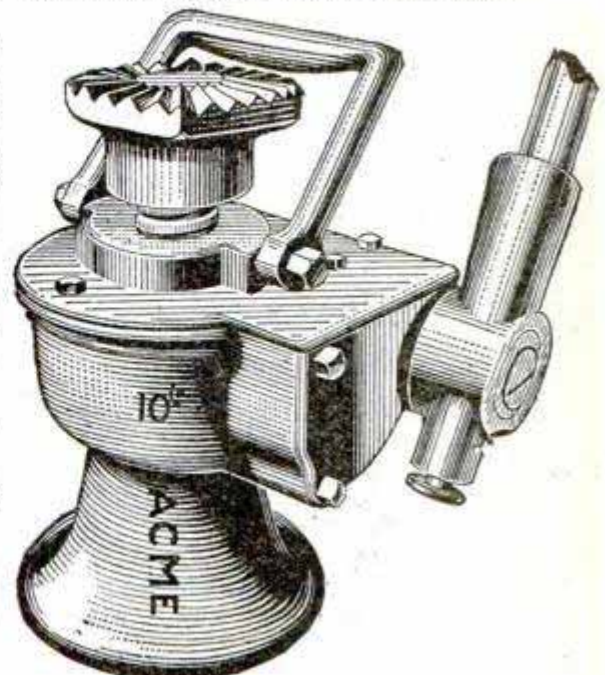
**N. Y. HYDRAULIC MOTOR CO., Dept. B, 52 John St., New York**

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GREATEST LIFTING POWER WITH LEAST LABOR AND TIME.

For Machine Shops, Builders, Railroad Trains, Railroad Shops, Contractors, House Movers and Manufacturing Establishments. OTHER SIZES FOR LIFTING AUTOMOBILES AND WAGONS. The Ball Bearings and Automatic Oiler reduce friction to a minimum and increase the power and life of the Jack. Mechanism is so simple anyone can work it. Weight rests entirely and evenly on the balls. The Jack is constructed with an automatic brake and cannot run down or drop a load. This feature of the Jack places the handling of a load always under the control of operator. All parts are standard and interchangeable and the cost of maintenance light. By embodiment of mechanical principles with our quick-action ratchet and short lever the Jack can be used in closest quarters, thereby insuring the lifting of the weight in any place under which the head of the Jack can be put.

Prices and particulars quoted on application.



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 Write us for estimate on any article you want manufactured. Prompt and careful attention given all correspondence

**FORT DEARBORN MFG. CO.**  
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**SPECIAL MACHINERY DIES, TOOLS, Etc.** Also Blanking, Forming and Drawing of Sheet Metal  
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 Gear and Cam Cutting Surface and Circular Grinding Screw Machine Work



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A new rapid flux and tin combined for soldering and mending Iron, Copper, Brass, Lead, Zinc, Tin, Solderene solders anything and everything that the old method of using bar or wire solder, acids, rosin and paste accomplished.

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**LITTLE GEM CEMENT BRICK MACHINE** **\$25**  
 Capacity 1200 per day—one man—brick tamped face down any design, makes three at a time. Outfit includes 3 plain dies, 1 Rock, 1 octagon, 1 Round Corner, 1 Rope Face, 1 circle plate for column -- **MOLDS** for Cap and Sill, base ball and baluster, Fluted Columns, etc.  
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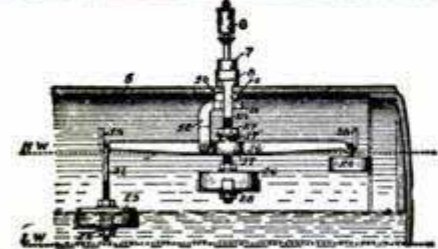


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**"KNIPE" PATENTS**—The Combination: A Ball Bearing and a Cone combined. For thrust, weight or both. Lowest price and best bearing made. For the lightest to the heaviest work. All sizes, 1/4-inch and up. No fitting—just push it on. 10 cents in stamps for samples.  
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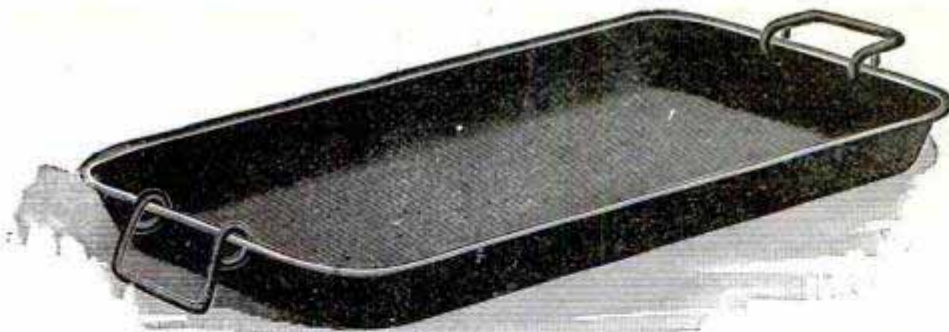
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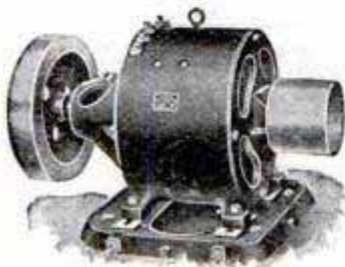
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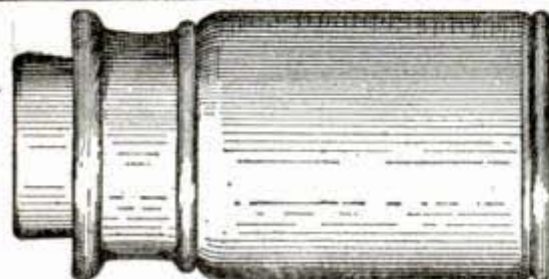
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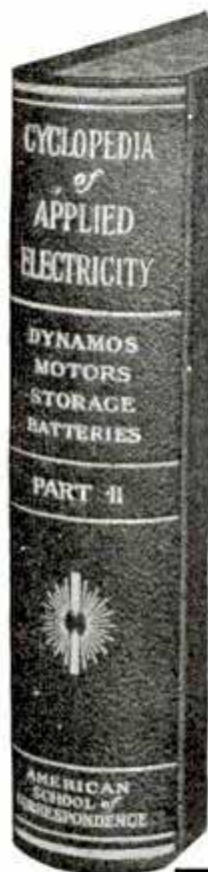
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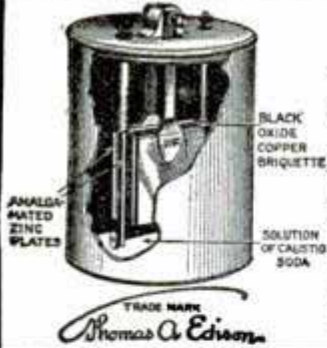
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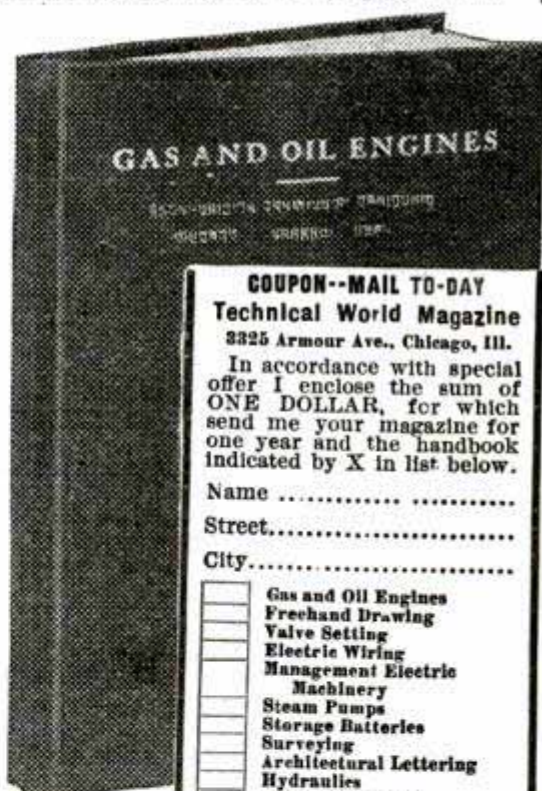
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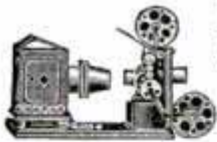
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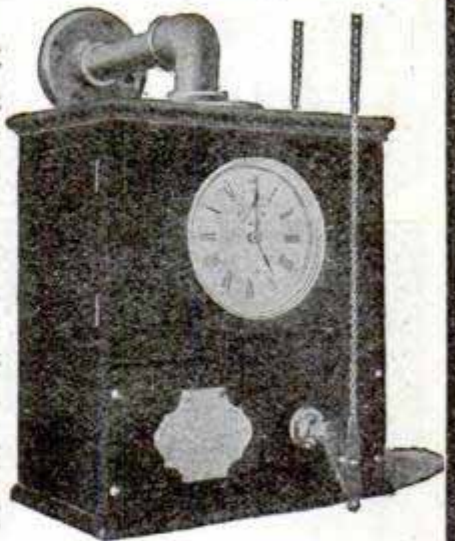


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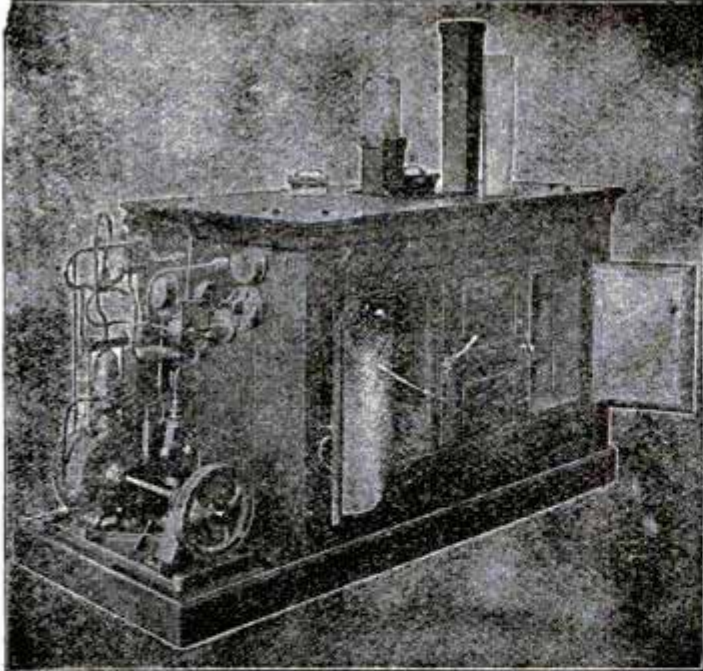


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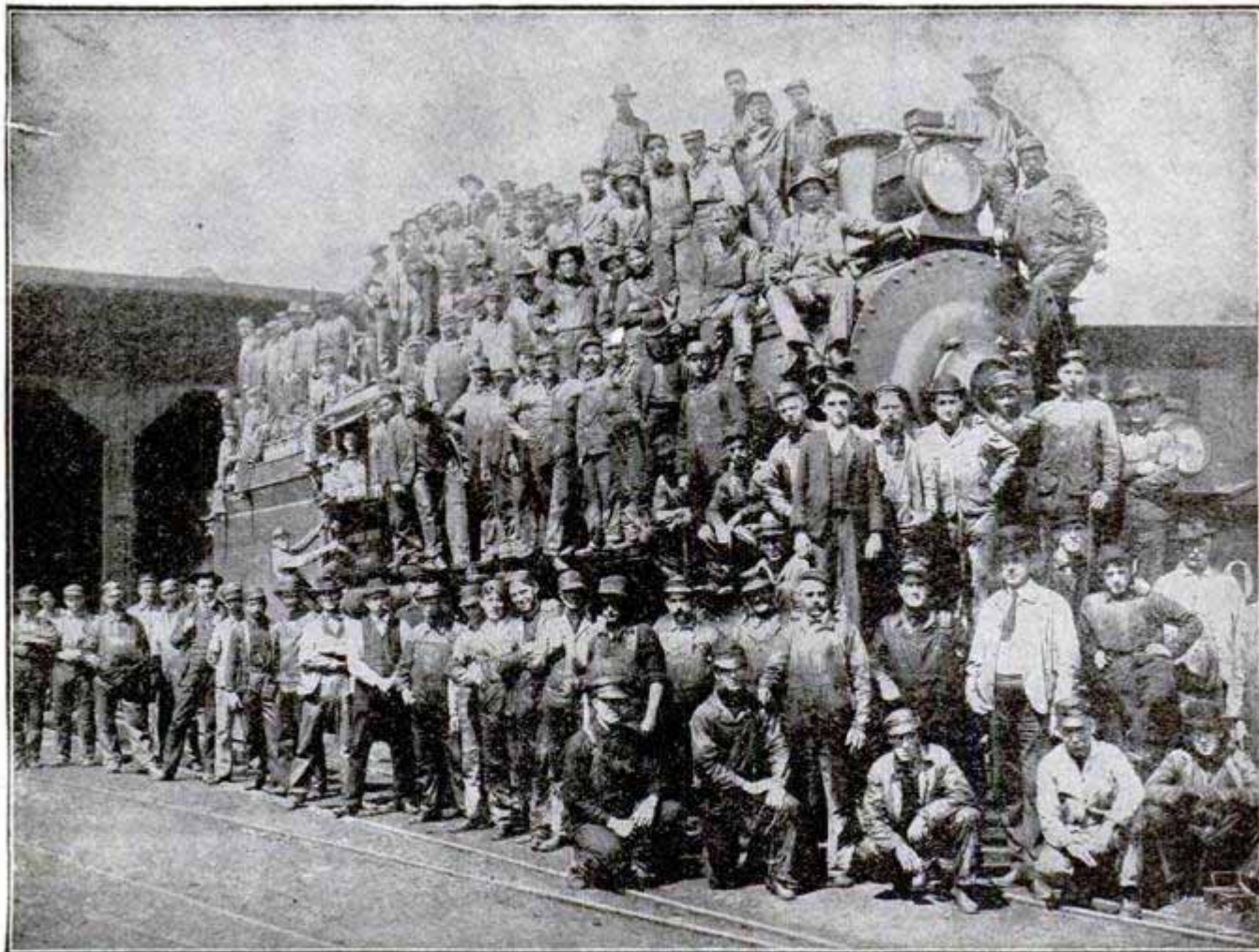


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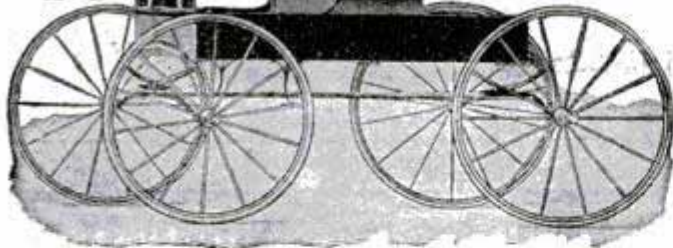
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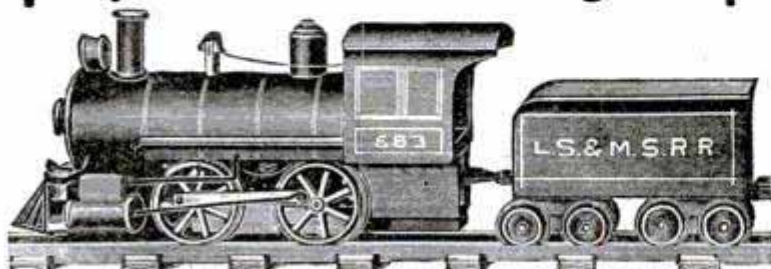
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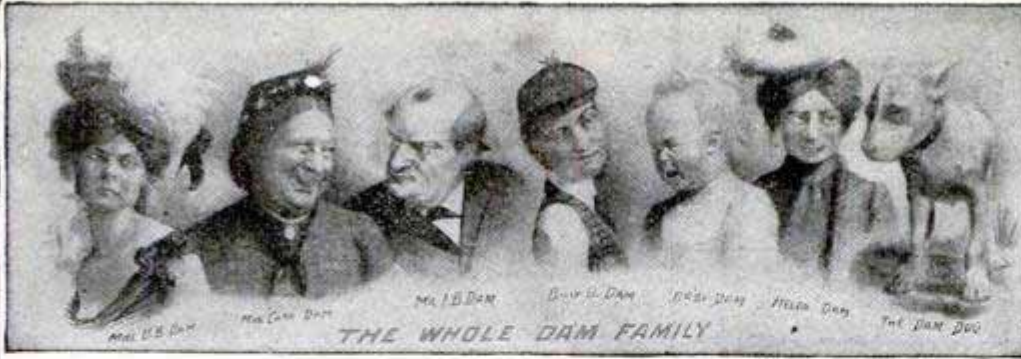
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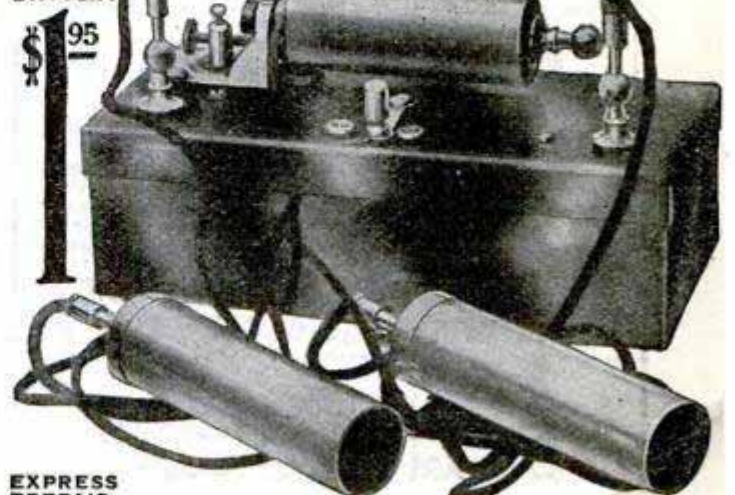
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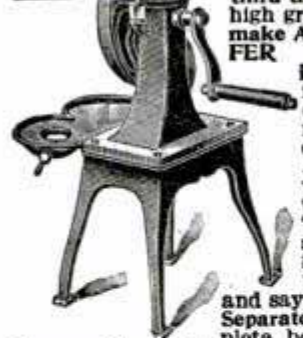
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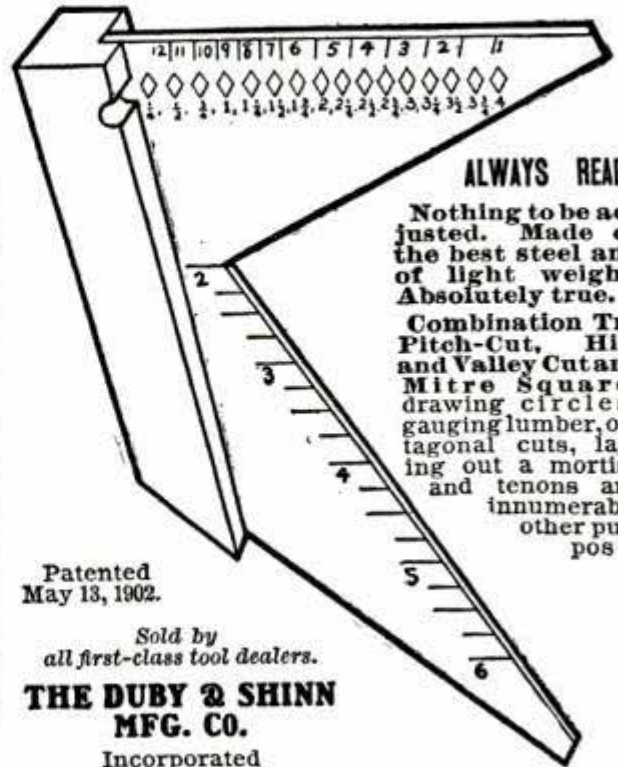
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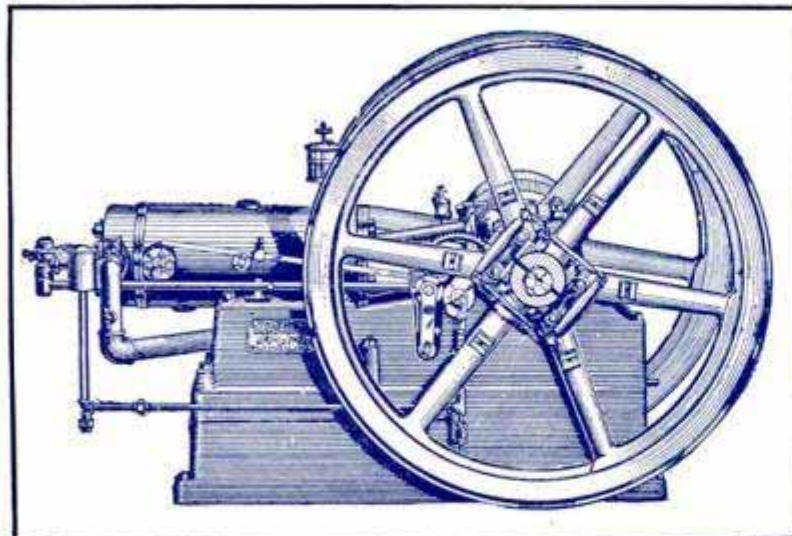
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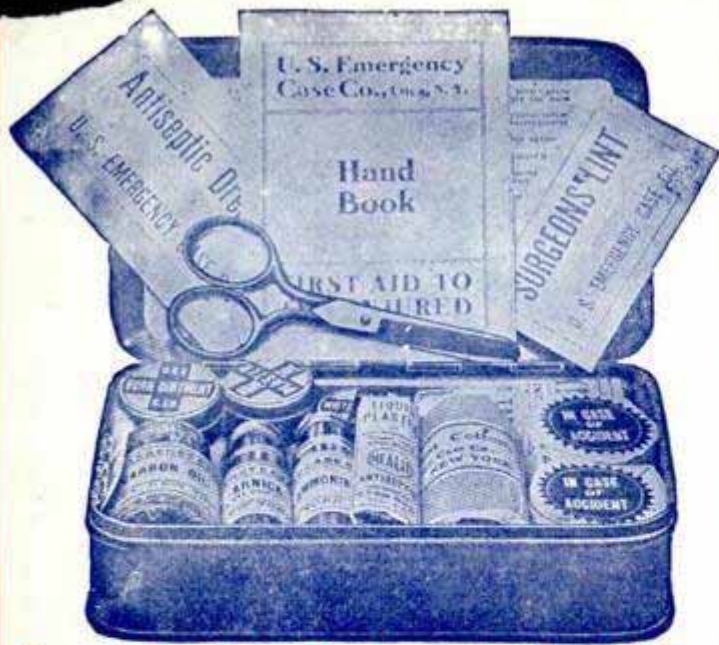
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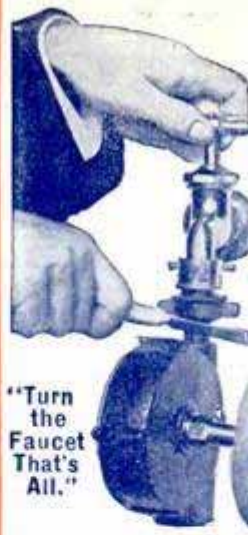
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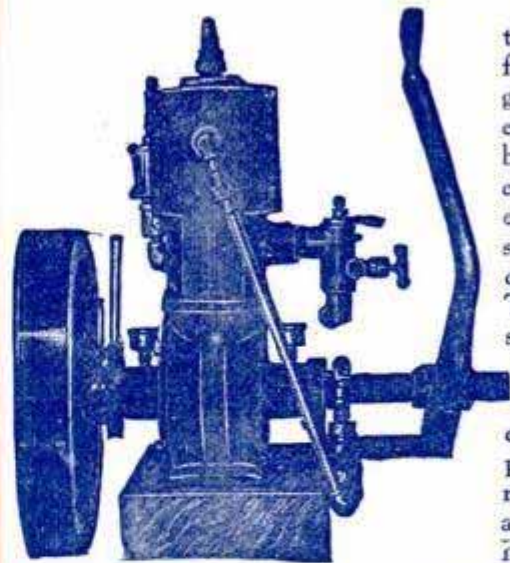
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