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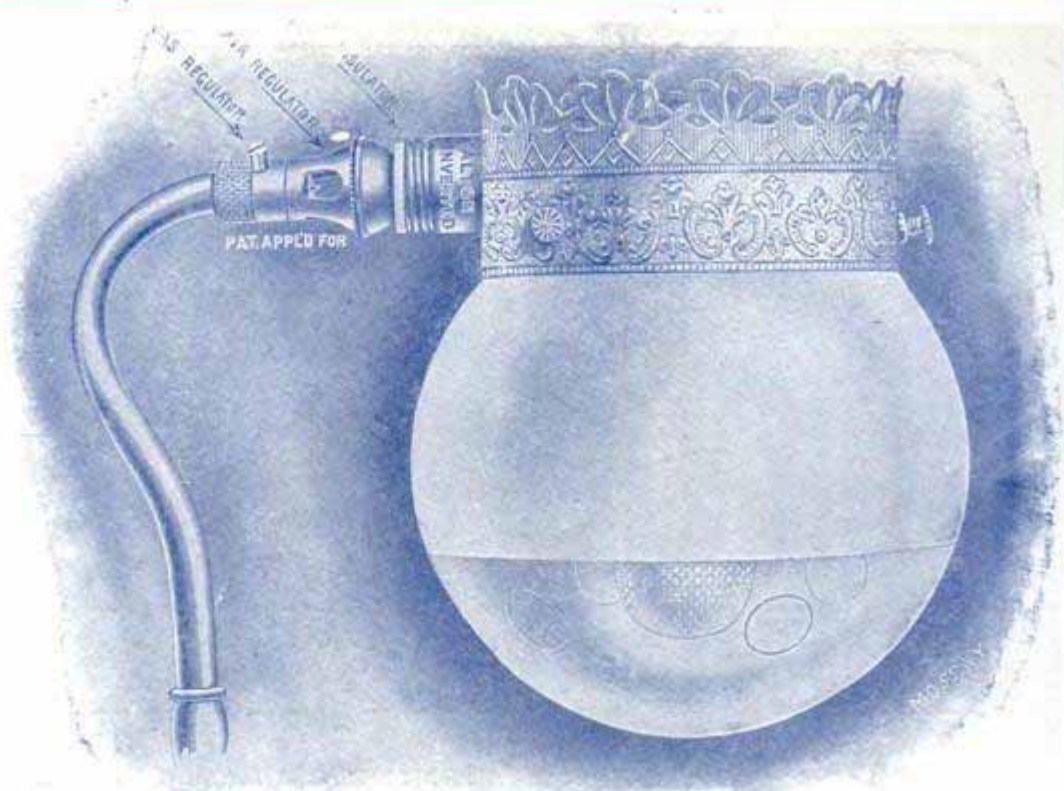
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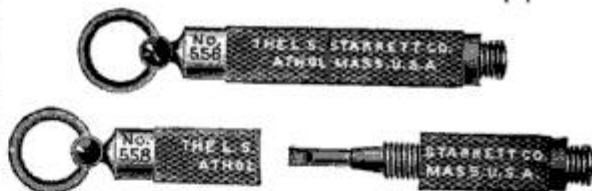
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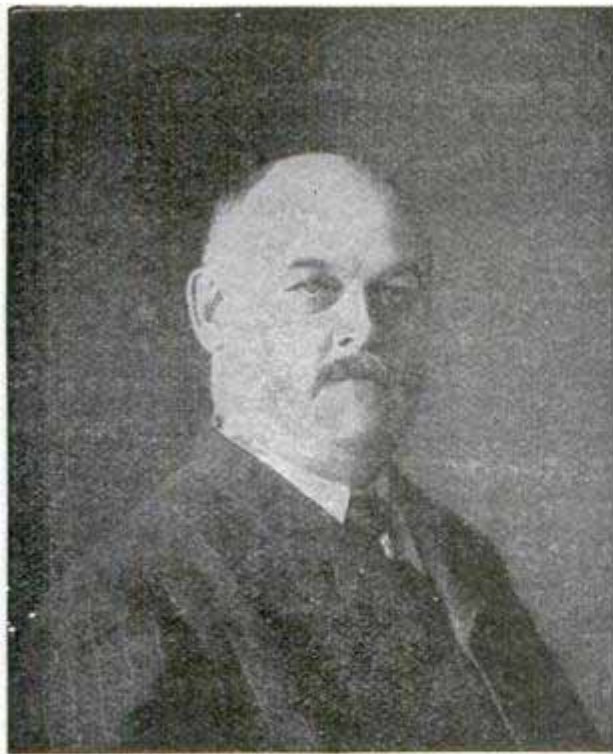
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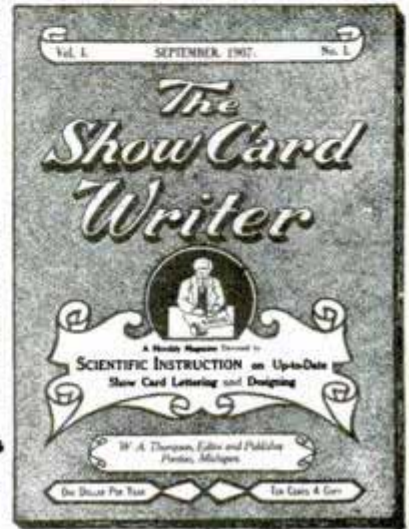
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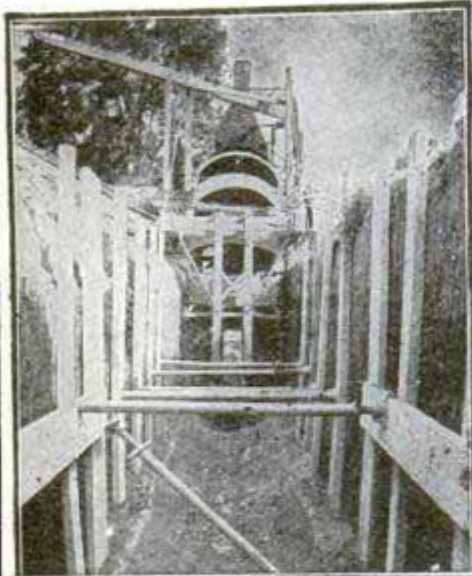
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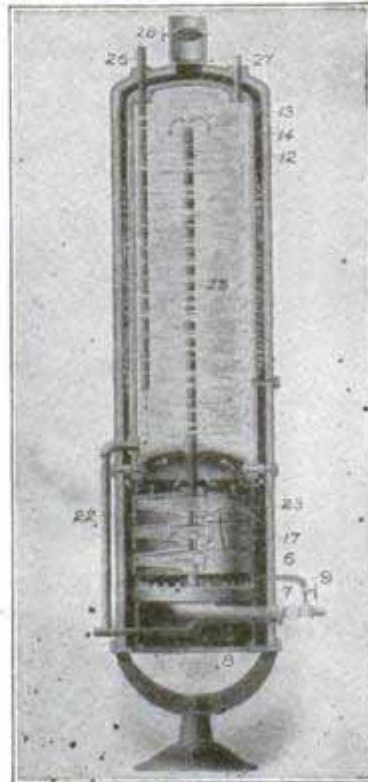
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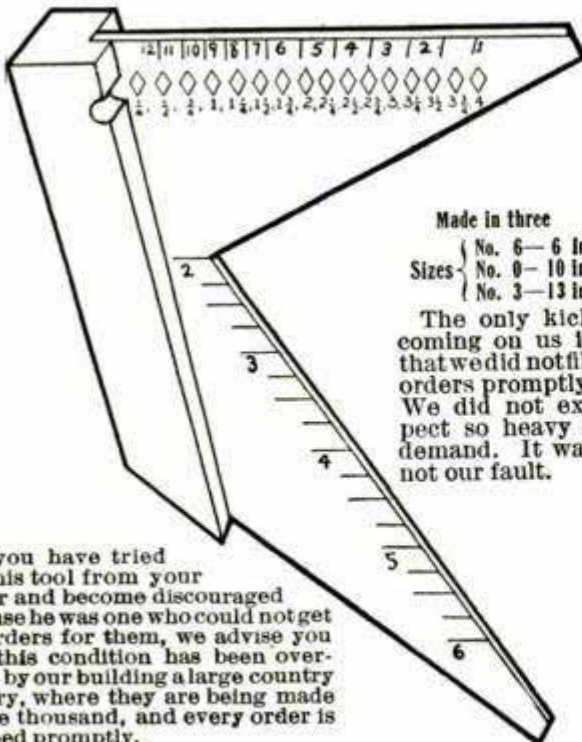
**Gas or Gasoline for Fuel.**

We are specialists in Water Heating, also in Gasoline Lighting Systems, and House Heaters. A novel line of highest class specialties necessary to the convenience and comfort of the modern house in city or country. It costs nothing to investigate AND WE HAVE THE POSITIVE PROOFS. In writing, if located in a city please give name of your plumber.

Peerless Kitchen Boiler & Supply Co.  
54 Dearborn Street, Chicago

## The New Universal Square

is proving itself sure to become the Standard Tool of its kind



Made in three Sizes }  
No. 6—6 in.  
No. 9—10 in.  
No. 13—13 in.

The only kick coming on us is that we did not fill orders promptly. We did not expect so heavy a demand. It was not our fault.

If you have tried get this tool from your dealer and become discouraged because he was one who could not get his orders for them, we advise you that this condition has been overcome by our building a large country factory, where they are being made by the thousand, and every order is shipped promptly.

If your dealer cannot get them now, write direct

**DUBY & SHINN MFG. CO., Inc.**  
Home Office and Works: LONG BRANCH, N. J.  
Branchport Station

## Publisher's Notice to Subscribers in Canada

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

The retail price on newsstands will remain at 10 cents per copy as the newsdealers' supplies are shipped in bulk by freight.

POPULAR MECHANICS



## Business Opportunities

We have had placed in our hands for negotiation patent rights on the following inventions:

A gas light flasher sign which has all of the advantages of an electrical flasher sign and is much cheaper to manufacture and operate. This sign is especially adapted to smaller cities where gas can be had, and where electric companies are disposed to charge high prices for motors to drive the electric flash signs. The inventor is a skilled machinist, who can superintend the manufacture of these signs, but needs the coöperation of a business man with sufficient capital to introduce the signs.

A pneumatic hammer which has proven by actual test to be superior in many respects to the pneumatic hammers now on the market. The cost of manufacture is no greater than the cost of making the other hammers, and at the prices at which said tools are sold there is a very wide margin for profit.

A combination tool, comprising pliers, wire cutters, wrench of different sizes, die stocks, etc. This is a high class tool to be made out of drop forgings and is especially suitable as an emergency tool for automobilists.

A hand-rake so constructed that if a tooth should be broken, a new tooth can be readily inserted by the user. The head of the rake is made of cast iron or can be made of wrought iron if desired.

An amusement device made principally of wood on the general plan of a see-saw, which is capable of being made small enough to be used in the house or large enough to be used in public parks. A similar device is being extensively sold at this time.

An electrical soldering iron in which the copper is quickly heated and will retain its heat.

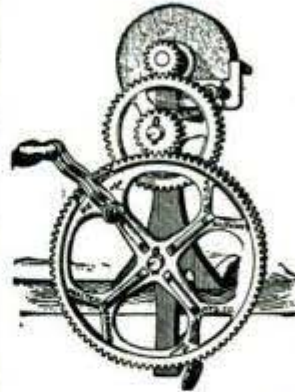
The inventions above named have all been thoroughly tested and are ripe for introduction to the public. The entire or controlling interest can be obtained at reasonable figures in any one of the inventions named. If you have from \$1,000 to \$5,000 to invest and are looking for a good opportunity of engaging in the manufacture and sale of articles for which there is an established demand, we will be pleased to give further particulars in reference to any one of the above, or better still, would like to have intending purchasers call at our office and make such personal investigation as the circumstances may warrant.

**Popular Mechanics Patent Bureau**

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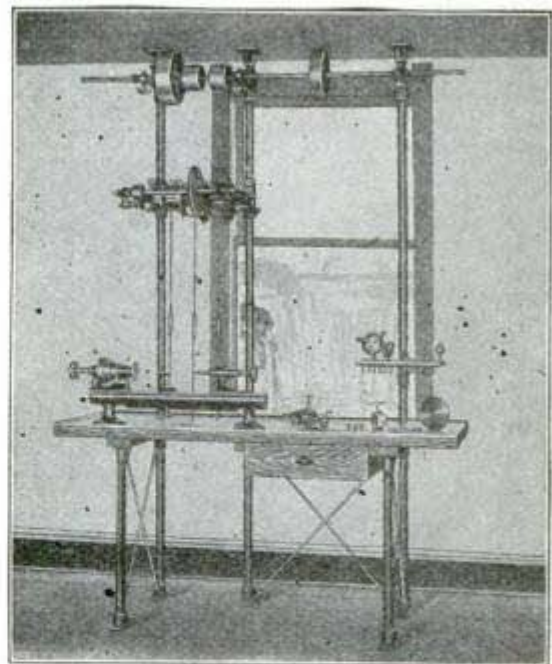
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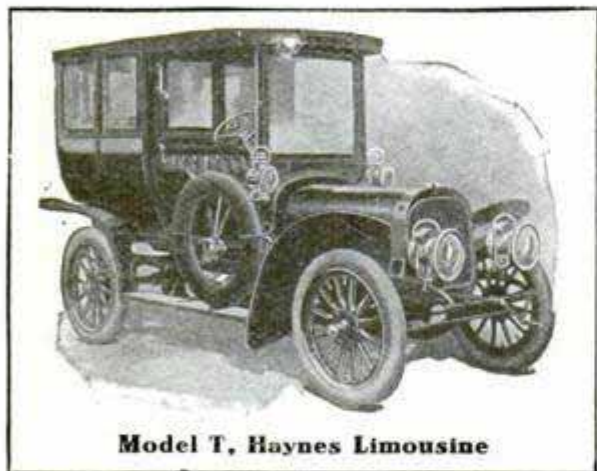
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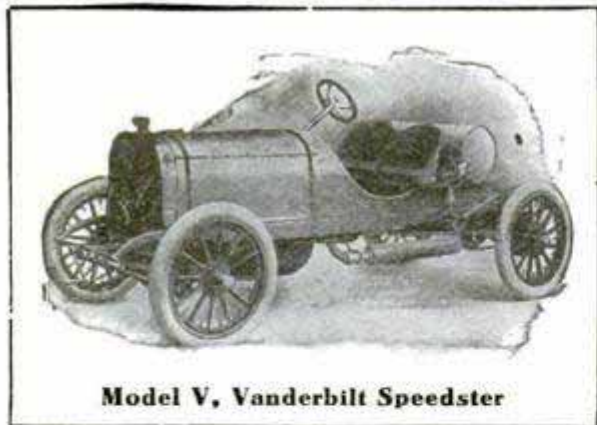


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The makers of the Haynes have been developing their car for 13 years. They know their car through and through. Year after year they have seen their old cars come back after varied use and have spotted here and there chances for improvements.

Their experience has developed for 1907 a car that can be safely advertised for *reliability*—a car that can be *trusted*. It contains no parts not made in the Haynes Factory, no principles that are unfamiliar to the Haynes designers.

In these days, when every blacksmith is buying parts and assembling cars under a private trademark, the fact that the Haynes factories really make *everything* in their car is a guarantee of Haynes *reliability*.



Model V, Vanderbilt Speedster

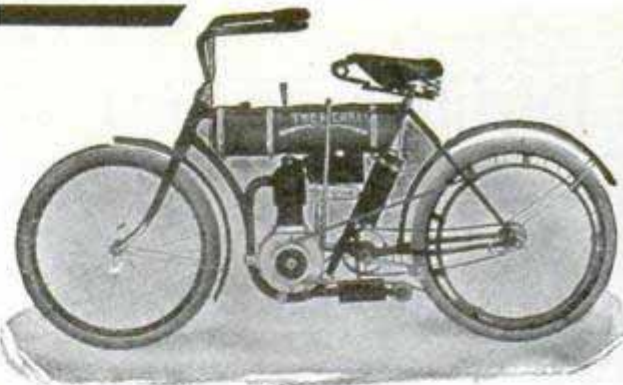
The Haynes Standard 50 H. P. Touring Car for 1907, Model "T," the highest powered shaft driven car built. Price, \$3,500.

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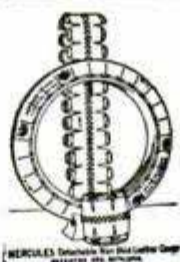
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**It's a Winner Everywhere**  
 with its positive control and marvelous speed it stands supreme among Motor Cycles.

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PRICE 75 CENTS EACH

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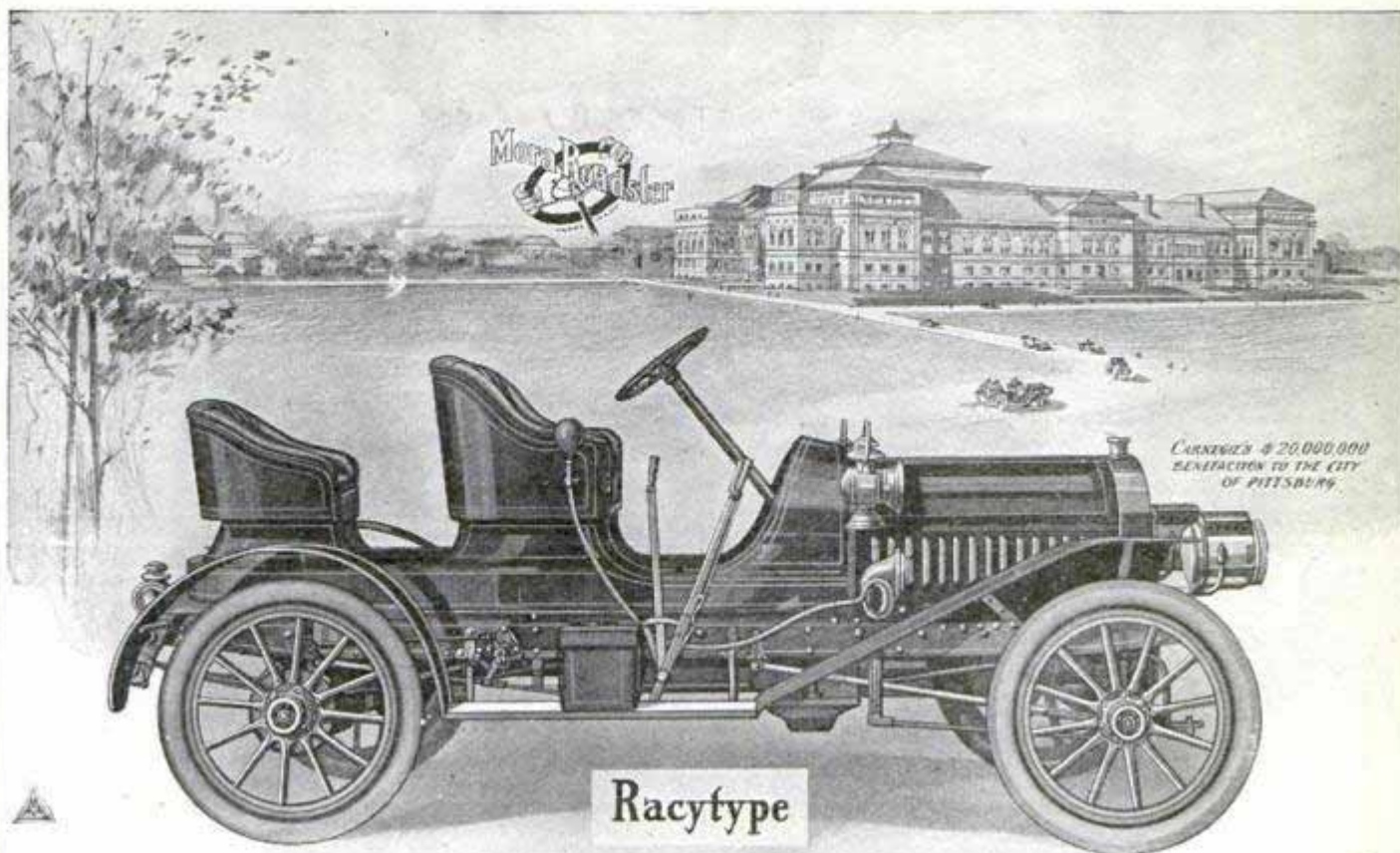
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Racytype

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Close examination of Mora chassis, illustrated below, reveals compact, symmetrical, mechanically excellent construction, with all parts in logical proportion to each other for work to be performed. This desirable result from clever, careful designing, exceptionally good workmanship,

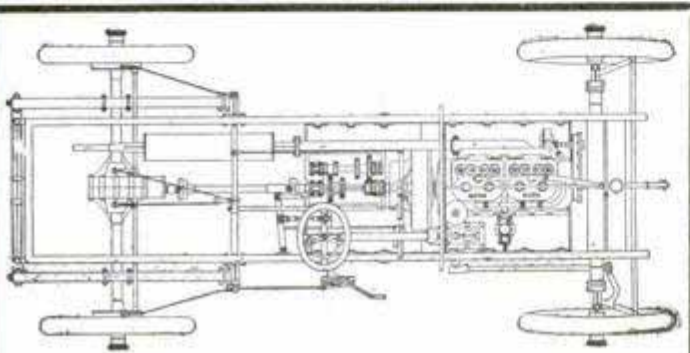
# Mora Roadster

MECHANICALLY RIGHT.

and, with exception of electrical appliances, because every part entering into a MORA is made for it. Unity and mechanically right is the keynote of MORA design.

## Specifications

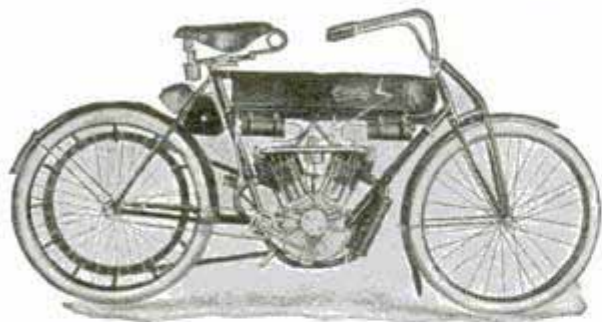
Rear Axle—Roller bearing.  
 Front Axle—Tubular ball bearing.  
 Springs—Transverse semi-elliptic front spring, platform type rear spring.  
 Wheels—32 inches, wood, artillery type.  
 Tires—32x3½ Regular Clincher, G. & J. raised tread.  
 Brakes—Two external, two internal operating on drums attached to wheels.  
 Tank Capacity—15 gallons of gasoline.  
 Tread—56 inches.  
 Wheel Base—98 inches.  
 Motor—Four cylinder, 4x5½, cast in pairs.  
 Water-cooler—Capacity, 5 gallons.  
 Lubrication—Splash system.  
 Carburetor—Mora.  
 Ignition—LaCoste Magneto also coil, timer, and storage battery.  
 Control—Throttle and spark.  
 Transmission—Sliding nickel steel gears.  
 Speeds—3 forward and reverse.  
 Drive—Shaft.  
 Steering Gear—Irreversible wheel, screw and nut type.  
 Equipment—2 oil side lamps, 1 tail lamp, horn and tools.  
 Horse Power—24. Mechanically Right.  
 Approximate Total Weight—1750 lbs.  
 Price—\$2,300.



**MORA MOTOR CAR CO.**  
 23 Mora Place, Newark, New York



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Latest achievement—mile race at Ormond Beach, Fla., won in 46 $\frac{1}{2}$  sec. Our machines hold all important records. Double and single Motorcycles. 2 $\frac{1}{2}$  to 40 H. P. light weight motors. Send stamp for catalog C.

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**WE WILL CONVINC** you that we sell a better bicycle for less money than any other house. Buy direct from the factory. If you want to **Make Money or Earn a Bicycle** write for our **Special Offer**.

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RESULT:—At the end of 5 weeks he took a position with the Madison, Indiana, "COURIER", at \$20 per week salary. YOU CAN DO AS WELL OR BETTER. LET US ASSIST YOU. This space will not permit us to tell about many others we want you to know about who are now earning good salaries. WRITE US.

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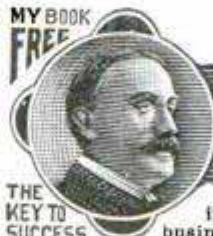
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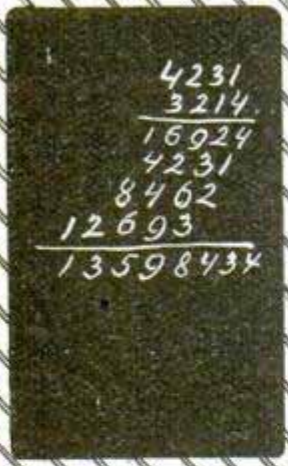
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The mirror swivels in all directions and can be so adjusted that no part of your face is ever in shadow when shaving or preparing your toilet.

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Textile Mill Supt.	Architect
Electrician	Structural Engineer
Elec. Engineer	Bridge Engineer
	Mining Engineer

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# POPULAR MECHANICS

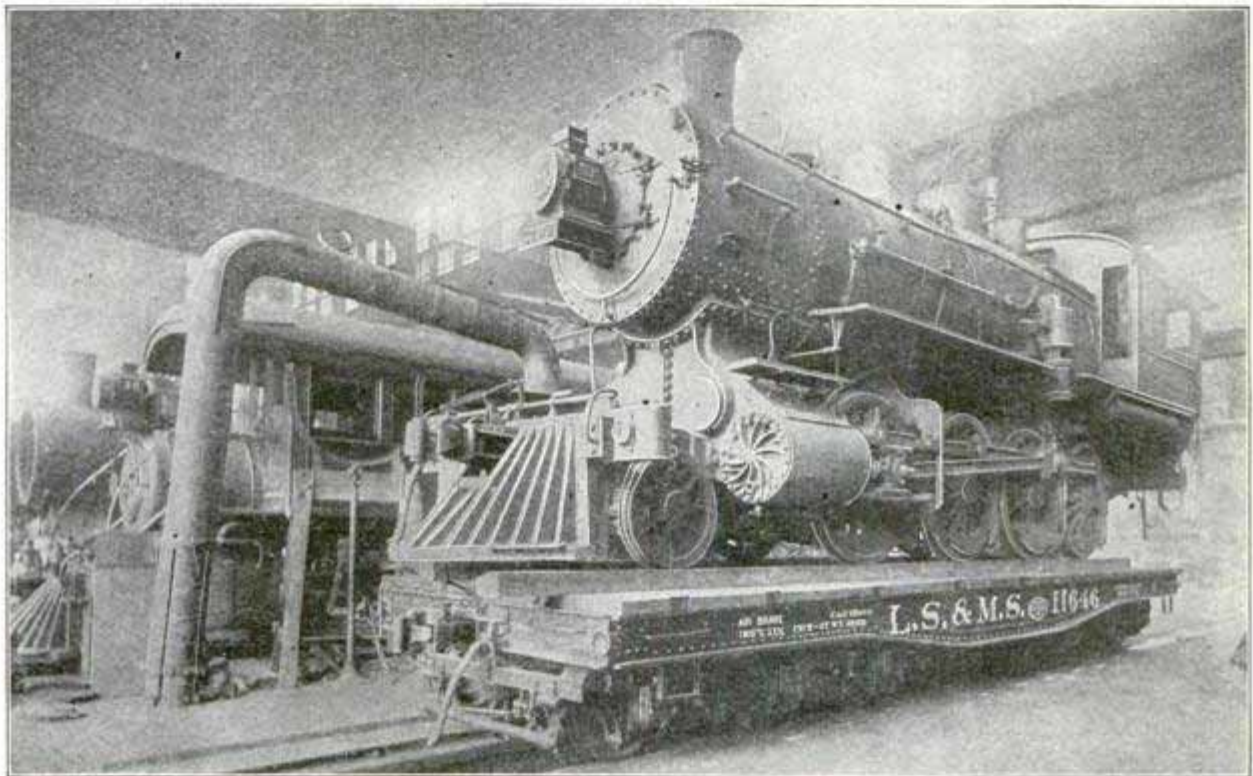
Vol. 9. No. 8.

CHICAGO, AUGUST, 1907.

10 Cents a Copy  
\$1.00 a Year

## 75-TON STEEL FLAT CAR

**Unusual Test to Which Steel Cars Are Put to Determine Their Safe Maximum Load**



"As a Test an 80-Ton Locomotive Was Run on the Car"

Five 75-ton steel flat cars have been built at the Collinwood shop of the Lake Shore road. These cars are 36 ft. 6 in. over all and 9 ft. 8 in. wide.

It is designed to stand an overload of 10 per cent., and as a test an 80-ton locomotive was run on the car, as seen in our illustration.

### FAST OCEAN RACING

Now the record time across the Atlantic from Daunt's Rock to Sandy Hook lightship is reduced to 5 days 18 hours and 39 minutes. That was the outcome of a spectacular race between the English "Lucania" and the French "Lorraine," in which the former not only overtook but passed the latter. A lot of money changed hands on the race and it was great fun for the passengers.

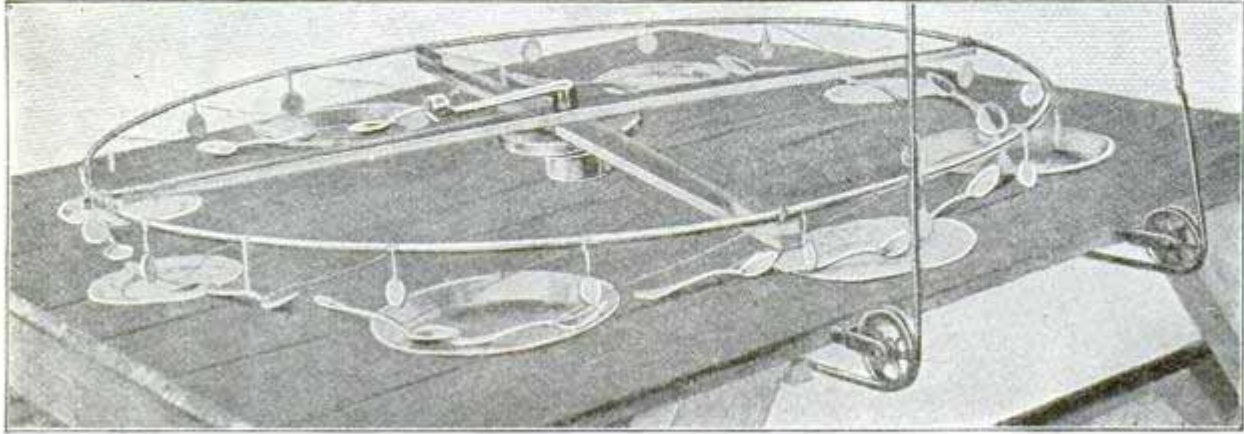
### ESCAPE FROM A VAULT

A knowledge of telegraphy enabled Geo. Stewart, who was accidentally locked in a safety vault at Pueblo, Col., to escape. The office had a private wire which passed through the vault. By cutting the wire and using the two ends as a key he quickly had the sounder out in the office repeating the word "help" and then slowly spelled out his trouble, which secured his release.



**TESTING THE LIFE OF SPOONS**

When a reputable manufacturer of plated tableware guarantees a set of spoons or forks to last a certain number of years the purchaser accepts the



“To get quick action natural wear machines are used”

statement in good faith, but wonders how the maker knows. The life of a plated spoon, however, is not a matter of guesswork, but is based on actual experience. To wait 20 years to determine whether the ware will endure that long would obviously be impracticable. To get quick action “natural-wear machines” are used. Tin and china plates of various sizes are fastened in a circle to a table; over the plates a metal ring revolves, to which the article to be tested is fastened. An electric motor keeps the ring in motion, and at each revolution the spoon or fork is dragged across ten or a dozen plates. As the ring makes 500 revolutions an hour each article is dragged across 5,000 plates, or 120,000 in 24 hours, for the machine can be left running all night. Hence one or two days in the wearing machine would represent as many contacts as a spoon would receive in the course of ordinary household use in a great many years, and the contacts are much harder and longer.

The congestion of traffic is much relieved by the use of the policeman's whistle at street crossings. One whistle means east and west traffic stop, north and south go ahead; two whistles mean the opposite.

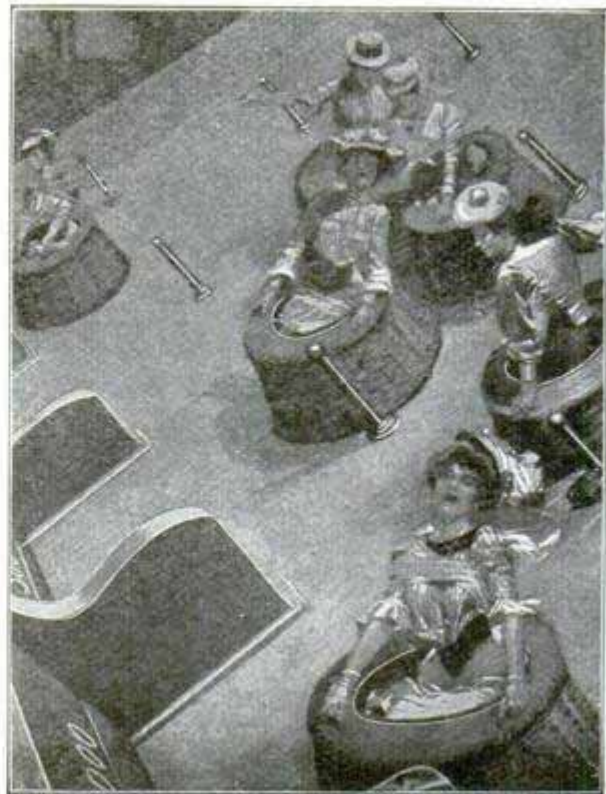
**STAMP-SELLING MACHINES**

For about two years the advisability of setting up slot machines for selling stamps has been under consideration by the postoffice department. At last it

has been decided to test the scheme in different parts of the country. The machines will carry postals and stamps for 1 and 5 cents.

**HUMAN BAGATELLE BOARD**

The human bagatelle board is a fascinating sport at summer resorts. The players seat themselves in wicker bas-



A New Sport



kets and slide down a steep incline, their direction being made uncertain on account of striking the iron posts. Prizes are awarded the players who make the largest score.

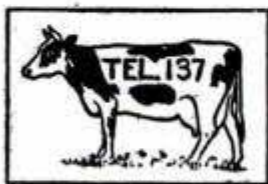
### FROSTED BULBS POOR LIGHTERS

So long as carbon filaments are used there will be a fine deposit of carbon inside the bulb, and this, together with whatever dust may collect on the outside, increases the tendency of the rays of light to be reflected inside the bulb and absorbed by the frosted glass. With the new metallic filaments it is claimed that all internal deposit is avoided. The tungsten filament, for instance, is subjected to so high a temperature in the process of manufacture that all its impurities are said to be driven off.

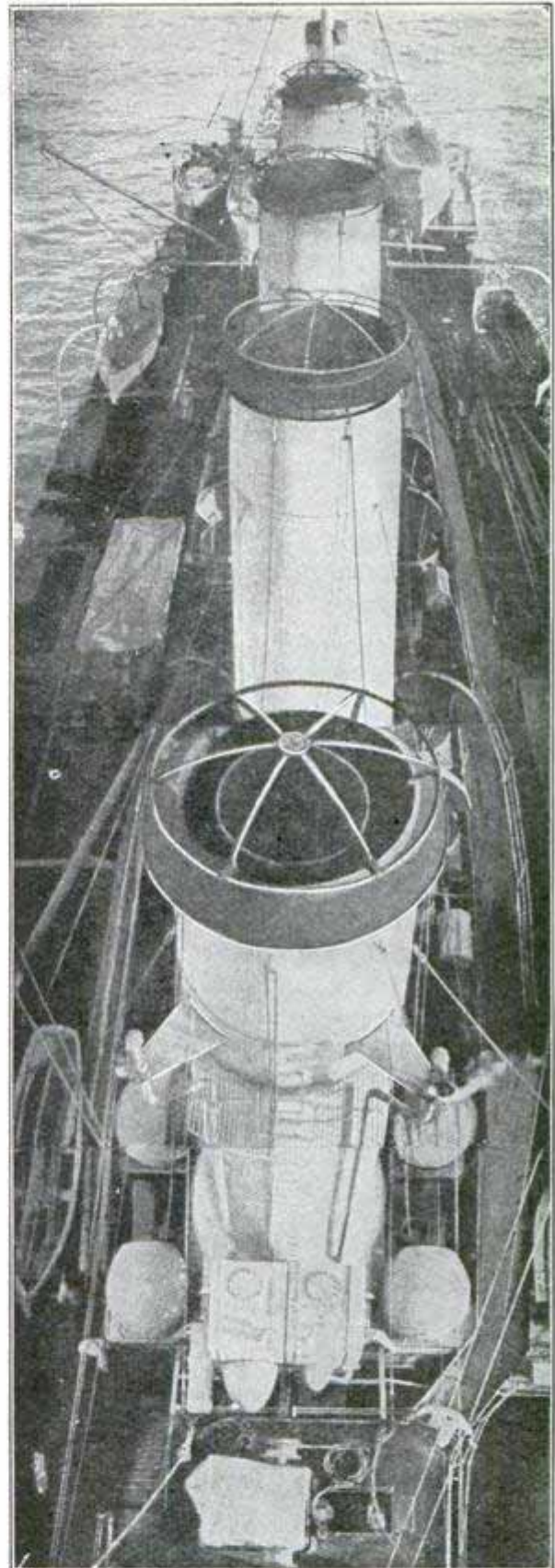
### NITRATES FROM ATMOSPHERE FINANCIAL SUCCESS

Getting nitrates out of the air by electricity has proved a big success. The plant at Notodden, Norway, at first designed to produce 5,000 tons a year, is being enlarged to increase the output tenfold. The enlarged works will use 50,000 h. p. from waterfalls, and the company is buying large additional water rights. Seems like picking money out of the air with Chilian nitrates fetching \$55 a ton.

### TELEPHONE NUMBER ON COW



A man living in a Chicago suburb who was troubled with his cow straying away conceived a novel idea of finding her. He painted his telephone number plainly on the cow, and when the animal wanders too far away some one who finds a strange cow on his premises calls up the owner, who sends for her.



This unusual photograph shows a cruiser, looking aft, the picture being taken from above.—Courtesy The Sketch, London.

It is stated no deposits of coal have ever been found in northern Africa. A French explorer has been trying to discover some south of Algeria, but without success.



## NEW UNITED STATES WAR BALLOON

### Official Recognition of the Balloon as a Factor to be Considered in Warfare

The army signal corps at Washington has a new war balloon, one of the largest ever made. It is simply a big gas bag and basket, without propellers or steering gear, and is capable of lifting four people. This is the first really large balloon in use by the U. S. army. Its first trip was recently made, going from Washington to Linglestown, Pa., a distance of 149 miles, in 4 hours 37 minutes.

Opinions differ as to the practical value of balloons and airships. Rear Admiral Sigsbee says:

"The airship may in time prove a dangerous enemy by dropping explosives into a city, but as a force against naval fighters it will never do."

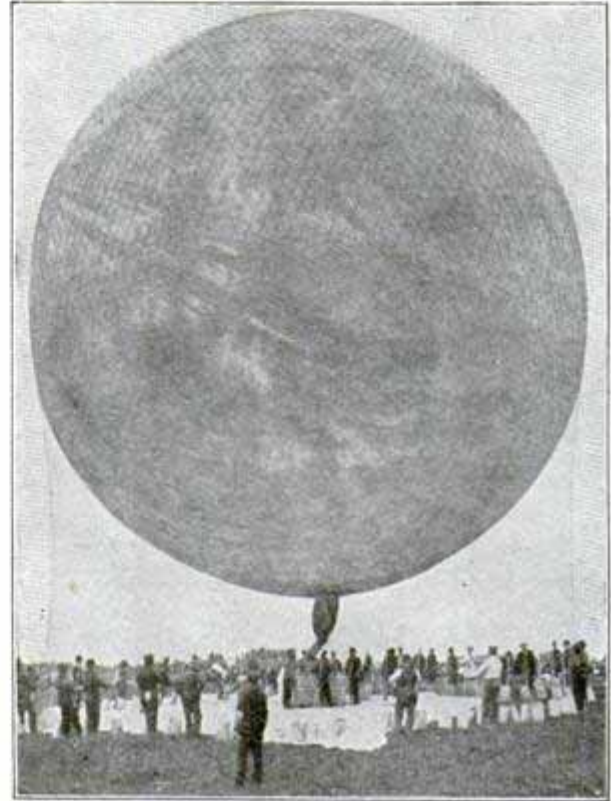
Rear Admiral Chester says:

"We old fellows have seen the sailing vessel give way to the armor-clad steam warships, and I predict that the future will see the aeroplane fighting machine.

"The aeroplane will be used for scouting purposes. With the aeroplane the enemy can be seen 100 miles away, which is now impossible, and with it the submarines can be attacked.

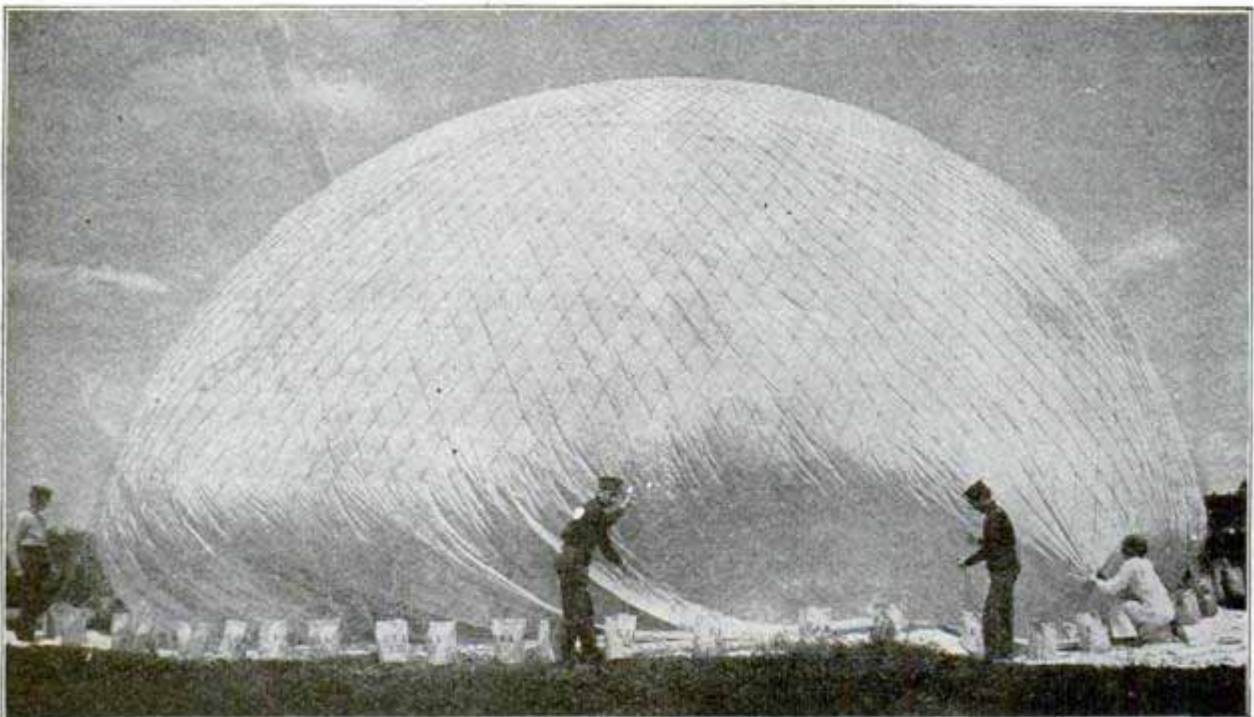
"From the aeroplane, high above water, the submarine can be located

beneath the waves and explosives dropped upon it, which is the only ef-



U. S. War Balloon Copyright W. Fawcett

fective way of fighting it. The aeroplane is the fighting machine of the future."



U. S. War Balloon Partly Inflated

Copyright W. Fawcett



## PARIS DOG POLICE

### Trained Newfoundlands Rescue Suicides and Are a Terror to Criminals

Dogs have long been used for smuggling on the Franco-Spanish frontier; as life-savers on the high passes of Switzerland; and also on the field of battle to seek out the wounded. But it is only of recent years that they have come into vogue as municipal aids. The idea is due largely to the Burgomaster of Ghent, who inaugurated the idea, and now has nearly 50 canine police at

quays; and, moreover, "apaches" or dangerous hooligans lurked beneath the bridges and sallied forth at night, a terror to the belated pedestrian. These thugs occasionally stunned their victims and cast them into the river, where they were drowned before aid could reach them. Thus the Paris dog police are both life-savers and deterrent agents.



Trained Dog Police of Paris

work, greatly to the benefit of the city. For crimes—especially night crimes—have decreased quite 50% while the expenses have been extremely small.

It stands to reason a dog is cheaper to maintain than a human officer; yet if well-trained he is more feared by the criminal; swifter in chase, and impossible of evasion, no matter how artfully a man may hide. So successful has the Ghent experiment proved that the movement spread into France, Germany, Italy and Austria. There are now bands of powerful Newfoundlands employed with the River Police of Paris.

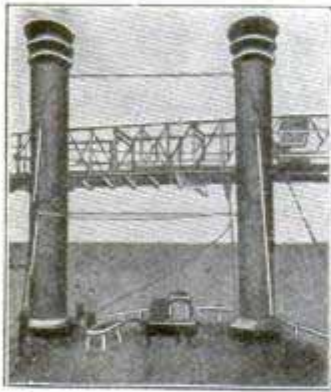
M. Lépine, the Prefect of Police of that city, found it very difficult to insure the efficient patrolling of the river's

During the day they look out for suicides, and persons who have fallen into the river by accident; and at night they patrol the quays with their two-legged colleague, to whom they are directly responsible.

The headquarters of these dogs is on the Quai de la Tourelle, and here they are trained in rescuing human life from the river by means of dummy figures. It is a very amusing sight on practice day when the big dummy is thrown into the water with a great splash and one of the dogs plunges in, dexterously seizes the comical figure by the coat at the shoulder, and begins to swim for the bank with swift and powerful strokes. One of the dogs, named Athos, has already saved 14 lives in the Seine.



### A CURIOUS DELUSION



A normal eye never makes mistakes, but the mind often draws false inferences from the data which the eye supplies. An amusing instance of this is illustrated by the accompanying cut, showing

the steamer *Island Queen* approaching the suspension bridge at Cincinnati and only 100 ft. distant. It looks as if the steamer's smokestacks would hit the bridge, does it not? That is just what several thousands of passengers have thought, with more or less alarm. The fact is that there is a margin of several feet.

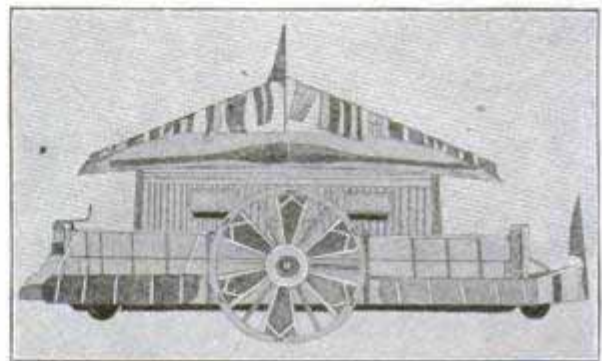
### STREET CARS AS DWELLINGS

Just before the big earthquake the street car company in San Francisco had put in service several hundred new cars, and consequently had an equal number of discarded cars on hand. The necessity for any kind of shelter created an immediate demand for the old cars, which were converted into houses. The cars were set up close together and made a row three blocks long. Small sheds or kitchens were added to each,

water piped in and a small cook stove installed, with a stovepipe through the roof for a chimney. These emergency houses earned fabulous rents, and are still occupied. The illustration shows a nearby view.

### AN AMPHIBIOUS AUTO

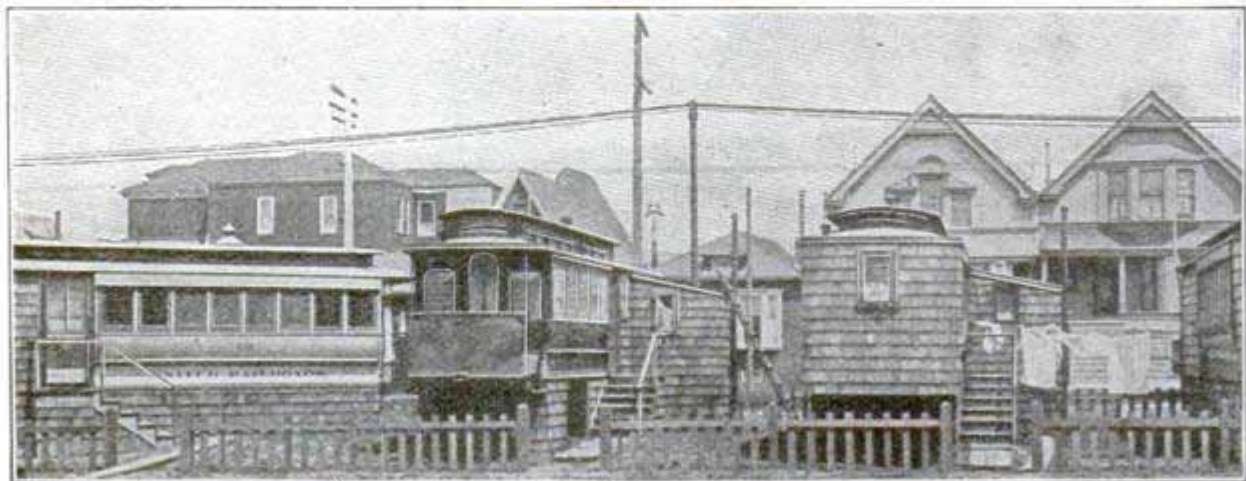
Of course it was bound to come—an automobile which can be run right into the water and become at once an auto-boat. It was tested recently on the Seine, France, making a speed of 55 miles an hour on land and 15 miles in



Motor Car-Boat

water. The front wheels are solid, so that they may be used for steering on either land or water.

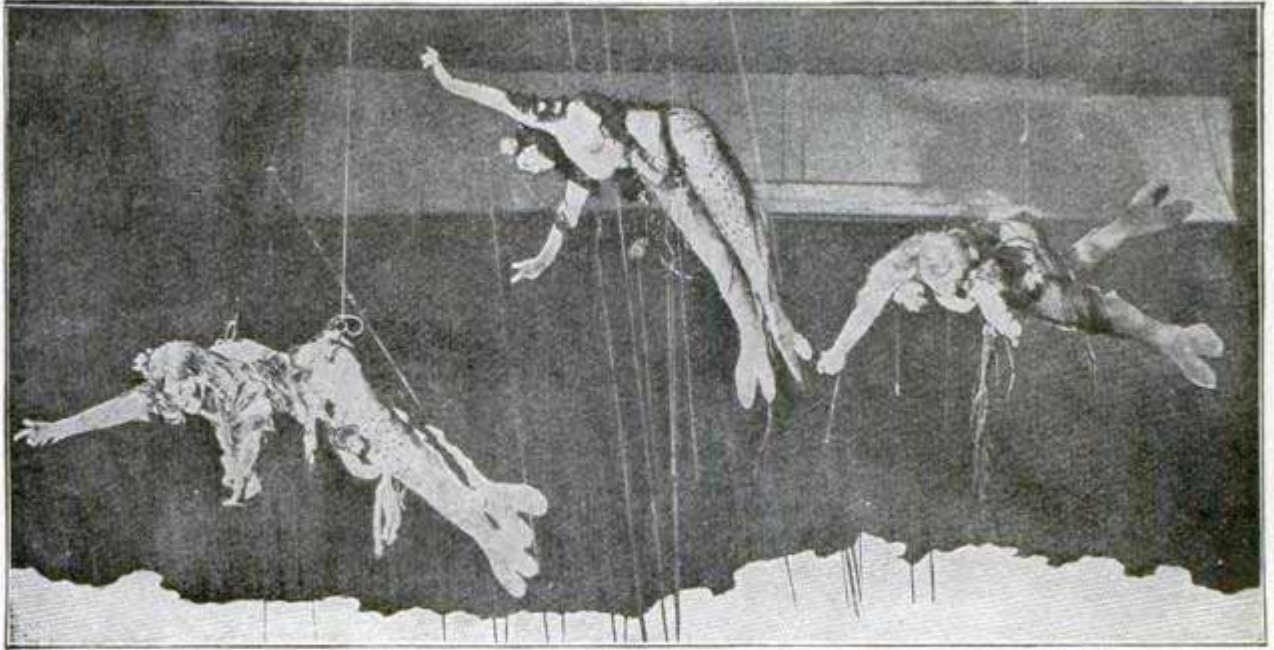
Nikola Tesla claims that the Dreadnought could be destroyed by a tidal wave produced by the explosion of an 8-ft. cubical tank of dynamite below the surface even at a distance of  $1\frac{1}{4}$  miles.



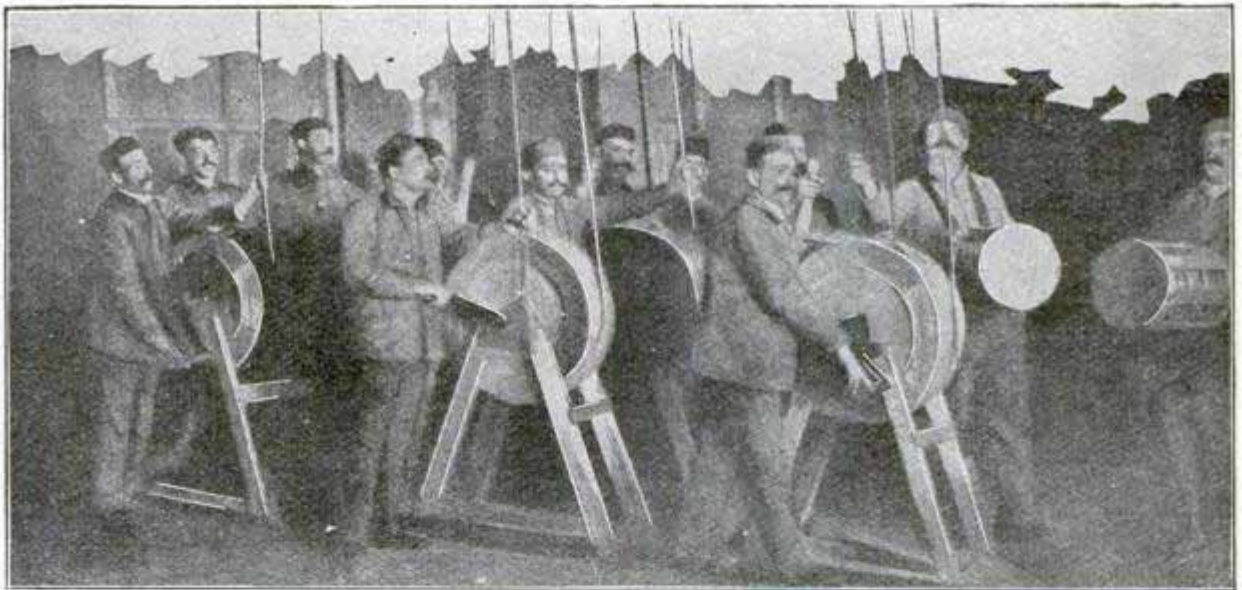
Several Thousand People Live in These Street-Car Houses



## FLYING ON THE STAGE



The mystery of living figures on the stage which float motionless in mid-air or fly gracefully about have ceased to be a secret; everybody knows the performers are suspended by means of fine wires of unusual strength. The public never sees the machinery for raising and lowering the wires, and the above illustration, which shows how this is done, will be interesting. The drums on which the wires are wound are turned by hand, and require considerable practice in their operation. The operators all face a leader, who gives the orders quite like the leader of an orchestra.



## BARREL POSTOFFICE IN MID-OCEAN

About 600 miles west of Ecuador, on the Equator, lie the Galapagos or Tortoise Islands. A barrel anchored securely off the shore serves as an international postoffice. It has neither postmaster, regular mails, stamps, nor appropriation—just an old barrel, placed there by the British government for the reception of mail by passing ships.

And yet two letters have recently been received at Washington, D. C., from the barrel postoffice of the Pacific and will be duly forwarded to the persons addressed. Having been written in October, 1905, and being rather the worse for weather and insects, these letters will probably have more interest as curiosities than as news.



### ELECTRIC MECHANICAL BOOK-KEEPER

One of the leading Chicago banks, which employs 600 clerks, expects to be able to greatly reduce its force by the use of a new mechanical calculator. This machine does much more than the adding machines already in general



The Mechanical Book-Keeper

use. It adds, subtracts, divides and multiplies and calculates in both vertical and horizontal lines simultaneously. It is operated by keys and resembles a typewriter. It is run by a small electric motor and prints its records. It is the invention of a bank bookkeeper, who has spent 12 years in perfecting it. He claims it will save one-half the time now spent in keeping books.

### AN ELECTRIC BATH

The usual methods of applying electricity for remedial purposes are unsatisfactory

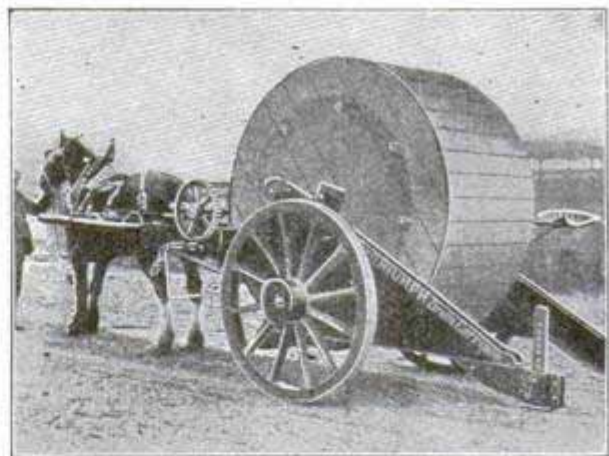


in several respects. If electrodes are applied to different parts of the body much of the current passes over the surface and a strong current is too intense at the points of application. If it is sought to avoid these objections by

placing the patient in a bath tub most of the current will go directly through the water, besides all the trouble and exposure of the bath. To obviate these and other difficulties four small baths have been devised, one for each limb, as seen in the cut. They are filled with water to cover  $\frac{1}{3}$  of the upper arm and  $\frac{2}{3}$  of the leg, and each tub has an electrode. In this way the action of the current may be made either local or general, and may be so directed as to affect certain organs especially. There is no need of undressing or of lying down, the latter being particularly important in cases of weak heart.

### ENGLISH CABLE TRUCK

The illustration shows the latest heavy truck construction for handling big drums of telephone or telegraph cable, with one man and one horse. A load can be taken on or discharged in four minutes. On each of the inclines is seen a groove. In these grooves slide two iron supports on which the ends of



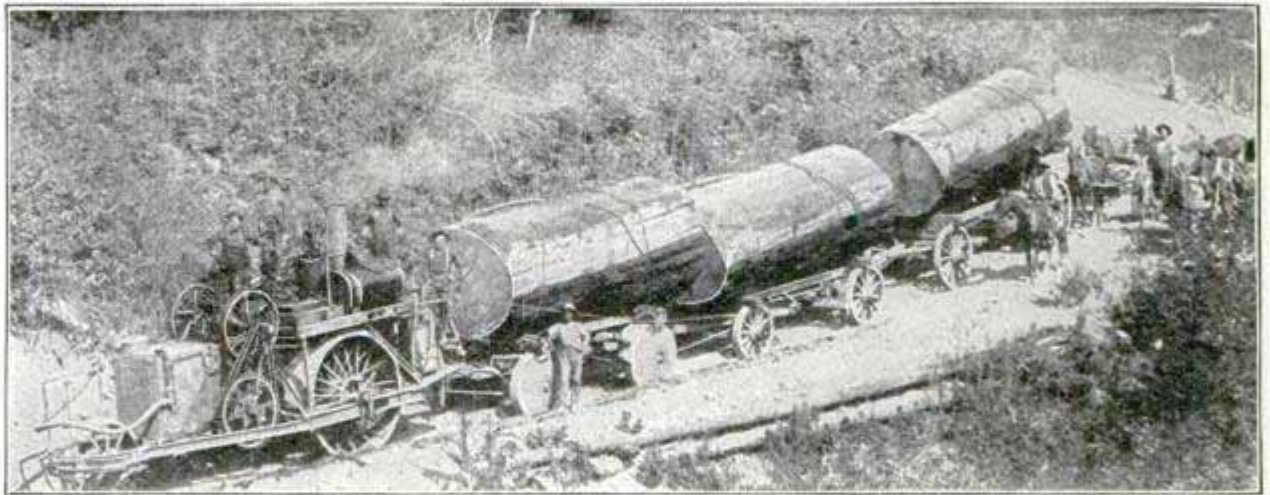
Loads 4 Tons in 4 Minutes

the drum axle rest, and each support is attached to a worm gear (seen in front of the drum) by a light cable. By this gear one man has no difficulty in drawing up a 4-ton drum.

The sum of \$3,000,000 has been appropriated by New York City for a memorial bridge across the Spuyten Duyvil, to commemorate the tercentenary of the discovery of the Hudson River.



## TRACTION ENGINES IN LUMBER TRADE

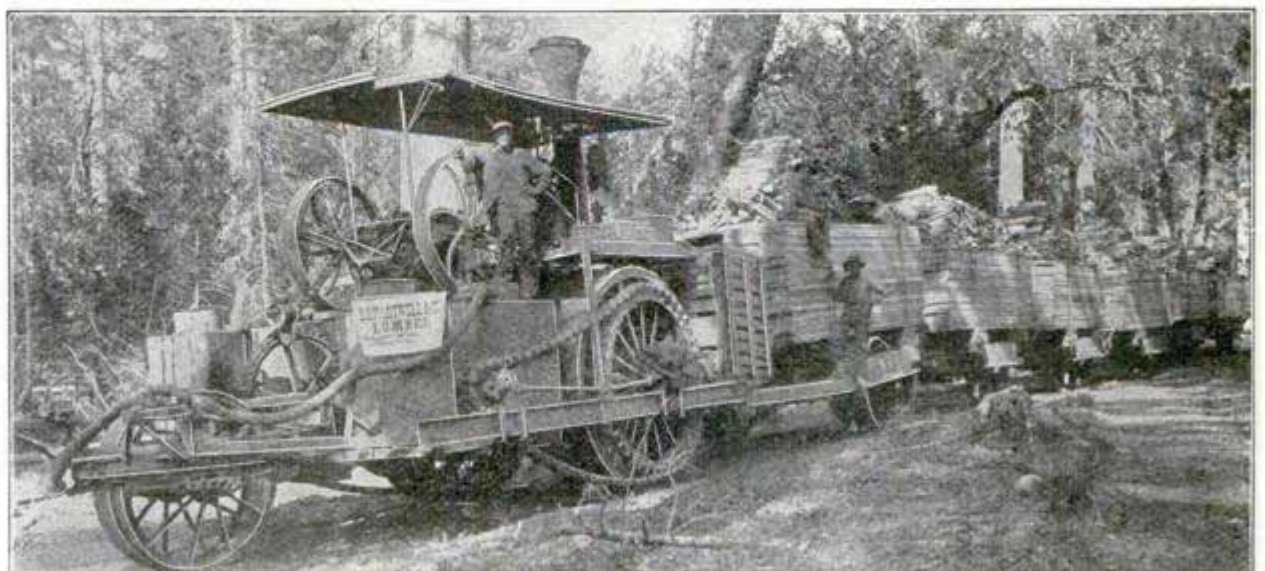


**Bringing Big Logs to the Mill**

Like small streams running to a great river the traction engine lines of the California logging districts feed the railroads. Next to the Puget Sound country the mountains of the coast range and the Sierra Nevadas in northern California furnish the most extensive logging industries west of the Missouri river. These vast forests contain redwood, yellow and sugar pine, cedar, fir and tamarack. The lumber is shipped east and exported to Mexico, Panama, the Central and South American ports, Sandwich Islands, China, Japan, Australia, and even Europe.

In the movement of logs to the mill and lumber to the railroad, traction engines have replaced horses, mules and

oxen almost entirely. A few teams are used to get the logs out to the wagon road, but much of this work is now done with donkey engines and wire ropes. It is no longer necessary to locate the mill on the railroad, for it can be erected in the woods and the lumber hauled on traction trains over any wagon road where teams can draw a load. It is much cheaper and quicker to build a good wagon road and equip with traction engines and wide-tired log wagons than to build the logging railway formerly employed, and when the district is cut over there is no track to take up and move. The size of the loads which can be drawn and the grades climbed is surprising.



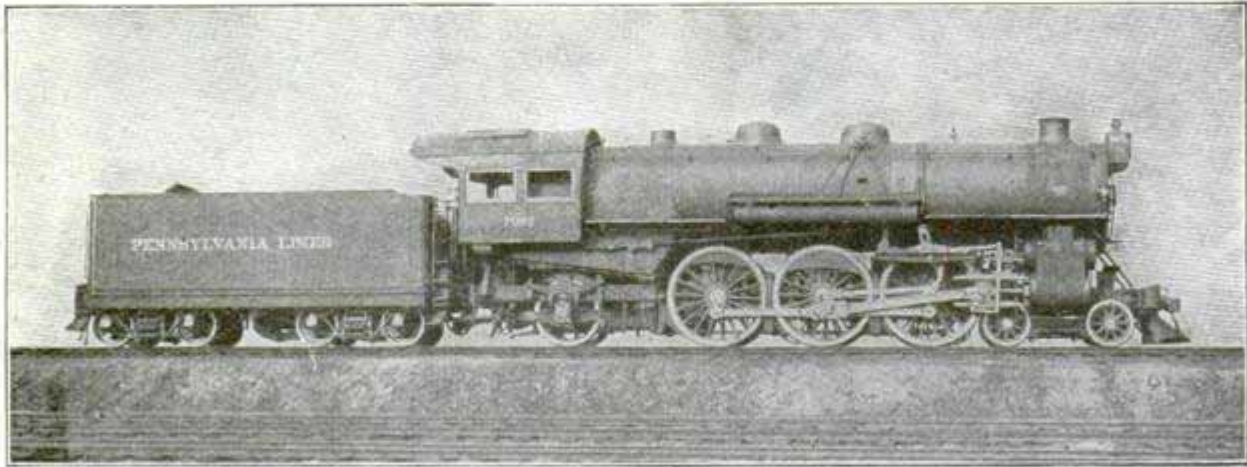
**Hauling Lumber from Mill to Railroad**



## HEAVIEST PASSENGER LOCOMOTIVE

What is said to be the heaviest passenger locomotive yet turned out has

ety of possibilities. In case an aspirant for the stage is long on voice but short on looks or shape the idea of inducing the manager to listen to her singing through the telephone is decidedly elev-



Heaviest Passenger Locomotive

been built by the American Locomotive Company for the Pennsylvania road. It has 80-in. driving wheels and cylinders 24 by 26 in. Heating surface, 4,427 sq. ft.; boiler pressure, 205 lbs. Weight, on trucks, 45,000 lbs.; on drivers, 177,700 lbs., and on the trailer, 45,300 lbs.; total (without tender), 268,200 lbs.

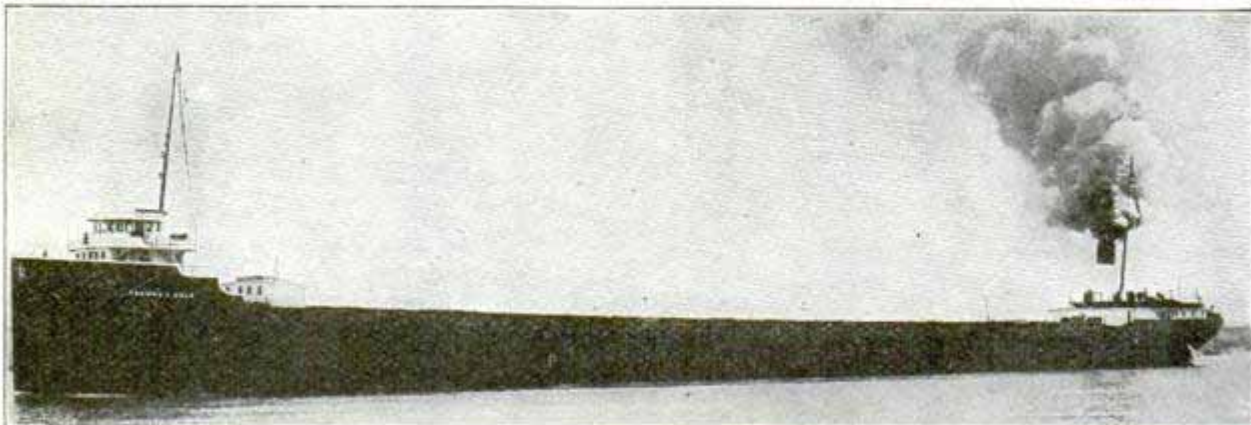
## SONG BY PHONE GETS POSITION

A young woman at Reading, Pa., has started a new way of securing an operative engagement, by singing a sample number into a long-distance telephone to a manager in Philadelphia. She got the job. The scheme opens up a vari-

er, for both distance and mystery lend their enchantment. On the other hand, may not this young woman's success in getting an engagement "on the wire" cause such a rush of singers to the telephone booths that managers will absolutely refuse to listen to any telephonic tones, however sweet?

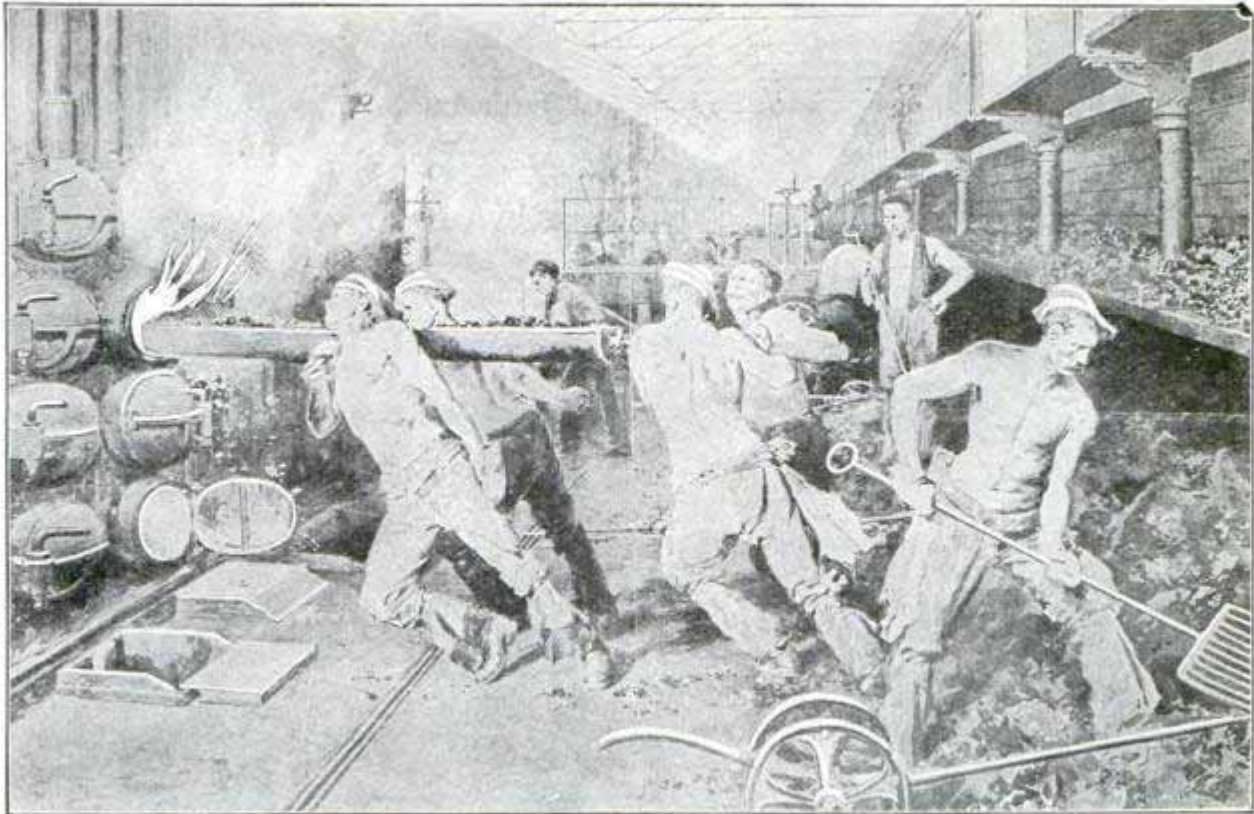
## BIG COLORADO DAM

The plans are drawn and the capital secured for a dam to hold back the waters of five rivers—a grand total of 5,000,000,000 cu. ft. of water. It will be 1¼ miles long, 150 ft. high and will cost \$4,000,000. All of which is to happen 9 miles northwest of Denver, Col.



The Thomas P. Cole, 605 ft. 5 in. in length, longest vessel ever built for fresh water, on her trial trip. She is equipped with submarine telephone system and an electric whistle, which is sounded by means of a Morse key. An automatic arrangement sounds a blast every 10 seconds when in fog.





**STOKING THE RETORTS**—The above animated illustration from the London Sketch shows the men stoking the retorts in one of the big gas plants. A long sort of scoop is filled with coal, pushed into the retort, and is then turned round so that the coal falls out. The scoop is also used to push back the material that has already been placed in the retort. This is such an exhausting task that, though the stokers have 8-hour shifts, they actually work under  $5\frac{1}{2}$  hours, as they have to rest 20 minutes out of every hour. They have their compensations, however, for along with the other employes, many of them ex-soldiers, they hold stock to the value of \$1,675,000 in the company, which turns out yearly 13,000,000,000 ft. of gas, for which 1,200,000 tons of coal are required.

## WHALE LEATHER FOR GLOVES

The industrial use of the whale involves a wicked waste of material. For instance, from a right whale 50 ft. long may be obtained 250 bbls. of oil and perhaps  $1\frac{3}{4}$  tons of whalebone. The remainder of the vast carcass, some 50 tons, is thrown away as absolutely worthless. There seems to be a gold mine here for any one with the enterprise and capital to work it. The hide of one whale, spread out, would cover 1,500 sq. ft., and when tanned makes excellent gloves and leather.

## A TUNNEL ON PILES

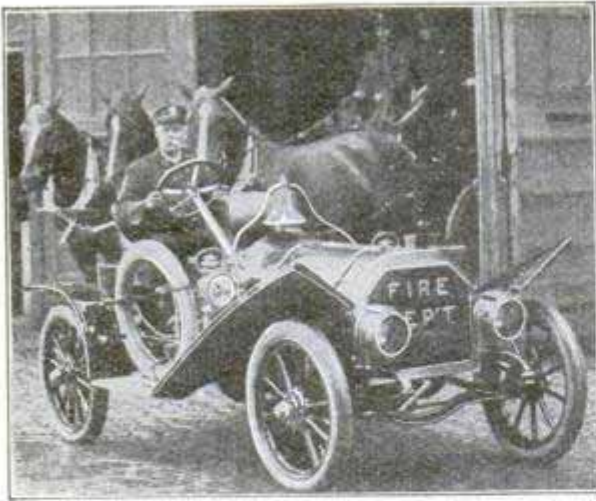
A very unusual piece of engineering work is now being done in connection with the Brooklyn tunnel under East river. The tunnel rests on soft mud and quicksand in many places, and it was feared the additional weight of the trains might cause it to sag and break. To prevent such a disaster holes 20 in.

in diameter are being cut through the bottom of the big steel tube and hollow steel piles in 5-ft. sections are put down into the mud. As fast as one section is down it is filled with cement and another 5-ft. section bolted to it and treated in the same way. This is continued until the built-up pile is 50 ft. long. Instead of driving, the pile is sunk by washing out a hole for it with a strong jet of water, into which the pile sinks of its own weight.

## CONCRETE HOUSE COSTS MORE THAN WOOD

The comparative cost of a dwelling in New York state containing 10 living rooms and 2 bath rooms, according to materials used, has been found to be as follows: For wood construction a contractor bid \$6,000; for concrete with wooden floors, \$8,900; for hollow-tile blocks in walls and partitions and some concrete, \$6,500.





Chief of Detroit Fire Department

## A SUBSTITUTE FOR GASOLINE

The enormous and increasing consumption of gasoline, besides the fact that it is practically under the control of the strongest trust in the world, makes any feasible substitute welcome. An English firm will soon place benzol upon the market as such a substitute, put up in cans of convenient size for use on motor cars. Benzol is very like gasoline in appearance and qualities, and can be sold at about the same price, with the great advantage that it is not in the grasp of the oil trust. It is a rectified spirit from the distillation of

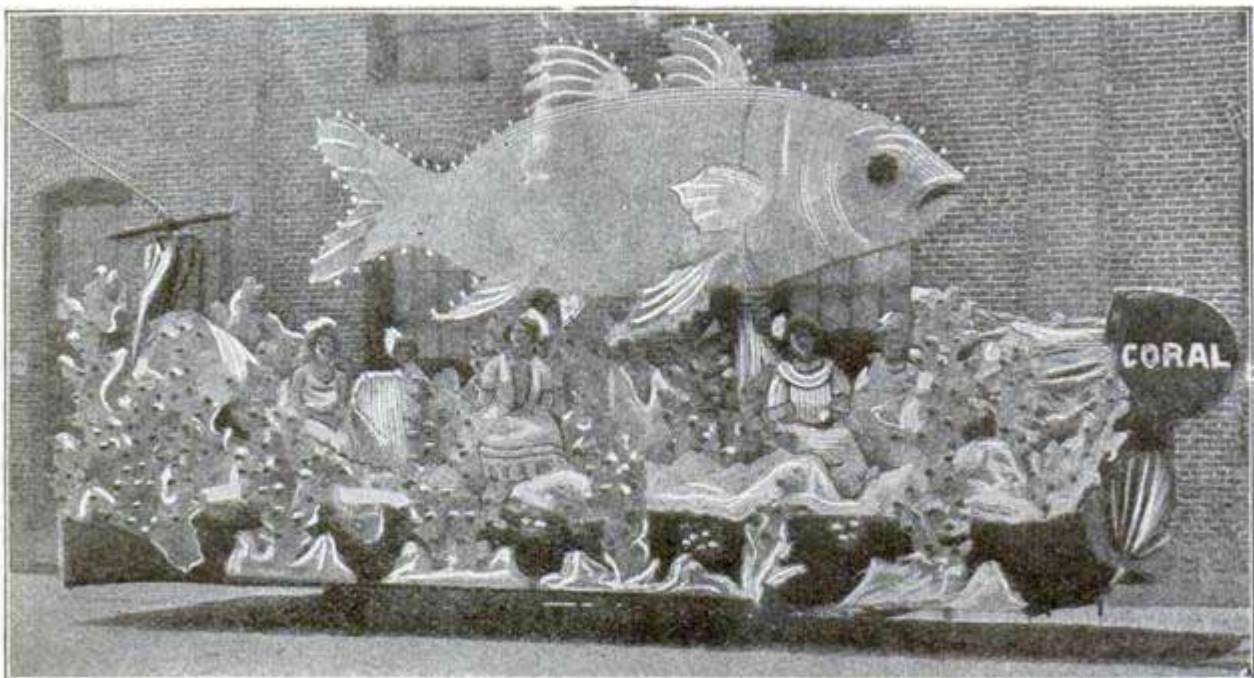
coal tar, which is a by-product of the manufacture of coal gas.

Experiments are still being made to perfect it as a motor fuel. It is claimed that benzol has some advantage over gasoline in potential energy, as tested by actual use in motor-car engines. Of course objections have been made to it, of which one is that benzol vapor is extremely poisonous. In odor it can claim no superiority over gasoline, the bouquet from the exhaust being just as sweet.

## CONCRETE BRIDGE—NOT REINFORCED

While nearly all concrete work is reinforced in some way, it is noteworthy that a bridge is to be built in Baltimore of concrete pure and simple. And yet it is to be 322 ft. long, with one span of 142 ft. and three of 60 ft. each. The concrete will be made of one part cement to three of sand and six of broken stone. It is to cost \$175,000.

Clean gold or silver watch chains by immersing for 5 seconds in pure ammonia, rinse in alcohol and shake dry in clean sawdust.



One of the floats in the annual parade at Los Angeles was named the "Coral" and represented a submarine scene. It was mounted on a street car truck, took its power from the trolley line, and was brilliant with sea-green electric lights.

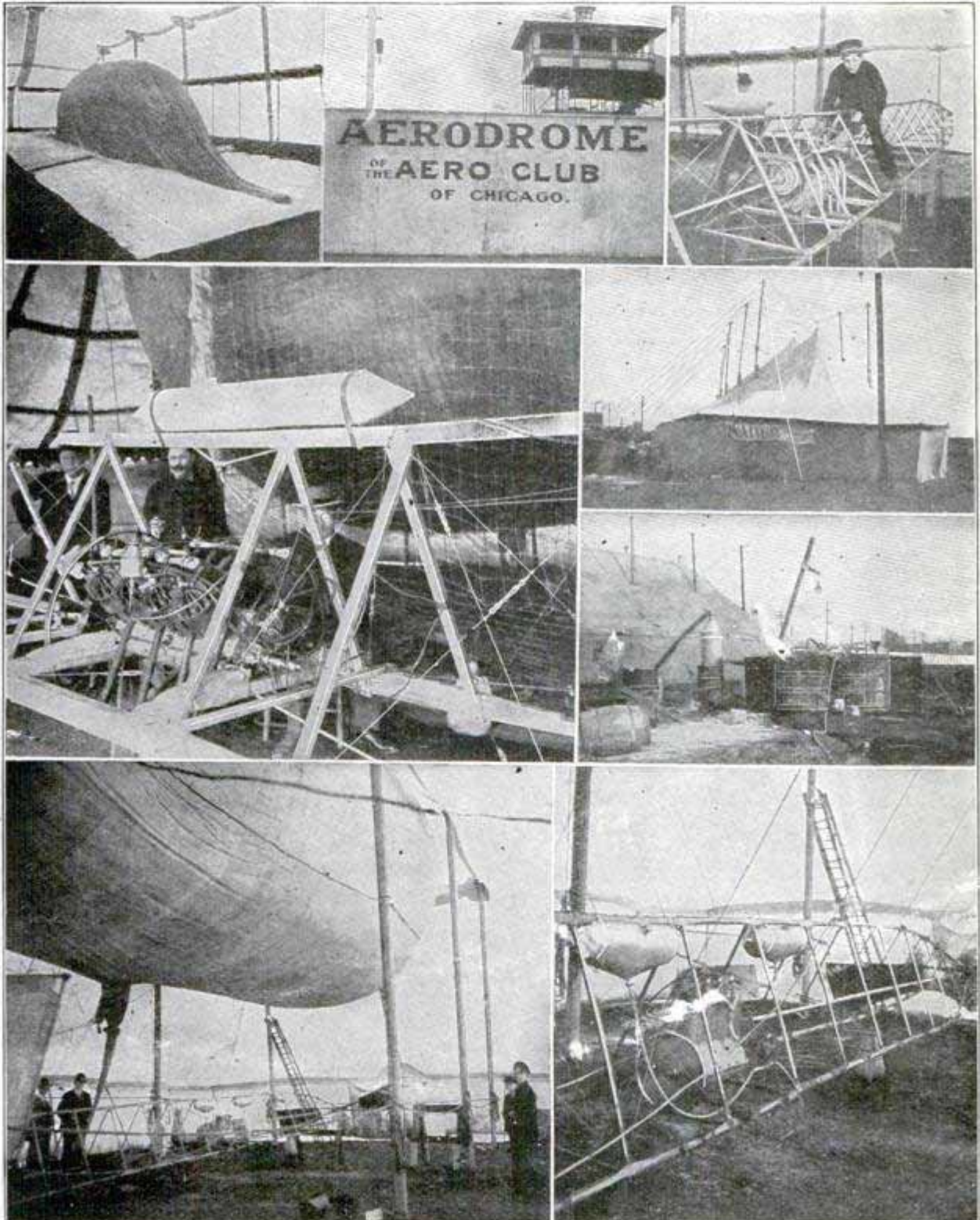


## AIRSHIPS IN CHICAGO

### The Aero Club Gives Its First Exhibition

The opening of the Chicago Aero Club attracted considerable attention, the exhibit including three airships and one aeroplane. Capt. Mattery had a large ship with an 8-cylinder engine

of 30 h. p.; Horace Wild and Chas. K. Hamilton each had an airship. A few flights were made but the entire week was rainy with high winds, which made long flights impossible and ascen-



Scenes at the Chicago Aero Club



sion dangerous. The gas bags were kept inflated constantly in hopes of the wind going down.

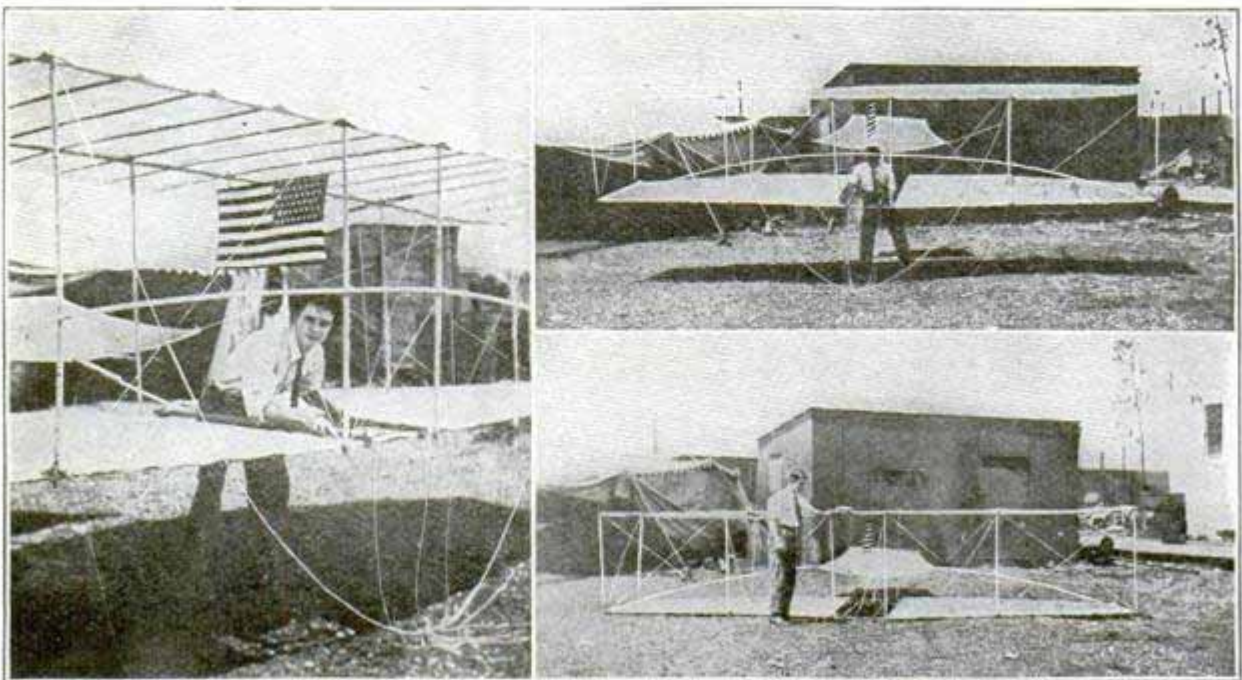
Mr. Lesh made one ascension in his double deck glider which was 20 ft. long, 6 ft. fore and aft, with 200 sq. ft. of surface. The tail was 11 ft. long; the decks 4 ft. apart. We say

"was" because the machine was wrecked by the storm on the last day.

On entering the grounds of the Aerodrome the first that attracts the attention of the sightseer is the various tents that cover the huge monsters of the air. The tents all seemed to be securely staked to the ground in order to hold the great gas bags from taking their flight. Near the side of each tent some tanks and barrels could be seen which formed the apparatus for making the hydrogen gas used in the gas bags. A combination of iron filings, sulphuric acid and a secret preparation makes this gas. A tube of cloth and about six inches in diameter conveyed the gas from the tanks to the gas bags. The gas bag is constructed

of a very fine grade of silk which is sewed together in squares with strips of heavier material. It is then oiled with a preparation that will not get hard. From these great bags, which are about 55 or 60 feet in length and 20 feet in diameter, is suspended, by a network of fish line, a small three-cornered frame made from spruce sticks and braced with piano wire. On this light frame and near the middle is bolted the motor that drives the 16-foot propeller wheel. On the various types of airships this motor differed in style and construction, ranging from 6 to 40 hp. and 2 to 8 cylinders. A tank for gasoline as well as a small storage battery is attached to the light frame. A large frame made of spruce and covered with muslin and fastened to the rear end of the light frame forms the rudder. The daring aeronaut strides the light frame and when in midair controls the motor by a long rod along the frame and changes the course of the ship by guide ropes to the rudder and changing his position along the frame.

The entire weight of an airship is about 350 pounds, while the motors weigh from 96 to 165 pounds. The light spruce frame will weigh from 65 to 80 pounds. The propeller is placed at the forward end.



Views of Aeroplane Built By L. G. Lesh



**INVENTED THE TELEPHONE**

Another claimant for priority in the invention for which the patent rights were granted to Alexander Graham Bell was Moujeot, a poor and obscure Frenchman who has just died near Paris

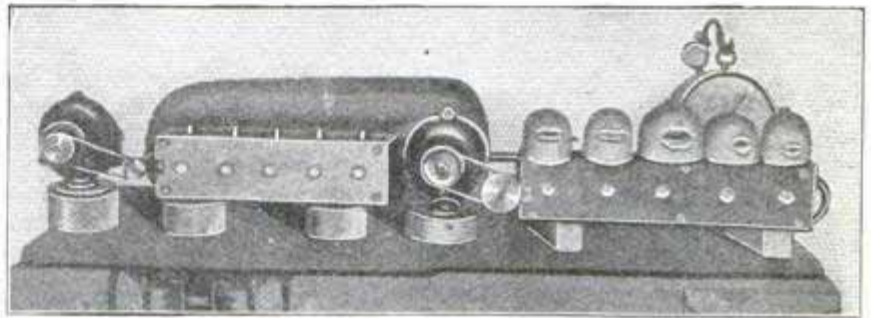
**MACHINE PRODUCES VOWEL SOUNDS**

The phonograph reproduces words or sounds, but the electric "siren" actually produces the vowel sounds. An electric motor compresses air in imitation of the human lungs and the operation of a keyboard causes the air to pass through the artificial mouths and lips which are cast from plaster of paris. These casts are shaped in exact imitation of the forms the human mouth and lips assume when speaking the several vowels.

In addition to being an interesting invention capable of considerable development, the siren is used in testing the degree of deafness of an impaired human ear, as with the machine it is possible to register the exact amount

**PROGRESSIVE LONDON**

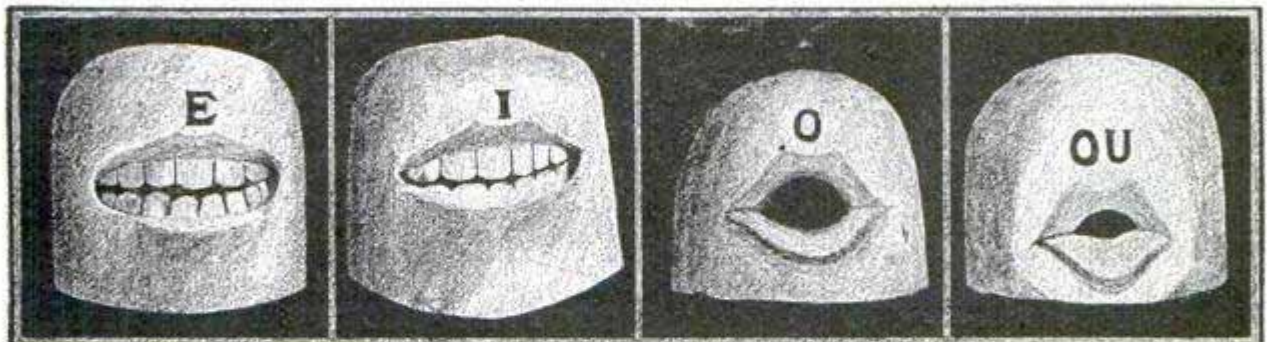
What is this? Did you never hear of the London ambulance service? Well, this is it. Don't laugh. London takes it seriously and is very proud of it. Inside the "dog kennel" is a stretcher on two wheels, upon which the victim of accident or sudden sickness can be jolted off over the cobblestones to the nearest hospital, enthusiastically accompanied by all the 'Arries and 'Arriets who can get near enough to feast their eyes upon the



"An Electric Motor Compresses the Air"

pale, distorted features. London is a great town and will have American police ambulances some day.

The bristles of any brush are kept in place by the tightness of the handle.



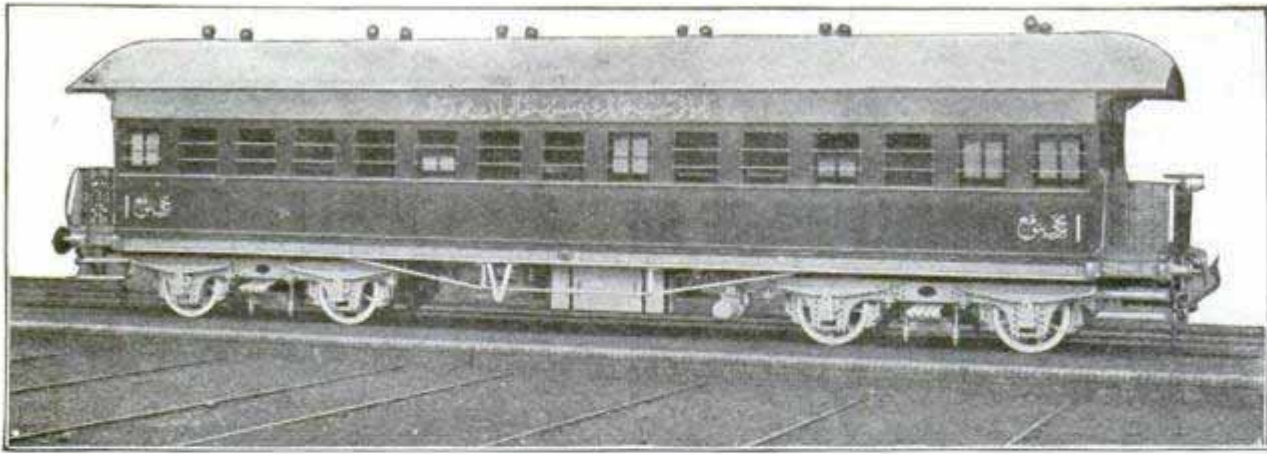
Plaster Cast Mouths for Speaking Vowels

of pressure required to produce a sound which the deaf person can hear. The invention is by Dr. Marage, of Paris.

Some curbstone brokers in New York are using wireless receivers instead of megaphones to get market quotations.

Therefore any shrinking of the handle loosens the bristles, and it should always be kept in a moist place. The bristles of a paint brush should be immersed in water when not in use, but it should never be allowed to stand on the bristles; hang it.

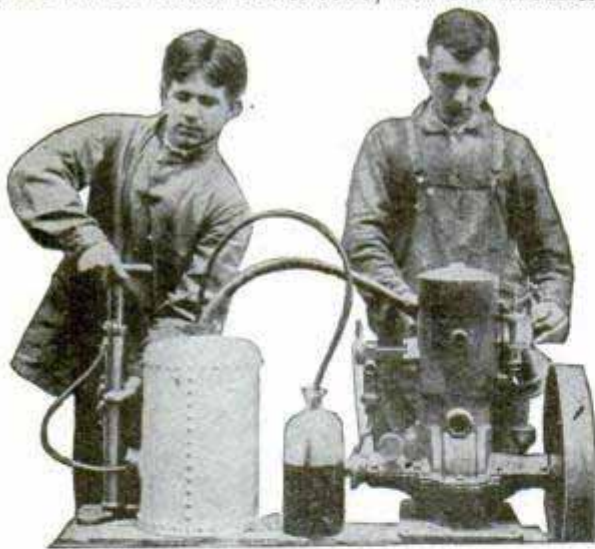




Corridor Car for the Ottoman Railways

## PREVENTS RUST FROM SALT WATER

One of the marine engine builders has discovered a process for preventing rust on the interior of water jackets of gas engines when salt water is used for cooling. The preventive is a secret chemical preparation which is pumped into the jacket under a pressure of 100 lb. One such treatment is supposed to make the iron immune to salt water rust. As a test, sal-ammoniac



Pumping the Chemicals

was injected and left in 6 weeks, but on removal and breaking the casting for interior inspection, no sign of rust was found.

The salt water gives little trouble in the way of rust as long as it is kept in motion, but where it remains unmoved for a few hours or days rust sets in and when once started increases rapidly.

## GAS MOTOR CARS



Three-wheeled chairs carrying two passengers and the driver are proposed for the Boardwalk, Atlantic City. It combines the features of the hand-pushed rolling chair and the automobile. Power is supplied by a small gas motor.

## OUR NAVY LEADS THE WORLD

The world's rapid-fire record has passed recently from the British to the American navy. The credit for this is due to Seaman J. L. Davidson, of the battleship Ohio, who put 11 consecutive shots from a 6-in. rifle through a 20 by 15 ft. target at a distance of 1,600 yds. in 51 seconds. The target was bobbing about continually in a rough sea. The best British record is the same number of hits in 60 seconds.

The Blue Jacket, an American naval publication, has the following by Margaret E. Schmidt in honor of the event:

England has her Dreadnaughts  
 With their deadly 12-inch guns;  
 Germany has battleships  
 Of twenty thousand tons;  
 Denmark, France and Italy  
 O'er great ships their flags unfurled.  
 But Uncle Sam has beaten all—  
 Our Navy leads the World.



## OIL FUEL FOR FOG SIGNALS

Until recently the United States Government has used coal for operating steam fog signals on the California coast. This consumption of coal is an important item of expense, even to the richest government in the world, for one "siren" alone—on the Farallone Islands, 25 miles west of San Francisco—eats up 100 tons a year. It has been decided to change the diet from coal to crude petroleum, in hopes of effecting a large saving of expense, so oil plants have been installed at five points where there are Government fog signals. Two other points are marked for the same equipment in a short time, if the results of the experiment justify further changes.

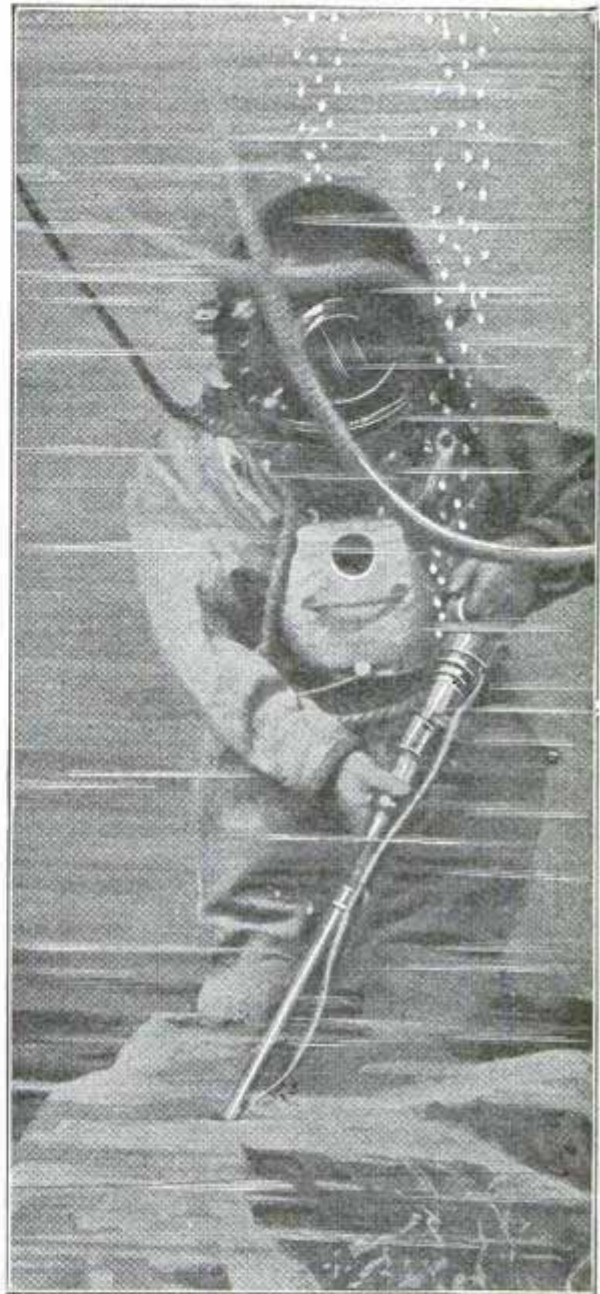
## DYNAMITE BLAST SAVES SHIP

### Divers Fight for Life With Great Devil Fish

On March 20 the big steamer "Northwestern" went ashore on La Touche Island, in Southeastern Alaska. The vessel was jammed in between two large hidden rocks, and was held fast as if in the jaws of a gigantic vise, and all usual methods of recovery would have torn big holes in the hull. A loss of \$225,000 seemed inevitable to the insurance company. However, the British Columbia Salvage Company took the contract to float the great hull. This was finally accomplished through the agency of dynamite.



All the work was done by divers. First a survey was made of the submerged rocks, and a map prepared. It was then decided where to drill the holes for the blasts, and considerable time was occupied in this work. The drills were operated by compressed air, and each hole plugged as soon as finished, to keep out the sand. When all the holes were ready the dangerous operation of filling them with dynamite was performed. A much



Diver Drilling Rock

greater danger, however, threatened the divers at all times. The waters fairly swarmed with giant cuttle (devil) fish which constantly attacked the divers, who had many narrow escapes. In fact, the progress of the work was so slow on this account, and as the fear of the divers increased, it was found necessary to send them down in pairs. While one drilled the other protected him.

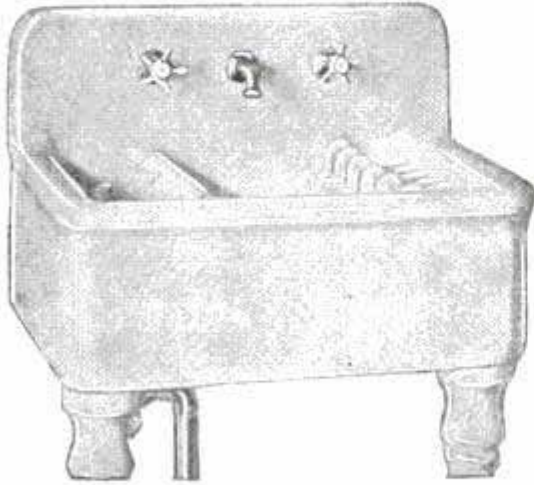
So scientifically was the work planned and executed that when the explosion occurred the summit of the submarine mountains were torn away without injury to the ship.

England plans to build another Suez canal with British capital only.



### NEW VEGETABLE SINK

A new vegetable sink for kitchens has three compartments. In one the vegetables are washed; in the middle com-



Three Compartment Sink

partment they are pared; the third contains clean water into which they are tossed until enough are prepared to transfer to the cooking utensil. The sink is made of porcelain.

### A WIRELESS DREAM

Will fast ships speed across the Atlantic some day, carrying almost no machinery, and propelled by wireless waves of power generated at Niagara Falls? That is the dream of Sir Hugh Bell, president of Iron and Steel Institute, London. Who shall declare it impossible in the face of the wonders which the new century has already seen?

### SEARCHLIGHT FRUSTRATES SUICIDE

A young New York City woman who leaped into East river one dark night recently and was fast being carried toward the terrible rocks of Hell Gate was spotted by the searchlight of an express transport boat. As the woman's screams rang out, the searchlight was played up and down the waters, until at last it found and rested upon the white upturned face of the girl, who

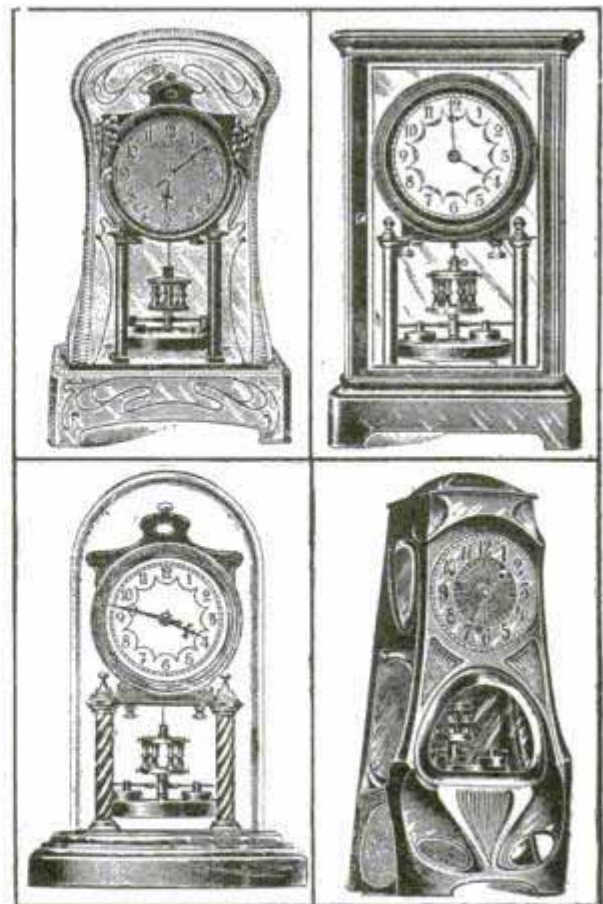
had been buoyed up by the skirts of a raglan coat she wore. Three men swam out from the shore and after a desperate struggle with the swift current brought her safely to terra firma.

### TICKLESS CLOCK RUNS 400 DAYS

Primitive man had no need of clocks—he lived in the open air, awoke with the rising of the sun and went to sleep with the birds.

When more accurate precision was needed, he invented the sun dial, and that was followed for indoor use by the hour glass, and similar contrivances worked by water or sand. Wheel clocks worked by water followed. There was a striking clock in A. D. 807, and a large clock erected in London in 1325; but it was not till the introduction of the pendulum by Huygens about the 17th century that we got anything approaching accuracy.

And now the swinging pendulum clock with its regular beats ticking out



Courtesy Fisher, London

Types of 400-Day Clocks

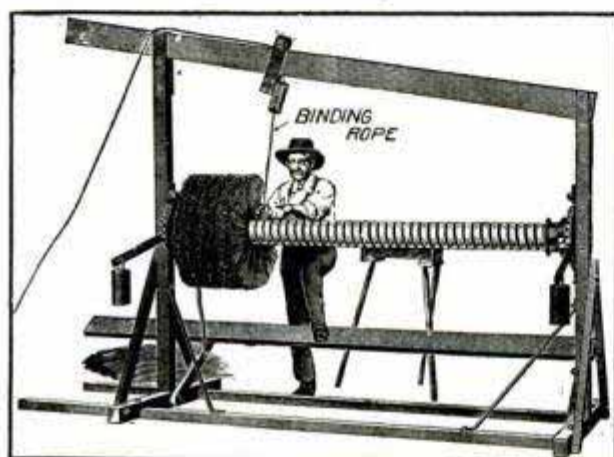


the seconds is to become a back number. In its place is a pendulum which turns and returns in a horizontal plane, like the hair spring of a watch laid on a table, but unlike the watch gives out no sound—it is absolutely noiseless.

And it runs 400 days with one winding.

### FILLING SWEEPER BROOMS

The illustration shows how to fill street sweeper brooms which have spiral grooves the entire length between hubs or sprockets in which the hickory fiber is fastened by Manila rope.



Making a Sweeper Broom

The broom spindle is placed in the frame, and the rope is passed through a tension on top bar of frame and attached to spindle. This spindle is connected with a treadle by means of a pawl and ratchet. Pressing down on the treadle with the foot winds the rope on the broom spindle, the material to be filled is looped around the rope, which is drawn into the grooves. The fiber should be dampened to prevent it breaking in being looped around the rope.

### BEST TEMPERATURE FOR STORING FRUIT

As there are nearly 1,500 cold storage plants in the United States which handle fruit of some kind, the best preservative temperature is a very practical question. Some experiments have been conducted in Maine from Septem-



TRAINING FRENCH SEAMEN—In the French navy special attention is given to a systematic training which is calculated to make the men active and light of movement. The picture shows one of the lessons by which the sailors are taught to "man a small boat" quickly when a high sea is running.

ber to May, with a view to determining the comparative merits of artificial cold and cellar storage for fruit, especially apples. The average artificial temperature was 35°; of the cellar, 42°. Whereas all the Baldwins and Spies in the cellar had rotted in that time, only 13 per cent of Baldwins and 21 per cent of Spies had gone to the bad in the artificial cold.

It was found also that maturity of fruit and promptness of storage had great influence on length of preservation. For instance, Spies which were stored immediately lost only 21 per cent in the same time in which others which had lain ten days in barn before storage lost 49 per cent. Also firm, ripe apples deteriorated only 18 per cent as against 62 per cent of apples picked two weeks later from the same trees.

To prevent glue cracking add a little chloride of calcium, which will absorb enough moisture to counteract excessive dryness of the glue.





This Will Be the Largest Steel Bridge in the World

### PROPOSED HELL GATE BRIDGE

A railroad bridge, which with its steel viaduct approaches will be three miles long, may be built over Hell Gate, N. Y. It will be the longest and heaviest steel bridge in the world, and will require 80,000 tons of steel. The four tracks will be 140 ft., and the top of the arch 270 ft., above the water.

### YOUNG LADY BUILDS BOILERS

Chicago has a young lady boiler-maker, the only one, so far as we know, in the country. She is Miss Ruth Kissing, 19 years of age, and, of course, good looking. Her father conducted a



Courtesy Ideal Power

Chicago's Lady Boilermaker

boiler shop for many years and Miss Ruth was his office manager the past three years, and for the year during her father's illness superintended the shop and had charge of the buying. She also learned the practical side of the work and can rivet up a boiler with pneumatic hammers as well as any of the men. Since the death of her father, which occurred several months ago, she has had entire charge of the business.

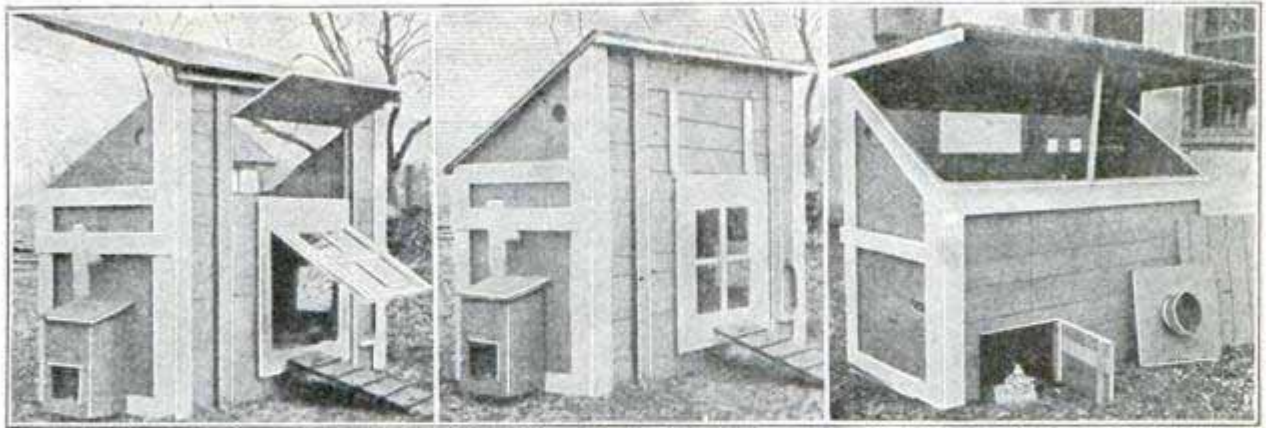
### NATURAL HOT WATER HEATING

People living in the western part of Southwestern Dakota are to be congratulated on having a never-failing supply of hot water for heating their houses and for other purposes. By drilling artesian wells they get spouters varying in temperature from 100° to 130°, and even higher.

### INCREASE OF U. S. NAVY

The growth of the "big stick" will be watched by the American people with various emotions. Part will be elated by the fact that the Navy Department will soon have 8 new battleships well under construction, besides 7 cruisers, 5 destroyers and 4 submarines. Most of these will be ready for service this summer, and work is being pushed as fast as is consistent with thoroughness. Other Americans will be pleased to note that their country is not yet committed to the ruinous race for naval supremacy, in which France has 126 war vessels under construction, England 76, Germany 43, and Austria 33.





### PIANO BOX BROODER HOUSE

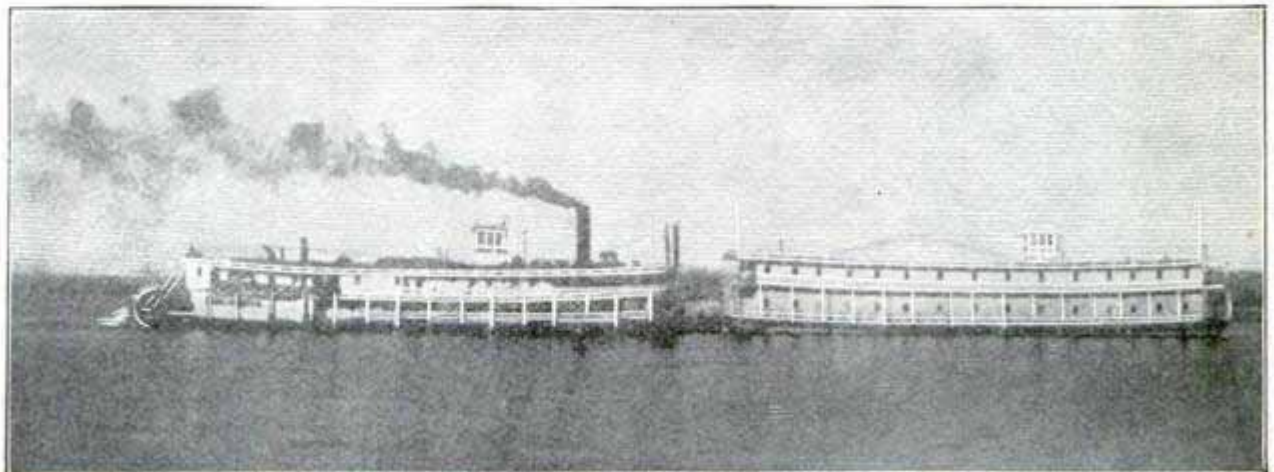
Copyrighted, 1907, by Poultry Publishing Co.;  
republished by special permission.

An excellent brooder house for chicks hatched in an incubator may be made from an upright piano box. The first operation is to saw off the top of the box diagonally, for proper slant of roof, on a line drawn from the division between upper and lower parts of the front, to a point near the top corner at the back, which makes the front of the piano box the back of the brooder that is to be. Then remove lower part of front of box and mark with a pencil around bottom of box on the inside, after which knock off bottom, and saw off edge on all four sides. The object of this is to bring bottom of box up inside the proper height, placed on well nailed cleats, to provide for heating apparatus underneath. Place hinged windows as shown in the cuts. The house will ac-

commodate 100 chicks, but 50 to 75 will do better. Make the roof and sides watertight with tarred paper.

### SUBSTITUTE FOR POSTOFFICE TWINE WANTED

The Postoffice Department would welcome some device or inexpensive appliance which could be used as a substitute for the jute twine now universally employed in tying letters in packages. The general public would hardly think of the amount of this twine required each year but it runs into big money. For 1906-7 the sum of \$200,000 was appropriated to buy this twine and the fiscal year is not yet up and the stock of twine is all gone. For the current year 2,000,000 lb. will be used, or 900,000,000 yd. The twine can be used only once. Some tying device which would hold the letters in bunches for transmission in mail



Courtesy Motor Boat

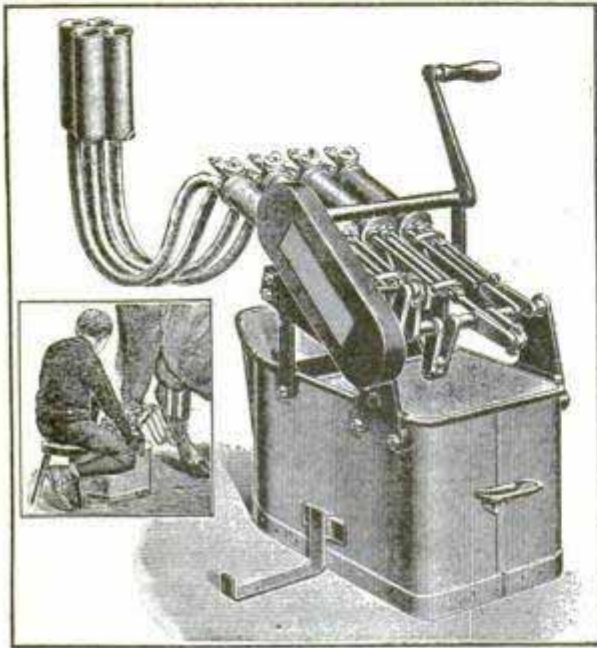
A floating theatre is one of the unusual things in water craft, but can be found on the Lower Mississippi river. It is a boat without power and is towed or pushed from town to town. The company live on the boat, which has an auditorium seating several hundred. One-night stands have no terrors for the merry company of sailing players.



pouches and do the work as well as twine would bring a fortune to the inventor.

### NEW MILKING MACHINE

A very simple mechanical milker is being used in Europe and reports indicate better results than have been se-



Simple Mechanical Milker

cured from any other of the several milking machines. It is so simple a boy 10 years of age can easily operate it. It consists of four pumps which work in succession, one after another, and at the same speed as a person milking by hand. Each pump is connected by a short rubber tube to a teat-cup, of which there are four. The milk has only a short distance to travel and discharges directly into the pail to which the machine is fastened. The operator sits on a stool and turns a crank at the rate of 45 revolutions per minute. The suction of any one of the pumps can be increased or decreased by turning a thumbscrew which controls the air passage. As soon as one teat is milked the suction is cut off and the cup removed, while the other pumps continue working. Where several machines are used in one place power through flexible shafting (1-10-hp. to each machine) may be used. With power one operator can superintend several machines. The

device has been patented in all countries.

### BIGGEST DREDGE IN THE U. S.

It is now at work off the north shore of Chicago, sucking up sand and clay from the bottom of Lake Michigan and passing it along through a 30-in. steel pipe to fill in a stretch of shallow shore a mile long. This strip has already been surrounded by a breakwater, and when filled in it will add 242 acres to the area of Lincoln Park. The value of the new land will be at least \$4,000,000. For this extension work \$1,000,000 have been appropriated and the commissioners will be able to keep within that amount by having their own dredge to do the work. Although the dredge will cost \$148,000, there will be a saving of 20 cents a cubic yard from the 30 cents bid by private contractors, and when the work is finished the machine can be sold for a large fraction of what it cost.

This hydraulic pumping dredge is well worth seeing. The hull is steel, 150 ft. long by 35 ft. wide, and contains engines of more than 1,200 hp. From the bow projects a long steel beam, which can be raised or lowered and this supports the intake dredging pipe. At the end of the pipe revolves



The Big Dredge



an enormous clay cutter,  $7\frac{1}{2}$  ft. across and weighing over 5 tons, of which a separate view was given in Popular Mechanics for June. As this cutter bores into the bottom, a powerful turbine in the hold of the boat sucks the loosened earth into the pipe and sends it out at the stern through a discharge pipe as far as may be necessary. The outlet pipe is in 100-ft. sections, connected by heavy rubber joints, and supported by steel cylinder floats, one on each side, and it will deliver a maximum of 1,500 cu. yd. per hour.

At the stern of the boat are two great "spuds" to hold it in position. They are solid cylinders of wood,  $2\frac{1}{2}$  ft. in diameter and 53 ft. long, each pointed with a steel tip weighing 12 tons; they can be lowered into the lake bottom either singly or together. By dropping first one and then the other, and swinging the boat on each alternately as a pivot, the dredge at the bow can be made to sweep a channel 175 ft. wide.

### A WIPE JOINT MACHINE

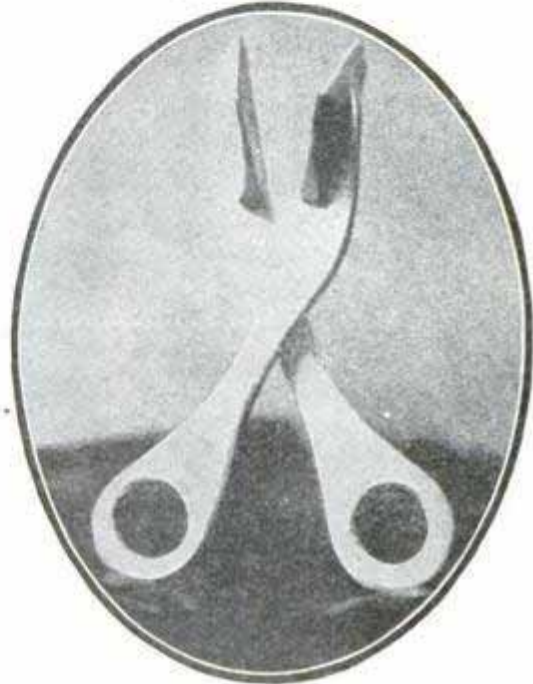
It does not make any difference if a man has had experience or not in wiping joints if he uses a wipe joint machine, as it can be operated by anyone of intelligence after reading directions. The illustrations show the machine in operation. The joints made by the machine are better than the hand-wiped, because the soldering metal is used at more extreme heat and it is a well-known fact that the hotter the metal the stronger the joint.

Brass fittings should be turned as usual and lead pipe scraped before being placed in machine. After applying the machine (Fig. 2) to the parts both should be heated with a blow torch on all sides until machine is hot enough to melt a small piece of solder laid in the trough

for that purpose. The molten metal is then poured in as in Fig. 3. When cool the job is complete as in Fig. 4.

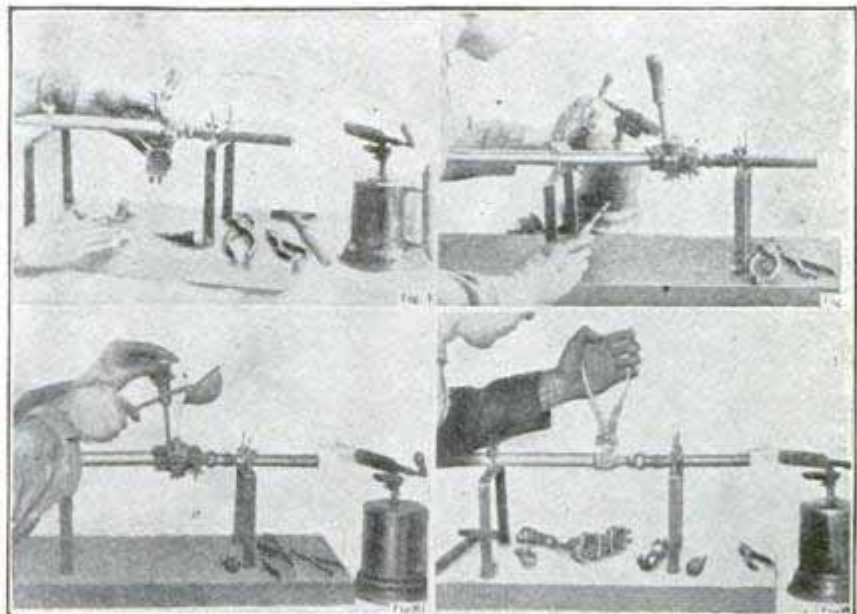
### WASP KILLING SCISSORS

This unique instrument for killing wasps and other undesirable insects



"Made of Wood"

which may enter a house, was the invention of the late Lord De Ros, of England. The scissors are made of



wood. The two handles can be whittled out of any soft wood, and the squeezers glued or tacked in place. Fasten handles with a small brass rivet.



## HOW THE "VARYAG" WAS RAISED

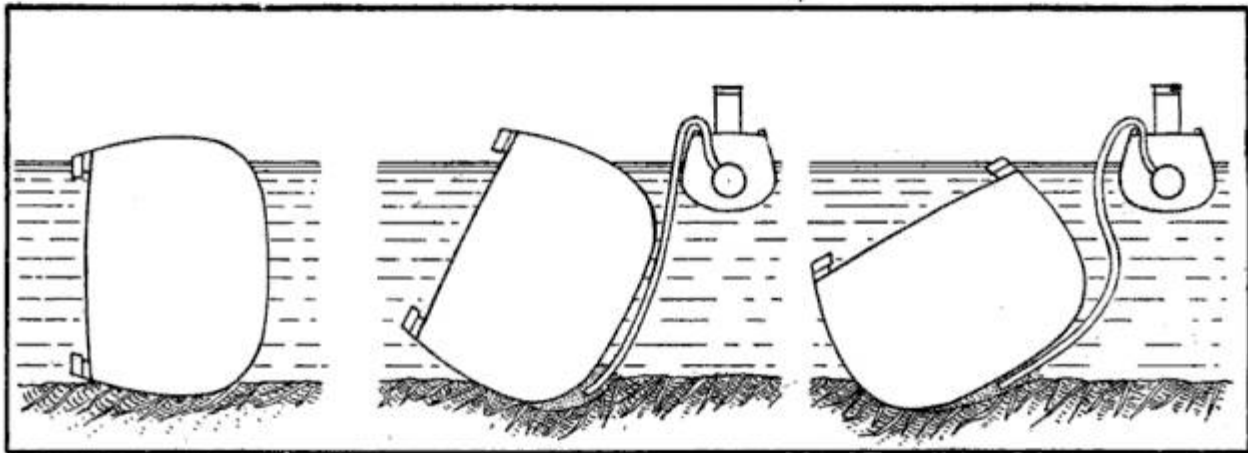
### Remarkable Success of Japanese Naval Engineers

On February 9, 1904, the fast Russian cruiser "Varyag," 6,500 tons, was driven from the neutral harbor of Chemulpo, and after engagement with the Japanese fleet was riddled with shot and sunk by her commander. For thirty months she lay on the bottom, deep in mud which partly filled the ship, then was brought to the surface and is now in service in the navy which sank her.

The event is extremely interesting as the most notable success of its kind, and

tons of water per hour, were installed on big floats over the wreck and connected to auxiliary vessels for steam supply. On August 8, 1906, an unusually high tide was running and the effort was made. In a short time the hull had reached the surface and repairs were made to hull and machinery which permitted the extraordinary feat of sailing to a Japanese port under its own steam and power.

In the work were engaged, in addition to the officers and divers, about 300 Japanese naval mechanics and as many Korean helpers. The cost, including the three big pumps, was about \$500,000. Had the same methods been adopted it



"Jets of Water Dug out a Sort of Ditch"

accomplished under difficulties which were pronounced impossible to overcome. Not only was the hull nearly buried in mud, but a 5-knot an hour current made the work of the divers slow and dangerous. Two months were spent in uncovering and stripping the wreck of as much armament as possible. The hull lay on one side, with the keel on a horizontal, and the first steps were to turn the ship over and bring it on its keel. This was done with jets of water forced under one side, which dug out a sort of ditch into which the hull gradually slid until at last it was in a vertical position. The big guns were then hoisted. Usual methods of closing the holes failed and a shell or outer vessel inclosing the wreck had to be constructed to completely envelop it. Three large pumps, built in Japan for the special purpose and capable of pumping 3,600

would seem that the raising of the "Maine" would have been a task easy in comparison to the recovery of the "Varyag."

### ACID-PROOF PIPES

Iron pipes lined with lead or tin are made for the transmission of acids which would quickly destroy unprotected iron. These pipes are made up to large sizes; one copper smelting company, for instance, has 30,000 ft. of 10-in. pipe lined with lead which has been in use 12 years.

Never let any soap-suds fall upon your eye-glasses — one drop will ruin them. The caustic alkali will make the glass iridescent.



## PEARLING AND PEARL-DIVERS OF TODAY

How Men Walk the Sea Floor in Search of Huge Shells with Costly Gems

By William George Fitz-Gerald



Steam Lugger—Pearl Diver Coming Up

Pearl-diving suggests to our mind much that is romantic; but the era of naked divers, in dire peril from sharks, has passed away; and modern progress now equips the pearler with a fearsome-looking suit of India rubber, glistening copper breastplates, with great leaden weights back and front, and lastly an uncanny-looking helmet, glass-paneled and with elaborate telephonic attachments; air-pipes, life-lines and a powerful submarine searchlight, carried on steam luggers.

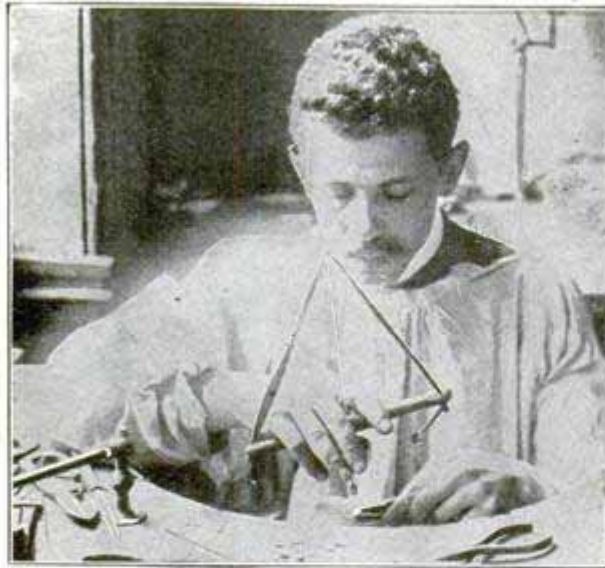
Thus equipped the pearl-diver of today may spend six or eight hours at the bottom of the sea, whereas in olden times three minutes made a record. Although pearls are found in nearly all molluscs, and even in univalves like the Australian *Haliotis*—a kind of barnacle—true pearls are only produced by the pearl oyster, or mother-of-pearl shell. And, by the way, the commercial "M. O. P." shell is really the diver's bread and butter. They are as big as an ordinary dinner plate and weigh 2 lb. when cleaned. These fetch from \$500 to \$750 a ton in the market and all the world knows that mother-of-pearl is a staple commodity of trade.

The pearl-fishers are aware that shells infested with living parasites are most likely to yield fine gems. The ancient fisheries were chiefly in the Indian Ocean and Persian Gulf; but nowadays the loveliest and most perfect pearls come from Ceylon, and above all Australian waters — especially Torres Straits and in various little-known spots in the remote Arafura Sea.

Pearl-fishing in Ceylon is a government monopoly, controlled and directed by officials; and in the month of March the fleet starts for the pearling grounds, each vessel with 20 or 30 divers and their assistants. But you will find the headquarters of pearling in the desolate country extending from Exmouth Gulf to King Sound, in Western Australia. A glistening white coastline is this, whose monotony is broken only by mangoe-fringed salt-water creeks and scorching deserts of spinifex and sand.

Here, then, we have 600 odd miles of coastline with perhaps 5,000 hardy adventurers engaged in the pearl trade. There are besides some thousands of Japanese, Manila men, Malays and men of other races, acting chiefly as crews for the little ships which so often run





Drilling a Pearl

on uncharted rocks in those far-off and little known seas. The vessels are schooner-rigged and from 7 to 14 tons burden. Each carries a master diver and a crew of four, one of whom officiates as the diver's assistant and works the cylinders and cranks of the air-pumps that supply him with air while he is below. Meanwhile the lugger drifts with wind or tide while busy gloved hands are groping for the huge shells amid great swaying, many-colored forests, 20 fathoms down in the tropical sea.

One man above holds the life-line and pays attention to signals; another is catching fish or peeling potatoes for the dinner; and it may be a third has gone off in the dinghy for fresh water and firewood. The shells are found on ledges about 90 ft. down in the sea, but it is common knowledge that they are far more plentiful at greater depths. Vast fortunes await the inventors of a diving apparatus which will enable the pearler to work in comfort at 100 fathoms deep. It should be borne in mind that even at 200 ft. the diver endures a pressure of 88 lb. on every square inch of his body!

The lugger has a dangerously low free-board to allow of the diver, with his heavy dress and gear, being easily hauled on board. He carries a net with him holding the shells, and when this is full he has it hauled up so that he himself may run no risk of entangling life-

line or air-pipe. You could not imagine an environment more weird than that in which the fully-dressed pearler works at, say, 20 fathoms. He moves airily, notwithstanding his 40-lb. boots, amid groves of coral trees, interlaced with fluttering fern-like plants, among whose branches swim gorgeous tropical fish and sinister water-snakes, who seem to resent the intrusion of so strange a monster.

A good day's work is anything over 200 pairs of shells, although I have known as many as 1,000 picked up in that time. The business, as may be supposed, is absolutely speculative. One diver may open ton after ton of shells without securing anything of greater value than a few seed pearls, while another may take a fortune out of a day's gathering. The most famous pearl discovered in Australia of late years is that known as the "Southern Cross." It consists of a cluster of nine superb pearls in the shape of a small crucifix, almost perfect in proportion. This curious freak of nature was picked up at low water on the Lacipede Islands by a "beach-comber" named Clark, who, after burying it for some time for superstitious reasons sold it for \$50; it fetched \$50,000.

The pearl diver of today, protected as he is by every device known to modern submarine engineering, is liable to many perils. He may lose his life by the ripping or tearing of his dress upon the sharp coral rocks through which he picks his way. Then, should an accident happen in the lugger above, his air supply may stop, in which case he is suffocated; a crew of Malays, by the way, can never be depended upon. Therefore, you may be sure the man below has an uncanny feeling sometimes, a feeling of utter loneliness and helplessness causing him to start sharply at the sudden appearance of a dark mass of rocks, or the unexpected touch of a clammy sea-finger.

He finds himself far from human aid—out of the world, as it were, where every form and creature is different from those on earth. Nor is his occupa-



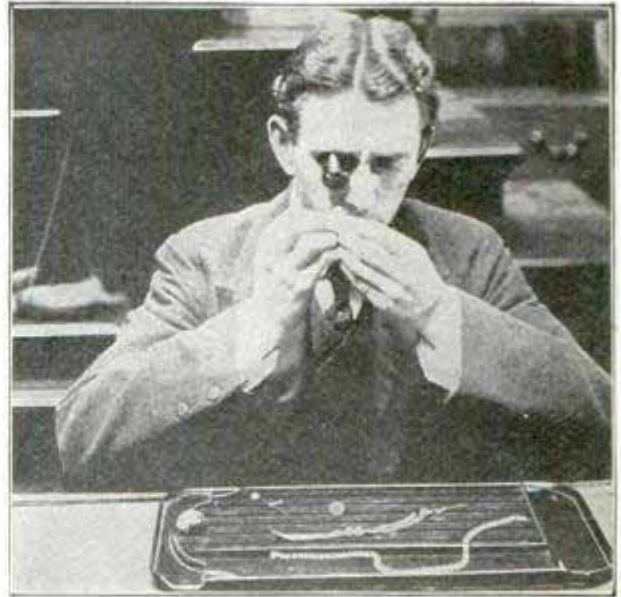
tion healthy. It predisposes to deafness and rheumatism and may affect the lungs and heart. The worst enemy the Australian pearl-divers have, however, are the terrible cyclones that annually visit the coast. As to sharks, they rarely attack a diver in modern dress, and he can always frighten them off when they persist in following him by letting a few air bubbles out of his dress. Other enemies are the black and yellow sea-snakes, the smaller octopus, the stingray and the blow-fish.

After a day's take of shell has been conveyed ashore the shell-opener gets to work at once. The pay of these men equals \$30 a month plus 10 per cent on the value of the pearls found. Some idea of the magnitude of the industry may be realized on learning that last year 520 luggers paid an annual \$5 license to engage in the trade, and they took many thousands of tons of pearl shell; the customs duties in the tiny pearl town of Broome exceeded \$5,000 a month.

The treasury authorities of Western Australia estimate they receive at least \$100,000 a year in dues from the pearl-ers. But of course the industry is enormously profitable and hardly a month passes without the discovery of these "tear drops of the ocean" having a market value of from \$5,000 to \$15,000 each, and sometimes much more. Thus a beautiful pink pear-shaped specimen weighing 206 grains was found last season and sold for \$80,000.

Before setting, pearls are classified according to size on a setting board; and the delicate work of drilling a valuable specimen is invariably done by an old-fashioned hand apparatus. Moreover, no matter how valuable a set of pearls may be, they are invariably strung on fine silk thread. One extraordinary fact is that unless pearls are worn they will pine away and die. Thus, in the Louvre Museum in Paris at this moment you will see a superb pearl necklace *on its death-bed!*

To be precise, it lies on a velvet cushion. This is the famous necklace left by M. Thiers, diplomat and statesman; it



The Pearls Are Strung on Silk

formerly belonged to his wife, and was once worth \$300,000. It consists of 145 pearls in three rows, weighing altogether 2,907 grains. The once lovely gems, however, are fast losing their luster, and in a decade or two will turn jet black and become quite valueless. The authorities in the Louvre view the matter with grave concern; but they are well aware that little can be done unless the decay of the gems can be arrested by their being worn on warm human skin, so sensitive are they to change of temperature.

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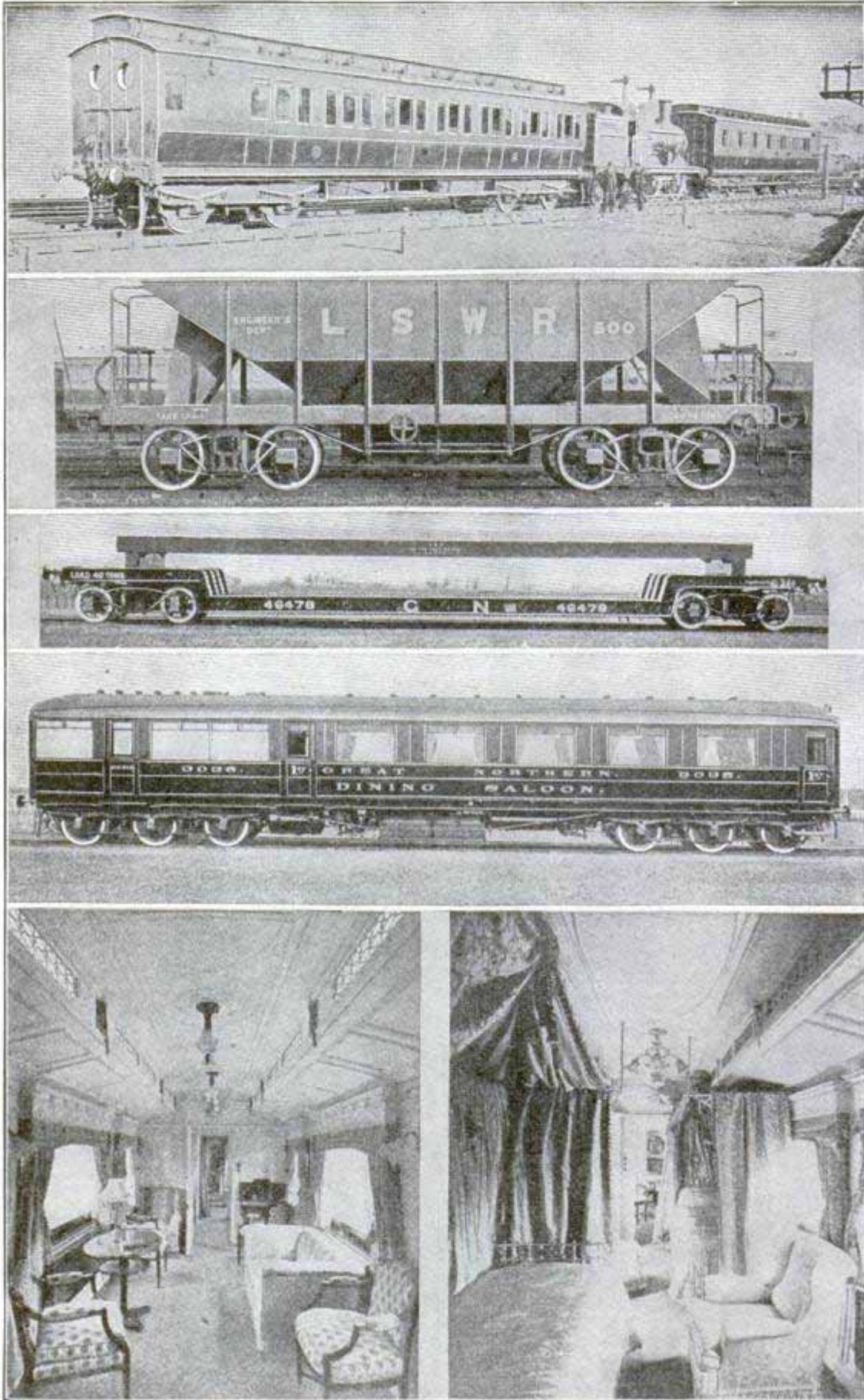
#### CAN'T CHANGE BOAT'S NAME AFTER 20 YEARS

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After 20 years the name of a vessel registered in this country cannot be changed unless it be rebuilt at a cost of at least one-half the original cost.

A navigation company on the Great Lakes is in an unusual predicament. It recently put on a new steamer named "City of Cleveland." The company has an old steamer of the same name which they changed to "City of St. Ignace," only to find to their surprise that they had collided with a Government regulation which forbids the name of a vessel to be changed after being carried longer than 20 years, and the older boat was named in 1886.





**TYPES OF ENGLISH CARS.**—The above illustrations are selected from a large number of views used by the president of the English Institution of Mechanical Engineers in his annual address. The first is a two-car Irish train which operates with the locomotive between the cars. The second is a standard ore and coal dump car. Next is a car for transporting large steel girders of 40 tons. The dining car is 65 ft. long and weighs 39 tons. The two lower views show the interior of the Queen's private car.



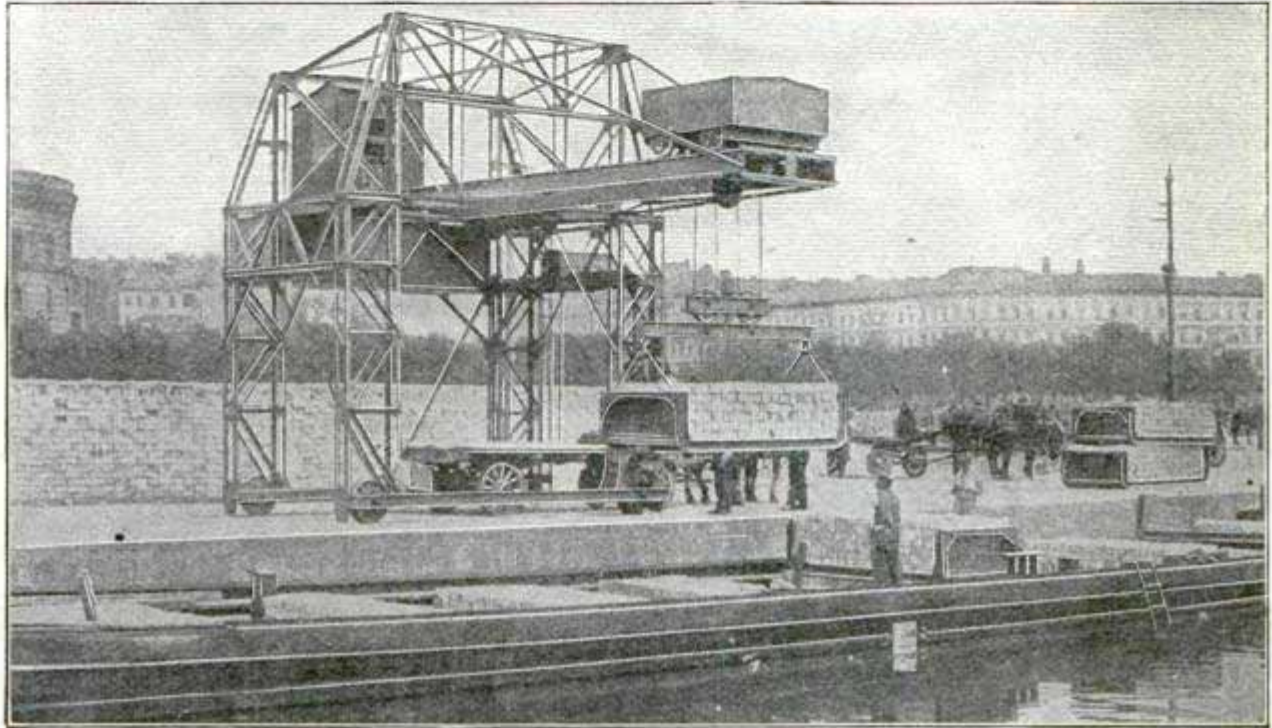
## A STRONG THIN PARTITION

In buildings where space is so valuable that every square inch is worth many dollars, very thin partitions which are at the same time strong, impervious and fireproof are at a premium. Such partitions are now built only  $1\frac{1}{4}$  in. thick, yet amply strong enough for all ordinary uses. Of

crete wall. This makes a partition not only thin but solid and impervious to ordinary sounds.

## ELECTRIC BRICK HOISTING CRANE

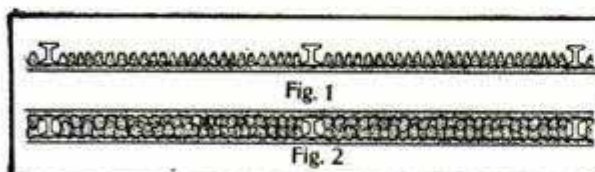
Brick and canals suggest ancient history, and electric power stands as the



Electric Crane Lifts a Wagon Load at a Time

course they do not carry doors or windows.

Small I-beams of steel about 1 in. in width are used for the studding, to which is wired the metal lath. These I-beams are set about 14 in. apart and can be of any length suitable for the height of the room. In the illustration Fig. 1 shows a partition in cross section as it appears with plaster pushed through the meshes in the metal lath.



In Fig. 2 is shown the plaster on both sides of a partition and how the plaster interlocks between the metal lath and forms what is practically a solid con-

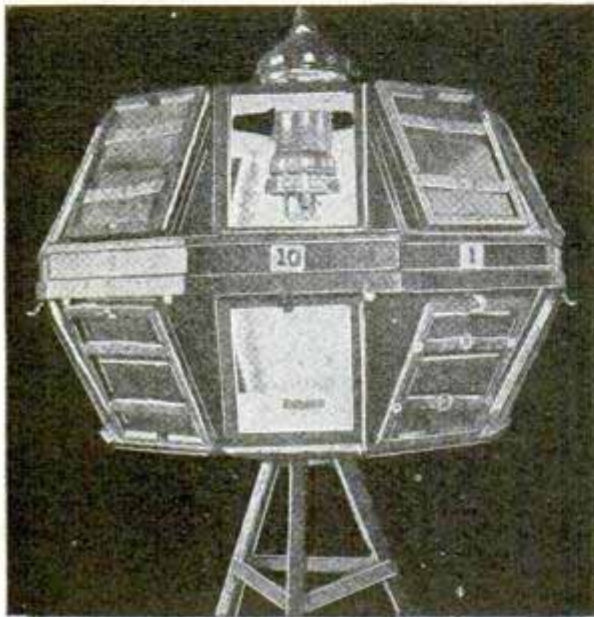
crowning genius of the new century; all three are linked together in one of the large industries of Germany.

The brick yards of Berlin are situated along canals not many miles out from the city, says the Western Electrician, and the transportation of the brick by water is found least expensive. The brick are loaded into steel crates holding 1,500 each, which are loaded into canal boats using storage batteries for power supply. Each crate is a wagon load and each boat holds forty crates. When the boat reaches the city dock, a great electric crane reaches down and lifts a crate with its 1,500 bricks up and out and sets it down on a wagon on which it is carted to the place where the brick are wanted. Could anything be quicker or simpler? The entire boat load is taken out in less than three hours.



## AN ELECTRIC BLUEPRINTING MACHINE

Where a number of small prints of the same size are made from tracings during cloudy days and winter conditions it is a long and tedious job. Usually such prints can be made in 8 by



Electric Blueprinter

10-in. frames, such as are used by photographers.

Mounted upon a tripod, having an arbor at its apex, is a 10-sided drum with flaring sides, having a hub with wooden rolls, upon which it revolves

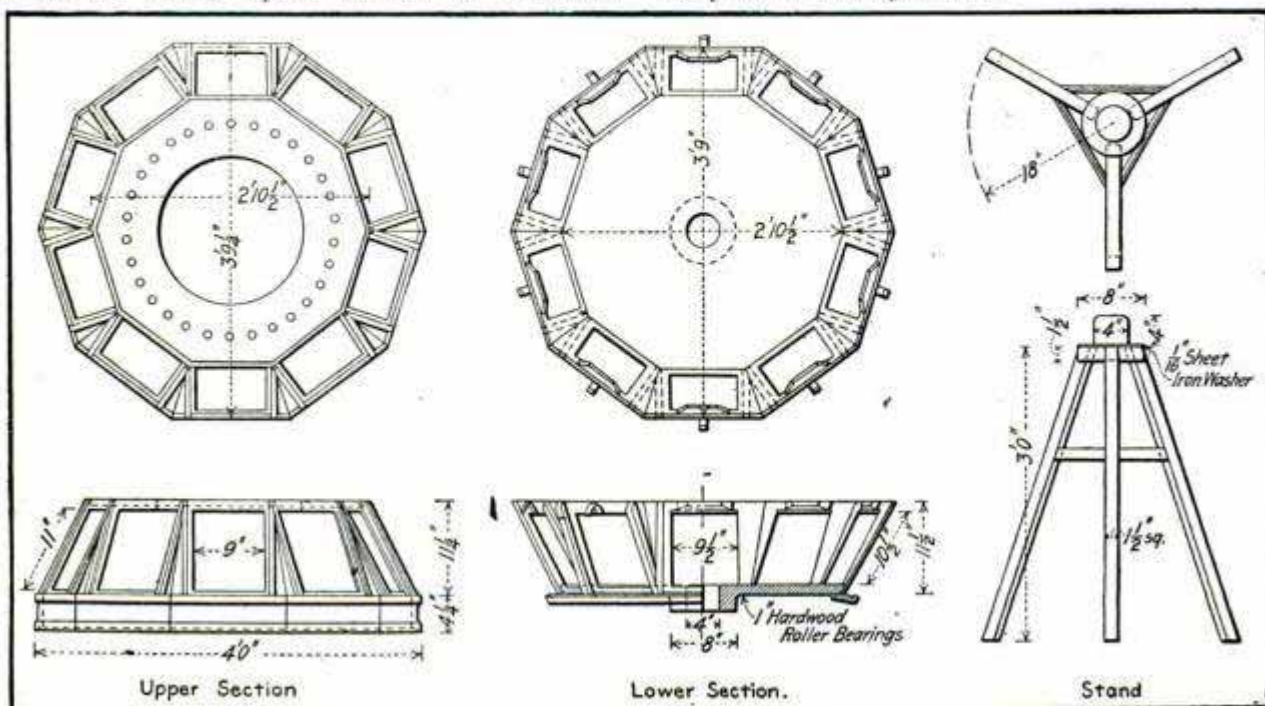
around the arbor; in this drum are 10 apertures the size of the inner face of the printing frames, says Engineering News. A rabbeted extension at the bottom holds the lower part of the printing frame while a brass spring engages and holds the top of same, as shown in accompanying illustrations.

Fitting on to the lower drum is a similar one with receding sides, but without the extension and the springs, as the frames remain fixed on account of their position.

This makes provision for 20 frames and each one is equal distance and at the same angle from the lamp, which is suspended and projects down through a hole in the upper drum and is centered by means of a plummet over the center of the arbor on the top of the tripods. The distance from the center of the flame to the center of the glass in the printing frame is 22 in.

The lamp may be of the ordinary direct-current arc light with enclosed clear glass globe.

Rust may be removed from iron or steel utensils in many ways. If recent, rub with an oil-soaked cork; or, rub with oil of tartar or with very fine emery and a little oil, or with strong alum and vinegar, or soak in turpentine or kerosene over night and clean with very fine emery cloth.

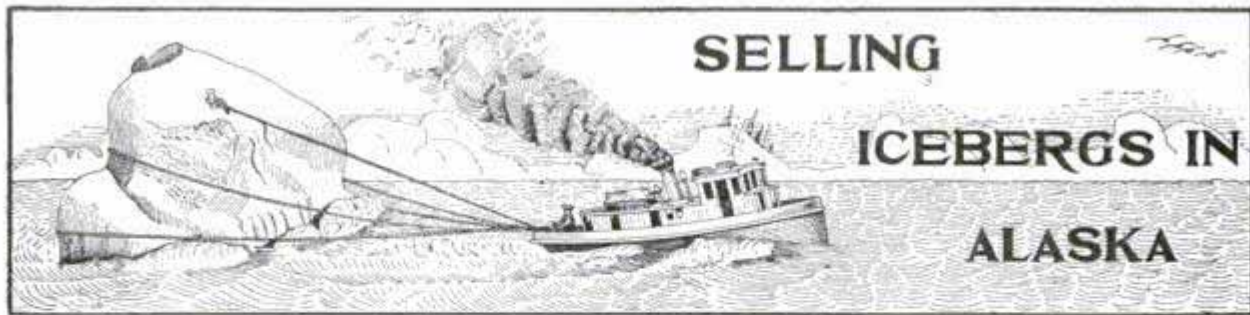


Upper Section

Lower Section.

Stand





Icebergs are a drug on the market in Alaska—that is, in the winter time, when 40 degrees below is a mild day; but one of the strange perversities of nature is to burn and blister with a hot sun during the few weeks of Arctic summer. Juneau and one hundred other enterprising Alaskan cities now have well-equipped cold storage warehouses, better than most towns of equal size down in “the states,” but there was a time when ice could not be had even in Alaska. It was during the second year of the Klondike fever and the Cold Storage and Ice Trade Journal relates the unusual manner in which a supply was found.

Berney Moran was certainly versatile. He had been a newspaper writer, track-layer, section foreman, street-corner preacher, miner, walking delegate and a dozen other things. He rejoiced in the nickname of “Casey,” and is now a wealthy mine owner. When Moran landed in Juneau he had a dollar bill and a thirst; the latter he proceeded to trade off for the former. The beer was served almost warm.

“Where’s your ice?” asked Moran.

“We ain’t no fancy dudes,” was the frontier answer. “We never have no ice here in summer. You’d better drink your drink without ice or noise.”

“Say,” asked Moran, “what will you give me for a constant supply of the best ice you want all this summer.

They dickered and came to an agreement, and Moran then visited the different saloons and markets and stores

selling perishable goods, and made an arrangement with the majority of them to supply the summer’s ice, an arrangement which few, if any, deemed he could keep.

Moran next hired a tug—on credit. He also hired an old warehouse on the shore. With a crew of two and himself and with a cargo of ropes, cables and anchors, he left the port and proceeded to sea.

Two days after the entire town of Juneau was down on the shore. A tug boat was approaching with a tow the like of which no tug boat ever had before. Fastened by a series of cables, ropes and anchors to the tug, and a hundred yards or so behind it, was a gigantic iceberg. On the berg Moran had sunk posts and fastened anchors, and finally managed to get a good towing grip. He gradually towed the mountain, composed of the most beautiful and clearest ice in the world, into the harbor, and stranded it in the deep water not more than fifty yards from his ice house.

Next day, in letters 10 ft. long, the following sign appeared on the old warehouse, thus establishing the first ice and cold storage business north of Fifty-three:

CASEY MORAN,  
ICE  
BY THE POUND, TON OR BERG.



“Casey” Moran

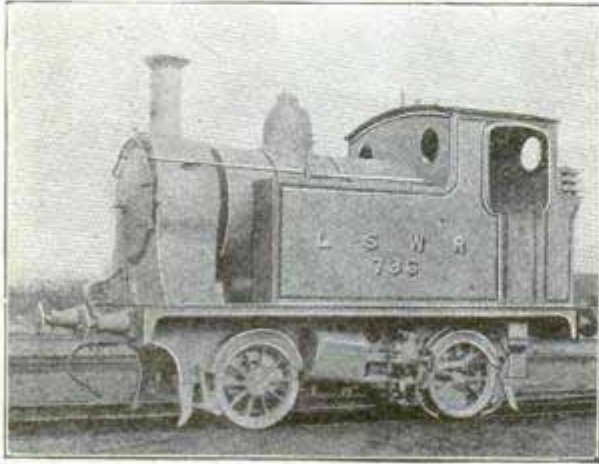
A young lady in street costume made a balloon ascent at Belleville, N. J., recently, because she wouldn’t take a dare. At a height of 1,300 ft., having crossed a river in the flight, she dropped with the aid of a parachute and landed safely. Then she fainted.

Deposits of meerschaum have been found in New Mexico.



## NEW SUBURBAN LOCOMOTIVE

A new type of suburban locomotive for light trains on short runs is being built in England for use on the London & Southwestern Railway. It is mounted on four 3-ft. drivers, has no tender, is



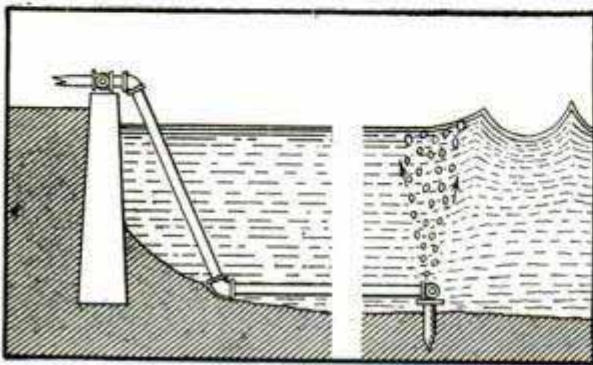
English Tank Locomotive

19 ft. long, and weighs 24 tons with 500 gal. water and 1 ton of coal.

On the top of the cab are two pulleys through which ropes pass from the throttle to the coach. When only one car is drawn the crew consists of two men, the engineer and conductor, and when the train is running car first the conductor can stop or start by working the ropes. The engineer does his own firing.

## WILL COMPRESSED AIR STOP WAVES?

Instead of casting oil on troubled waters, it is proposed now to break them up with compressed air. Theoretically it seems feasible. A wave is



Pipe Has Minute Holes

most dangerous at the instant it breaks, releasing tons of water, it may be, to fall from a height of many feet with crushing force. If, then, the wave can be broken up before it strikes, it is rendered practically harmless. It is proposed to do this by running out a pipe with many minute holes at the end, through which air may be pumped under water to protect a breakwater, a helpless ship, or a light-ship. So far the only practical application of the theory which can be cited is the alleged effect of the compressed air rising to the surface of the Hudson river after escaping from the tunnel beneath. It is claimed that this breaks up all the waves in the vicinity. But that is far from conclusive, and it remains to be demonstrated that compressed air, apart from the question of expense, will be any more effective than a few cents worth of petroleum.

## STREET CARS WITH TWO ROOFS

Street cars are now being built with a double roof—the upper one an inch above the other and projecting 8 in. on either side. The purpose is to prevent leaking when cars are kept out of doors



Courtesy Elec. Traction Weekly

Water-Tight Roof

for want of storage room. The double roof also reduces the humming noise of the trolley wheel.

It is not generally known by retail pipe dealers or by many users of pipe that any size of standard wrought iron welded pipe above 1½ in. will just fit in the next size larger. This is so up until 6-in. is reached, when the sizes are made only in full inch numbers; that is, they jump from 5 to 6 and from 6 to 7, etc.



## HOW YOUNG MEN ARE TRAINED FOR THE AMERICAN NAVY

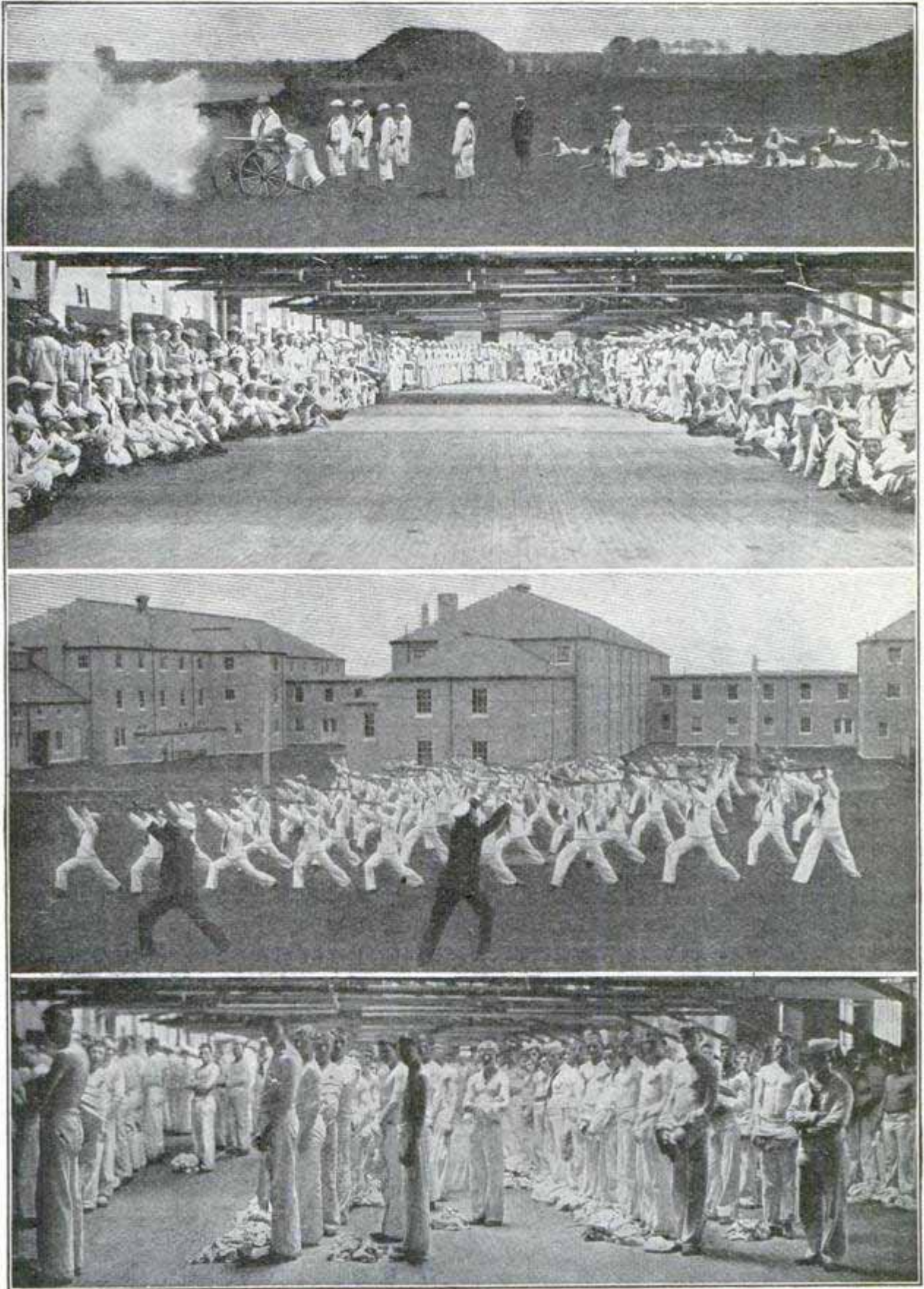


Fig. 1.—Apprentice Seamen Drilling With Rapid-Fire Gun Supported by Infantry. Fig. 2.—Interior of Drill Hall, U. S. Naval Training Station. Fig. 3.—Drill Under Arms at Newport Training Station. Fig. 4.—Physical inspection.



**GOLD DREDGING IN THE DESERT**

is two cycle, starts absolutely without fuel after half a turn, and runs

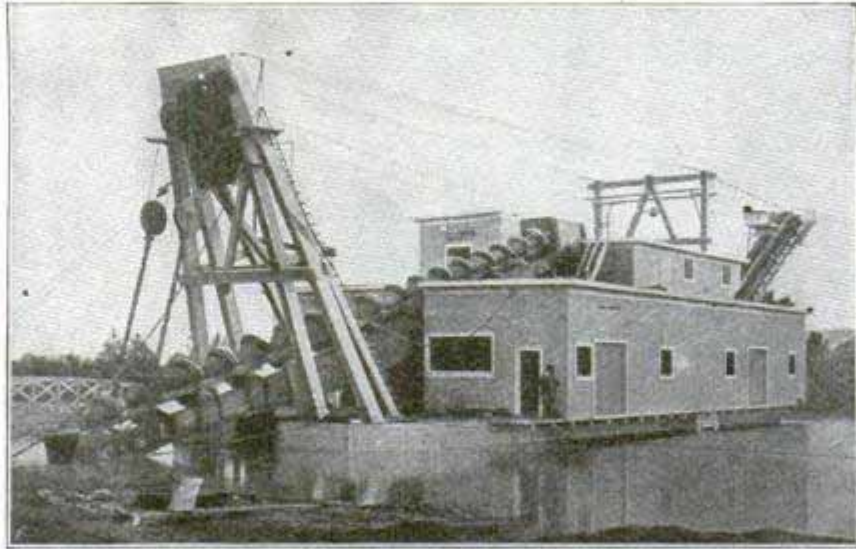
Gold-hunger has drawn men everywhere except, perhaps, to the shifting sands of the Mojave desert. But now a mining company, recently organized in the southern part of California, proposes to dredge the dry bed of a prehistoric Mojave river for the precious yellow grains.

There is nothing new in the idea, for mining experts have long declared that the sands of the Mojave were well salted with gold; but how to get it? Now that problem has been solved by the drilling of several artesian wells whose overflow, after being pumped four miles, will be amply sufficient for dredging purposes.

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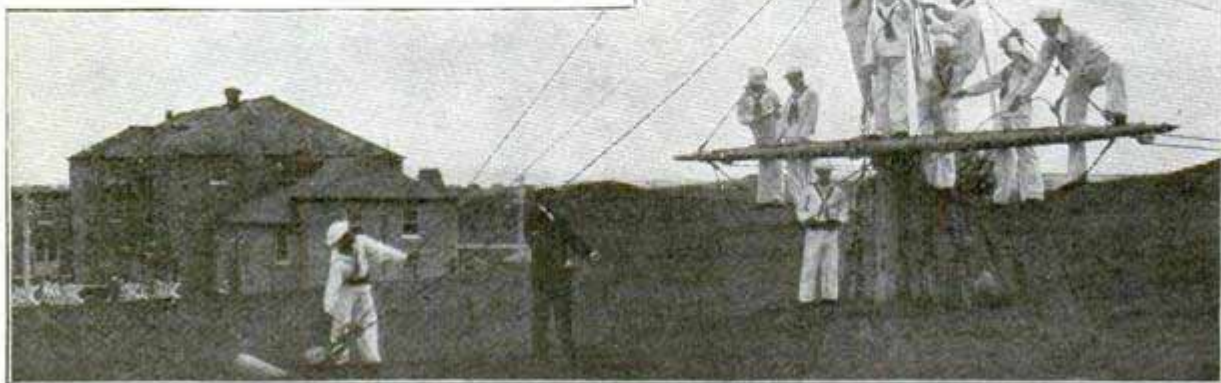
**16-HP. FROM A 54-LB. ENGINE**

The automobile and the flying-machine are developing marvels in the line of engine construction. The latest wonder is 16 hp. which a man can lift with one hand. Ordinarily such power requires an engine of 300 to 1,000 lb., but this was devised as the motor of a new balloon, and it is so powerful that the chief concern of the inventor is to fasten it firmly enough to the frame of the airship to prevent its tearing loose. The design of this little giant is original in many respects. It



• Dredging in a Desert

without any carbureter. The spark coil contains, instead of the usual two windings of wire, six windings, of which the last five are looped in series with a battery of condensers. The lubricating oil is injected along with the gas mixture.



Seamanship Work on a Land Mast—U. S. Naval Training Station



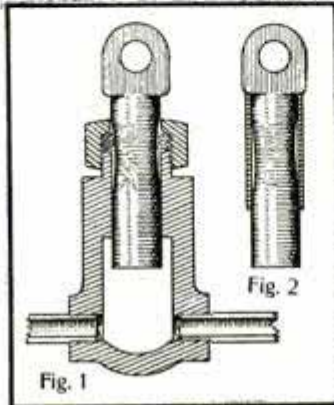


# SHOP NOTES



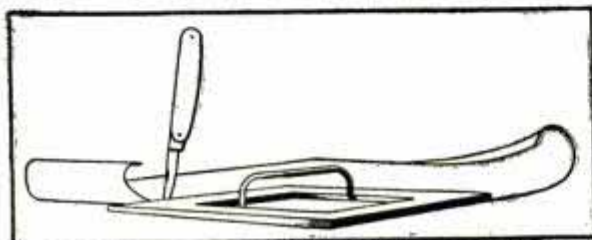
## To Repair a Gasoline Pump

The piston or plunger that becomes worn, where it comes in contact with the packing (Fig. 1) in a gasoline or oil pump on an engine can be repaired by using a piece of brass tubing near the size of the piston cut to a length that will cover over the part that is worn (Fig. 2). Dress the piston with a file until tubing will fit close. The tubing should be soldered to the piston if it does not fit close enough to keep the air from passing between them. The hole through the packing nut and head will then have to be drilled with a drill large enough to admit the brass tubing.



## Special Forms for Cutting Blueprint Paper

Anyone using blueprint paper from rolls will know that it is not easy to cut the right size and when cut it has some curl to it. We use different sizes of paper, says a correspondent of Industrial Magazine, and, therefore, we have a form for each size. The smallest is simply a  $\frac{1}{2}$ -in. board cut true and provided with a knob handle in the center. The larger forms are made of



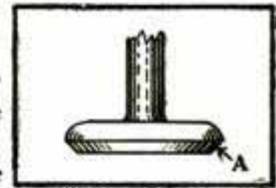
Form for Cutting Blueprint Paper

$\frac{1}{2}$ -in. by  $1\frac{1}{2}$ -in. poplar, braced with brass corner pieces, as shown in sketch.

By using these forms we can cut enough paper to last several days; lay it in a dark drawer, face down, one sheet on top of another, and then place a flat surfaced weight on top of it all. The advantages are: rapid cutting, cutting to size, practically no waste, and flat paper instead of curled paper to put in the printing frame.

## Repairing Leaky Valves

Often globe or angle valves used for cold or hot water, or other liquids, start leaking after being in use for some time. Of course, where a set of reseating tools are available they can soon be repaired, but these handy tools are not always on hand.

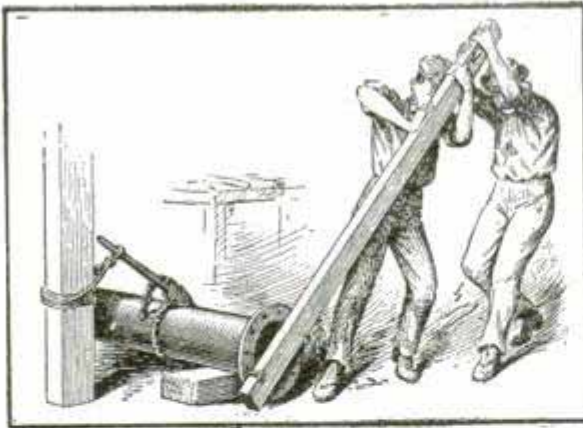


A simple method of overcoming the difficulty is to remove the hood and sandpaper the brass valve disc bright at A where it sets on the seat, then go all around it with a hot soldering iron and place a coating of solder all around it; when it is put back it will be found to be perfectly liquid tight. This scheme is not effectual where high pressure steam is used, as it will not stand long in this case.—Contributed by Jas. Ellethorn, Toronto, Ont.

## Screwing Flanges on Large Pipe

The difficulty of screwing flanges on pipe of large size is well known to those who have tried it, as these flanges are made so short that it is difficult to grip them in any way. An expedient which has been resorted to and found amply satisfactory in many cases is to place bolts loosely in the bolt holes in such a manner that a large stick of timber





Screwing a Flange on a Large Pipe

will be held between them, says The Metal Worker, the stick acting as a lever by which the flange can be turned. This method is shown in the accompanying illustration, and will commend itself not only on account of its simplicity but the rapidity with which the work can be done.

### A Handy Reamer

Forge the shank A to go in the brace or bit stock, then draw the end down to the taper you want the reamer to be and make a little short, say  $\frac{3}{4}$  in. If the reamer is to be  $\frac{1}{2}$  in. at the large end and  $\frac{1}{4}$  in. at the small end, draw it down to that size and flatten down to  $\frac{1}{4}$  in. at both ends. In making the twist, care should be taken that it is done properly and not given too many turns, says a correspondent of The Blacksmith and Wheelwright. After the twist is given, hammer lightly at a low heat until proper size is obtained, then let it cool. File with a round file, using care not to touch cutting edges. One thing to remember is



Handy Reamer

the twist should be just the opposite from a twist drill. To temper, heat it all except the shank at a low heat, plunge in water and cool entirely, after which polish with emery stick and draw temper over the fire, using care not to heat small end too fast. Let color run to a purple and cool.

### To Stop Gas Tube from Leaking

The ordinary woven tubing for connecting lights, stoves and heaters to the gas jet almost invariably leaks. The salesman will claim that the gas soaks through the webbing and that the odor cannot be avoided except by buying expensive tubing—10 to 15 cents a foot. The fact is that the leak is at the junction of the rubber tips with the webbing, as you can prove easily by wrapping the joints carefully with bicycle tape. Examine your tubing closely before buying to make sure that it is not defective or broken at any point, and then wind the joints spirally and tightly with the tape, going over it twice in opposite directions and continuing it at least  $1\frac{1}{2}$  in. each way from the junction. It will be still better, if you have any rim or tire cement, to smear joint freely before wrapping. In this way a 5-cent tubing\* is made odorless.

### Removing Paint from Iron Tank

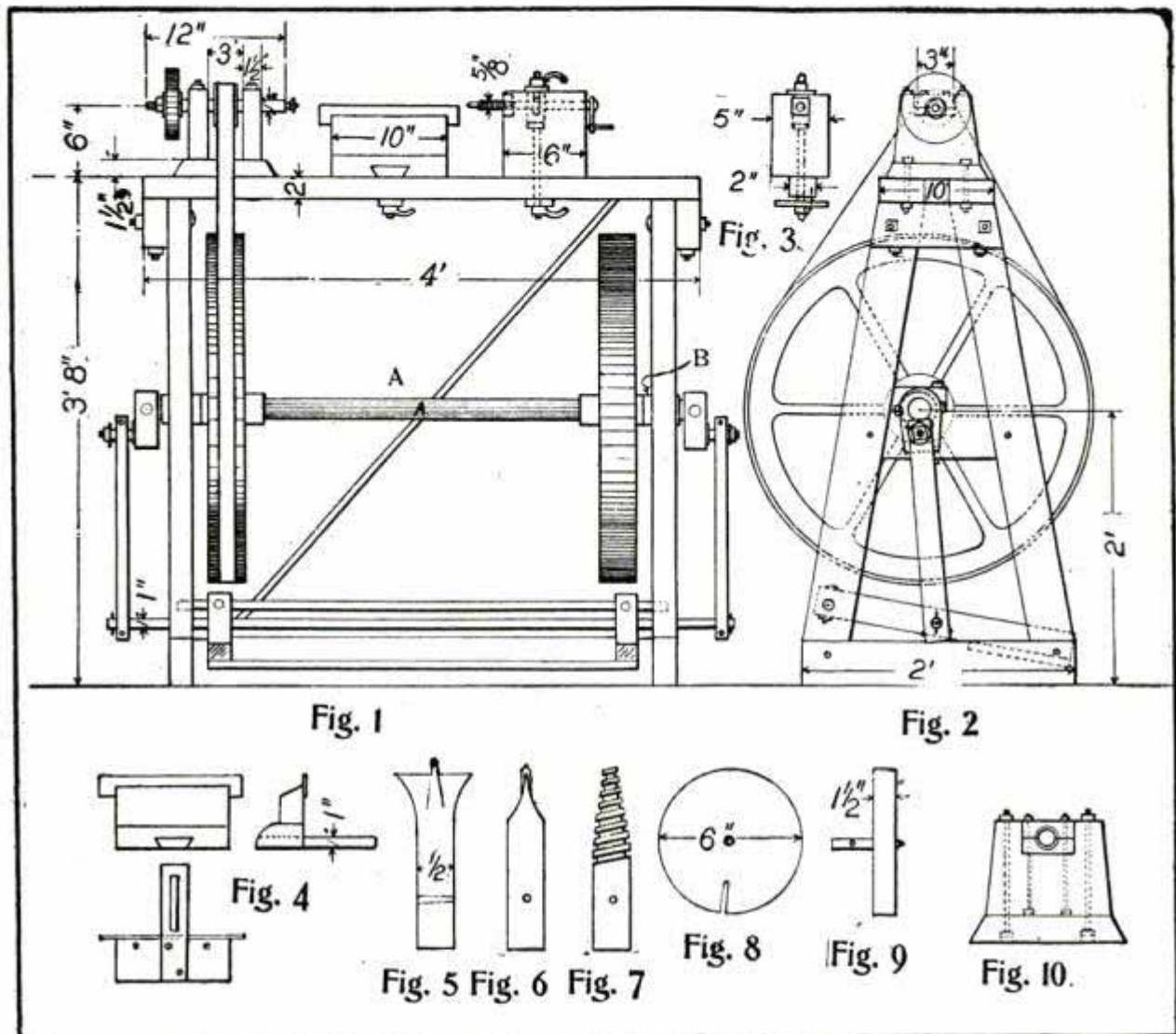
To remove paint from an iron tank, take lime and mix with common lye into a thick paste by the addition of water, says Engineering Review, and apply over the surface of the metal with a mason's trowel to a thickness of about  $\frac{1}{8}$  in. After allowing the mixture to remain a short time, wash off with a hose and most of the old paint will be entirely removed, the remainder being easily scraped off with a scraper. If the tank contains several coats of dried paint, two or three applications will be necessary before the entire surface is clean.

### Cleaning Porcelain Bath Tubs

To clean a porcelain-lined bath tub, use hot water and a rag saturated with gasoline. If the gasoline is objectionable, smear a little vaseline on the dirtiest parts and remove dirt and vaseline at once with rag and hot water. Never scour porcelain tub, nor nick or scratch its surface in any way.



## Home-Made Turning Lathe and Emery Grinder



Details of Home-Made Turning Lathe and Emery Grinder

The frame is made of 2 by 4-in. timbers framed and bolted together. The driving power consists of a pair of old mowing-machine wheels and their axle, A, mounted in brass boxes, B, also taken from old mower. The lathe head is made of  $1\frac{1}{2}$ -in. lumber, and held together with  $\frac{3}{8}$ -in. bolts. The spindle is a piece of 1-in. bright turned shafting turned down to  $\frac{3}{4}$  in. at bearings and to  $\frac{5}{8}$  in. for emery wheel. In end of shaft opposite emery wheel a  $\frac{1}{2}$ -in. hole is drilled in center of shaft 2 in. deep. Into this hole is fitted the different attachments. A spur center is made by flattening the end of a piece of  $\frac{1}{2}$ -in. shafting and filing a point on it, Fig. 5, and the screw center, Fig. 7, is made out of a wood screw with head re-

moved, while the face-plate, Figs. 8 and 9, is made of another piece of  $\frac{1}{2}$ -in. shafting fastened in a round disc of wood. A  $\frac{1}{2}$ -in. bolt with head removed makes the arbor. The spindle bearings are held in separate wooden boxes fastened in head standards and are babbitted, which allows adjustment of bearings without loosening standards.

The tail screw is made of a  $\frac{5}{8}$ -in. bolt screwed in its own nut which is countersunk in the face of tail block and is held from turning by an eye bolt, with hand nut. A piece of rat-tail file ground to a point is inserted in a hole drilled in the tail screw.

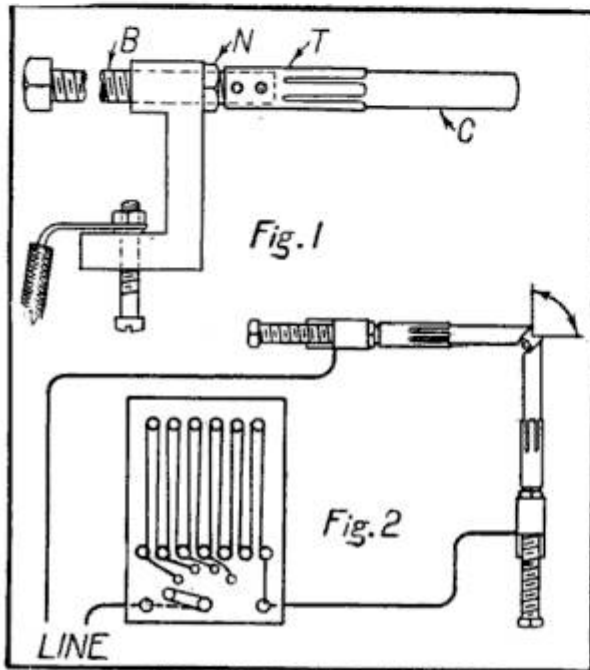
The lugs were removed from mower wheels by striking them on the side with a hammer and dressing down with



a file and cold chisel.—Contributed by Frank W. Rumsey, New London, O.

### Home-Made Arc Lamp for Blueprinting

An arc lamp that will save time and trouble for those having large quantities of blueprinting or photographic work may be built as follows:



Blueprint Arc Lamp

In a plaster mold, cast two lead uprights as per sketch. If you want a fancy job make them of brass. Drill and tap the shoulder for a  $\frac{3}{8}$ -in. bolt and the base for a 10-24 machine screw. Thread two  $\frac{3}{8}$ -in. bolts 4 in. long up to the head (B, Fig 1), pass on a lock nut, N, and then screw one through each of the uprights. Bush the ends of the bolts to fit tightly inside of a piece of thin wall brass tube 2 in. long by  $\frac{1}{2}$  in. inside diameter, the other end of the tube being double slotted (T, Fig. 1). Two pieces of  $\frac{1}{2}$ -in. carbon, such as is used for trimming ordinary arc lamps, should be forced into the tube, the slotted ends gripping them firmly (C, Fig. 1).

The two uprights should then be mounted on a board, over which has been pasted a piece of asbestos  $\frac{1}{8}$  in. thick, at right angles, so that when

the bolts are screwed clear back the carbons will be about  $\frac{1}{2}$  in. apart.

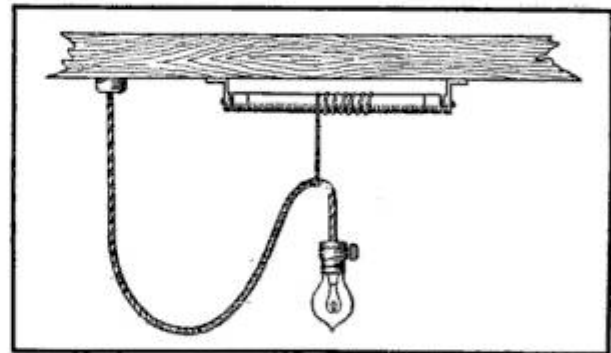
As the lamp will probably have to operate on a 110-volt circuit it will be necessary to have some sort of a resistance to hold down the current to the required 50 volts at the arc and 5 amperes also for regulation.

For this resistance we will need about 100 ft. of bare German silver wire No. 18 which may be wound on porcelain insulators on the face of a board which has been lined with asbestos. A 4-point switch should be connected in to cut out the required resistance for regulation. Small prints from linen tracings may be done in from 8 to 15 seconds, while those from co-ordinate paper will take from 40 to 80 seconds. With this piece of apparatus you can do as good work as can be done with a lamp that would cost in the open market from \$10 to \$25.

With suitable lenses this lamp may also be used in connection with a stereopticon.—Contributed by A. D.

### Adjustable Drop Light

Cut a spring shade roller to any convenient length for attaching, by the usual sockets at each end, to rafters or other supports over the spot where you wish an electric light to be suspended. Attach a cord to the roller



Adjustable Drop Light

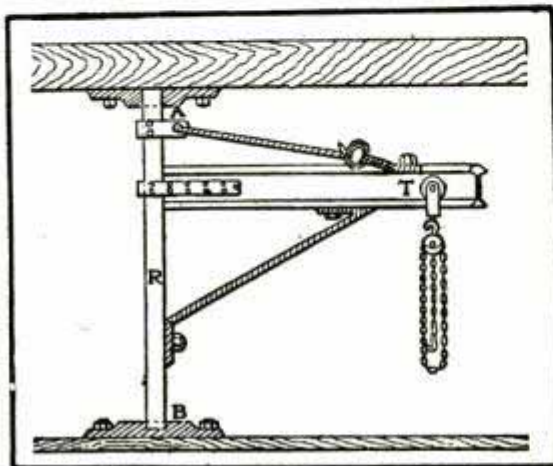
and wind it so as to coil the spring when it is pulled down, just as a shade would do. Tie the other end of the cord to the insulated wire of your electric light. Of course, the latter can



now be made to hang at any desired elevation.—Contributed by Joseph M. Campbell, Altoona, Pa.

**Home-Made Jib Crane**

A small jib crane can be made out of material gathered up around the scrap heap. The standard, R, as



Home-Made Jib Crane

shown in sketch, may be cut from an old piece of 3-in. shafting, says American Machinist, while bearings for top and bottom ends, A and B, may be made from reinforced blank-pipe flanges. Suitable grooves should be cut around bottom of the shaft for lubrication. A one-ton chain block hung on trolley, T, travels on the I-beam. It can be made to cover a circle 20 ft. in diameter.

**How to Make a Portable Table**

A table for outdoor use that can be taken apart, stored or changed from place to place may be made at small expense. Fasten cleats with screws, as shown in Fig. 1, to the bottom of a board of suitable size. The legs are built with a cross-piece, A, Fig. 4, at the top which fits into slot formed by the cleats, CC, and a cross-piece, B, that has two cleats, D, making a place to receive the bot-

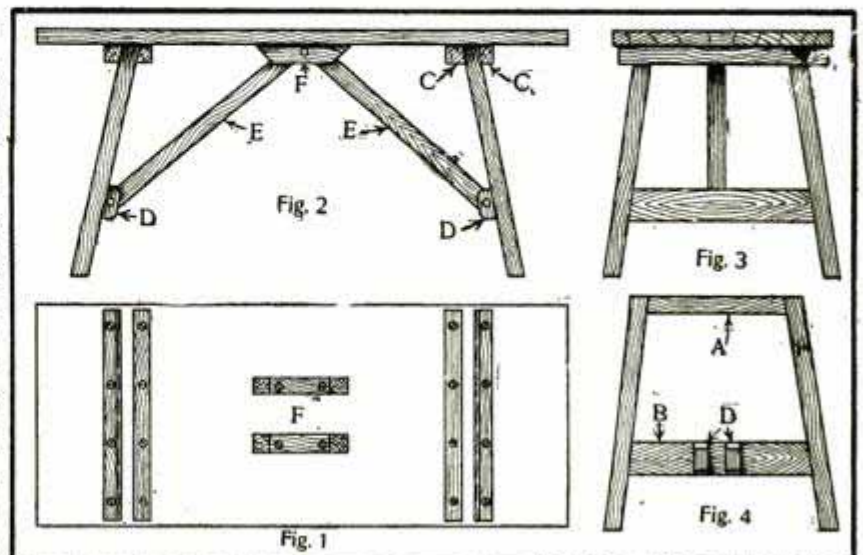
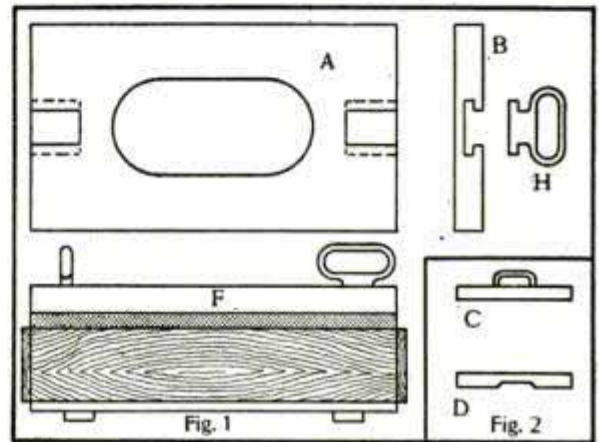


Table for Outdoor Use

tom end of the brace, E, Fig. 2. The upper ends of the braces, EE, fit in between two pieces, F, fastened in the middle of the board. The three pins fitted loosely in DD and F, Fig. 2, is all that holds table together. The end view is shown in Fig. 3.—Contributed by F. B. Ewing, Santa Clara, Cal.

**Snap Flask Weights**

After using weights as shown in end views, Fig. 2, for snap flasks, I devised ones as shown in Fig. 1. Weight



Snap Flask Weights with Removable Handles

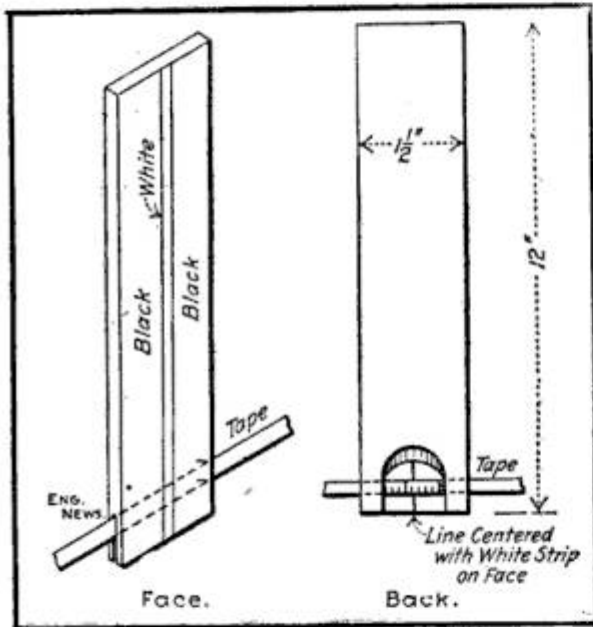
C, Fig. 2, is cast with a wrought-iron handle in it, which makes it very inconvenient for stacking. The cut-out for the fingers in weight D, Fig. 2, brings the hand in contact with the hot gases. In Fig 1, A shows top plan and B end view of the flask weight I constructed. The handle H is removable and allows weights to stack well



when not in use, and also remains cool for the hands. A flask is shown at F with the weight in use.—Contributed by C. R. McGahey.

### Device for Long-Distance Tape Reading

A little device used for the purpose of taking ordinates is illustrated in the accompanying sketch. The device fits over the tape and slides along it, and when properly set is clamped by the thumb and the distance read, says Engineering News. This device enables one to take right-angle ordinates from



"Fits Over Tape and Slides Along It"

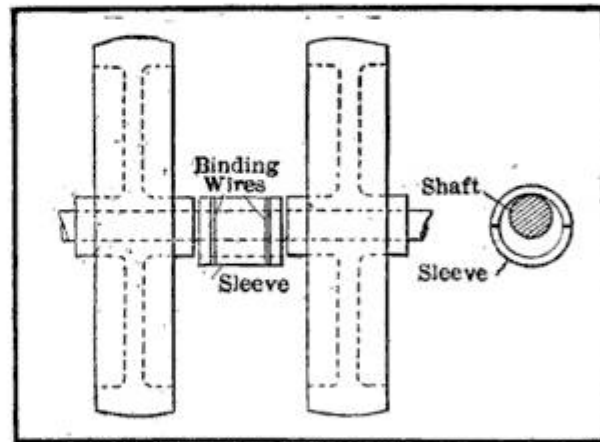
the transit line at a distance of five or six hundred feet with great accuracy and convenience.

### Pointer for Turning Tapers on a Lathe

A point which should be remembered but is often neglected is that in turning tapers of any kind on a lathe be sure to have the cutting edge of the tool exactly the same height as your centers. If you don't the taper will vary with each cut, no matter whether you are using a taper attachment or a set-over tail stock. The variation may be slight, but on fine work it tells.—Contributed by E. V.

### Saves Belt Wear

It is poor policy to let an idle belt hang loose on a revolving shaft. Of course, in time there will be an appre-

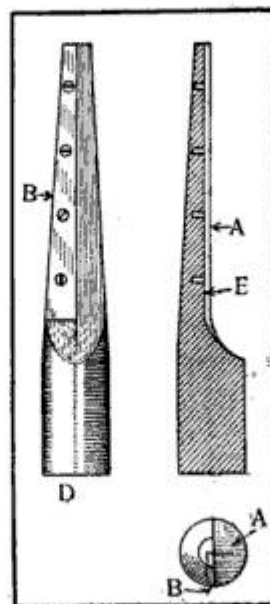


To Save Belt Wear

ciable wearing away. Better take two wood bushings a little larger than the shaft and bind them on with soft wire at the place where the belt will rest when idle. The cut, by courtesy of the American Machinist, shows this device very plainly.

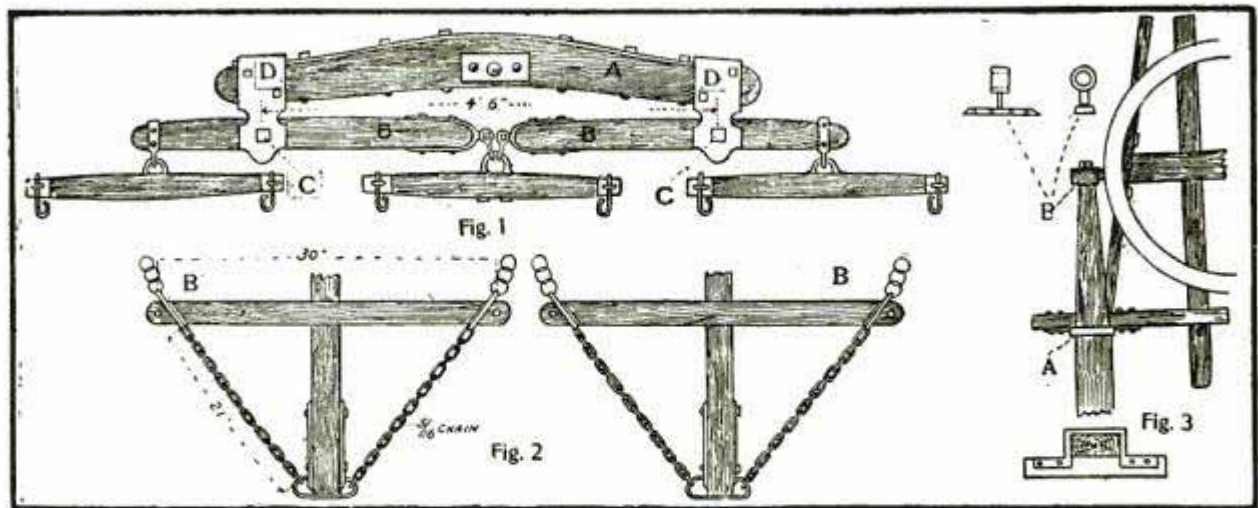
### Handy Taper Reamer for Roughing out Holes

A first-class reamer for roughing out all kinds of tapered holes for valves and pet cocks is made as shown in drawing. The shank and cutter holder, D, is turned from tool steel to within 1-32 in. of the size wanted, then milled as shown at A. A second cut is taken on the milling machine as shown at E, leaving a recess to take the cutter blade, B. The screw holes in blade should be a little large to allow adjustment for wear,



which can be taken up with strips of paper inserted behind it. The holder and blade must be hardened and ground to size.





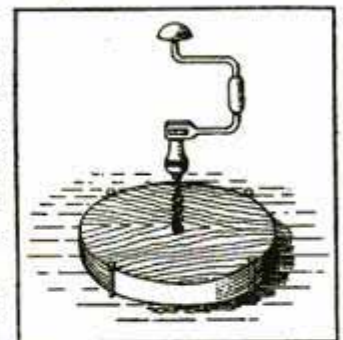
## How to Make a Three-Horse Evener

A good way to make a three-horse evener to be used on a truck wagon for heavy work is shown in Fig. 1. The doubletree, A, is made like any other doubletree for a two-horse wagon, except that it is longer, and, of course, somewhat heavier, being 4 ft. 6 in. long. The eveners, B B, are 33 in. long, and divided so that two-thirds of their lengths are inside the drawpins, C C. The two cleavices, shown at D D, are made of  $4\frac{1}{2}$  by  $\frac{5}{16}$ -in. iron, and, to give to them a neat appearance, the top side is cut out with a gouge and rounded at the points as shown, says The American Blacksmith. A heavy plate 2 by  $\frac{5}{16}$ -in. is fitted and bolted to the back of the doubletree, and a hook is to be turned up on each end to keep the cleavices in place. These eveners could not be used with one pole only in the center, because the middle horse is placed in front of the center of the wagon, and for that reason two poles are used. Three-horse trucks are sometimes built with a double set of hounds, but any two-horse truck can readily be converted into a three-horse truck and still be available for two horses by simply changing the doubletree and pole. In Fig. 3 is shown the attachment and the way they are put on. A socket, A, is bolted to the splinter bar and made to fit the pole. Another socket, B, for the back end of the pole is bolted to the side hound as shown. No neckyoke is used, the pole-chains

answering the purpose of holdbacks, the two inside pole-chains shown at A, Fig. 2, being attached to the middle horse. To prevent the chains from pulling the horses together a spreader bar is made, 30 in. long. This is cut down at the ends to fit the long links of the chain at B, Fig. 2. A pin is inserted in the hole outside of this link as shown.

## Boring Hole Through Wheel

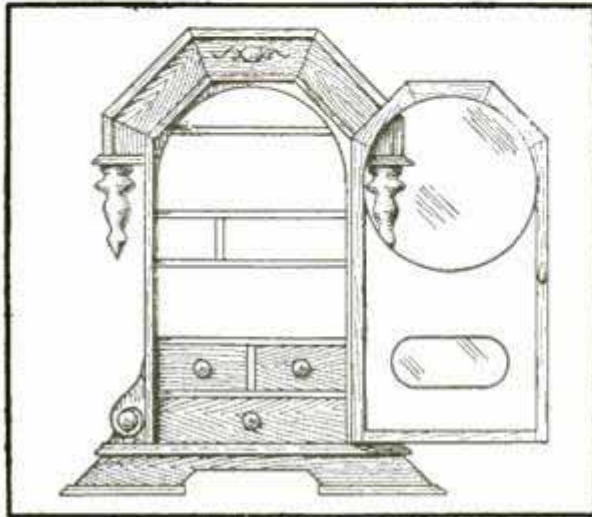
Many times when boring a hole for the shaft of a wood pulley or when filling the old hub and reboring, if a lathe is not at hand, a brace and bit has to be resorted to and the hole bored is quite likely to be anything but square and straight, lay the wheel flat on the floor and drive about it three or four spikes so that it may be turned. Place your bit in center found by compasses or square and begin boring, holding brace as you think about straight above the wheel. While you are boring let another person be continually turning the wheel. Bore half way through, turn the wheel over and finish the hole in the same manner, and when finished the hole will be true with wheel.





### Home-Made Medicine Cabinet

A cabinet for medicine can easily be made by using an old clock. After removing the works, shelving may be placed in it suitable for bottles and a drawer or two may be added for

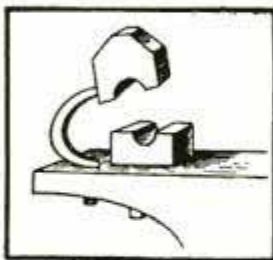


Medicine Cabinet

smaller articles. The one shown in sketch is the way I arranged the drawers and shelves. It answers the purpose of one that would cost several dollars.—Contributed by G. C. Murphy, Owensboro, Ky.

### A Simple Anvil Shears

I have never seen any tool as handy as this one, says A. S. Primmer in American Blacksmith. I learned its use in a railroad shop. It is a pair of shears for use on the anvil. It is made of steel and is forked to fit the size of stock to be cut. But small



iron can be cut in a large tool. The top tool need not be so deep as the bottom. One good heavy blow with sledge of 12 or 14 lb. will cut  $\frac{3}{4}$ -in. round. It can be made with a spring or, if a helper is handy, a handle same as on a chisel or fuller is best. Be careful to temper the inside of the fork for cutting and you will have no trouble. It is tempered same as a cold cutting

chisel, but in the center of fork. Be sure to bring the two straight sides of both tools together. I have seen this shear do some very heavy work. A size for each rod is best, but you can make one do for several sizes of stock.

### To Stop Leak in Suction Gas Producer

The top plate of our gas producer is cast iron and somewhat over 4 ft. in diameter. The fire having been allowed to burn out over Sunday, to give a chance to clean out the producer, the top plate became unusually warm and then cold, so that the expansion and contraction caused it to crack. The iron was of too hard a quality, and the crack extended right across the top and opened up nearly  $\frac{1}{16}$  in. The engineer, not noticing the crack, started a new fire Monday morning, and the engine ran all right until it had sucked all the gas out of the scrubber. Then it slowed down and finally stopped, for it was sucking air through the cracked plate instead of gas from the coal. By closing the air-mixing valve on the engine we got it started again, but the supply of air through the crack was still too great.

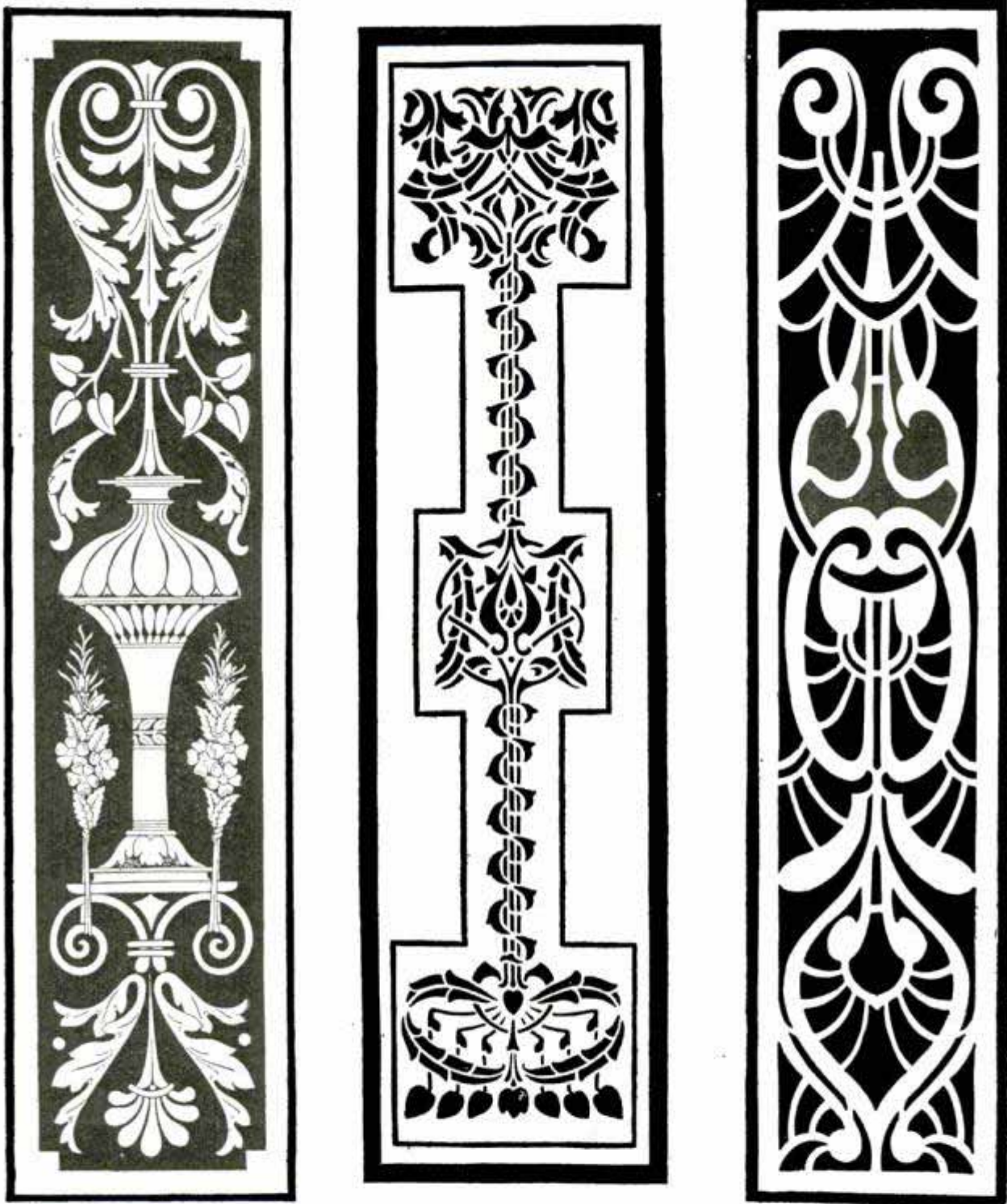
In this emergency I took some clay, used to babbitt bearings, thinned it with water, and let it drop slowly on the crack. As the suction of the engine drew the clay gradually into the fissure, the heat baked it so thoroughly that the leak was effectually stopped and everything worked as well as ever. As the crack closed it was necessary to open the air valve gradually to compensate.—Contributed by J. A. Manning, Owen Sound, Ontario.

### Tempering Color for Tools

After hardening a tool should be polished and drawn as follows:

Lathe, planer and boring tools—Light straw.  
Reamers, taps, scrapers—Dark straw.  
Drills—Brown.  
Wood bits, slitting saws, etc.—Light purple.  
Wood saws, screwdrivers—Dark purple.  
Cold chisels, punches—Blue.





DESIGNS FOR PANELS—From Decorator and Painter's Magazine, London

### Coloring Putty

Ordinary painters' colors in oil, preferably transparent colors, such as burnt and raw sienna, burnt and raw umber and lampblack, are best for coloring putty. Make the putty several shades darker than the wood, says the American Carpenter and Builder, as all wood grows darker with age.

### Noiseless Exhaust for Motor Boat

Everyone who rides in a motor boat will be indebted to the Motor Boat magazine for suggesting this method of abolishing the nuisances of the exhaust. It is simple enough—when you know how.

Run the exhaust pipe overboard at a point one-half foot above water line,



and there screw on an ordinary elbow, leaving it free to turn. Into the elbow screw solidly 4 ft. of 1½-in. pipe, and to this attach a wire or cord by which the end may be held up out of the water. Now, with a little practice, you can master the problem of a noiseless, odorless, heatless, sprayless exhaust.

With the hinged pipe drawn up out of the water, start your engine. As soon as the boat gains headway drop the pipe in, and you will be delighted to discover that your boat is actually going faster and your engine running freer, and without noise or smell.

The reason is evident. The water rushing past the open end of the pipe produces a suction which makes the exhaust more perfect, emptying the cylinder of all exploded gas after each stroke of the piston, so that the next explosion has full effect. On account of varying speed at different times a little experimenting may be necessary in order to find just the right depth to which the open pipe end should be dropped. The vacuum may be still further increased, if desired, by attaching a funnel-shaped piece to the open end.

### A Handy Balancing Device

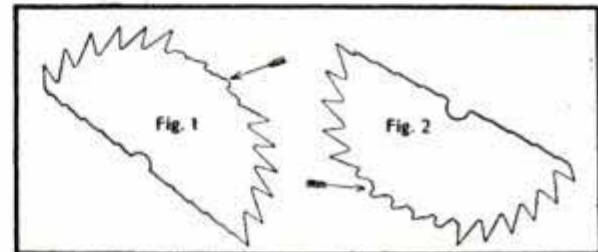
I was in a large shop which devotes itself to the manufacture of heavy transmission machinery, when I noticed a 6-ft. pulley being balanced on a mandrel which was so far from the horizontal that the eye 10 yd. distant could detect the deflection, says a correspondent of *The American Machinist*. My first thought was that some apprentice new to the job was responsible for such a state of affairs; but when I pointed it out to my friend the superintendent, who was with me, he went over and showed me that ends of the mandrel, instead of resting on parallels, were between and on little steel wheels (Fig. 1). These wheels or rollers ran on carefully ad-

justed ball bearings (see Fig. 2), giving a minimum of friction. Each set was blocked up on anything handy until the rim of the pulley cleared the floor. The castings holding the rollers were rough all over outside, and it did not appear to matter whether they were used in a perfectly vertical position or not.

I expressed my surprise at such a method, but was assured that wheels balanced in this manner were as well done as by the ordinary method.

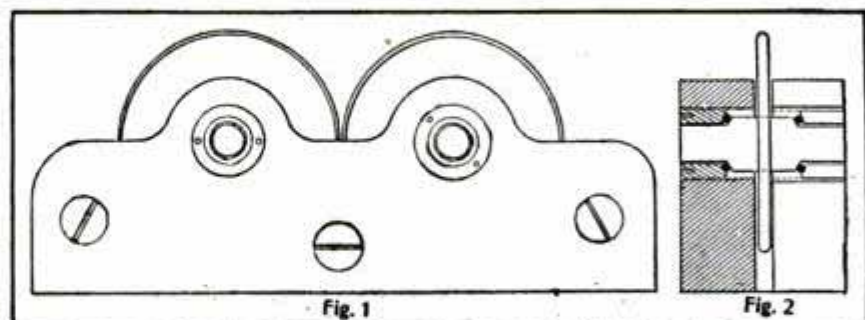
### Managing Saws with Broken Teeth

Roughly-sawn stock is frequently claimed to be caused by one or more



"Set Stubs to Same Gauge as Good Teeth"

teeth being broken out of the saw used. We find sawyers retooling saws when a few teeth are gone, because they think a saw in that condition cannot be made to do good work, says J. B. Harland in *The Woodworker*. There is really no excuse for rough sawing because a tooth or two have been broken out. Just set the stubs to the



Handy Balancing Device

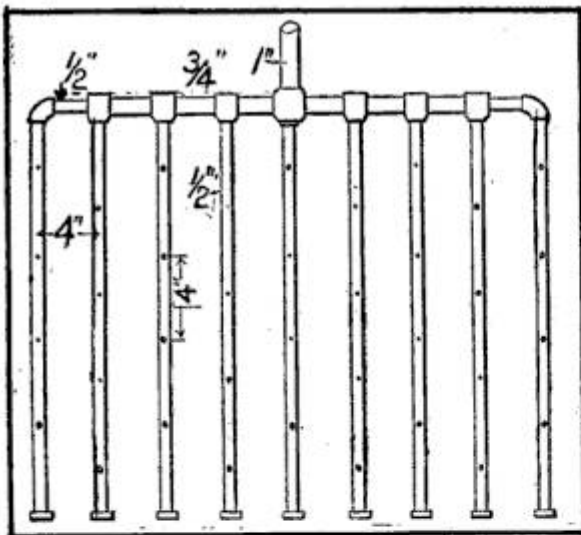
same gauge as the good teeth, and go ahead. If the stubs are too short to be spring-set, grind or file the throats until they are long enough. If the points of the teeth are swaged, bending the stubs alternately, so that they project just as far as the corners of



the swaged teeth, will be all that is necessary. The sketches show cut-off saws thus treated, but rip saws may be handled in this manner to even greater advantage. I know a barrel-heading saw which is doing smooth work notwithstanding eight teeth are broken out, five of them in direct succession, the others in different places. The theory of this treatment is that bending the stubs so that they give the rim of saw plate the same support in the cut that the rest of the plate has, prevents the teeth following the broken ones from dodging, and insures smooth sawing.

### Emergency Steam Blower when Stack Fell

A stack was blown down at a lighting station and as the plant had to be in condition to run the same night, a steam blower was made to serve the purpose.



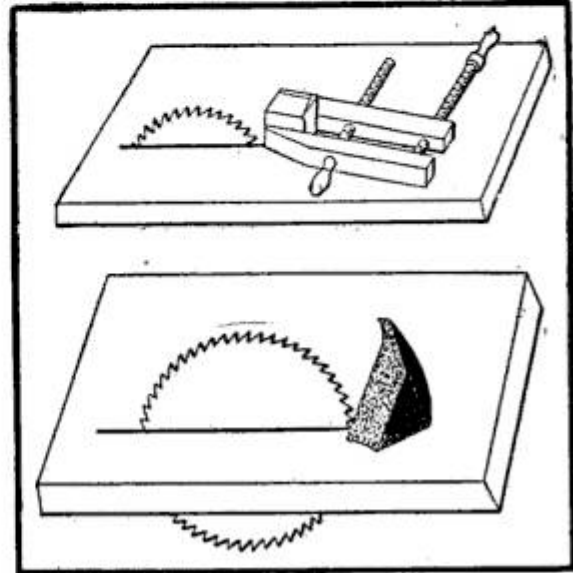
Steam Blower

A steam fitter constructed one like that shown in the accompanying sketch, the vertical pipes being  $\frac{1}{2}$  in., 4 in. apart; the holes were  $\frac{1}{8}$  in., 4 in. apart. This was applied to the boiler, says Power, and the station started up on time. This blower continued to furnish blast for the boiler for a period of six months.

It is estimated that 50,000,000 bbl. cement will be used this year.

### Jointing a Saw

A good method of jointing a saw, particularly a large one, is shown by Fig. 1, in which a piece of emery wheel is shown standing on the saw table. To use the stone grasp it firmly with both hands, and tip the top edge toward



Jointing a Saw

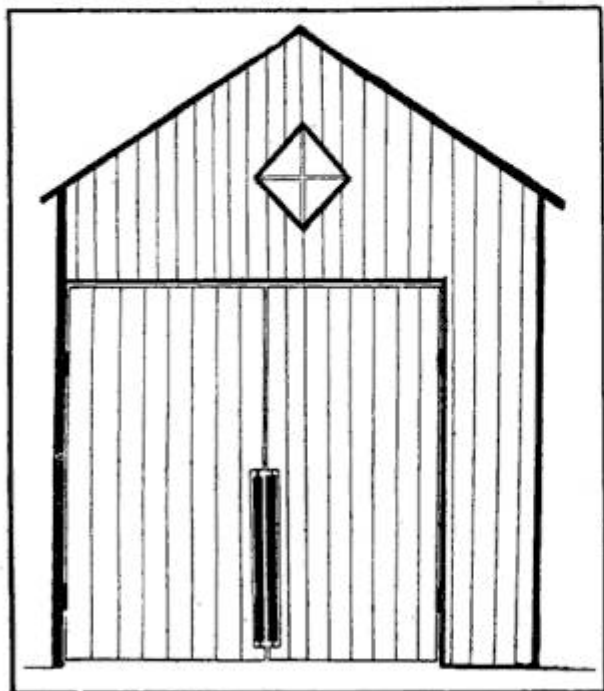
the saw until the stone barely touches the teeth. Watch very closely when the fire begins to fly, for that is the guide to go by when rounding or jointing saws, says Wood Craft. There is no danger of cutting too much off the teeth of the saw, when the sparks are watched closely, for the jointing should be stopped the instant all the teeth are brought to an even length, and when the fire flies from all the teeth they must be all the same diameter and the emery should be removed.

When the fragment of emery wheel is very small, it is not a very desirable operation to hold it in the hand and press it against the fast running saw. In this case, catch the bit of stone in a pair of hand-clamps, square up the stone so it will stand square with the clamps and when they are laid on the saw table the stone must necessarily stand "square with the world." With the clamps, the stone can be fed against the saw in a manner perfectly under control and the method is preferable to the first method of holding the stone in the fingers..



### Swinging Doors for Boat-House

Owners of motor-boats will appreciate boathouses supplied with swinging



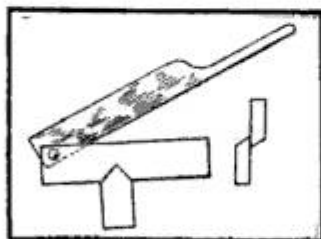
Swinging Doors for Boat-House

doors, as shown in sketch. The doors are each fitted with spring hinges and a set of rollers arranged vertically on the edge where they swing together. On entering or leaving the house simply steer the boat between the rollers and pass in or out without hindrance, says *The Motor Boat*, the rollers rolling easily along the gunwale. The rollers may be of plain wood but can be covered with felt or rubber, if desired.

### Handy Shear for Light Metal

A good home-made shear for light metal is described in the *American Blacksmith*:

It will cut hot metal  $\frac{1}{4}$  in. thick and  $\frac{1}{2}$  in. wide. To make it, take a piece of stock 2 in. by  $\frac{1}{2}$  in.



and steel its edge with a strip of old rasp. Then weld on shank to fit in hardie-hole of anvil. Now make the lever of same stock, weld on handle of 1-in. or  $\frac{7}{8}$ -in. round and drill  $\frac{5}{8}$ -in. hole in end. Then temper.

### Antique Finish on Copper or Brass

Every one who is at all observing has seen and admired the various articles finished in antique copper or brass that are in nearly every office and store. It is one of the prettiest as well as the cheapest finishes known to the metal worker, and is used on hinges, gas-fixtures, transom lifters, trays, and the thousand and one articles in the hardware line. This finish is also known as "oxidized" work and is produced on both copper and brass in exactly the same way.

Suppose you have a small piece of copper that you wish to finish in this way. First mix a strong solution of potash or lye, using about two tablespoonfuls to a quart of hot water.

Then put 5 cents' worth of sulphuret of potash into two quarts of hot water. Also have a bucket of clean hot water handy.

Now take the piece of copper and fasten a short piece of wire to it for a handle, and dip it into the lye, working it up and down to remove all grease and dirt. Then rinse in the bucket of hot water and dip into the sulphuret solution till it is a good, sharp black (brass is a grayish black). Then again rinse in the hot water and hang up to dry. When thoroughly dry, buff all over lightly on a soft cloth buffing wheel, and then buff through to the copper in spots. A little practice will enable one to buff a piece so that it will look as well as if done by an expert.—Contributed by E. V., Menomonic, Wisc.

### Brazing Cast Iron

To braze cast iron take 1 lb. boracic acid, 4 oz. pulverized chlorate of potash, 3 oz. carbonate of iron, 2 lb. fine brass spelter. Mix well. Heat casting to a brazing heat before applying. Then lay on liberally and work it along the break with an iron rod flattened on the end. Use a gas, gasoline or coke fire, but do not use coal.



### How to Determine Speed of a Machine

A very simple way of getting at the speed of any machine you are about to start, and which has an intermediate or countershaft, is to draw a perpendicular line and put the speed of line-shaft and all sizes of the drivers on the left-hand side of the line, says Dominion Mechanical News. Then put all the sizes of the driven pulleys, with X for the required speed, on the other side of the line. Thus: take the speed of a line-shaft at 300 which has a pulley 20 in. in diameter, driving tight and loose pulleys on a countershaft which is 10 in. in diameter. This countershaft has a pulley 18 in. in diameter, driving a cutter head whose pulley is 3 in. in diameter. What is the speed of the cutter-head? By putting the figures representing the driving speed and all the drivers on one side, and all the driven on the other, and working by cancellation, we find that the required speed of the cutter-head is 3,600, thus:

$$\frac{300 \times 20 \times 18}{10 \times 3 \times X} = 3,600$$

This same rule is equally handy for the determination of the size of any drivers or driven pulley driving or driven speed. It is a simple and direct method, and it is accurate and quickly learned. It beats guessing all to pieces.

### Packing Pump Piston Rod

I have used a piece of new leather shoe lace for packing a pump piston rod, with excellent results, and for pumping cool water it is hard to beat.—A. L. White, Cresco, Iowa.

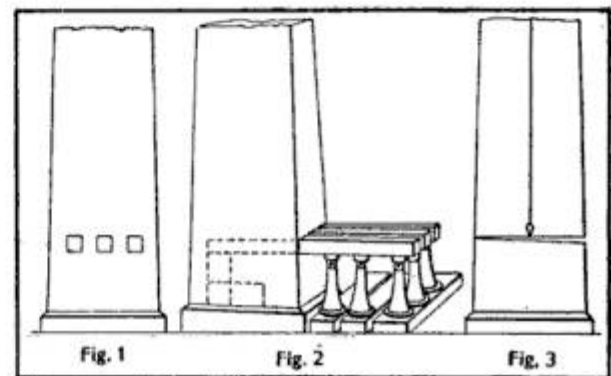
A mixture of 4 oz. benzol, 3 oz. fusel oil and 1 oz. of alcohol will remove varnish, paint, tar or lacquer from any varnished or painted surface in less than ten minutes, or restore a hard paint-brush after an hour of soaking in the mixture.

### Straightening a Brick Stack

A certain brick stack 75 ft. high, 8 ft. square at the base and 4 ft. 6 in. square at the top, was straightened by the method as described in sketch. The stack was 3 ft. out of plumb and looked as if it were going to fall, says a correspondent of Engineers' Review.

Two good brickmasons and several helpers were secured and the job was completed in just 10 hours.

First, they cut three holes through the north side about 4 ft. above the ground, as in Fig. 1. Through these holes they put three timbers, 16 by 16 in., about 15 ft. long. Back close to



Straightening a Chimney

the inside of the south wall the timbers were blocked up so they were about level while resting on the jack screws on the other end, as shown in Fig. 2. Under each timber was placed three jacks resting on suitable blocking. He then nailed a block on the east side of the stack about 30 ft. from the ground and in line with the center of that side; from this block a plumb bob was suspended as shown in Fig. 3. The stack was out of plumb 18 in. in the 30 ft.

The jacks were then screwed up until there was a good strain on them, while the masons took thin chisels and drove them between the bricks even with the top of the timbers, on the northeast and west sides, while the helpers kept the jacks going up slowly.

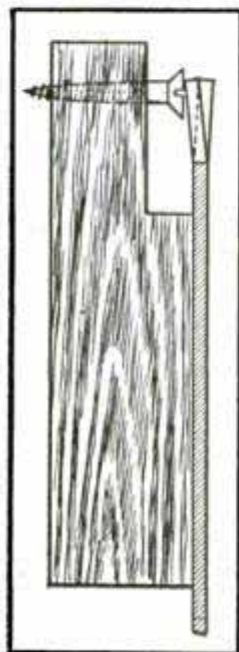
In a short time the bricks began to open, and the opening followed the course as straight as if the stack had been cut into with a saw. The opening on the north side was large enough to



insert an extra course of brick with ease (see Fig. 3). The brick was then laid between the timbers and on the east and west sides the timbers were removed, the holes bricked up and the job was completed and has never given any trouble since.

### Saw Gauge

A very useful gauge for measuring the set of saw teeth is shown in the accompanying sketch. It consists of a

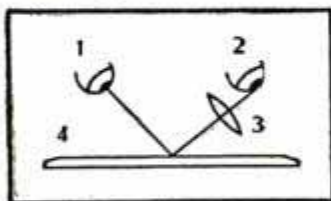


small strip of hard wood with one corner cut away as shown, and a small wood screw. The screw may be adjusted by means of a screw-driver until the head just touches the edge of the tooth as shown. Then by keeping the edge of the wood against the side of the saw and moving the screw from one tooth to another the teeth that are not set properly can be quickly

found.—Contributed by M. J. F., Philadelphia, Pa.

### To Examine Own Eye

The accompanying cut shows how a magnifying glass and mirror may be used by one's self to locate emery or



similar substance that may be lodged in the eye.

Beside magnifying the object, the lens, 3, shuts off the vision of the affected eye and enables one to see it plainly at a convenient angle with the unaffected eye.

Explanation of figures in illustration: 1 is unaffected eye; 2, affected eye; 3, lens; 4, mirror. A small reading glass will answer nicely for the

lens.—Contributed by Frank Setton, San Jose, Cal.

### Home-Made Wheel Bench

The wheel bench is so well illustrated as to need little or no explanation, says American Blacksmith. The rod is adjustable, as shown at A. The rod which supports the spoke is also adjustable for the regulation of the dish. The rod B is fastened at the bottom end to a lever, C, which is operated by the foot. This lever is hinged at the side of the bench, opposite the operator.



Serviceable Wheel Bench

The clip tongs are fashioned from an old buggy top prop iron. In selecting the material for this tool, be sure to have plenty of stock on each arm of the joint.

The other tool is for pulling broken tenons out of hubs. It consists of a lag screw, the head of which is replaced by a piece of  $\frac{1}{8}$ -in. round stock, sufficient to make the entire tool about 18 in. long. To enable the operator to get a good hold on the tool after screwing it into the broken tenon, the handle end is bent, as shown in the engraving.

One way to impart a deep blue to polished steel is to place it in sand and heat until the color is obtained. Or, paint it with blue lacquer, which is more usual.



### How to Grain Pitch Pine

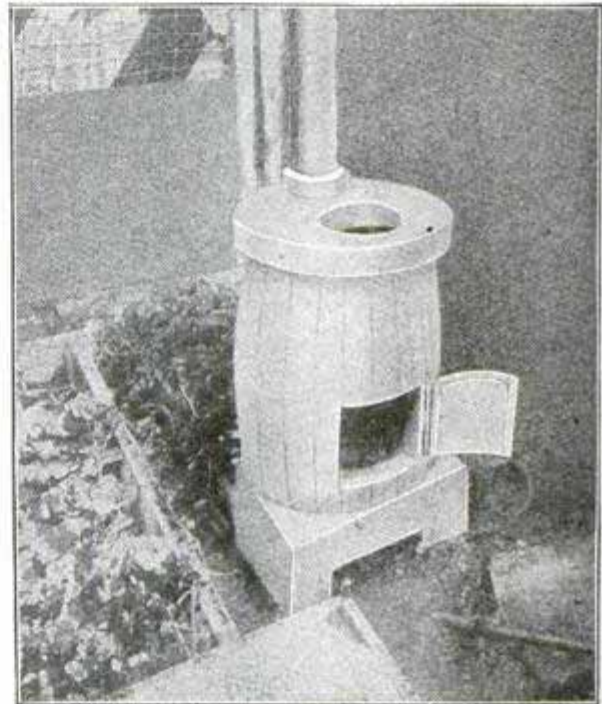
To prepare the ground color for pitch pine it is best to work off a light oak ground color, made by mixing white lead and chrome yellow with a little burnt sienna and patent driers and equal parts of turpentine and oil. The graining is done best and easiest in oil color, which should be mixed the same as for oak, but in place of the umber a little burnt sienna or Venetian red should be employed. The color should be used thin, with equal parts of boiled oil or turpentine, a little patent drier being added, as well as a little megilp. These ingredients should all be thoroughly mixed together in the can, says The Decorator. It may be mentioned here that the megilp is made from the best beeswax melted down in turpentine with a little boiled oil.

Having the graining color ready, prepare a similar color, but quite stiff, and place it on a palette board; then commence by forming the heart of the wood and taking a small flat sable hair fitch, dip it first into the thin graining color in the can and then in the stiff color on the palette. Now, with the fitch full of color, work out the heart from the center of the panel upright in curls and twists. With the same fitch the fine parts of the heart can be worked out, and by holding the fitch on the flat side one can get the broad parts of the curl. The center of the heart must be kept open, but farther apart from each other and darker in color. Then work the veins out finer to each side of the panel, with a lighter shade of color, and with a badger hair softening brush very lightly soften the upright lines, being particularly careful not to let the veins run into each other.

For the stiles or rails of a door, etc., use a 2½-in. thin oak overgrainer. Dip into the thin graining color and pass the hairs through a dividing comb, so as to keep them straight and open. Commence at the top and draw the overgrainer down to the bottom of the stile, then soften the work with a badger very lightly up and down.

### How to Make a Concrete Stove

A cement residence in which the building, roof, chimney, porch, and a good portion of the interior finishing was made entirely of cement, led the owner to build a cement stove with which to heat the conservatory. We do not understand that any heating advantages are claimed over an iron stove, but the novelty of the thing makes it interesting.



Reinforced Concrete Stove

The stove was made in three parts, the base, the body and the top. The base was made with concrete grate bars in an ordinary box, the top was made in a round form with a piece of sewer pipe put in for the base of the stove pipe, the hole in the top was made by setting a tin pan, bottom of which was covered with oiled paper, right in the form. The body of the stove was made by setting a small barrel inside a large one and filling the space between the two with concrete, the door being blocked out in the barrel, hinges set in while the concrete was wet. The whole stove was reinforced with "lock-woven steel fabric" at a cost of about one-sixth of what an ordinary iron stove would be.



### Economy Ice Box

Scarcely has the last coal been paid for—perhaps before that—when the ice question must be considered. Here there is usually a big leak, both figuratively and literally, for much good ice water is allowed to run to waste.

The ice question has two equally important parts—first, get the weight you pay for; second, get the full benefit of it. It is a safe estimate that half the good of a cake of ice is lost by the usual method of keeping it in the top of a refrigerator. The economical way is to get an ice-box large enough to hold 200 lb.; it costs about half the price of the ordinary 50-lb. refrigerator.

Take the wooden frame (on which the ice is to rest) out of the box and saw it across into halves. Get an ordinary spool and whittle one end to fit the outlet of the box watertight. It may be necessary to wrap a layer of thin cloth around the end of the spool to secure a tight fit. Having driven the plug in, but not so hard as to strain the metal bottom, put in half the wooden frame, and pour in cold water until it begins to run out through the hole in the spool; but the top of the frame should be out of water. If it is not, nail strips under it.

Order 100 lb. and see that you get it. Have it set on the frame, in one corner of the box, and wrap it on all sides except the bottom with a thick woolen cloth previously dipped in cold water. Now you have an arrangement which will make 100 lb. last a week in ordinary summer weather and at a cost of 35c. Furthermore, you have a splendid tank of ice-cold water all the time in which to set bottles of milk, filtered water, etc., while the food set on the shelves of the box will be almost frozen. Last, and not least, every time you open the box, your cold air will not all spill out, as it does from a refrigerator.

At least once a week the plug should be pulled and the box given a thorough scrubbing with hot water, and left open for a half-hour. Leave the

half-frame out to dry and use the second half. In really hot weather the box should be covered on top, back and sides with a heavy woolen blanket, held in place by a few tacks. If the box cover is too heavy for lifting, part of the weight may be carried by a rope attached to the front edge and passed over a pulley to a small weight.—Contributed by Dr. C., Chicago.

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### For Burns

A good practice in foundries, where burns are frequent, is to put on thick soap suds. It beats all the patent compounds ever gotten up, and besides soap is obtainable anywhere at any time. The lather keeps out the air and draws out the inflammation. After a few minutes the burn, if a bad one, may be wrapped up, but if just an ordinary burn, an occasional application of lather is all that is needed.

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### Soap and Alum Waterproof Cement

The cement reservoir of the new water system at Uxbridge, Mass., which leaked water at the rate of 25,000 gal. a day, when tested, has been treated with an inside coat of a composition of soap and alum. The composition is made by heating soap, alum and water in a kettle until the mixture is the thickness of a paste, says Cement Age. It is believed that this will fill the pores in the cement and prevent the water from leaking through. This process has long been known to engineers, and, in spite of the theory of some that it will not last, has given entire satisfaction on more than one occasion.

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### A Hard Drill

If you have a job that requires an unusually hard drill, heat the drill to a nice cherry red and dip about a quarter of an inch of the end in common soldering acid (muriate of zinc).—Contributed by E. Viall.





# Amateur Mechanics



## How to Make "Freak" Photographs

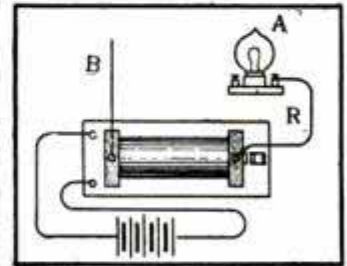
The "freak" pictures of well-known people which were used by the leading dailies recently made everybody wonder how the distorted photographs were made. A writer in *Camera Craft* gives the secret, which proves to be easy of execution. The distortion is accomplished by the use of prisms, as follows: Secure from an optician or leaded glass establishment, two glass prisms, slightly wider than the lens mount. The flatter they are the less they will distort; about  $20^\circ$  is a satisfactory angle. Secure them as shown by sectional sketch, using straw board and black paper. Then make a ring to fit over the lens mount and connect it with the prisms in such a way as to exclude all light from the camera except that which passes through the face of the prisms. The inner surface of this hood must be dull black. The paper which comes around plates answers nicely. If the ring which slips over the lens mount is lined with black velvet, it will exclude all light and hold firmly to the mount.



Place over lens, stop down well after focusing, and proceed as for any picture.

## Electric Blue Light Experiment

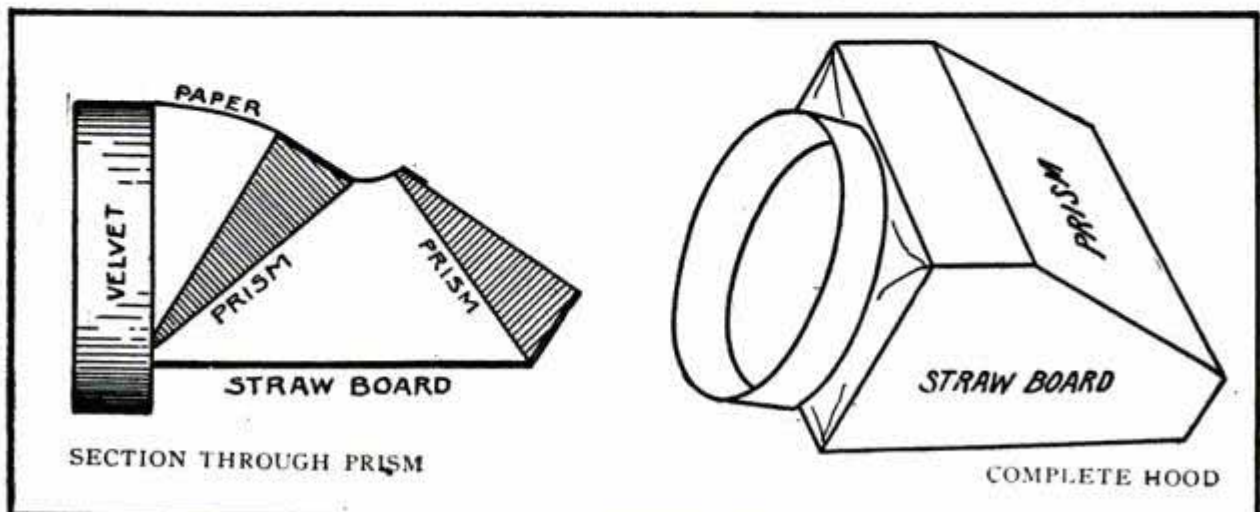
Take a jump-spark coil and connect it up with a battery and start the vibrator. Then take one outlet wire, R, and connect to one side of a 2-cp. electric lamp and the other outlet wire, B, hold in one hand and press all fingers of the other hand on globe at point A. A bright, blue light will come from the wires in the lamp to the surface of the globe where the fingers touch. No shock will be perceptible.—Contributed by J. H. Spade, 203 E. 1st Ave., Altoona, Pa.



## How to Make a Music Cabinet

A neat music cabinet can be made as shown in the accompanying sketch:

Each side, AA, Fig. 1, is cut from a board about 36 in. in length and 16 in. wide. Both are alike and can be cut from same pattern. As the front legs curve out a little the main body of the boards, AA, should be 15 in. wide. The back, B, should be about 22 in. long by 16 in. wide and set in between sides AA. Cut the top, C, 16 in. long and  $14\frac{1}{2}$  in.

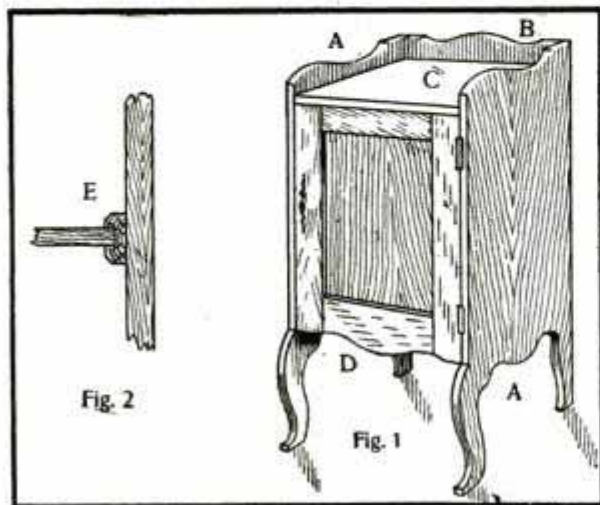


"The Distortion Is Accomplished by the Use of Prisms"



wide. The bottom must be the same length as the top and  $13\frac{1}{2}$  in. wide.

The door, D, can be made panel as shown, or a single piece, 16 in. wide and



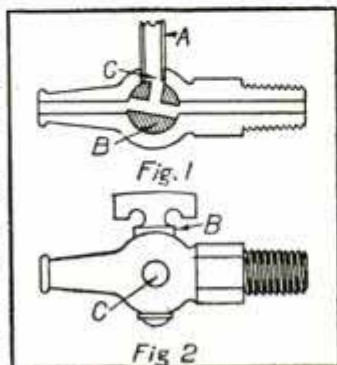
How to Make a Music Cabinet

about 20 in. long. All material used to be made from boards that will dress to  $\frac{3}{4}$  in. thick.

Shelving may be put in as shown in Fig. 2 and made from  $\frac{1}{4}$  in. material. Make 12 cleats, E,  $13\frac{1}{2}$  in. long, from a strip of wood  $\frac{1}{2}$  by  $\frac{3}{4}$  in. with a groove  $\frac{1}{4}$  by  $\frac{1}{4}$  in. cut in them. Fasten 6 cleats evenly spaced on the inside of each, A and A, with  $\frac{3}{4}$ -in. brads. This will give seven spaces for music and as the shelves are removable two places can be made into one.

### How to Make a Three-Way Cock for Small Model Work

In making models of machines it is often necessary to contrive some method for a 3 or 4-way valve or cock. To make one, secure a pet cock and drill and tap hole through, as shown in the cut. If for 3-way, drill in only to the opening already through, but if for a 4-way, drill through the entire case and valve. Be sure to have valve B turned so as

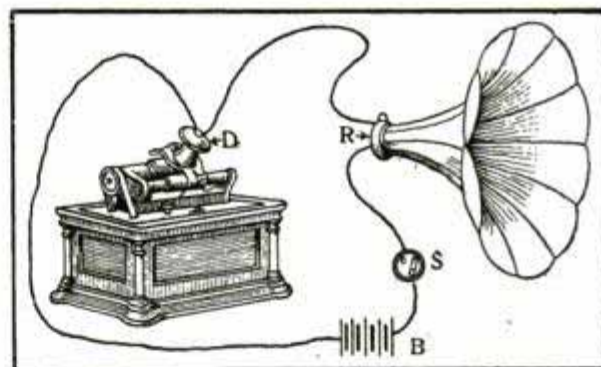


to drill at right angles to the opening through it. After drilling, remove the valve and remove the bur with a piece of emery paper and replace ready for work.

### How to Transmit Phonograph Music to a Distance

An interesting experiment, and one calculated to mystify any one not in the secret, is to transmit the music or speech from a phonograph to another part of the house or even a greater distance. For an outdoor summer party the music can be made to come from a bush, or tree, or from a bed of flowers. The apparatus is not difficult to construct.

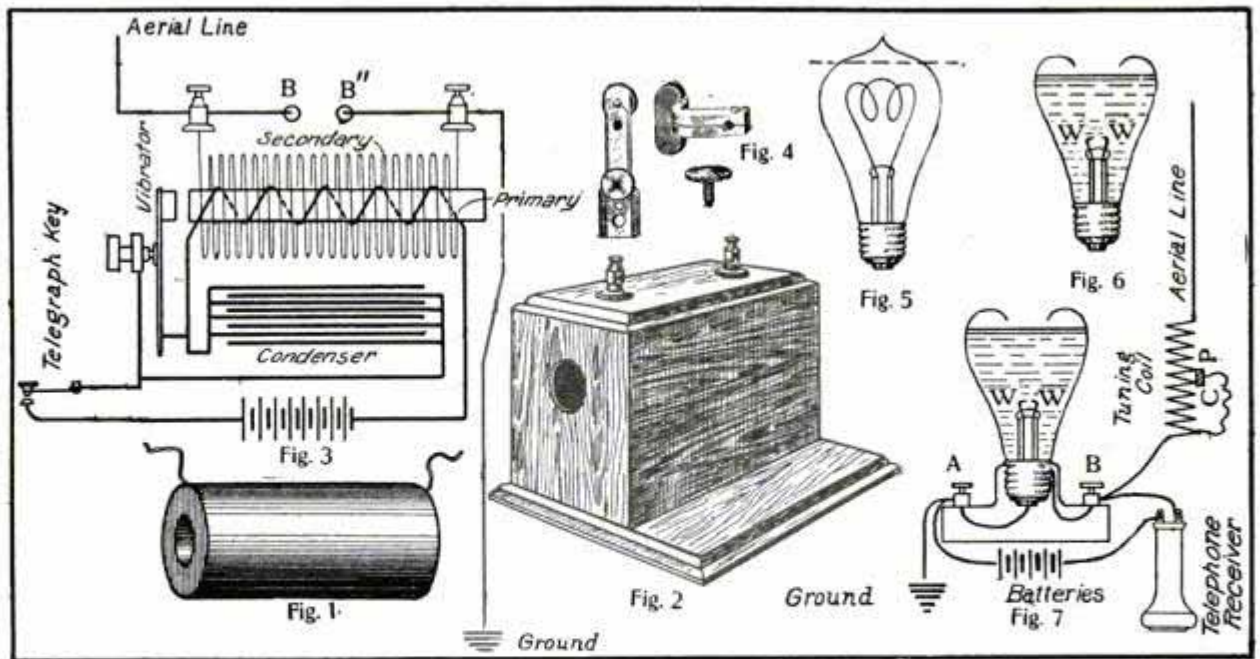
The cut shows the arrangement. Pro-



cure a long distance telephone transmitter, D, including the mouthpiece, and fasten it to the reproducer of the phonograph. Also a watch case receiver, R, which fasten to the horn. These parts can be purchased from any electrical supply house. Connect two wires to the transmitter, running one direct to the receiver, and the other to the battery, thence to a switch, S, and then to the receiver. The more batteries used the louder will be the sound produced by the horn, but avoid using too much battery or the receiver is apt to heat.—Contributed by Wm. J. Farley, Jr., Camden, N. J.

The Russian government is building several cars for transporting live fish which are to be planted in Western Siberia.





## How to Make An Efficient Wireless Telegraph

By George W. Richardson

A simple but very efficient wireless telegraph may be constructed at slight cost from the following description:

The sending apparatus consists of nothing but an induction coil with a telegraph key inserted in the primary circuit, i. e., the battery circuit. This apparatus can be purchased from any electrical supply house. The price of the coil depends upon its size, and upon the size depends the distance signals can be transmitted. If, however, one wishes to construct his own coil he can make and use, with slight changes, the jump spark coil described on page 672 of the June, 1907, number of *Popular Mechanics*. This coil, being a 1-in. coil, will transmit nicely up to a distance of one mile; while a 12-in. coil made on the same plan will transmit 20 miles or even more under favorable conditions.

Change the coil described, as follows: Insert an ordinary telegraph key in the battery circuit, and attach two small pieces of wire with a brass ball on each, by inserting them in the binding-posts of the coil as shown at B, B". From these two terminal wires one is grounded to earth, while the other wire is sent aloft and is called the aerial line. This constitutes all there is to the sending apparatus.

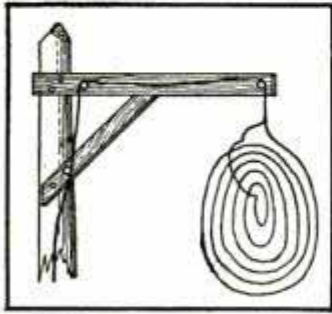
Now for the receiving apparatus. In the earlier receiving instruments a coherer was used, consisting of a glass tube about  $\frac{1}{8}$ -in. diameter, in which were two silver pistons separated by nickel and silver filings, in a partial vacuum. This receiver was difficult of adjustment and slow in transmission. An instrument much less complicated and inexpensive and which will work well can be made thus:

Take a 5-cp. incandescent lamp and break off the tip at the dotted line, as shown in Fig. 5. This can be done by giving the glass tip or point a quick blow with a file or other thin edged piece of metal. Then with a blow-torch heat the broken edges until red hot and turn the edges in as seen in Fig. 6. Remove the carbon filament in the lamp and bend the two small platinum wires so they will point at each other as in Fig. 6, W W. Screw the lamp into an ordinary wall socket which will serve as a base as in Fig. 7. Make a solution of 4 parts of water to 1 part sulphuric acid, and fill the lamp about two-thirds full (Fig. 7). This will make an excellent receiver. It will be necessary to adjust the platinum points, W W, to suit the distance the message is to be worked. For a mile or less the points



should be about  $\frac{1}{16}$  in. apart, and closer for longer distances.

The tuning coil is simply a variable choking coil, made of No. 14 insulated copper wire wound on an iron core, as shown in Fig. 7. After winding, carefully scrape the insulation from one side of the coil, in a straight line from top to bottom, the full length of the



coil, uncovering just enough to allow a good contact for the sliding piece. The tuning is done by sliding the contact piece, which is made

of light copper wire, along the convolutions of the tuning coil until you can hear the signals. The signals are heard in a telephone receiver, which is shown connected in shunt across the binding-posts of the lamp holder with one or two cells of dry battery in circuit, Fig. 7.

The aerial line, No. 6 stranded, is run from binding-post B through the choking or tuning coil, and for best results should extend up 50 ft. in the air. To work a 20-mile distance the line should be 100 or 150 ft. above the ground. A good way is to erect a wooden pole on a house or barn and carry the aerial wire to the top and out to the end of a gaff or arm.

To the end of the aerial wire fasten a bunch of endless loops made of about No. 14 magnet wire (bare or insulated), attaching both ends to the leading or aerial wire. The aerial wire should not come nearer than 1 ft. at any point to any metal which is grounded.

Run a wire from the other binding-post, A, to the ground and be sure to make a good ground connection.

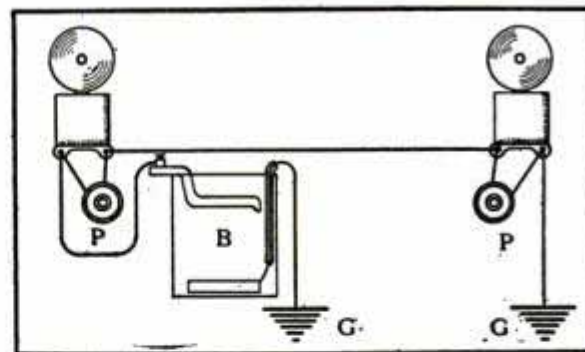
For simple experimental work on distances of a few hundred feet only, an ordinary automobile spark coil can be used in place of the more elaborate coil, Fig. 1 to 4.

The above mentioned instruments have no patents on them and any one is at liberty to build and use them. The

writer does not claim to be the originator but simply illustrates the above to show that after all wireless is very simple when it is once understood. The fundamental principles are that induction travels at right angles,  $90^\circ$  to the direction of the current. For an illustration, if a person standing on a bridge should drop a pebble into the water below, after contact he would note circles radiating out over the surface of the water. These circles, being at right angles,  $90^\circ$  to the direction of the force that caused the circles, are analogous to the flow of induction, and hence the aerial line, being vertical, transmits signals horizontally over the earth's surface.

### Return Call Bell With One Wire

To use only one wire for a return call bell connect up as shown in the diagram, using a closed circuit or gravity battery, B. The current is flowing through both bells all the time, the same as the coils of a telegraph sounder, but is not strong enough to ring both connected in series. Pressing either push



Wiring Diagram

button, P, makes a short circuit of that bell and rings the one at the other end of the line.—Contributed by Gordon T. Lane, Crafton, Pa.

The best flux for ordinary brazing is this: One cup boiling water, add one cup borax. Let dissolve. Then add two cups boracic acid and it is ready for use. You can make brass run uphill with this flux.—Contributed by E. Viall.

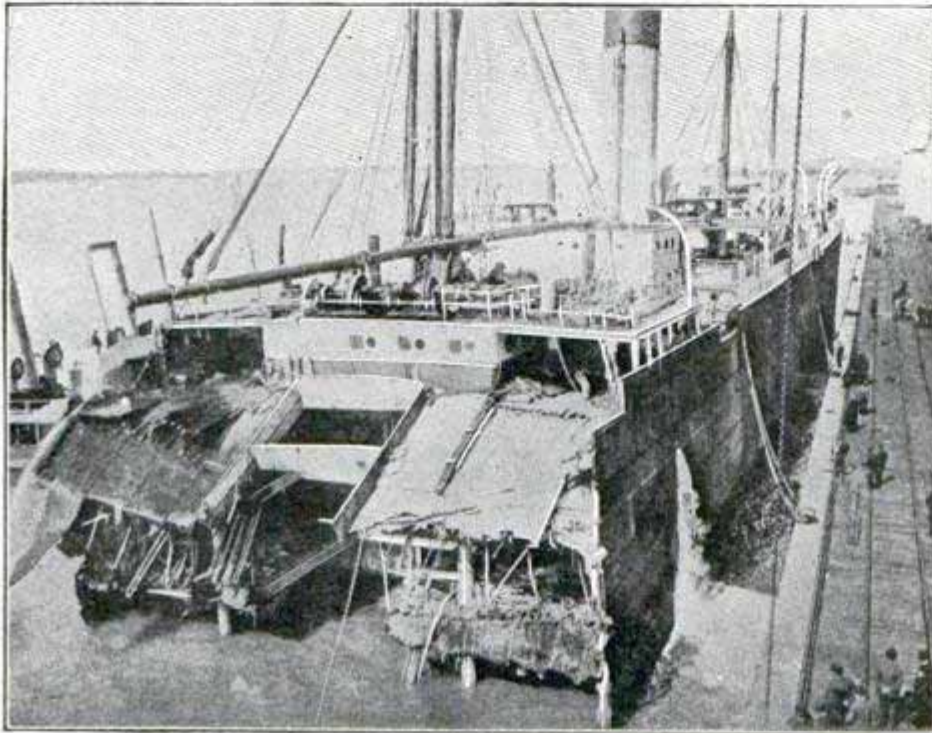


## EXTINGUISHING FIRE WITH OIL

That sounds incredible, and yet a workman on a kerosene tank in a Michigan town saved his life by leaping into the tank with his clothing all on fire. A fellow workman on a ladder above carelessly upset  $\frac{1}{2}$  gal. of gasoline right over him and the liquid instantly sat-

the repair station for reassembling. The others were destroyed on foreign lines, and it is safe to say that probably all of them could have been repaired to advantage with the present knowledge of and facilities for repairing steel cars.

## DYNAMITE BLASTS SAVE SHIP



The Recovered Section in Port

urated his clothes. At the same moment it caught fire from his lighted pipe and at once the poor fellow was a living torch. There was but one thing to do and he did it—dove into the 5 ft. of oil in the tank.

## THE LIFE OF THE STEEL CAR

It is practically impossible to damage a steel car so badly that it cannot be repaired to advantage, says the American Engineer. This may readily be seen by the data in the following section, showing that of over 23,000 all-steel cars on the Baltimore & Ohio, a large number of which have been in service for as long as eight years, only eleven have been destroyed. Three of these were destroyed on the Baltimore & Ohio, shortly after steel cars were first introduced, on account of the salvage being picked up and scrapped, instead of being diverted to

The ocean steamer "Suevic" was declared a total loss when a few months ago she went onto an English reef in a storm. The Liverpool Salvage Co., however, concluded to undertake the job of saving something. The hull was impaled on sharp rocks, which made it impossible to move it in any direction. Divers who were sent down actually stood while at work on the wrecks of two other vessels.

The "Suevic" was 550 ft. long and when it was found impossible to save all, the company undertook to raise the stern section, 370 ft. long. For days the dangerous work of cutting the ship in two by means of explosions of dynamite was continued until the larger part of the hull was entirely cut away. The illustration from the Shipping World shows the recovered section as brought into port. The hull was cut where the cold storage was located, and the pipes can be seen in the picture. The same salvage company has already dispatched an engineer to Japan to see if anything can be done toward recovering the "Dakota."

The original cost of the "Suevic" was about \$1,000,000.

Deposits of meerschaum have been found in New Mexico.



## INTERESTING FACTS ABOUT PAINT

### How the American Product Almost Caused A Revolution

A little less than half a century ago there was not a gallon of machine-made paint in the world. At that time all house paints were made in the old-fashioned way—by stirring turpentine, white lead and linseed oil together with a stick. Today the paint industry is one of the greatest in America. There are upward of 250 paint factories in the country, employing more than 50,000 people. The annual output of these factories is approximately 100,000,000 gallons.

If this annual product could be brought together it would make a "sea" of paint a little over half a mile square and ten feet deep. Volume enough to float much of the navy of the United States. In a recent discussion in Congress one member referred to the United States as the "paint pail of the world."

At present this "paint pail" needs additional stirring, and one of the greatest paint manufacturers in the country says that there is room for 10,000 more men in the industry. "We want men—men—men!" is the cry in almost every paint factory. From this "world's pail" is sent out paint to every civilized land under the sun. American paint is used in India, China, all the countries of South America, in Europe, Africa and the South Sea Islands.

Three years ago paint almost created a revolution in Costa Rica. In that little country's capital city there was a native establishment wherein paint was manufactured by the simple stirring process. Then came the first shipload of American paint. The owner of the local industry was a politician in high favor and he tried to get government action to prevent the entrance of American paint. But he lost. He was soon threatened with bankruptcy by the hustling Americans. He threatened to turn against the government unless ac-

tion was taken—and did so. Many of his constituents supported him. Paint became the great topic of conversation in the Costa Rican capital.

A carload of the American product was waylaid and dumped. The store of one of the American agents was burned and the agent was severely injured. But other shiploads of American paint came over and in the end the threatened revolution subsided.

Not long since a wrecking vessel discovered a sunken ship off the Atlantic coast. Her cargo was supposed to be practically worthless, so no effort was made to raise her. A clerk in a New York paint factory, H. C. Ridges by name, discovered that she was loaded with paint, argued that the paint, tightly inclosed in cans, would still be good and formed a little company to recover the cargo. Nearly 15,000 gallons were recovered, netting a neat profit of over \$18,000.

"Paint schools" are now quite common. The manufacture of paint has become a science, and in a large number of the big plants courses of study and practical work are given young men applicants who have an ambition to become experts. That there is a large and steadily growing field for young men with these ambitions is shown in the fact that 1,000 skillful chemists are now employed by American paint factories, and there is a crying need for more. Statistics recently made for the government show that city people paint their homes on an average of every two and a half years; farmers, every seven years. Of 10,000 rural house owners visited 4,000 still used the old-fashioned paint can and turpentine bottle, 4,600 used ready-made materials and 1,400 used no paint at all.

The little town of Fairview, Ohio, was at one time entirely painted by the women of the place. The women, after urging the men in vain to do the work,



## POPULAR MECHANICS

sent a committee to a big paint manufacturer, who was induced to donate the paint for the advertising he would get out of it. There were 127 buildings painted in the place, which included the village hall and church.

Few people know that a turpentine famine is threatening, and that if turpentine alone were used as a "thinner" in paints the product would cost the consumer several times what it does now. There are also other and better "bases" than white lead. Recently the French government passed a law prohibiting the use of white lead because it was injurious to health. Zinc white is now used largely in its place.

It is predicted that within the next ten years the paint industry of the United States will represent a capital of a billion dollars, will employ 100,000 men and will produce annually at least 300,000,000 gallons of paints and varnishes.

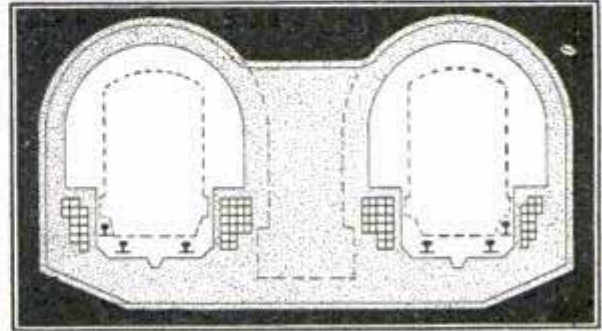
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### BIG TUNNEL AT DETROIT

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Big things are getting to be so common that few people outside of Detroit realize what a job the Michigan Central has undertaken to avoid ferrying its trains across the river to Canada. It is a double tunnel, made of steel tubes and concrete, and will cost \$10,000,000. Many dredges and 500 to 1,000 men are hard at work digging the approaches on both sides of the river, while floating dredges are scooping out two great trenches in the river bottom as a bed in which the steel tunnel tubes shall rest. These tubes are now in process of construction at St. Clair,

each  $23\frac{1}{2}$  ft. in diameter and 260 ft. long, from  $\frac{3}{8}$ -in. steel plates. When placed in position they will be joined by enormous bolts and lined with 20-in. of concrete reinforced by 1 in. longitudinal rods every 18 inches. A peculiar feature is that the inclined approach on the American side will be  $\frac{1}{2}$



Section Detroit Tunnel

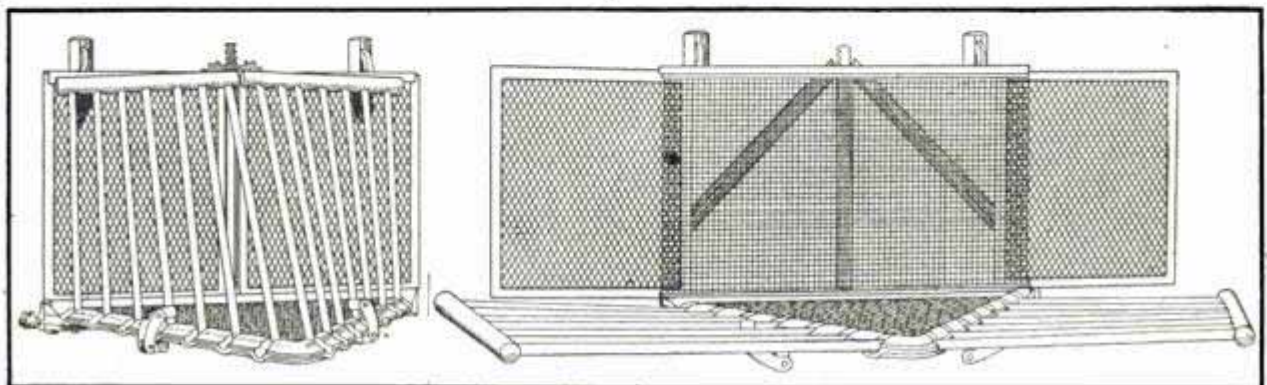
per cent. steeper than on the Canadian. That is because the heaviest freight traffic on the M. C. is eastward, the westward being largely empties. Electric locomotives will haul trains through the tunnel, which will be completed in 1909.

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### AUTOMATIC AUTO FENDER

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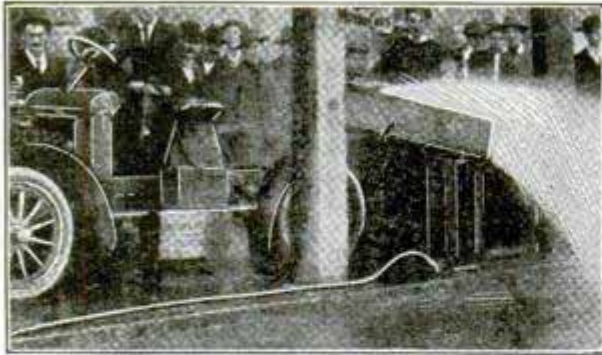
The illustration shows a new safety fender for automobiles which normally much resembles the pilot of a locomotive. A lever within easy reach of the hand or foot of the chauffeur releases a dog which causes the fender to open instantly by means of springs, and calculated to catch a person and prevent him from getting under the wheels. One or two state legislatures have considered bills for making fender guards on automobiles compulsory, but as yet no such law has been enacted.



Auto Fender—Closed and Open



### AUTO PUMPS WATER



Pumping out a Basement

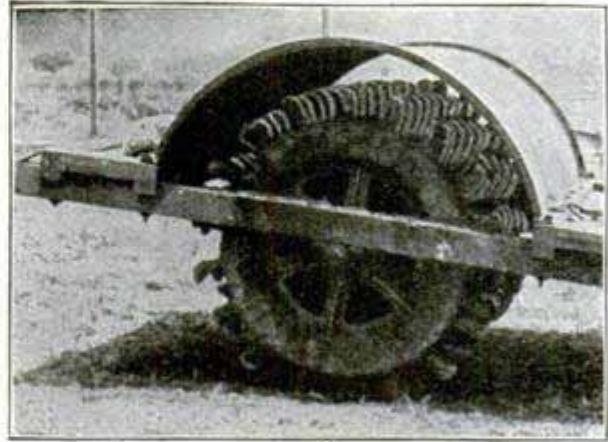
The utility of the automobile constantly increases, but the above illustration is probably the first instance of a motor car being used to pump out a basement. During a flood in Stockton, Cal., many basements were filled with water and automobiles were pressed into service to pump them out. The driving wheels were raised from the ground, a belt connected to a pump and the way the water came up is shown in the photograph.

### AROUND THE WORLD IN 40 DAYS

The construction of new railways, improvements in steamer service, and the greater speed on both which have been accomplished during the past two years, have so reduced the time that we soon will be able to make a trip around the world in 40 days.

### PRONGED ROAD ROLLER

In working crude oil into a sandy roadway, the pronged road roller shown

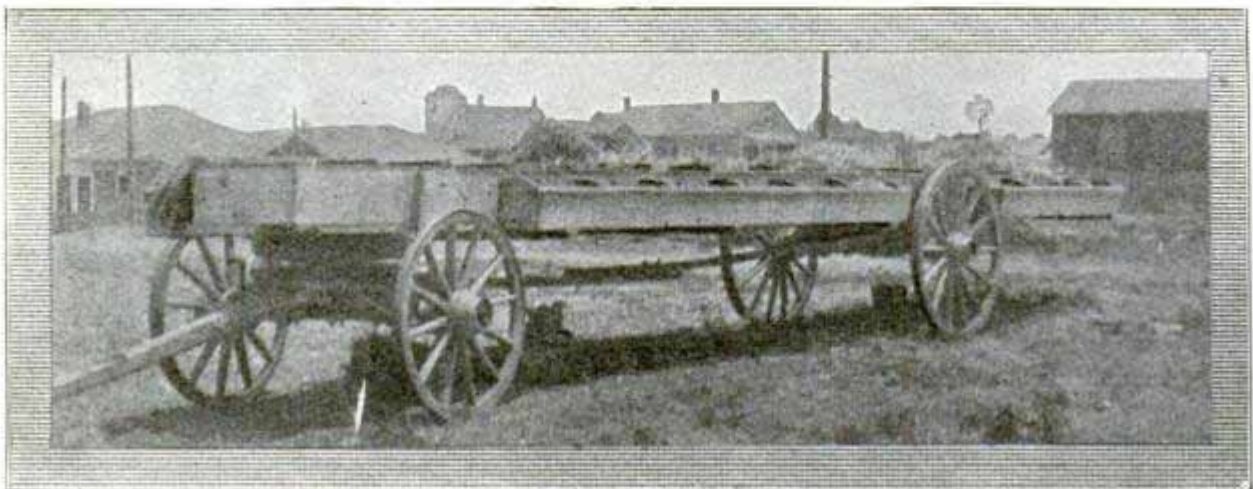


Mixes the Oil and Sand

in the illustration is used as a mixing machine. After the surface has been thoroughly oiled and mixed to a depth of several inches, an ordinary road roller completes the work, leaving a firm, smooth surface.

### CONTRACTOR'S FEEDING WAGON

A contractor near Pasadena, Cal., who uses a large number of teams on work which takes them long distances from home, has built a feeding wagon. This wagon has 9 feed boxes on each side and one at the rear end, thus accommodating 19 horses at one time. The space between the rows of boxes is filled with hay. An ordinary wagon gear was used with an extra long reach.



Portable Feeding Boxes for Contractors



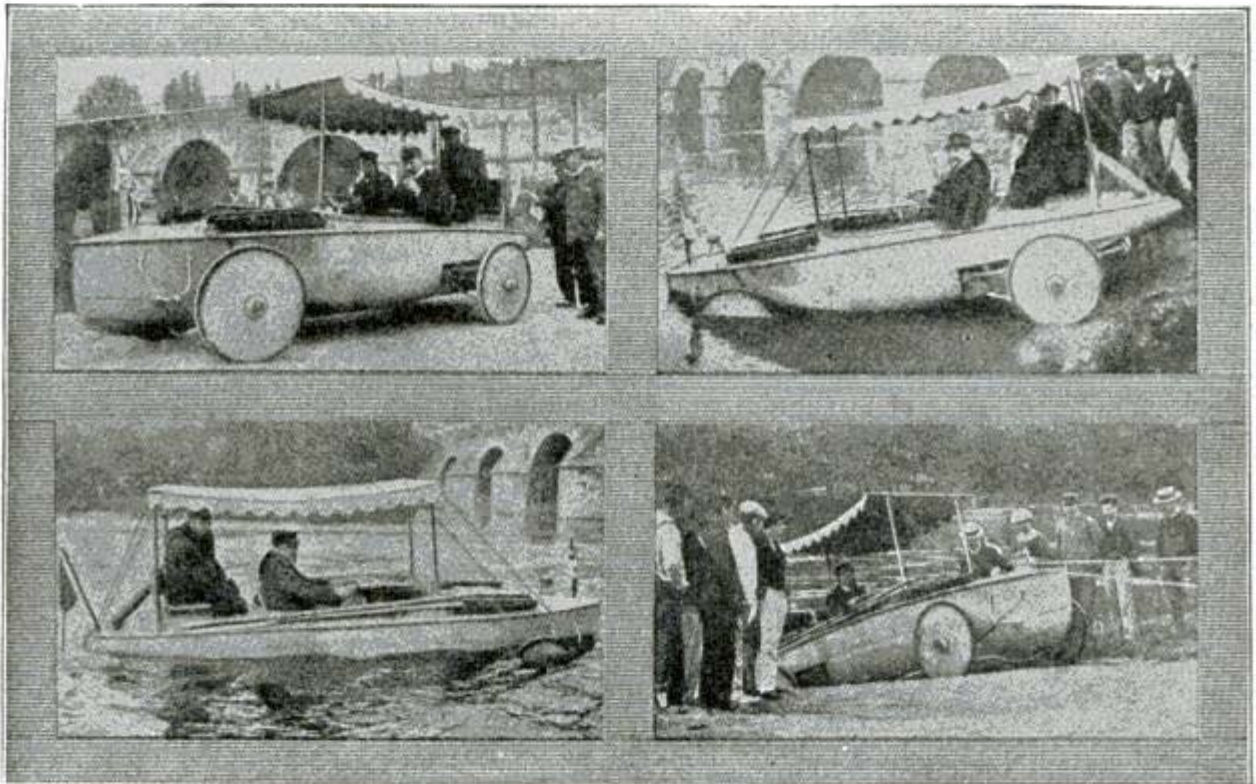
### A RICH OIL REEF

There is a chance to make big money waiting for someone with enterprise and capital at Bolinas Bay, 8 miles north of San Francisco. On the north side of the bay juts out Duxbury Reef, 2,000 ft., saturated with petroleum and spouting gas as long as the rocks are not covered by the tide. The gas finds outlet mainly through pipes which have been driven into the reef, and the fish-

### COMBINED MOTOR CAR AND BOAT

Shifting of one lever converts car into boat without stopping

The motor car which can be used as a boat was considered a freak only recently, but there seems to be a growing demand for the combined machine. For touring in districts where rivers and streams are more numerous than



The front wheels guide its course in the water

ermen find it extremely convenient to light the gas for cooking and heating. When the men go away they leave this natural gas stove still burning, and the fierce flames produce a weird effect, especially at night as the tide flows in. Long after the reef is out of sight the fitful fires, fanned by the wind, still leap up from the waves, as if the sea itself were burning.

It is evident that a rich yield of oil and gas may be obtained here by setting up a steel framework on the reef, strong enough to withstand the shock of the waves and high enough to keep dry the machinery necessary for driving a pipe deep into the reef.

the bridges the new car permits a continuous passage without even stopping. The car body is really a boat with screw propeller and upon entering the water the movement of one lever shifts the power from the rear wheels to the screw propeller. In many cases a short cut can be made across lake or river which otherwise would require going several miles out of one's way to get around a lake or over a stream.

Glass or china will never crack from hot water if it is first toughened by placing in cold water, bringing to boil gradually, boiling 4 hours and leave standing till water is cool.



### BRASS BED CHAIR

A recent novelty in furniture is a brass chair, matching the bed, and in-



Chair Matches Bed

tended specially for use in dressing. It is purposely made low, is mounted on casters, but looks well and is usually most convenient when placed against the foot of the bed as illustrated.

### TELEGRAPH POLES FROM CONCRETE

Next to railroad ties telegraph and telephone poles use up vast quantities of trees, and it is hoped that concrete poles will be found cheaper in both initial cost and endurance.

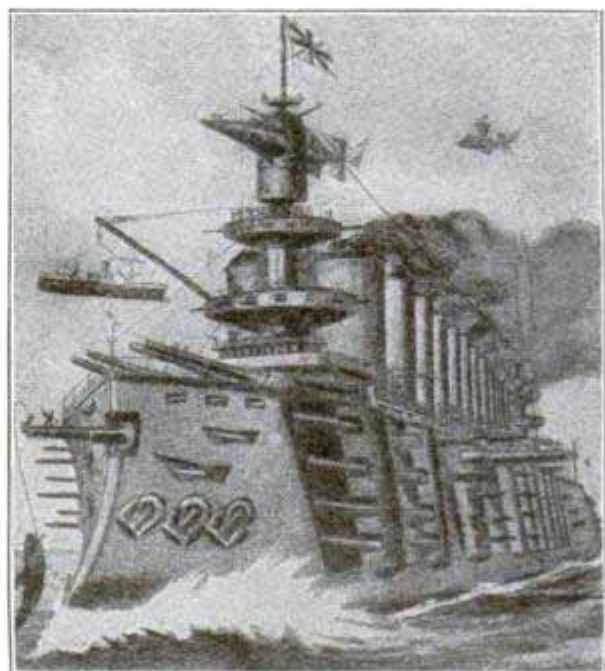
Concrete telegraph poles may be made of various forms, sizes and reinforcement. Those above mentioned taper from 8 in. square at the bottom to 6 in. at the top, the corners are chamfered 2 in., and they are reinforced by two dozen  $\frac{1}{4}$ -in. wires running the full length of the pole. All necessary holes, for braces, cross-arms, and steps, are made in the molding.

Strange to say, concrete poles show great elasticity as well as strength, the former depending upon the steel reinforcement. Another style of pole, taper-

ing from 10 in. to 5 in., and reinforced by triangular pieces 1 in. wide at each of the three corners, was subjected to the following test: It was connected by cable to a cedar pole 25 ft. distant, and at a height of 21 ft. from the ground. Midway from the cable was suspended a gradually increasing weight. When each pole had been deflected 21 in. and the load had reached 975 lb., the concrete pole began to crack from the ground to the cable; but as soon as the load was taken off, it straightened up. It seems to be as good as ever, for it has been in use for heavy guy wires ever since, which is more than a year. This style of pole, 35 ft. long, can be made in quantity at \$7, which is cheaper than wood, provided no profit is paid to a contractor.

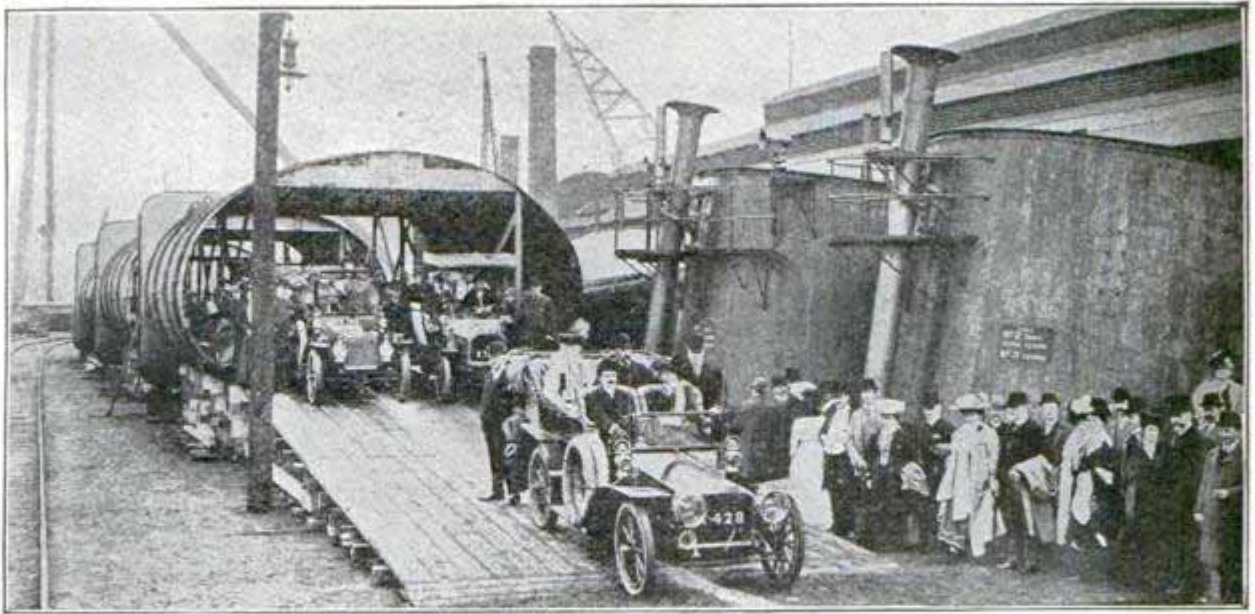
### CARICATURE OF THE DREADNAUGHT

In it the ship is shown with twenty-four funnels and a hundred 12-in. guns. An Atlantic liner is being hoisted onto her deck as though it were a pinnace, says American Marine Engineer. A railway runs round this fearsome vessel's deck, and sailors are playing football in her fighting tops, while others are fishing for sharks from the great guns.



A Peace Dream





## MOTOR TRACK THROUGH STEAMER'S FUNNELS

Since it is difficult to convey by mere figures an adequate conception of the world's record liner, the new Cunarder "Mauretania," her builders turned her colossal smoke stacks into a long tunneled track for big touring automobiles; and three of these were able to run abreast "down the pike" at high speed. A couple of trolley cars might easily have run side by side through these enormous funnels, which are over 25 ft. in diameter.

The "Mauretania," soon to start on her maiden trip, will eclipse all other leviathans of the sea. Her displacement is 45,000 tons, and her length nearly 800 ft., while keel frames and plating alone weigh over 16,000 tons. Her turbine engines will develop 70,000 hp. by means of four turbine shafts, and along any one of these will be transmitted six times the total horsepower developed by the whole pioneer Cunard fleet of the forties.

## OIL WELLS ON THE DEEP

The whale is by no means the only source of marine oil. Though little known to fame, the humble menhaden yields oil and fertilizer worth \$1,000,000 a year, giving employment to 1,800 fishermen and 1,600 employes of 50 factories. The people who are so profitably engaged in slaughtering 700,000,000 of these fishes every year naturally claim that they were created providentially for that express purpose, since they are not fit for food, and yet the supply seems inexhaustible. No one knows whence they come or whither they go; all we know is that every spring vast schools of them appear in the Gulf of Mexico, heading north in closely packed masses, near the surface, utterly incapable of either defense or escape; all

that is needed is simply to scoop them up with big seines.

## LARGEST BALLOON IN WORLD

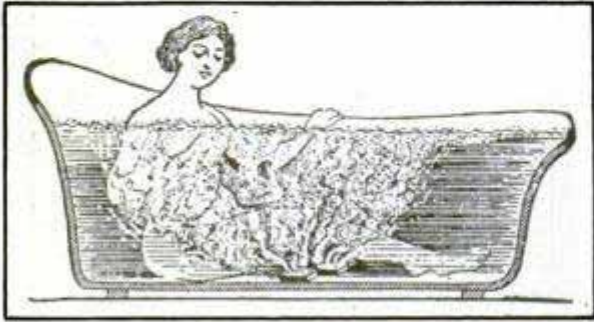
The "Mammoth" is the largest balloon in the world, and on its first ascension recently in London had 16 passengers, the largest number ever carried in a balloon. The envelope contains 1,482 squares of silk, the balloon weighs 460 lbs. and is capable of lifting 4,320 lbs. The car is double decked and has special rooms for storage of provisions when long voyages are attempted. The envelope contains 108,000 cu. ft. of gas and is of the ordinary globe shape.

Glass artificial hair is the latest European novelty: said to be quite stunning.



## CARBONIC BATHS

Perfumed tablets containing carbonic acid, which when placed in a bath cause the water to bubble vigorously, are recommended by French physicians. The treatment is recom-



The Carbonic Bath

mended for old and infirm persons, and those troubled with weak hearts. The effect is said to be a mild and pleasant stimulant.

Telimeter is the name of a French invention by which you can tell the distance of any visible object of which you know the height and not have to "figure" on it.

## TRACK LAYING MACHINE

The track-laying machine with comparatively few men accomplishes as much as several hundred working in the old way. The ties are brought forward and dropped on the roadbed and quickly spaced to proper distances by hand. The rails follow at the same time a little behind the further ties. One gang places the rails in position while the men nearest the machine are spiking. In this way there is a steady advance, the machine traveling over the new track it has just laid while the surface gangs follow, leaving a track ready for use.



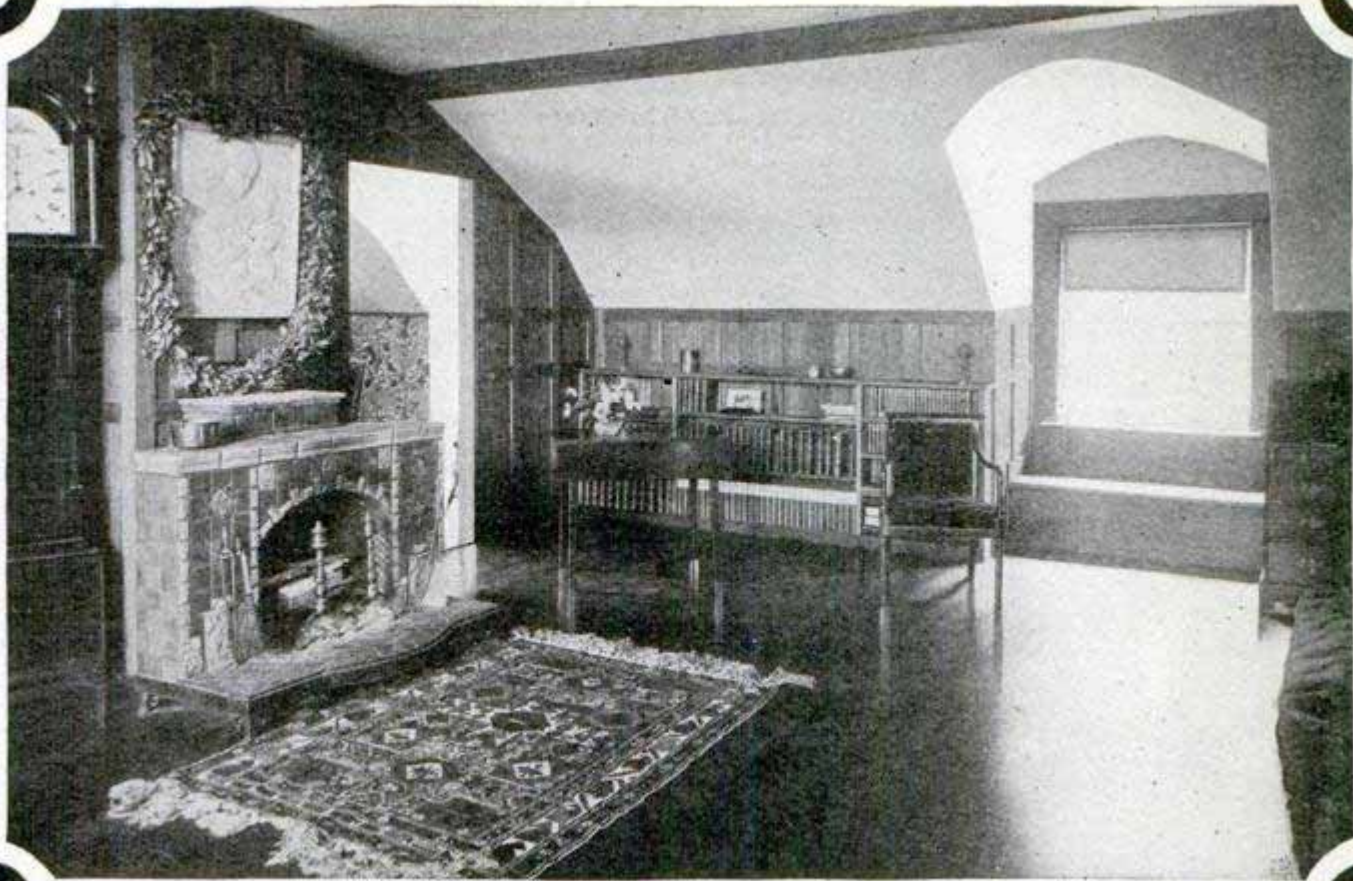
**HARDLY A FIRST-CLASS RISK.**—Voice from Below: "Mind you don't have an accident, Pat!" Pat: "Faith, an' wasn't it only last week Mr. McCarty assured me forninst accidents? Is ut a thafe you're after makin' him?"—London Sketch.



Track Laying Machine

For obstinate spots, as coffee or chocolate, apply hot glycerine. After letting it stand two minutes wash off with water or alcohol.





LOIS L. HOWE, Architect, Boston.

# LIQUID GRANITE

## and the Home Beautiful

Varnish occupies a conspicuous place in the making of modern homes, and **Liquid Granite** is the most desirable, durable and satisfactory



varnish yet produced for **Floor Finishing** and all other domestic purposes. ❁ ❁ It is invaluable in restoring Oilcloth and Linoleum. ❁ ❁ It is easy to apply and difficult to deface. ❁ ❁ Put up in cans of convenient size from  $\frac{1}{2}$  pint to 5 gallons.

Send for samples of Finished Woods and information on Wood Finishing and Home Varnishing, — *Free on request.*

**DEALERS EVERYWHERE**

New York  
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**BERRY BROTHERS, Limited**

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**\$10.00**  
DAILY

**A MAN OR BOY OF ORDINARY INTELLIGENCE**

**\$10.00**  
DAILY

Can Make Ten Dollars Each Day In His Own Town By Making CONCRETE BRICKS With The

# WINNER BRICK MACHINE No. 2



It is a little gem four (4) brick face down machine, perfect in every detail. Strong and durable, perfect workmanship, and made of first-class material. Makes perfect brick in common, moulding designs or rock face.

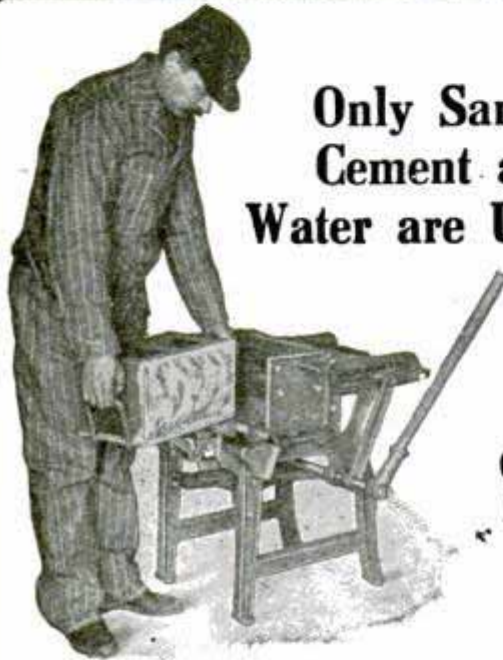


**One man can produce, without effort, 1,500 Perfect Bricks in 9 Hours**

Operation so simple and perfect a boy can operate it with ease and perfection.  
No Investment—**\$35.00** is all—complete, f. o. b. Minneapolis.

Ten Dollars with Order--Balance C. O. D.

**WINNER BLOCK MACHINE CO.** 607 Northwestern Building  
MINNEAPOLIS, MINNESOTA, U. S. A.



## Only Sand, Cement and Water are Used

in  
making  
Concrete  
Building  
Blocks

### No Experience Necessary

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

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

**Medina Concrete Machinery Co.,**  
28 Court Street, Medina, Ohio

**VALUE OF FAMILY SCALES.**—Every family should own platform scales which will weigh 150 lbs., at least. They are cheap, and soon pay for themselves by protecting the household from short weights of all kinds. The greatest saving will be on ice and coal. Many ice men make a practice of delivering short weight, often not half what they are paid for. If the customer protests, he will be overwhelmed by a volley of assertions that the weight is all right, and he is helpless unless he can say "Put it on the scales, then." That settles it. The fellow will not repeat the fraud, for he knows that there is a severe penalty for short weight.

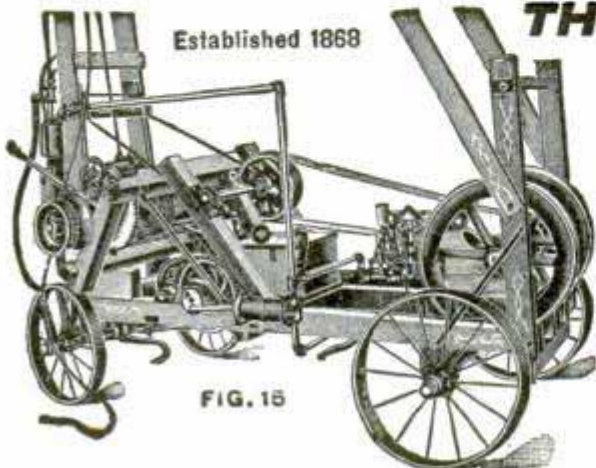
But how can you weigh a ton of coal on family scales? Easy enough. Have it delivered in bags, and have all partly filled bags set on the scales platform. The first time you will probably find that your ton is a hundred or two light, but if you stand on your rights the swindle will not be repeated, at least by that man.

Lighter articles may be weighed in the scoop of the scales, which will protect you against cheating by the butcher and grocer. The "rake-off" of unscrupulous tradesmen, in addition to legitimate profits, is enormous, because most people take no measures to detect fraud. In buying cheap scales, however, it is necessary to make sure that they are accurate. This is easily accomplished by weighing several articles, light and heavy, on the best scales in the shop and then weighing the same articles on the scales you think of buying.

**WHAT THEY WANTED TO KNOW.**—"The annual rush of tourists back and forth over the Atlantic has begun," said a liner's captain, "and I am hardening myself to stand the usual ten tourist questions.

"There are ten questions that every tourist who can get near enough puts to me. You'll put them to me if you ever cross on my ship. I have been asked these ten questions 3,764,952 times. They are:

- "Were you ever shipwrecked?"
- "Any whales in this latitude?"
- "How deep is the water here?"
- "What tips are usually given, and to whom?"
- "How many times have you crossed the Atlantic?"
- "What is the best remedy for seasickness?"
- "Why are you always painting this ship?"
- "Will you let me come up on the bridge some time?"
- "Do you remember my cousin who crossed with you in the spring of '93?"
- "I suppose the passengers ask you a great many stupid questions, don't they?"—Marine Journal.



Established 1868

FIG. 15

## THE AMERICAN WELL WORKS,

Aurora, Illinois, U. S. A.

Chicago, Ill.

Dallas, Tex.

MANUFACTURE FULL LINE

**Jetting, Rotary, Coring, Rock**

**Drilling and Prospecting**

**Machinery.**

**Any Diameter or Depth. Strong and Speedy.**

**CATALOG MAILED ON REQUEST.**



The Greatest of Musical Inventions—the Two-Horn

# DUPLEX

## PHONOGRAPH FREE TRIAL

NO MONEY IN ADVANCE

It is the phonograph that gives you all the sound vibrations. It has not only two horns, but two vibrating diaphragms in sound box. Other phonographs have one diaphragm and one horn. The Duplex gets all the volume of music; other phonographs get the half. The Duplex gives you a better tone—clearer, sweeter, more like the original. Our

**FREE Catalogue** will explain fully the superiority of **The Duplex**. Don't allow any one to persuade you to buy any other make without first sending for our catalogue. The Duplex is not sold by dealers or in stores. We are **Actual Manufacturers**, not jobbers, and sell **only direct from our factory** to the user, eliminating all middlemen's profits.



Each horn is 30 in. long with 17 in. bell. Cabinet 18 in. x 14 in. x 10 in.

That is why we are able to **manufacture and deliver** the best phonograph made for **less than one third** what dealers ask for other makes not as good.

### Freight Prepaid

Seven Days' Free Trial

We allow seven days' free trial in your own home in which to decide whether you wish to keep it. If the machine does not make good our every claim—volume, quality, saving, satisfaction—just send it back. We'll pay all freight charges both ways.

### All the Latest Improvements

The Duplex is equipped with a mechanical feed that relieves the record of all the destructive work of propelling the reproducer across its surface. The needle point is held in continuous contact with the inner (which is more accurate) wall of the sound wave groove, thus reproducing more perfectly whatever music was put into the record when it was made. The Duplex has a device by which the weight of the reproducer upon the record may be regulated to suit the needs of the occasion, thus greatly preserving the life and durability of the records. These are exclusive features of the Duplex and can not be had on any other make of phonograph.

Plays all sizes and makes of disc records. Our Free Catalogue explains everything.

Duplex Phonograph Co.,

331 Patterson St., Kalamazoo, Mich.

## The "CHICAGO" Automatic Temperature Regulator

The best device for controlling your heating system. Even temperature at all times.



Put in the coal and it will do the rest.



This attachment alone is worth what we are asking for the complete outfit. It will check the fire during the night, until such time as you may want it warmer in the morning.

SIMPLE—DURABLE—RELIABLE

**The Chicago Heat Regulator Co.,**  
Dept. P. Suite 322, 40 Dearborn St., Chicago

## HOT WATER IN 2 MINUTES Cost—Two Cents

The Peerless Kitchen Boiler has solved the hot water problem, in city and country homes, hotels, restaurants, clubs, bath-houses, gymnasiums—every place where hot water is required. Burns either gas or gasoline; heats water to 185° and keeps it hot at **one-half cent per hour**. A hot bath in **two minutes for two cents**. The PEERLESS is simple in construction—only **three parts**—disk, burner, drum. Absolutely noiseless; creates no odor. Occupies but a very small space; easy to install and connect. No pipes to clog or mechanisms to get out of order. The water is kept in constant circulation, the capacity almost unlimited. **PRICE, surprisingly moderate.** Ask your plumber about the PEERLESS, or write for catalog, prices and discounts.

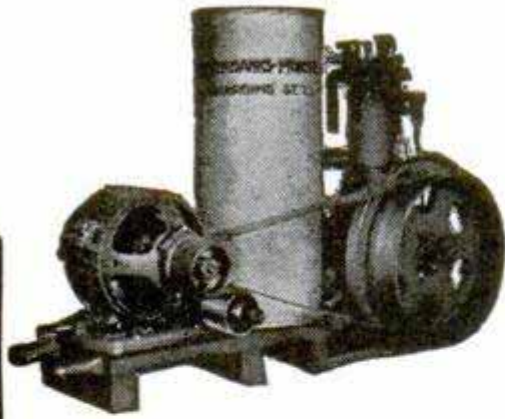


**JAMES McCARTNEY**

39 State Street, - CHICAGO



# Make Your Own Light



THE FAIRBANKS-MORSE Electric Light Outfit gives plenty of good light at a moderate cost.  
Gas, Gasoline or Kerosene Engines for all purposes, from 2 h. p. up.  
Send for illustrated Catalogue No. C 449 Gasoline Engines.

## Fairbanks, Morse & Co.

Monroe Street, Chicago, Ill.

# SKIDOO!

## MARINE ENGINE

The 2-Cycle-Engine-Sensation of the Year. Entirely new and improved design introducing many exclusive features. Runs on Gasoline, Distillate, Kerosene or Alcohol.

Pats. Pend. **2 ACTUAL H. P. Engine** Bare \$23  
COMPLETE ENGINE  
With Fresh Water Boat Fittings, \$39.90  
With Salt Water Boat Fittings, \$43.90

Swiftest, most powerful, efficient and reliable engine of its size on earth. Drives Canoe, Row-boat or 14 to 20 ft. Launch, with load, 6 to 10 miles per hour. Reversible, easy to install and operate, unflinching endurance powers, economical and FREE. safe, cannot back-fire. Sold under 5-yr. Guarantee.

Belle Isle Motor Co., Dept. 10, DETROIT, MICH.

# "GET THE BEST"

which means

## The Clipper Water Motor

We do not claim it THE CHEAPEST, but we do claim it THE BEST.

Buy one for the boy and watch him "get busy."  
Send for circular with full description and price.

L. E. RHODES  
HARTFORD, CONN.



1½ H. P. \$58.00

### Look at the Neat Design!

The finest little 1½ H. P. Engine on the market.

Handsomely finished.

Bore 3½ inches; stroke 3 inches.

These engines will develop over 2 H. P.

Write for Catalog "P" of 1½ to 16 H.P. Motors.

AMERICAN MOTOR CO.

EAU CLAIRE, WIS.



**JENNEY, FATHER OF SKYSCRAPERS.**—William Le Barron Jenney, of Chicago, who died recently, was the inventor of the modern skeleton structure; he startled the architects and builders of every land by his daring innovations, saved half of Grant's army at Shiloh, made Sherman's march to the sea practicable by his bridge work, caused Vicksburg to fall by his wonderful engineering, was dean of the architects and acknowledged master builder of the world. He trained and taught many of the great architects and builders of America, and died a comparatively poor man.

The story of how Jenney saved a section of Grant's army at Shiloh not only illustrates his resourcefulness as an engineer but throws an interesting sidelight on the great general.

Part of Grant's troops, almost overwhelmed, were holding the river bank. It was imperative that they be brought across. Grant ordered Jenney to bring them. Jenney rode down, discovered some rusty, battered steamers which had not had fire in them for weeks. There was no wood, coal, or other fuel. He rode to Grant and reported.

"What did I send you down there to do?" asked Grant quietly.

"Why," stammered Jenney, "to bring those troops across."

"Well," rejoined Grant, "Go bring them."

Jenney went. He had the order. First he tore away the upper works, wheelhouses, and decks, and fed them into the furnaces. Nothing more was in sight. An inspiration seized him. He levied on the commissary stores—and he got up steam and brought those troops across by burning thousands of dollars' worth of hams and crackers in the furnaces.

The hams and crackers were charged to Grant's personal account, and he, as a joke, switched and charged it against Jenney's salary—and it was canceled after the war.—Washington Post.

Your old straw hat may be renovated, if it is of natural color, by brushing thoroughly with a weak solution of tartaric acid in water. Rinse in clear water and pin to a board for drying, to keep shape. A real Panama can be cleaned even more easily, using suds of any good white soap with a little ammonia added. Some glycerine in the rinsing water will prevent stiffness and brittleness when dry.

# Perfection

## MARINE MOTORS

2 H. P. \$45  
complete

Positively the simplest, quietest and most powerful two-cycle marine engines built; and better fitted and finished finer than any other at any price.

### Reversible—No Cranking

No valves nor cams. Highest grade material throughout. Our broad GUARANTEE covers replacement of any engine that does not give complete satisfaction and is backed up by the largest and most complete factory in the business. Can you afford to take chances or buy on any other terms? Price includes everything ready for installing except gasoline tank and piping.

Handsome catalogue illustrating and pricing all sizes FREE.  
The Caille Perfection Motor Co.  
1411 SECOND AVE., DETROIT, MICH.



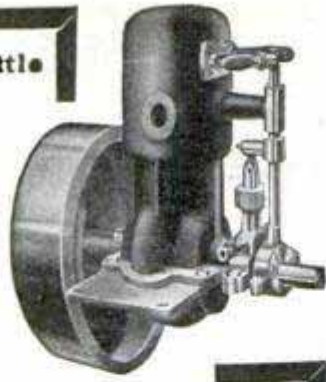


A Strong, dependable little  
2-Cycle Engine

# SKIPPER

\$24<sup>90</sup>  
=

2 h. p. Marine Engine



Designed and built by H. D. Baird, unquestionably the foremost designer in the marine engine field. The **Skipper** is his latest and is built upon the experience of **his other designs**. Here are some of its **exclusive features**: Runs equally well on kerosene, distillate oil, alcohol or gasoline; a fuel device that is absolutely new and extremely simple; will not, **cannot**, back fire. Starts without cranking; easy to reverse and regulate speed. Made in 5 sizes. 3 h. p. bare engine, \$24.90. Complete with engine, electric and boat fittings, \$39.00.

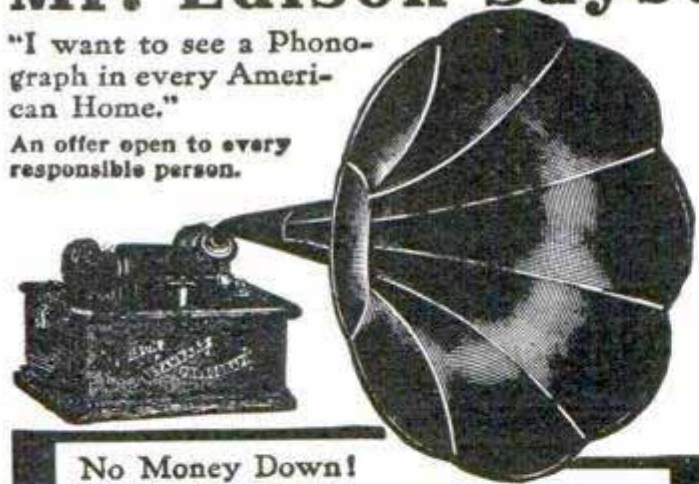
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**ST. CLAIR MOTOR CO.**  
Department E Detroit, Mich.

## Mr. Edison Says:

"I want to see a Phonograph in every American Home."

An offer open to every responsible person.



No Money Down!

# Free Trial

The Edison, the genuine Edison!—positively on free trial in your own home! No C. O. D.—no guarantee required. If acceptable pay lowest cash price at \$2.00 a Month (larger installments for larger outfits) without even interest on payments  
**\$2.00 a Month** buys a genuine Edison outfit!

Remember—nothing down—no C. O. D.—we want you to see the great Edison outfit and compare it with any of the imitation machines sold at many times the price of the Edison outfits.

WRITE TODAY for the great Edison catalogs and full explanation of this wonderful offer—free prepaid.

**FREDERICK BABSON,**  
Edison Phonograph Distributors,  
Edison Building, Suite 119 Z Chicago



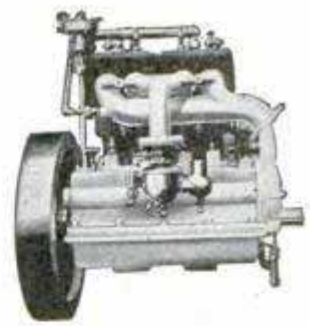
## The Greatest Marine Engine Offer Ever Made

Here is a **STRICTLY FINE** engine—fine in every meaning of the word. From base up to spark plug every part of it has been constructed by skilled workmen, with painstaking care and along the latest scientific lines. Our materials are the finest the market affords (such as aluminum, special grey iron, highest grade carbon steel, Parson's Manganese bronze, etc.). In a word, there is only one word, and that is—**QUALITY**.

The market is flooded with "cheap" marine engines. We believe the public is tired of these toys and makeshifts; hence we offer a strictly fine engine at a reasonable price.

### This Is the Offer

For the next thirty days we will sell to just one man in each town our 8 H. P. or 15 H. P. motor at agent's cost (we will quote the exact figures of the price only to interested inquirers). Of course, at such a price we make little profit on the individual order but expect to make one on the advertising brought us by the splendid work of our motor in your community. One engine we know will sell others.



### The Engine

The Scripps Motor is a four-cycle, two and four-cylinder engine; aluminum crankcases; positive automatic system of lubrication; two roomy hand hole plates in crankcase; Parson's Manganese bronze connecting rods; Schebler float feed carburetor; highly finished castings and polished brass trimmings. Only two sizes made, 8 H. P. and 15 H. P. Write today for catalogue and special price to you.

## SCRIPPS MOTOR CO.

602 Trumbull Ave., Detroit, Michigan

Above is shown the "P. D. Q.," a 32-footer, equipped with 15 H. P. Scripps Motor.

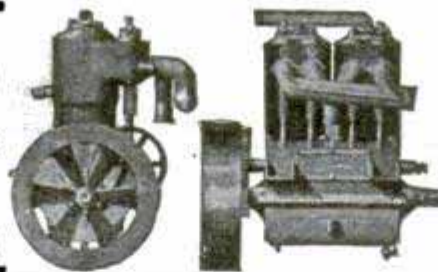
*Scripps* **MARINE MOTORS**



# MOTORS

For Marine and Vehicle Use

Williamson Motor Co.



1 1/2 to 60 H. P. (Air and Water Cooled)

Experimental Work Solicited

8-12 S. 39th St., Phila., Pa.

If your water pressure is 25 lbs. or over, buy a **WATER MOTOR, 5-in., \$2<sup>50</sup>**

Larger Sizes Proportionately Low

Attach to any faucet, and will run fan, lathe, sewing and washing machine, air compressor, etc., etc. Reliable agents wanted.



**A SAMPLE MOTOR FREE** to the right person in each town. Write for terms, stating water pressure.

**ENGINEER WANTED**

to send for catalog of Indicators, Reducing Wheels, Planimeters. Address,

**LIPPINCOTT M. S. CO.,**

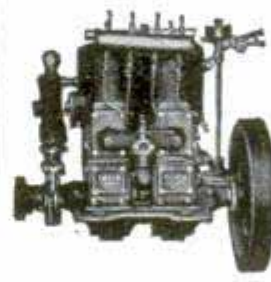
Newark, :: :: New Jersey



## REVERSIBLE MARINE ENGINES

1 1/2 to 30 H. P.

Send for Catalog. Prices right.



**TERMAAT & MONAHAN CO.**  
Oshkosh, Wis.

**AS TOLD OVER THE TELEPHONE.**—The story is told of a balking mule named "Shoe" driven by an old negro named "Abe." and owned by a wholesale feed store. One day Shoe balked on Broad street and refused absolutely to be driven again. After old Abe had spent his energies on Shoe for an hour in the vain endeavor to get him to start, he went into a store to telephone to his employers. The following is what a party of gentlemen near the telephone heard, says Lippincott's:

"Please, marm, gimme number two hund'ed an' 'leven. is dat you, Marse Henry? . . . Yes, sir, dis is Abe. I dun ring yer up, sir, ter tell you about Shoe. Shoe he done balk down yer on Broad street, sir."

"'Bout a hour, sir."

"Yessir, I bus' him in de head."

"I dun wear de whip handle out on him, sir."

"Yessir, I kick him in de belly 'bout eight times, sir."

"Marse Henry, I would ha' kicked um some mo' but I hu't mah big toe on um de las' time I kick um."

"'Twis' he tail? No, sir, not dis nigger. A gemman from New York, he twis' he tail."

"No, sir, I don't think he dead. De doctor take him 'way in de amb'lance."

"Yessir, it was sure foolish."

"Marse Henry, I done set fire under Shoe."

"De harness? Dun bu'n the harness clean off um."

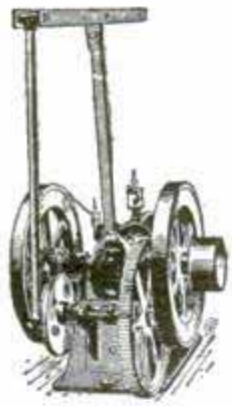
"De cart? Yessir, dun bu'n de cart, too, sir; all 'cept one wheel, sir."

"Yessir, I get de feed out fust, sir."

"Marse Henry, is you want me to come back to de store and go to work, or mus' I wait for Shoe to move?"

## HORIZONTAL AIR-COOLED MOTORS

1 1/2 and 2 1/2 H. P. Equipped with short connection for spray pump or walking beam attachment for pumping from wells. Will work against 150 lb. pressure. Gasoline in base of engine or outside. Write for agency.



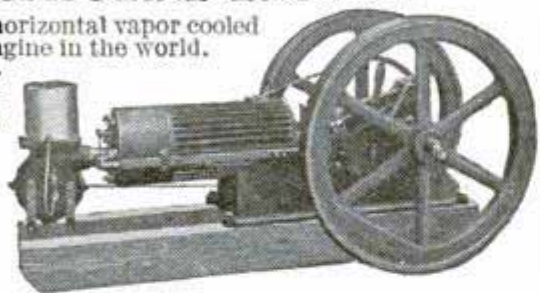
**AIR-COOLED MOTOR CO., LANSING, MICHIGAN.**

## WATERLOO VAPOR COOLED GASOLINE ENGINES

The only horizontal vapor cooled gasoline engine in the world.

Absolutely frost proof and cannot freeze.

Patented May 15, 1906



The king of all gasoline engines. Our catalog will tell you all about them, also our power and sweep feed grinders. Send today.

**WATERLOO GASOLINE ENGINE CO.**  
1021 Cedar Street Waterloo, Iowa

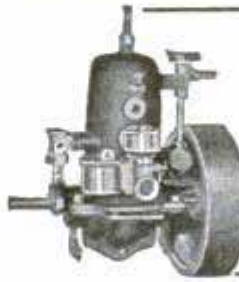
## THE VICTOR MARINE ENGINE

1 1/2 H. P. up to 20 H. P.

The Engine you have been looking for; safe, sure and noiseless. A new and perfect model. Distinctly new and prominent features.

BUILT BY

**R.S. HILL, 27 Woodbridge St., E. Detroit, Mich.**



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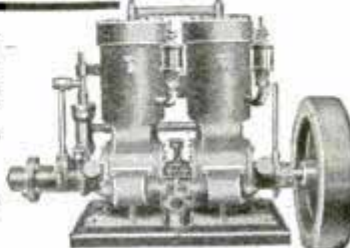
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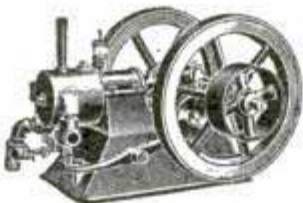


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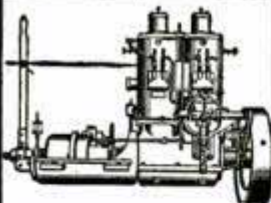
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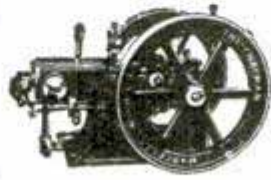
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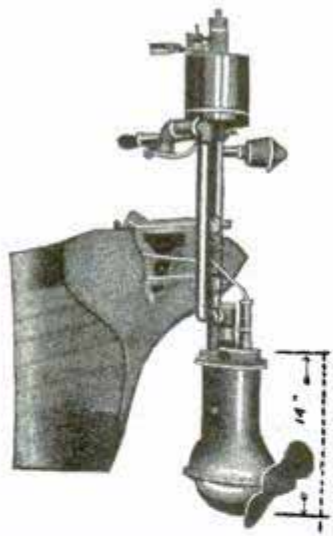
Using these thin steel shoes; nickel plated; always clean; never go on the stove; hot iron heats it instantly; no bees-wax required. No dirty streaks or scorched clothes. Ironing done in half the time. Sample, either style, postpaid for 50 cents. Agents, here is a fast seller. Something new, not sold by dealers. Sells in every home. Get busy. For particulars write

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Lightest, most practical, easiest applied (and most powerful for weight), 4 cycle Gasoline Motor Propeller in existence. Can be attached and detached to any boat in a moment, and can be raised or lowered to run in shallow water when necessary. When in operation the engine is entirely submerged, the water in which it operates forming the cooling jacket, which is a most effectual one. It is fully  $1\frac{3}{4}$  H. P. and will propel a 16-foot boat at a speed of about 7 miles per hour. Can be operated easily by any boy or girl and run for 1 day with 1 gallon of gasoline, but the tank on engine holds only enough for a little over a half day's run.

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**HOW TO CLEAN A STATION.**—At the Fourteenth street station of the New York Subway the way has been to let the station clean itself, to the disgust and discomfort of that part of the public which was obliged to use it. But recently something happened. A big man wearing glasses came in, looked around a few minutes, and then inquired how long a time had passed since the last cleaning. No one could tell, no one had ever heard of such a thing. Then His Eyeglasses called for the station master and said a few emphatic things to him, which made that functionary jump for the telephone and call frantically for the broom brigade. This temporary insanity of the autocrat of the station could have but one explanation—President Shonts was behind the eyeglasses.

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Ease of starting. Smooth, quiet running.

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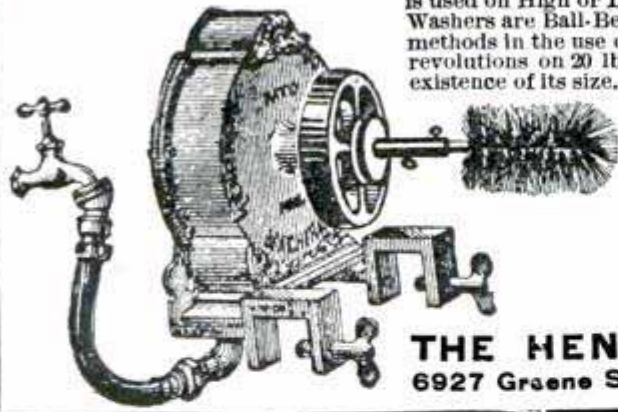
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is used on High or Low water pressure. No Friction to hinder the speed or power. Our Bottle Washers are Ball-Bearing which are specially protected from the water. Most modern economic methods in the use of washing bottles and glasses of any size or shape; will make 1,200 to 1,500 revolutions on 20 lbs. water pressure and develop more power than any other Water Motor in existence of its size. Will give the same speed as electric motor with far less expense. In cities where meters are used, the cost of operating our motor is only two cents per day. Specially recommended by the Philadelphia Milk Bottlers' Exchange, wholesale liquor and beer bottlers and bottlers of vinegar, pickle, mustard and sauce. Bottles all shapes. Guaranteed as represented or money refunded. The price of Bottle Washer is \$30.00. Weight 40 lbs., Space 10x12 inches. We will offer for the next 30 days, to all who mention the Popular Mechanics Ad., this Bottle Washer Machine for \$25.00 F. O. B. Philadelphia. Our Bracket Water Motor Fan for \$3.00. Our Desk Fan for \$5.00, 10-inch blades.

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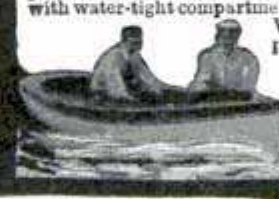
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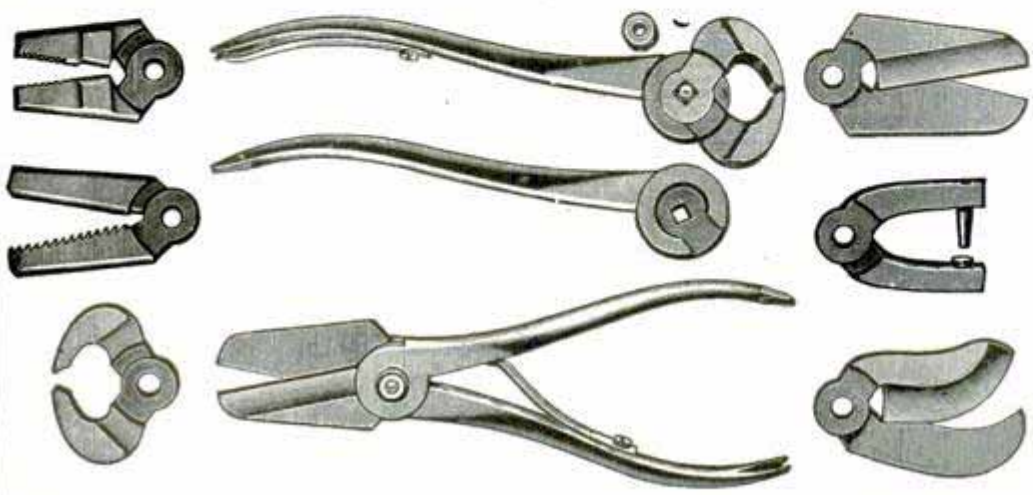
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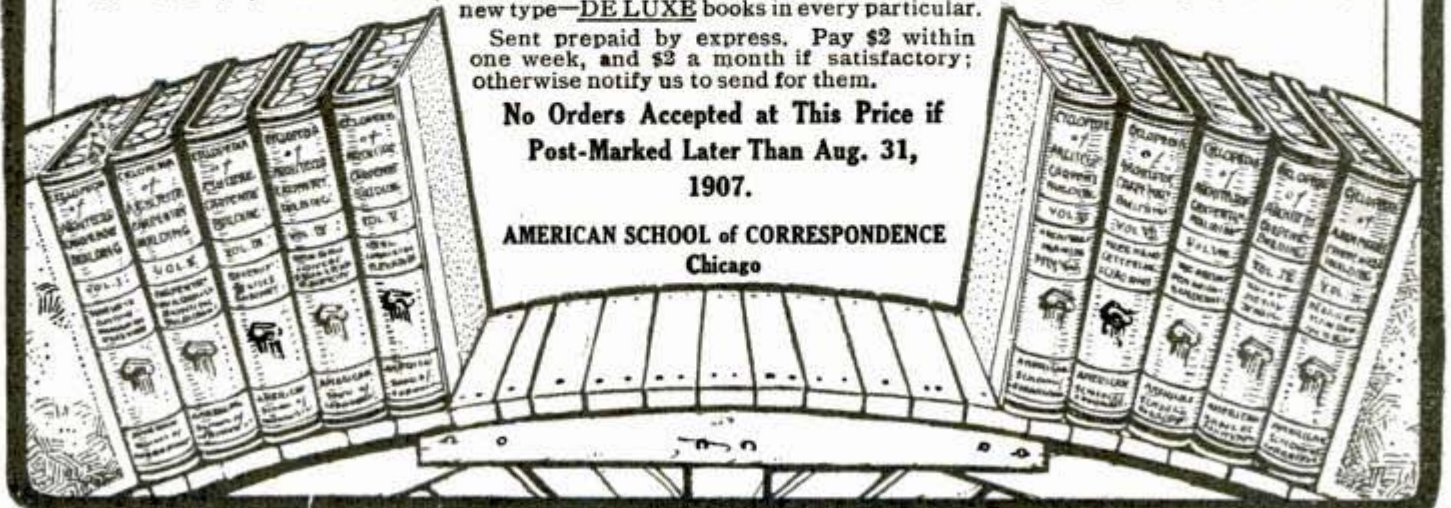
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Enough set in a saw is enough, and too much is a waste of power and material. This is a point up-to-date filers are taking note of. The tendency now is to see how little set can be made to clear the blade well. It is a good tendency, too.

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Some persons think all that is necessary to dry lumber is to place it in a tight room with plenty of air space and sufficient heat. Air circulation under such conditions is at best only sluggish. Artificial means must be provided to induce proper circulation—tall chimneys, fans, or some other method.

In our July issue mention was made of the accidental death of a workman in a Chicago packing house, whose leg was drawn into a vacuum pipe, drawing all the blood from his body. The statement that the vacuum pressure was 400 lbs. was somewhat misleading, inasmuch as the pressure referred to was not per square inch, but the aggregate surface pressure, being about 50 sq. in. at 8 lb. per square in., making a total of 400 lb.

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Slip the pipe in sideways *not endways* and save no end of time and trouble. Made of strong malleable iron, with finest crucible steel *interchangeable* jaws.

A vise like this will outlast two cheap vises and will not break at the time you need it most. Every shop needs one. Write for special circular.

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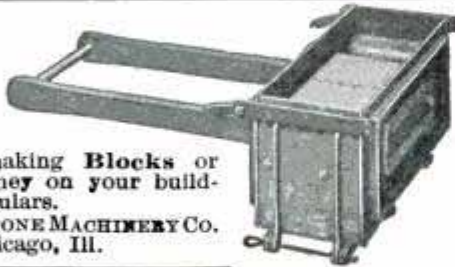
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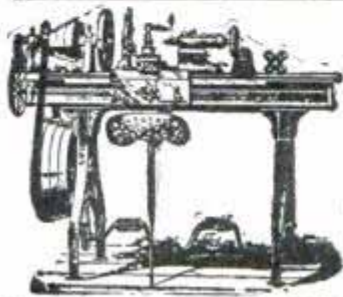


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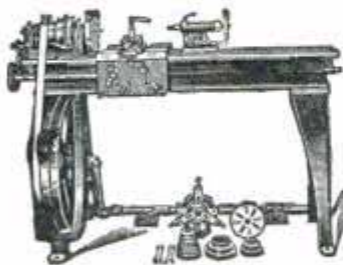
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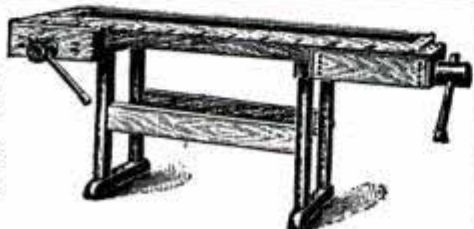
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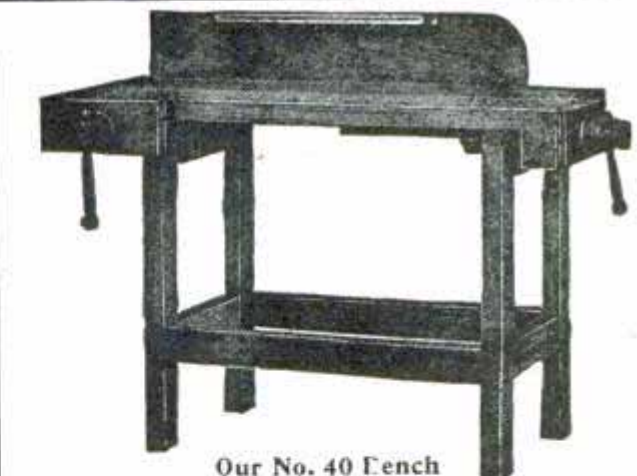
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—C. B. Woodworth, care of Ladd & Tilton, Portland, Ore.

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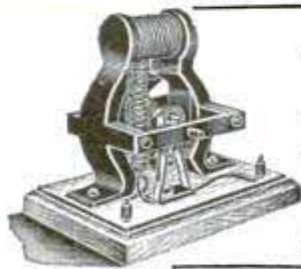
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"Need any butter this morning?" asked the farmer in the course of the conversation.

"Well, I don't know," answered the lawyer. "Wait a minute. I'll ask my wife about it."

After speaking at the telephone he went on: "My wife says no."

The farmer's face was a study for a moment. Then he broke out with: "Look ahere, Mr. Lawyer, I may be a 'rube' and have my whiskers full of hayseed, but I'm not such a blamed fool as to believe that your wife is in that box."

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Mr. Parsons, smiling, interrupted himself to tell a story.

"There was a man," he said, "who entered a dairy and asked how much the milk was.

"'Ten cents a quart, sir,' the young woman behind the counter answered.

"The man looked disappointed.

"'Haven't you any for six cents?' he asked.

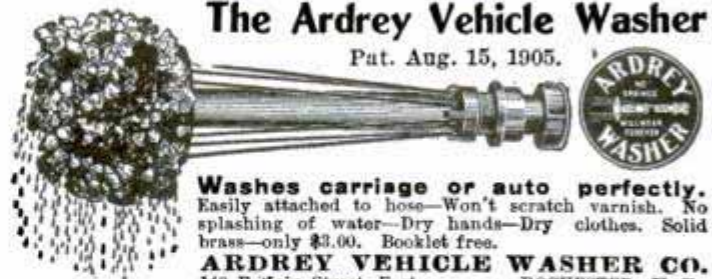
"'No,' said the young woman, 'but,' she added, 'we can soon make you some.'"—The Dirt Mover.

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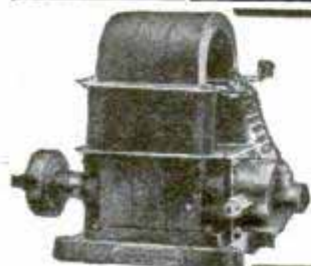
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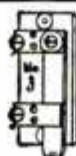
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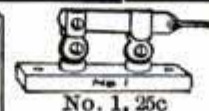
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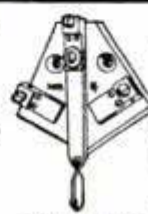
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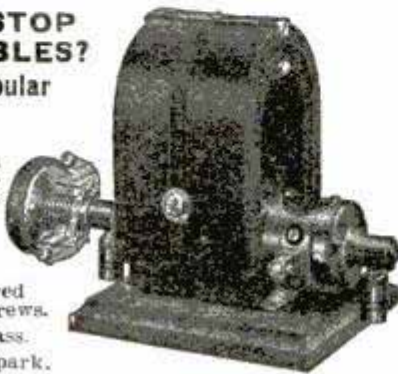
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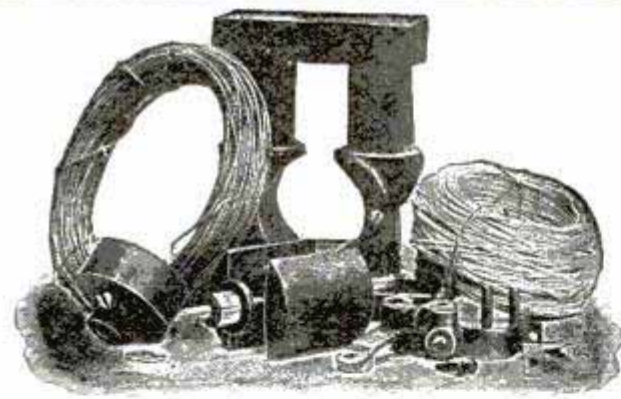
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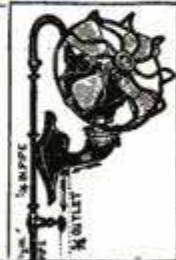
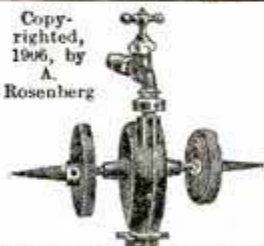
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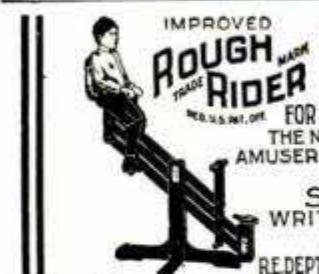
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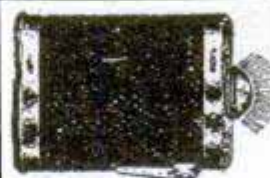
Man is a tool-using animal. He can use tools, can devise tools; with these, granite mountains melt into light dust before him; he kneads iron as if it were soft paste; seas are his smooth highway, winds and fire his unwearied steeds. Nowhere do you find him without tools; without tools he is nothing, with tools he is all.—Thomas Carlyle.

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**LIGHTSHIP TAKES LAND VOYAGE.**—"No. 50" has been a lightship eight miles off the mouth of the Columbia River for fifteen years, excepting two years in which she took a land trip. In this trip she passed through forests and climbed hills over a roadway just like a real wagon. It was this way: A terrific November storm snapped the chain of links 2 in. thick by which "No. 50" was holding to her anchor, and away it drove her toward land. Desperate efforts were made by the crew, aided by tugs, to get the lightship into the river mouth, but three times the cables parted, and the rescuers were obliged to save themselves and leave "No. 50" to her fate. By good seamanship the captain was able to beach her between two promontories, where the crew was all saved by breeches buoy and the ship was afterward thrown high and dry. Examination showed that the vessel was but slightly damaged, yet she was of little more value on land than if she had gone to the bottom. For sixteen months she nestled deeper into the beach, helped by the great quantities of sand which she had swallowed, while all the wise men showed how someone else ought to get her afloat. At last the government called for bids, and one firm was bold enough to undertake the job for \$17,500. To make a long story short, the contractors adopted the plan of dragging the ship across the peninsula on which she rested to a good launching place on the other side. Anyone who has seen a large house moved on rollers knows just about how it was done, the chief difference being that the ship was moved in a strong cradle on wheels.

**MANUFACTURE OF WOOD MEAL.**—In Europe, especially England and Germany, this has become a large industry, the demand often exceeding the means of supply. The principal consumption is in the manufacture of dynamite and low grade blotting paper. The process is neither expensive nor complicated, being merely the reduction of ordinary sawdust to fineness and purity. Pine sawdust is preferred, because it yields a whiter meal, and it may be dry or moist. The first step in the process is a screening through cylindrical sieves covered with wire gauze of different degrees of fineness. This must be done with special care in order to be sure of getting out all objectionable matter—splinters, chips, nuts, and especially any pieces of steel or other metal. For the next step is to run the screened sawdust between millstones, where the presence of any bit of metal is likely to produce a spark and a disastrous explosion. In order to reduce the risk of fire to a minimum all the bins in which either sawdust or meal is received are made of sheet iron. The meal is shipped in two grades of fineness, packed tightly in large sacks or in bales of 40 cu. ft. The price at the mill of grade No. 1 is 65 cents for 112 lb.

**RATS COST MILLIONS YEARLY.**—Farmers' Bulletin 297 will soon be issued by the United States Department of Agriculture. Its title, "Methods of Destroying Rats," is likely to excite fallacious hopes in the bucolic mind, since it offers no new or infallible devices for exterminating one of the farmer's most dreaded pests. The best it affords is a recapitulation of the traps and poisons which have been found best by experience, with much good advice about rat-proof construction. If it could tell how to really exterminate rats, the department would be able to save enough to the people of this country to equal the cost of its maintenance from the beginning.

For the little rascals' board bill alone runs into millions of dollars worth of grain, eggs, poultry, and even pigs and lambs, every year. But they might be forgiven for picking up a living where they can find it if they did not ruthlessly destroy vast values of laces, carpets, silks, leather goods, insulation of electric wires, etc.

**BUILDING DROPS INTO A SHAFT.**—A very unusual accident has occurred at Butte, Montana. With a crash that could be heard half a mile away a two-story dwelling house dropped 50 ft. into the shaft of the Phoenix Mining Company. Five men were working beneath the building, when the bank began to cave, and the dropping of rock and crashing of timbers warned them of approaching danger. Superintendent J. E. Davidson and Will Owsley had very narrow escapes, being the last to get from under when the house dropped into the shaft. The shaft is about 100 ft. square, and in the center a hoisting shaft took dirt from the tunnel which is being driven under the street just beneath where the building stood. The building was totally wrecked. Fortunately, the house was tenantless at the time. The tunnel was so far below the foundation that engineers never imagined the earth would yield to the weight.

**A GIRL BLACKSMITH.**—She is only sixteen, and St. Louis is proud of her. After an apprenticeship of three years in her father's shop, Miss Minnie Hagmann is able to shoe horses, make a wagon and do all the usual work of a blacksmith, and she does it quickly and well. What little bookkeeping and bill collecting there is to be done she attends to at night, for all day long she is busy in the shop with hammer and tongs. She enjoys her work, and, needless to say, she is well and happy, has plenty of nerve and no nerves.

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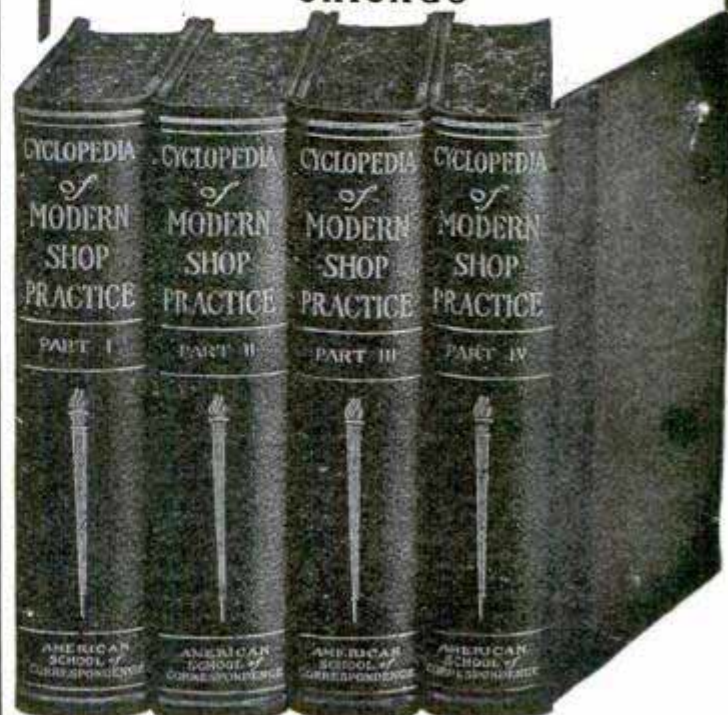
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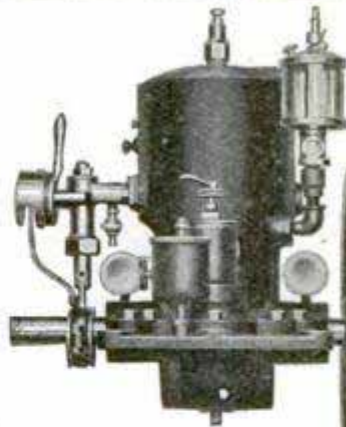
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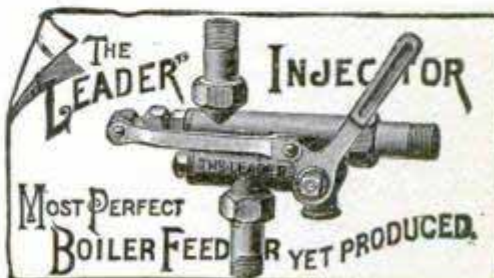
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**NAVIGATING THE AIR.** By The Aero Club of America. Illus., 250 pp. Cloth, \$1.50. A scientific statement of the progress of aeronautical science up to the present time, describing machines of all noted aeronauts. Doubleday, Page Co., New York.

**THE TWENTIETH CENTURY TOOLSMITH AND STEEL WORKER.** By H. Holford. Illus., 240 pp. Cloth, \$1.50. A practical and scientific book written in the interests of locksmiths, toolsmiths, toolmakers and allied craftsmen. With color chart for hardening steel. Frederick J. Drake & Co., Chicago.

**LOCOMOTIVE ENGINE BREAKDOWNS AND HOW TO REPAIR THEM.** With Questions and Answers. By W. G. Wallace. Illus., 282 pp. Morocco covers, red edges, \$1.50. Indexed for quick reference. Thorough and clear in expression. Frederick J. Drake & Co., New York.

**FIRE ASSAYING.** By Evans W. Buskett, B. S. Illus., 95 pp. Cloth, \$1.25. Practical treatise on fire assaying of gold, silver and lead, including description of appliances used. Many valuable tables. D. Van Nostrand Company, New York.

**MECHANICS OF HOISTING MACHINERY.** By Julius Weisbach and Prof. Gustav Herrmann. Translated from the German by Karl P. Dahlstrom, M. E. Illus., 329 pp. Cloth, \$3. A text-book for technical schools and a guide for practical engineers. Includes accumulators, excavators and pile drivers. The Macmillan Co., New York.

**HOW TO BUILD AN 18-FT. LAUNCH.** By Howard A. Myle. Pamphlet form; illustrated. Price, \$1. All the details of constructing an inexpensive, easy-to-build launch, light, graceful, speedy and powerful; told by an amateur who built one. Belle Isle Motor Co., Detroit, Mich.

**STANDARD EXAMINATION QUESTIONS AND ANSWERS FOR LOCOMOTIVE FIREMEN.** By W. G. Wallace. Illus., 343 pp. Morocco covers, red edges, \$1.50. Progressive examinations for first, second and third years, adopted as standard by the Traveling Engineers' Association. Also much valuable information. Frederick J. Drake & Co., Chicago.

**CONCRETE ROADWAYS** (Bulletin No. 14) and **CONCRETE BRIDGES** (Bulletin No. 15), containing interesting matter on the subjects named, are distributed free upon application to the Association of American Portland Cement Manufacturers, Land Title Bldg., Philadelphia.

**TABLE OF VOLUMES THROUGH AIR-WAYS.** Ready reference for engineers who meet with problems of air transmission through large air-ways. Price, 25 cents. E. E. Meyer, Allegheny, Pa.

## NEW CATALOGS

**PRACTICAL IRRIGATION.** An illustrated 36-page pamphlet, No. 449 P. I., dealing with the mechanical irrigation problem and describing various types of pumping machinery used for this purpose. Fairbanks, Morse & Co., Chicago.

**KEWANEE SYSTEM OF WATER SUPPLY.** A handsome catalog published by the Kewanee Water Supply Co., of Kewanee, Ill., describing and illustrating their system for both city and country use and answering many questions in regard to the same.

**AIR TEN MILES UP.**—The height of the atmosphere has long been a matter of speculation, and it has an important bearing on many scientific questions. A Frenchman is reported to have obtained a sample of air of slight density from a height of 51,000 ft. above the sea by means of an automatic balloon.

**FUTURE MOTOR OMNIBUS.**—Although the motor omnibus has come to stay, it grows daily more and more evident that it will not—indeed, cannot—remain in its present form, concludes the London Times, which says:

"Before it can be ranked as a successful vehicle it must be considerably reduced in weight, and therefore to some extent in carrying capacity. If the reform does not come from within, it will assuredly be enforced from without, for the wear and tear of suburban roads, the extremely serious deterioration of roadside property, due to the noise and vibration inseparable from these huge cars, is raising most strenuous opposition. A few days ago a deputation from Paris arrived in London for the purpose of investigating the traffic problem as dealt with in this city, and particularly with regard to the motor omnibus question. This deputation had an audience with the chief commissioner of police, who, in the course of his remarks, gave it as his opinion that the motor omnibus of the future must be a much smaller, lighter and quieter vehicle than that at present in use."





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**NATURAL COLD STORAGE.**—Alaska is a hard and cold proposition in some respects, but there will be no ice trust there. Every man can make his own cold storage plant by digging a 3-ft. hole in the back yard and keeping it well covered. For the thermal condition of the soil there is just the reverse of that in the temperate zone. Instead of the ground freezing a few feet in winter and thawing out promptly in the spring, Alaska is frozen solid to an unknown depth, and in summer only a surface layer of 2 or 3 ft. is thawed out. Consequently, if you dig but a little below the roots of growing vegetables and flowers, you will find frozen earth—congealed molecules of water which have been there unchanged since the great cataclysm which shifted the north pole to its present position. A shaft driven 200 ft. yields earth which is frozen solid.

For wholesale storage of meats, vegetables and fruits, however, there is a need for large plants in which different foods may be kept at the best temperatures for preservation. Of the 200 towns in Alaska more than half have such storage, but the remainder present a field as rich as a gold mine waiting to be worked by the builders of cold storage plants. The number of such towns is increasing constantly, and by 1909, when the Alaska-Yukon-Pacific Exposition opens in Seattle, their capitalists will be on hand to examine exhibits of cold storage and place big orders for mechanical plants.

**THE EIGHT WISE STEERS.**—Some fifty years ago, when the first sawmill was built on the Waccamaw River, S. C., a cargo of mill supplies was shipped from Searsport, Me., together with four yoke of oxen. When the schooner came to anchor, there being no landing facilities, the cattle were jumped overboard, and all swam ashore to a grass plot on the bank of the stream, the idea being to allow them to rest and recuperate before being put to work. Imagine the surprise of the crew that night, all below at supper, when the cook rushed into the cabin yelling: "Cap'n, Cap'n! The cows be all comin' off to the ship, again!" And sure enough, there were the eight oxen circling around the ship, clamoring, as it were, to be taken aboard again. Was this nature or instinct?—New York Press.

**TOO LATE TO CHANGE.**—"I hear you have a little sister at your house," said a Chicago grocer to a small boy. "Yes, sir," said Johnny. "Do you like that?" was queried. "I wish it was a boy," said Johnny, "so I could play marbles with him and baseball." "Well," said the storekeeper, "why don't you exchange your little sister for a boy?" Johnny reflected for a minute, then he said, rather sorrowfully: "We can't now. It's too late. We've used her four days."



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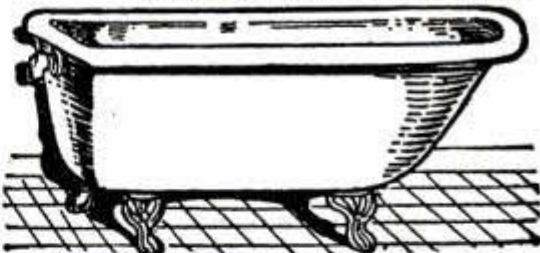
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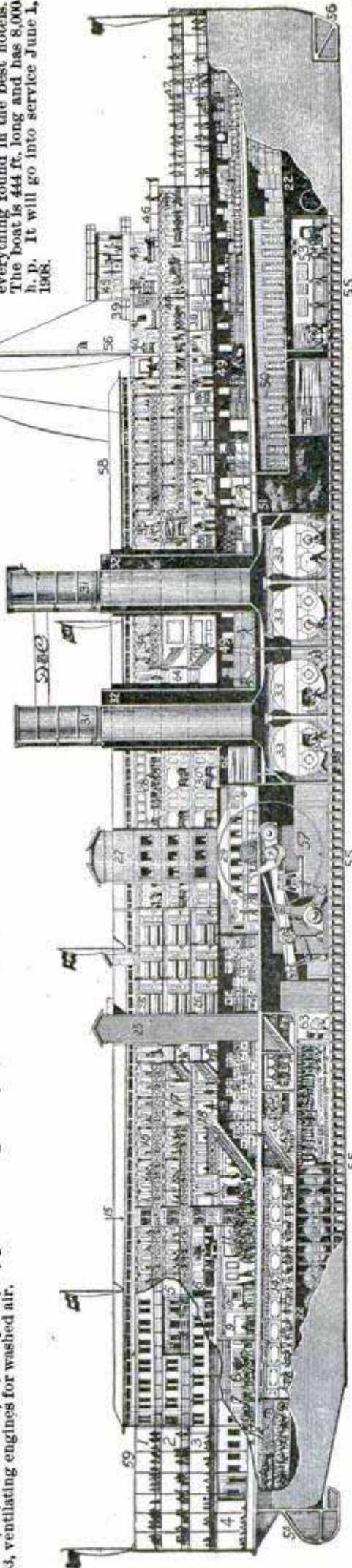
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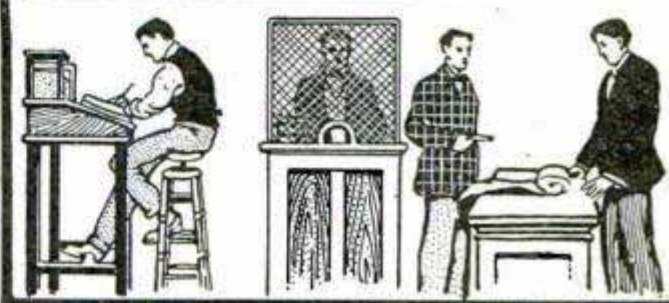
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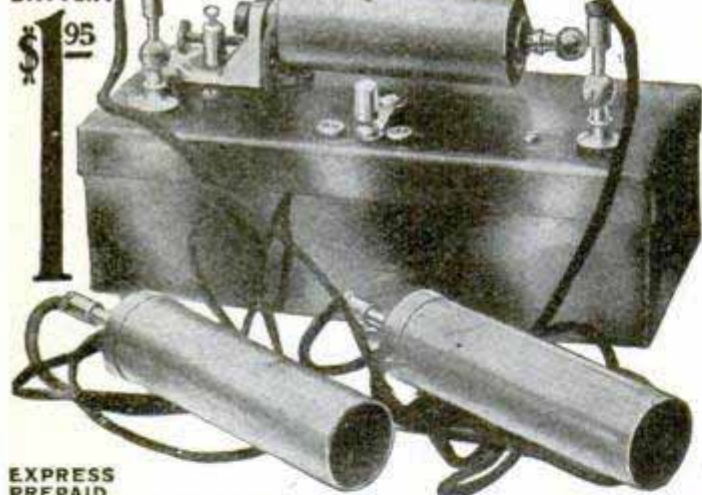


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**VENTRILOQUIST GOT EVEN.**—A woman in sad-colored garments, with a forbidding aspect and a poke bonnet, was a passenger in a morning train from Harrisburg, Pa., to New York. She was disturbed by the draught from an open window. She was annoyed by the shrill chatter of the children across the aisle. But when four young college men took the double seat behind her and joyfully uplifted their voices in favor of a good smoke, her wrath knew no bounds. Turning swiftly, her poke bonnet focused the face of the man nearest, and she observed:

"The noxious weed they call tobacco. It is too filthy even for insects to crawl upon, and yet you put it in your mouth and expect to be received in decent society."

The tide of her eloquence was stemmed by the civil suggestion of her neighbor that though he regretted his remarks had offended her, they had not been addressed to her but to his friends. She refused, however, to be placated, and was still pouring forth her views on the "vile and disgusting tobacco habit" for the benefit of the carload of passengers, when immediately beneath her seat the sharp yelp of a small dog was heard. The woman started and looked nervously about. There was nothing to be seen.

She was about to begin again when the small dog's yelps, plaintively prolonged, came from under her skirt. She gave a little shriek and pulled it back as the conductor said firmly: "Sorry, madam, but you will have to take that dog into the baggage car."

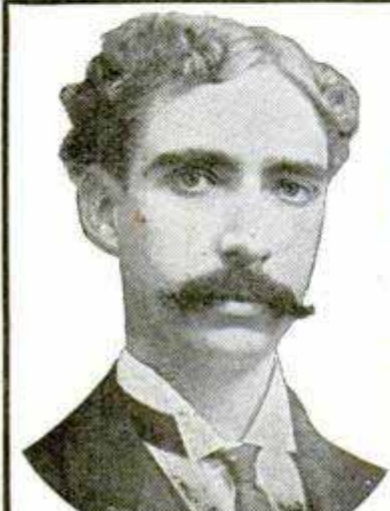
"Can we help you, madam?" asked the polite voice of the smoker behind.

"I have no dog," snapped the woman, searching the floor with fearsome eyes. The conductor searched, too, then looking at her suspiciously, he passed on down the aisle. The next instant a scratching and spitting, intermingled with mad yelps and howls, sent the woman flying from her seat as the conductor came back on the run. Although the car was diligently investigated from end to end, no cat or dog was visible to the naked eye.

Everybody began to smile. Even the conductor seemed to see a joke. Only the victim of the unseemly visitation and the four young tobacco fiends behind her failed to join in the general hilarity. The young men were chatting among themselves with a beautiful unconsciousness of the excitement about them.

When at the next station, however, a poke bonnet tremulous with feeling disappeared precipitately into the next coach the quartet exploded.

"I haven't quite lost the trick," said the college man on whose head the abuse had been heaped. "And it worked to a charm."—New York World.



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### ENDORSED BY PHYSICIANS

The Lambert Snyder Vibrator is used and endorsed by noted physicians because it is based on scientific principles of health. It cures by removing the cause, forcing the red blood through the congested parts at once. Don't pour drugs into your stomach for a pain in the knee or back; the trouble is not there.

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Rheumatism, Sciatica, Lumbago, Gout, etc., are caused by uric acid in the blood in the form of urate of soda. This acid, through poor circulation at some particular part, gets stopped on its way through the system and, congregating, causes pain. Apply the Vibrator to the spot and you will relieve the congestion and get relief at once.

Deafness, Head Noises, Ringing in the Ears, in most cases, are caused by the thickening of the inner membrane through catarrh or colds. To cure this vibration is the only thing, as it is the only way to reach the inner ear drum and loosen up the hard wax or foreign matter, so sound may penetrate to the drum.

Stomach Trouble, Indigestion, Constipation, etc., are caused by the food not properly digesting; it lacks necessary saliva and gastric juices, thus creating congestion in the stomach; forming gases, causing pains, bad breath, etc. Apply the Vibrator to the stomach; it settles the food down, releases the gases, regulates the action and brings about relief instantly.

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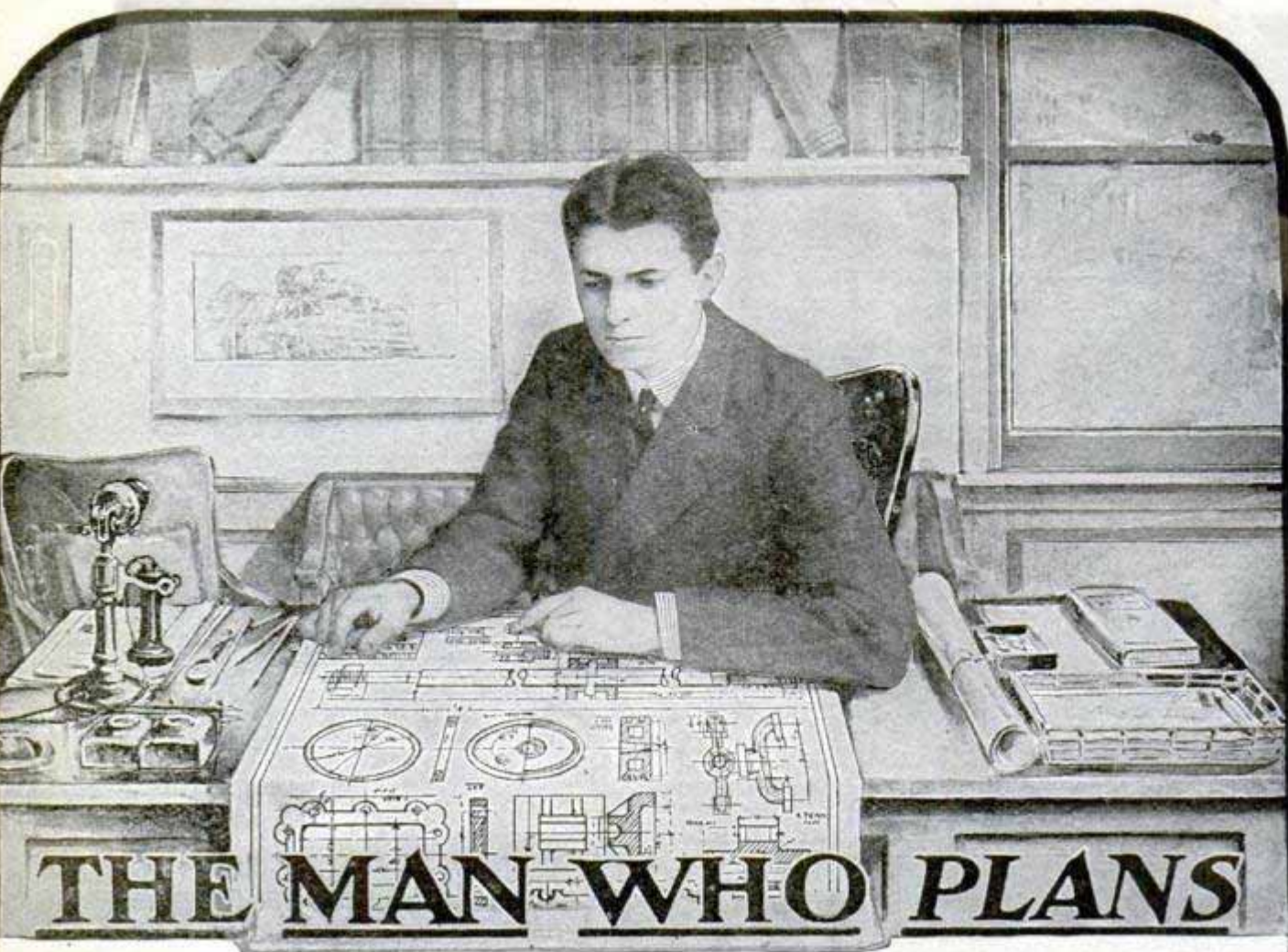
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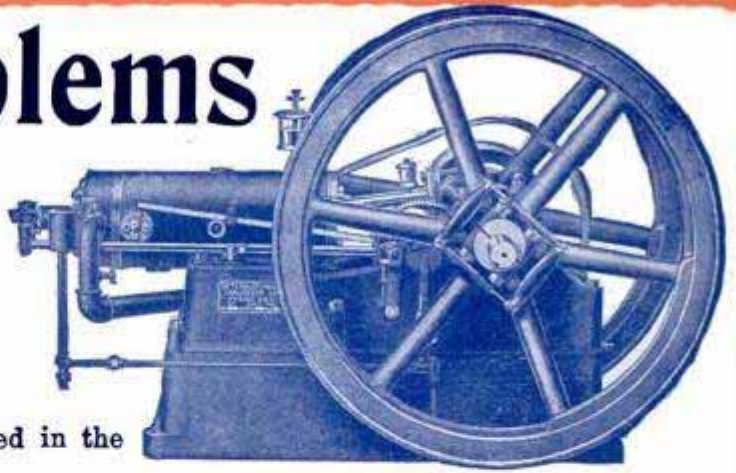


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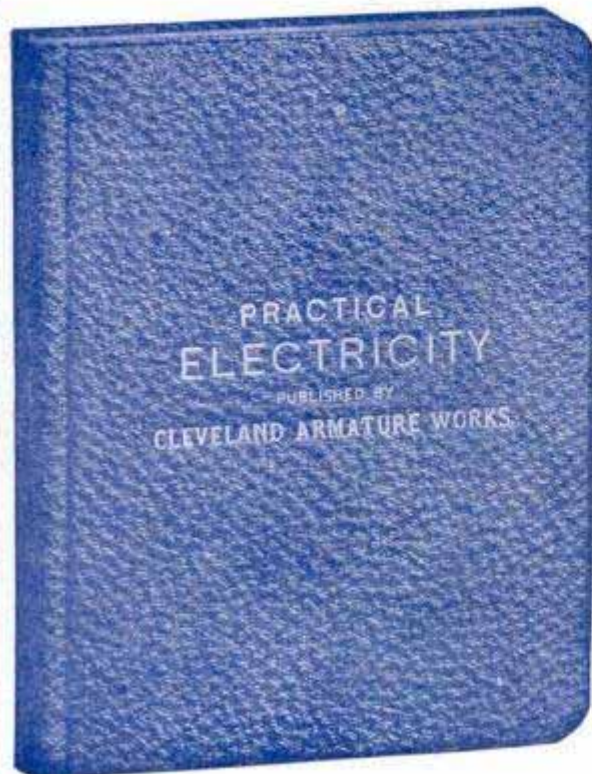
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- III—Magnetism
- IV—The Magnetic Circuit
- V—Magnetic Traction
- VI—Magnetic Leakage
- VII—Energy in Electric Circuit
- VIII—Calculation of Size of Wire for Magnetizing Coils
- IX—Calculation of E. M. F.'s in Electric Machines

CHAPTER

- X—Counter E. M. F.
- XI—Hysteresis and Eddy Currents
- XII—Armature Reaction
- XIII—Sparking
- XIV—Winding of Dynamos and Motors
- XV—Proper Method of Connecting Dynamos and Motors—Self-Excitation and others

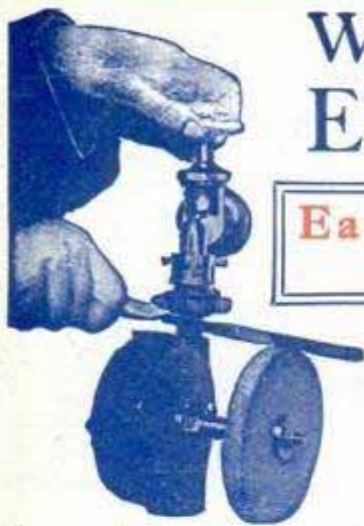
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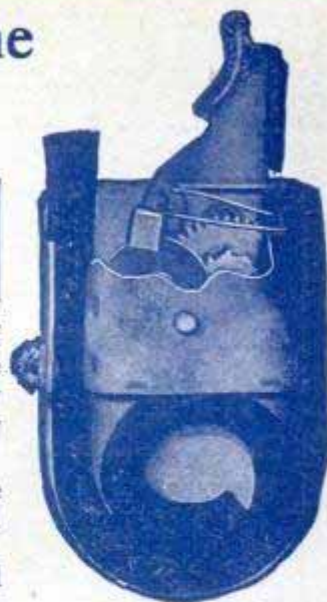
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