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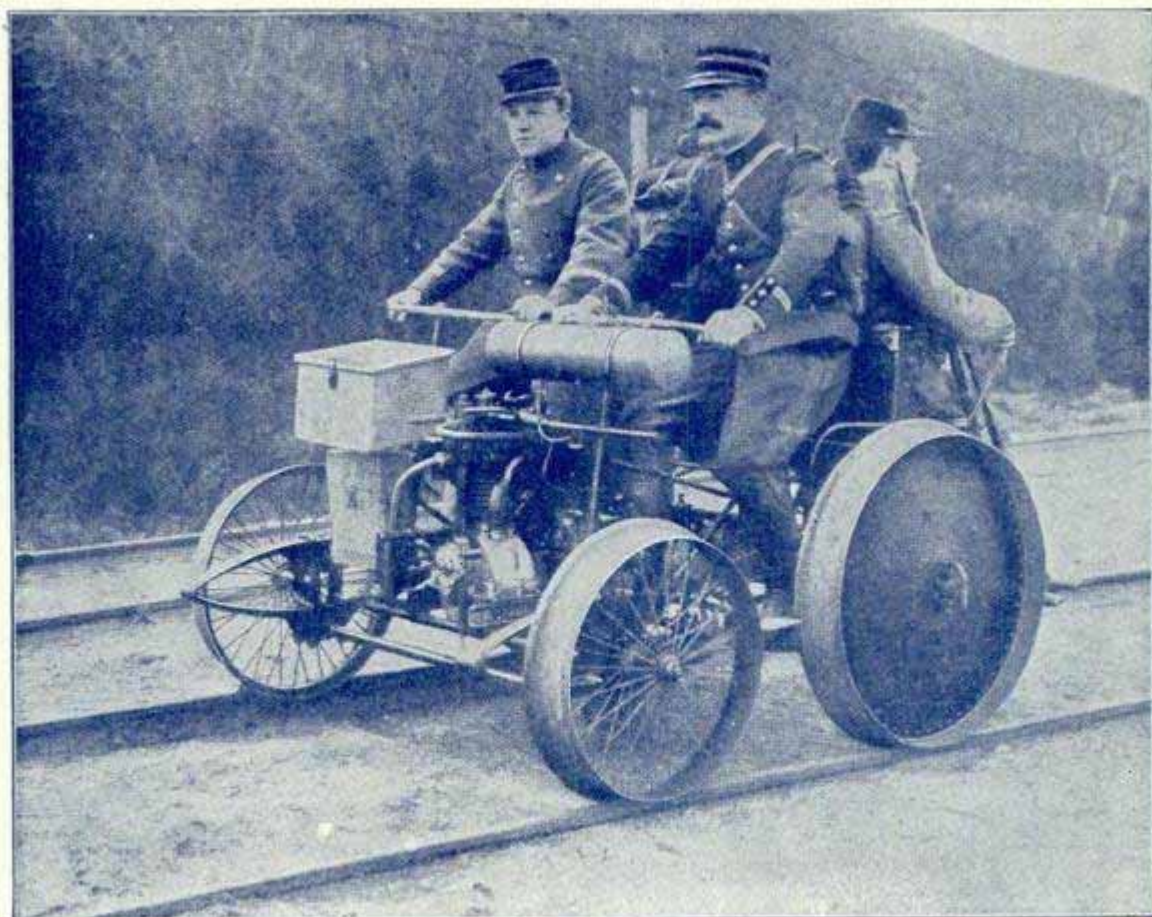
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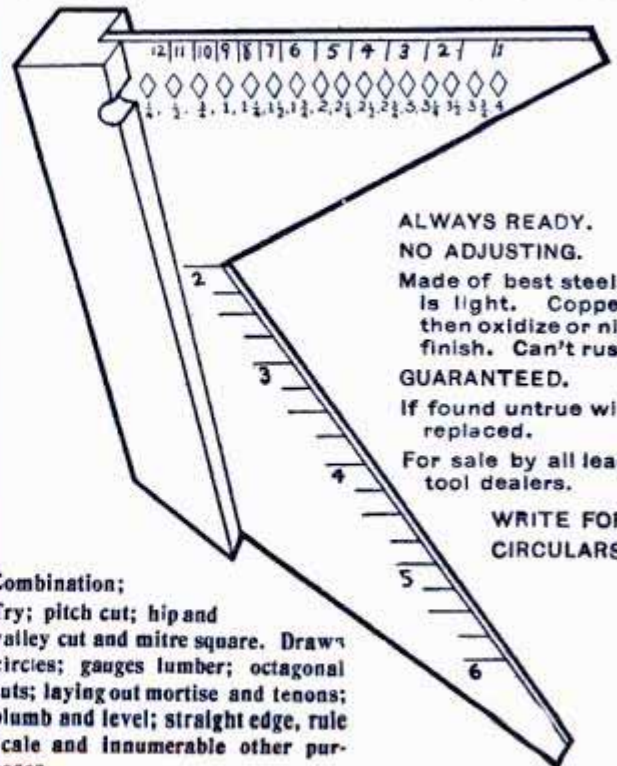


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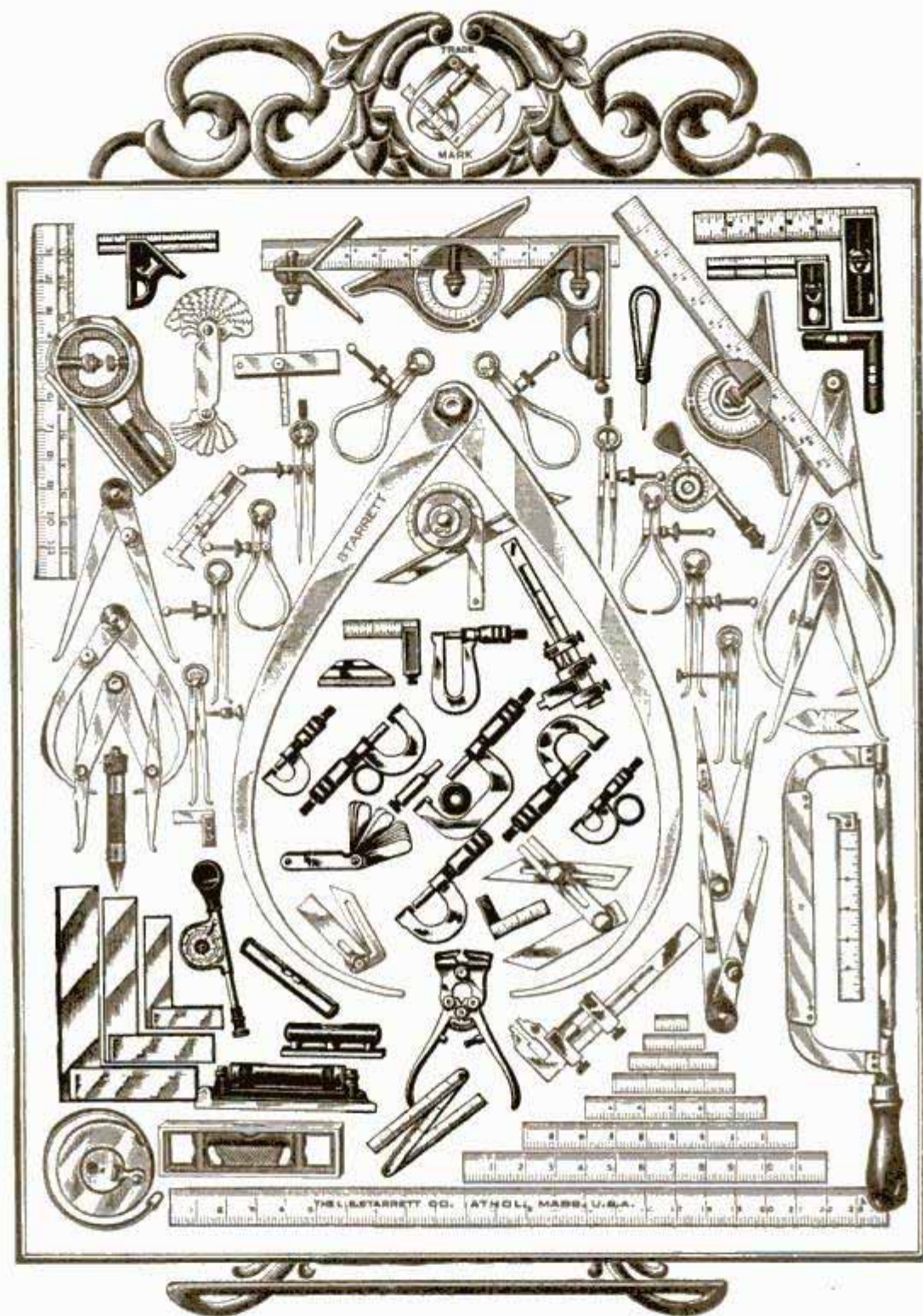
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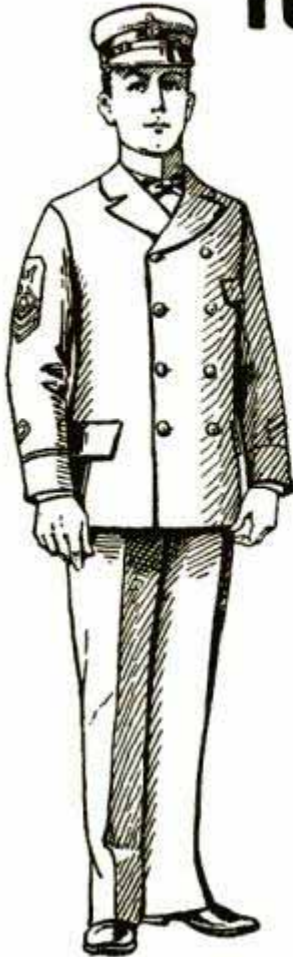


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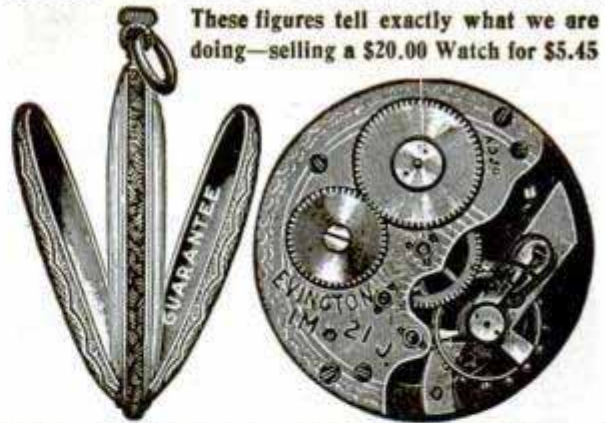
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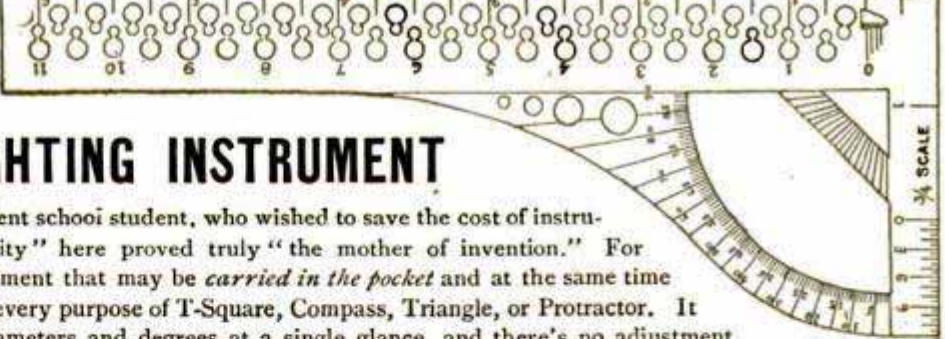
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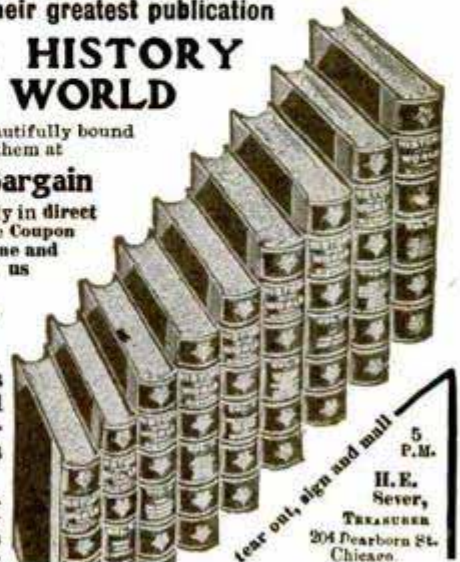
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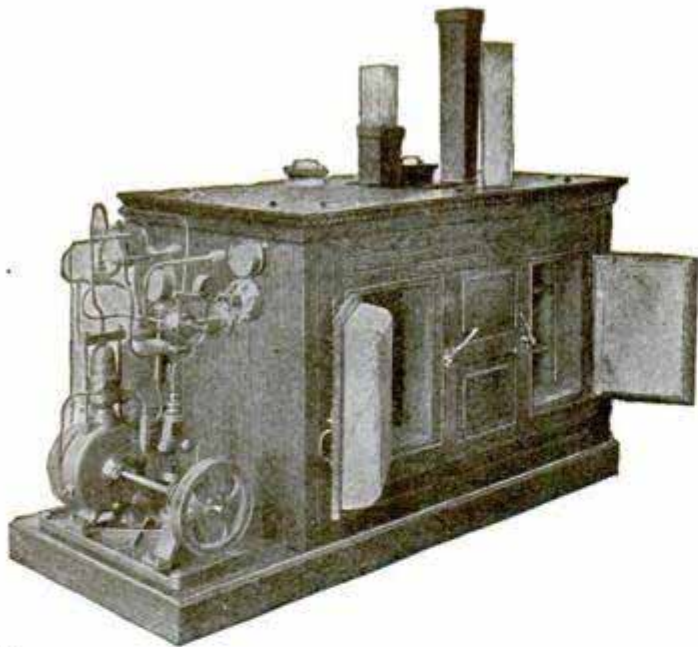
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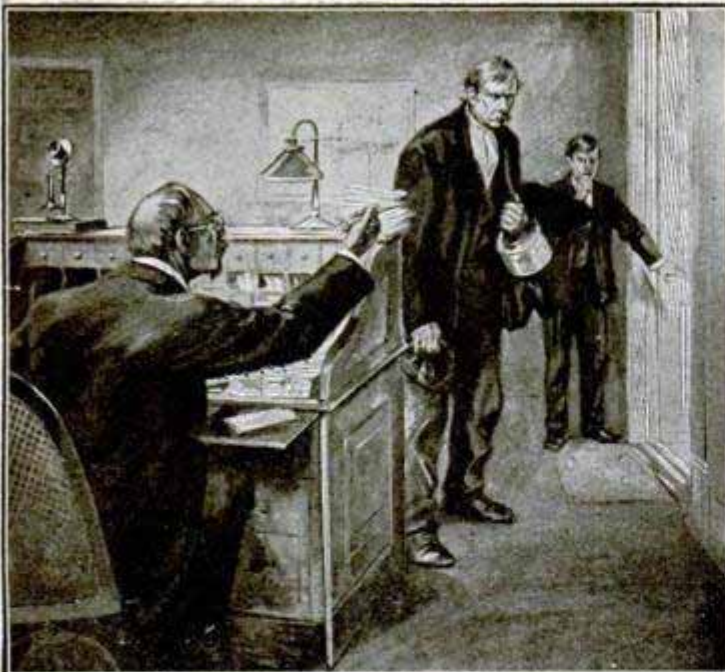
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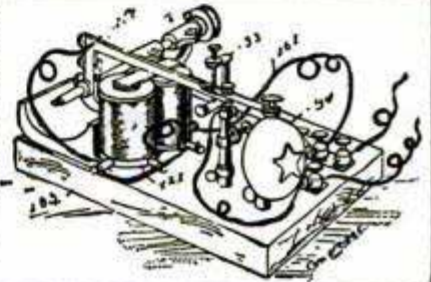
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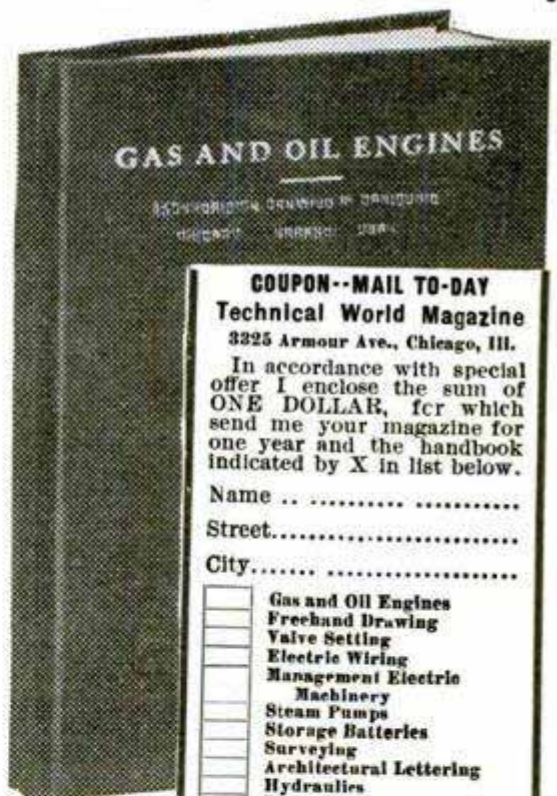
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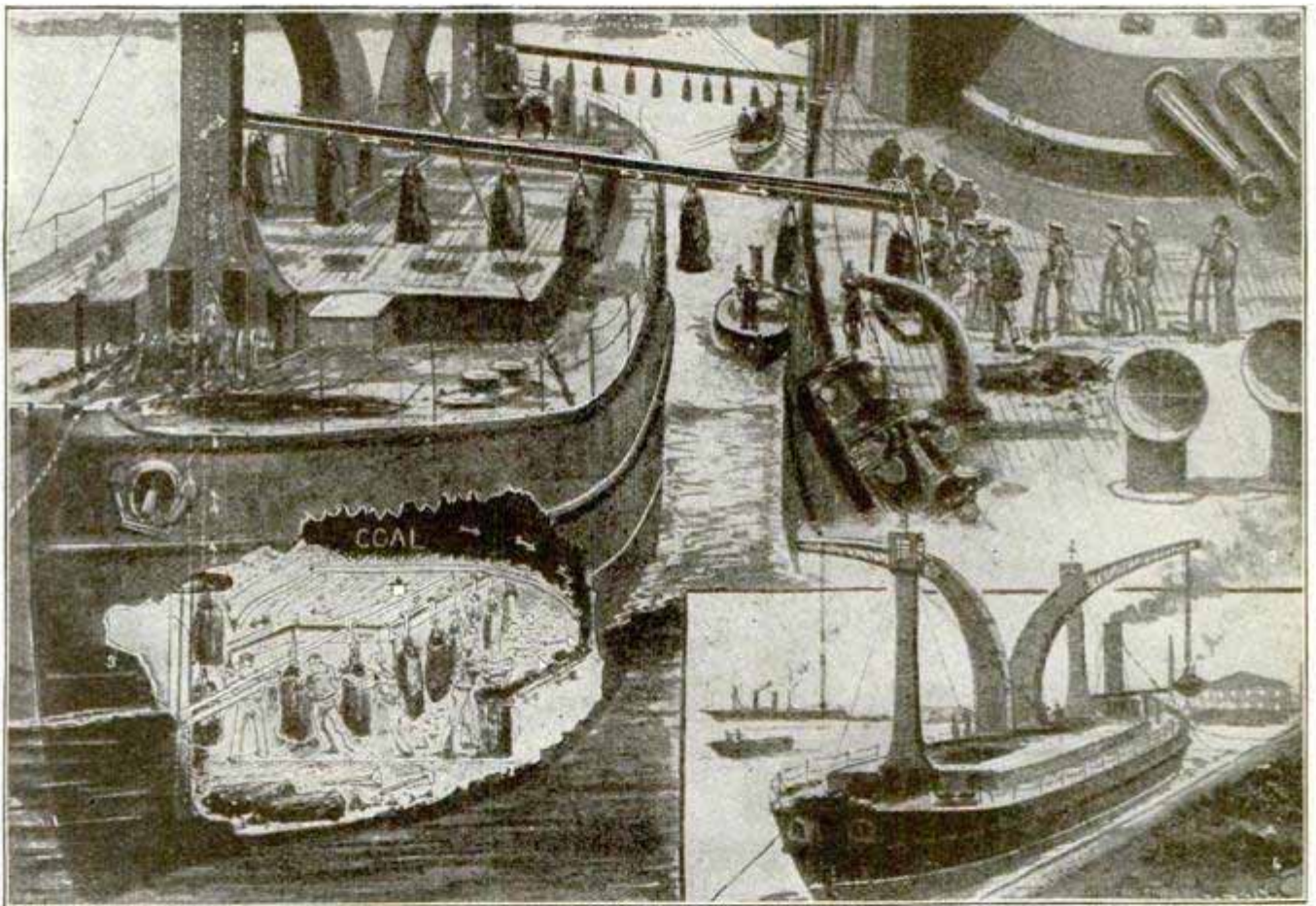
# POPULAR MECHANICS

Voi. 8. No. 5.

CHICAGO, MAY, 1906.

10 Cents a copy.  
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## FLOATING COAL BAGGING DEPOT FOR COALING WARSHIPS



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A coal lighter of 1,000 tons' capacity wherein the coal is bagged without shoveling and then transported automatically to the battleship alongside is a new English coaling device which promises increased speed in this important work. The lighter receives its store of coal into its holds by means of two high-speed  $2\frac{1}{2}$ -ton cranes (Fig. 4), which are also used for transporting bagged coal from barges to vessels requiring it on the other side. These powerful cranes can pick up and set down their loads at any point within a radius of 40 ft., and

outside a radius of 8 ft. from the lighter.

Within the lighter (the process being the same at each end) the coal is fed by gravity (Fig. 3) upon a bench whence it is raked into bags by middies. As fast as these bags are filled they are hung upon an overhead rail along which they run to the elevator, and are sent up the shaft at great speed, passing from it in the direction indicated by the arrows and crossing to the battleship along another rail. This method delivers the coal to the deck of the warship at the rate of 100 tons an hour.

## AUTOMOBILE MAIL ROUTE IN NEW MEXICO

An automobile mail route 111 miles long connecting the cities of Roswell and Torrance, New Mexico, is a recent and significant enterprise of Uncle Sam. A passenger stage business had been in operation over the route for about eight months when an echo of its success reached Washington and an inspector was sent down to study its possibilities. As a result, auto mail service with a schedule of eight hours was established between the two points.

The route is over rolling prairie with no trees and few rocks. A fine road has been constructed by dragging plow-shaped knives attached to a machine similar to a road drag over it, making two smooth 30-in. tracks for the two sets of wheels, right and left. Five 27-hp. machines are handling the passenger and

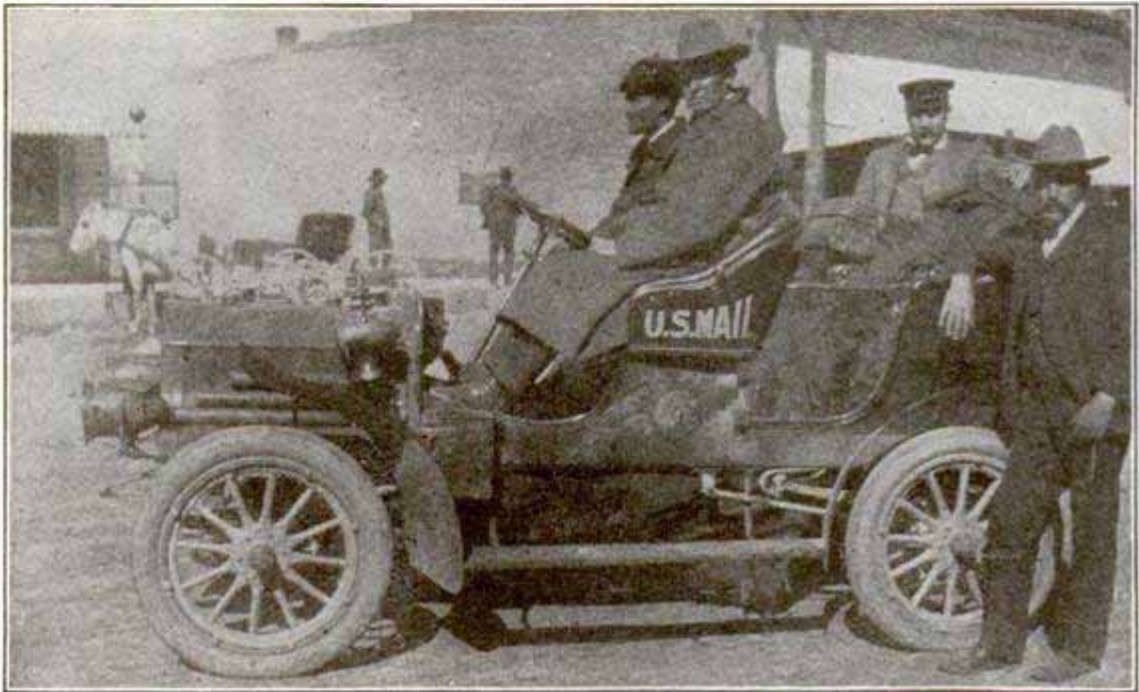
mail business and the only interruption in the service was during a deep snow that blockaded steam trains, as well. At a half-way station mails and passengers are transferred to a fresh car as better time can be made with this plan.

When traffic is exceptionally heavy the mail is carried in a large box mounted on a pair of wheels taken from an old auto. Frequently the mail car makes the trip in five and one-half hours, and under its regular schedule, the time of receiving mail has been shortened from four to twenty-four hours in the various localities benefited by the service.

Hereafter the Weather Bureau will warn ships at sea of storms and fog by means of wireless telegraphy. In case of fog the area to be affected will be given, thus enabling vessels to shape their course accordingly, with less danger of collision.

## EXHAUST STEAM RUNS TURBINE

A new application of the steam turbine has been discovered. In an electric railway power plant in Philadelphia a low-pressure steam turbine drives an 800-kw. generator using the exhaust steam from five corliss engines which total 8,200 hp. The exhaust steam enters the turbine at 1 lb. above atmosphere and exhausts into a condenser where a vacuum of 28 in. is maintained. The turbine works best with not less than three of the corliss engines running, but gives satisfactory efficiency on only one.



New Mexico Mail Auto

## PRODUCER GAS FOR MARINE PROPULSION

The use of spirit motors for marine service is necessarily limited, and therefore the employment of producer gas is now claiming the attention of many engineers. An example is given of a suction producer installation in the "Lotte," a freight boat 134 ft. long, 15 ft. beam, and 6 ft. 6 in. draught, with a load of 240 tons, says the London Gas Review. Two gas engines, well balanced and placed with cylinders vis-a-vis, develop about 100 hp. and the experiments made with this and similar vessels have proved that the cost of transport per ton mile by such means is two-thirds that by steamboat, and one-fifth that by railroad.

That gas engines and suction gas producers will be extensively utilized for freight boats is very evident. An unlimited supply of water for washing and generating

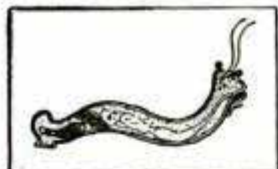
the gas and for cooling of engine cylinders is all in its favor. The question of weight is of little importance. While the larger size of gas engines have not been applied to marine propulsion, the smaller engines have proved their capability and high economy for propelling boats of moderate size at the speeds common to ordinary river transport. There is no doubt that great strides will be made in this direction, both with the gas engine and with oil engines.

## LAZY BUG HINDERS PANAMA CANAL

### Government Looking for Immunes to Dig the Big Ditch

The Lazy Bug, the subject of extravagant ridicule two years ago, is now recognized as an actual, serious proposition, and one which quite as much as yellow fever must be reckoned with in building the Panama canal. The lazy bug is the discovery of Capt. Bailey K. Ashford, assistant surgeon in the United States Army. The vindication of his investigations is seen in the appropriation of \$50,000 to carry on his work in Porto Rico, and the sending of a government officer to that island in the effort to secure native immunes for work on the Panama canal.

The lazy bug is a microscopic parasite in the form of a small worm, which attaches itself to the walls of the small intestines and absorbs the nutritious chyle before it passes into the blood; in a short time the blood is so impoverished the victim loses strength and becomes dizzy and light headed. None are exempt; the parasite attacks children and people of all ages.



Capt. Ashford not only solved the question of what caused this universal debility, but discovered an antidote in the form of a serum. During the past two years hundreds of thousands of Porto Ricans have been treated and cured. Many of the natives actually walked over 200 miles to take the cure. Ten stations for free treatment are now operated, and one big tobacco manufacturer employing 2,000 hands, reports his output increased one-half after his men were treated.

Capt. Ashford has been ordered to Washington, from which point he will enlarge and direct his work. The treatment will be established in the canal zone for the benefit of laborers on the canal.

## THE FRENCH MINE DISASTER

A glimpse of the coal mine at Courrieres, France, where nearly 1,200 miners lost their lives recently, is given in the illustrations reproduced from the London Illustrated



A Narrow Gallery

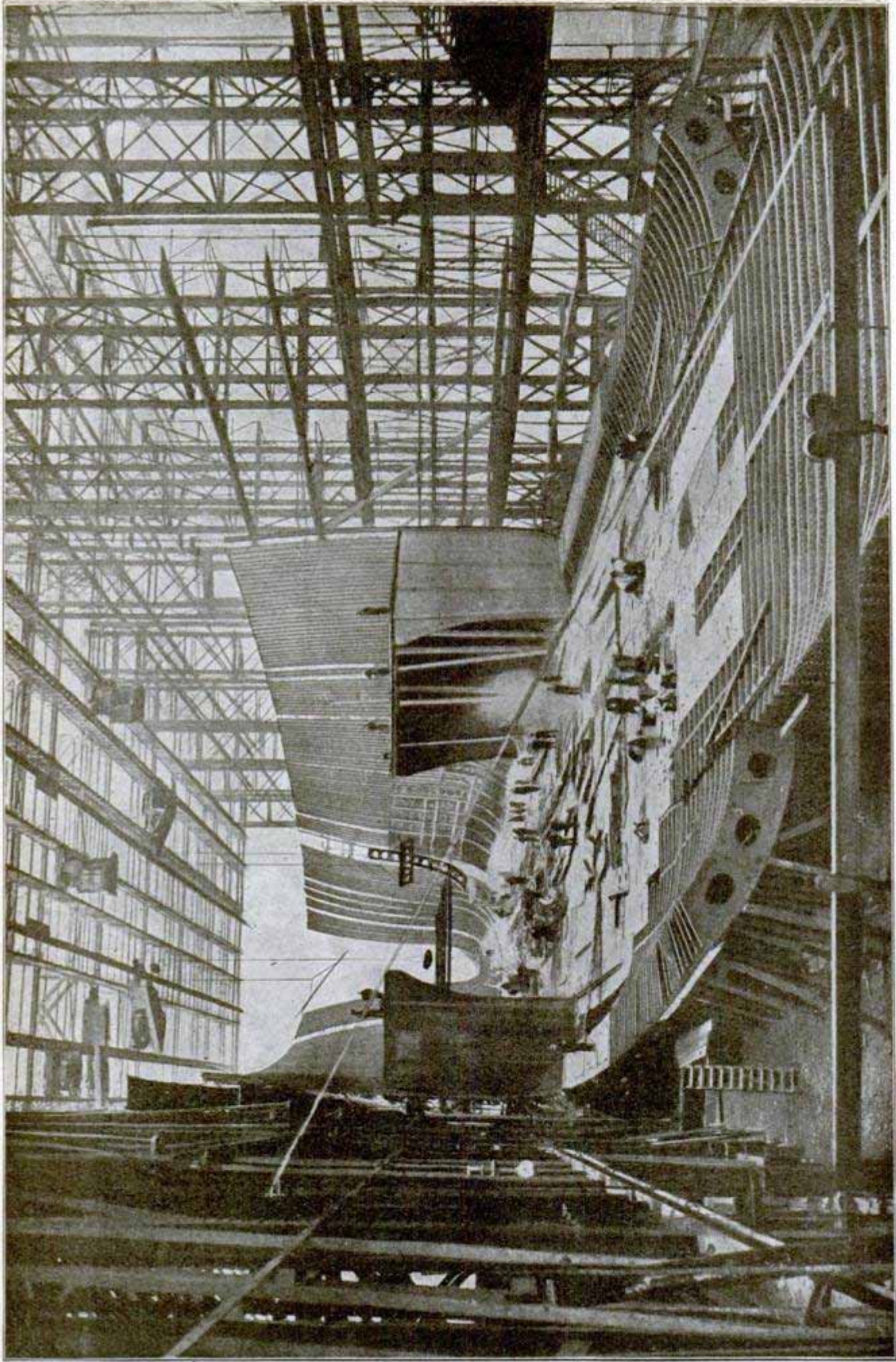
News. The vein of coal is a narrow one, compelling the miners to work while in a sitting or reclining position. On March 29, twenty days after the disaster, fourteen men were rescued, who had been compelled to subsist on the meagre rations they happened to have at the time, and hay which was kept in the workings for the donkeys which draw the small dump cars to the bottom of the shaft. The rescue was one of the most



The Rooms are Low

remarkable in the history of mine accidents, and was made days after all hope had been abandoned.

Portugal has decided to purchase two steerable aerial warships for the use of her expedition against the revolted tribes in West Africa.



"The hull is being constructed in a large shed with glass roof; when the work is done 30,000 tons of steel will have been assembled."



## BUILDING THE NEW CUNARD EXPRESS STEAMERS

**All Previous Efforts in Shipbuilding to Be Exceeded in the Atlantic Liners**

Each year the shipbuilders approach a few feet nearer the ultimate goal of an ocean steamship 1,000 ft. in length. The two new Cunard liners now building, one of which will be launched the last of the present month, will be 790 ft. long; 88 ft. breadth; depth moulded 60½ ft.; displacement over 40,000 tons; and speed from 27 to 29 statute miles per hour. The accomplishment of such magnificent record breaking has been made possible by a subsidy of \$750,000 a year, and the loan of \$10,000,000 at 2¾ per cent from the British government. In return the ships are to fly the English flag, and be available to the admiralty in event of their need in case of war.

The two ships are identical in construction, hence the description of one applies to both. The hull is being constructed in a large shed with glass roof 700 ft. long, 100 ft. wide and 144 ft. high. All manner of electric cranes move in every direction far overhead; when their work is done 30,000 tons of steel will have been assembled and taken form in a gigantic hull of graceful form and bound together in the strongest manner known to the art. The rudder weighing 65 tons, and with its main castings totaling 200 tons, suggests the massive lines of construction. There are six decks, which will accommodate 2,350 passengers and 800 employees.

The captain on the bridge will be 110 ft. above the keel; while the four funnels will rise to 154 ft. above the keel, and are large enough to permit two locomotives of ordinary size to pass within any one of the funnels. The two masts are each 210 ft. high. In order to secure the high speed required, each ship will require an indicated horsepower of 60,800. This will be derived from four screw propellers driven by steam turbines—two low and two high pressure—supplied with steam at 195 lbs. from 23 double-end boilers and two single-end, with a total of 192 furnaces. In addition to the 4,500 electric lights, electricity will operate the elevators and other conveniences, while all parts of the ship will be connected by telephones.

Two German soldiers sailed in a balloon from Berlin recently, crossed the Baltic Sea in a fierce snow storm and landed, exhausted, but safe, on the Swedish coast.

## CLEANING HOUSES WITH STEAM

In England a new method of cleaning the exterior of buildings has been introduced. A workman dressed in waterproof clothes and with face carefully protected handles india-rubber tubes by means of which a jet



**A Jet of Steam is Used**

of hissing steam is played over the building, cleansing it beautifully.

## FLEXIBLE GLASS

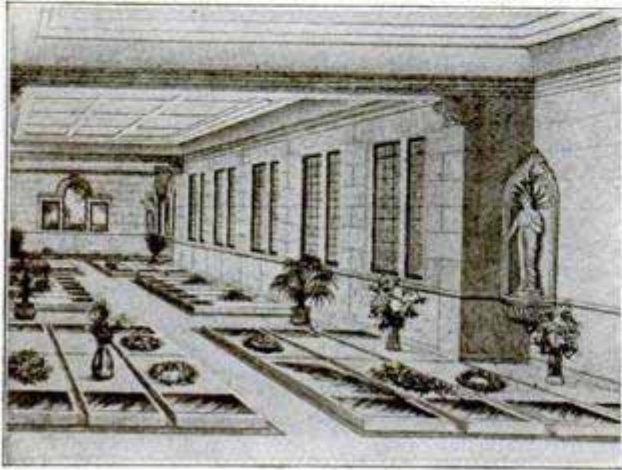
The imitation glass windows used in automobile tops are simply celluloid, similar to that used for making draughtsmen's triangles, only much thinner, being 10-1000 and 15-1000 of an inch thick. In use the surface often becomes scratched which makes it opaque. Another disadvantage is its extreme inflammability which makes it dangerous in some cases.

An imitation flexible glass is also made of gelatine. This is not inflammable like celluloid, but it will not withstand the action of water, which prevents its use for most articles. Novelty candy boxes are sometimes made of this gelatine glass, and are very attractive, the contents of the box being visible before opening.

## MEMORIAL TEMPLE WITH BURIAL CRYPTS

Idea of Westminster Abbey Applied for the Benefit of the Rich Rather than the Illustrious

A classic memorial temple with a chapel and two halls containing crypts for the dead is soon to be built at a Chicago cemetery. The structure will embody, in a modernized form, the idea of Westminster Abbey and



Memorial Hall--Right Wing--54 Spaces

other old English cathedrals and will be built with a view to permanency.

The architecture will be of the Ionic order. In the center of the temple will be located a chapel equipped with a pipe organ and other essentials, and at the right and left of this chapel, the wings with spaces for 108 caskets in all. These receptacles will be built of concrete and slate just beneath the floor, each capped with a heavy granite sarcophagus cover, polished to receive the inscription. Complete sanitation will be provided by means of in and out currents of air. At the rear

of the temple will be 40 crypts for temporary receiving purposes. A chime of bells in the dome will be made to play music appropriate to burial services. The building will cost \$150,000.

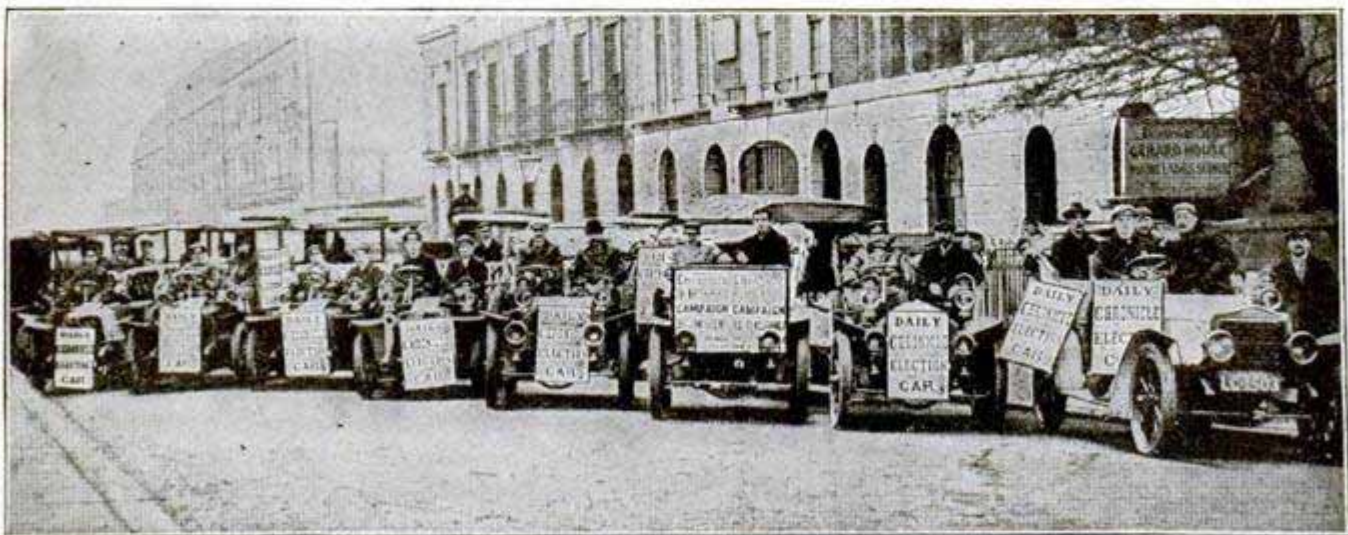
## FIRE PRECAUTION IN MILLS

If cobwebs and fine dust are allowed to collect in the planing mill, the danger of fire is greatly increased. A tiny flame will flash all over a large building in a few minutes where it has this inflammable matter to feed on. It pays to keep the dust and cobwebs well swept down. A correspondent of the Wood-Worker says:

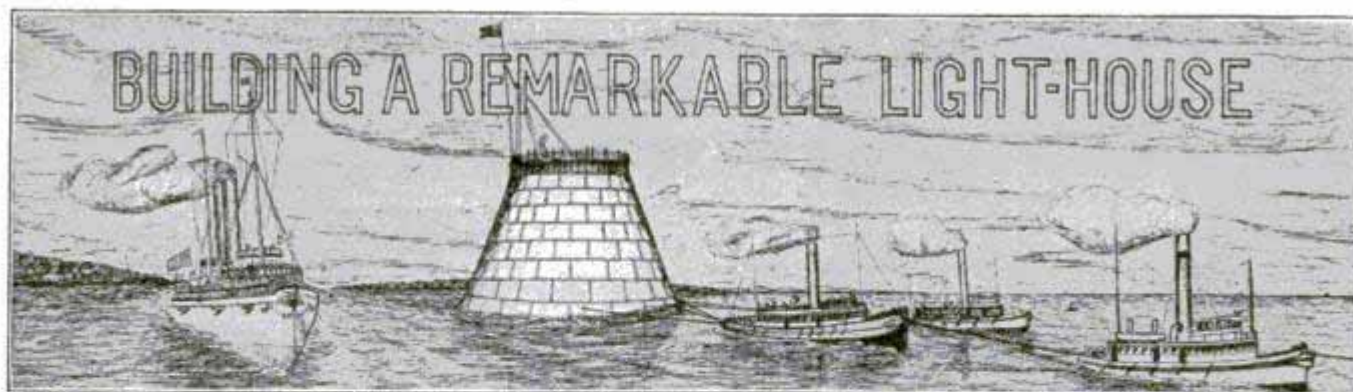
"I well remember one fire. My first experience in a mill was taking away from a matcher. I was just outside the mill, taking away ceiling and putting it into a car on a side track, when the man who was feeding the machine threw up his hands and cried out 'Fire!' I ran into the mill and there was a small blaze about the size of a man's hat in a pile of shavings just in front of the boiler. In less time than it takes me to write it the fire was all through the mill. The men upstairs did not have time to pick up tools, and some of them had not time to get their coats. Not a thing was saved. That was a case where there was no time taken to sweep up, and the fire seemed to flash all over the mill at once."

## MOTOR CARS FOR LONDON DAILY

One of the great London dailies uses a large number of motor cars in reporting political meetings and elections at points where telephone and telegraph are not available.



Motor Cars for Reporting Elections to Isolated Districts



**Towing Out the Lower Section of the Light-House**

At the outermost spur of land off North Carolina's ragged coast lie the dreaded Diamond shoals of Cape Hatteras, now covered with towering waves and a surge of seething white spray; and again, swept bare of the deep and exposed, treacherous sand-bars, rock-fanged and relentless, to the sky. Outside the shoals and the heavy sea continually thundering over them is a narrow strip of safe water, six miles in width, and beyond—fourteen miles at sea—northward sweeps the swift and powerful current of the Gulf Stream. A lightship swings at its cable on the coastward edge of the stream and its tiny beacon is lost at times amid the swirl and swoop of the elements as it is engulfed in the trough of the waves, only to shine again triumphantly from the crest, whither it has been tossed. Northbound ships pass outside the lightship and float with the Gulf Stream, but every southbound vessel, riding the narrow channel between the Stream and the shoals, is in imminent peril; in a heavy storm the chances are that any vessel will be driven from that narrow course to destruction, as hundreds have been. With the construction of the Panama Canal the volume of traffic passing Cape Hatteras will be greatly increased, but long before the Canal is completed the terrors of the point will have been diminished. Seamen will have one inflexible law for their guidance: "Keep outside the light," for upon the outer Diamond shoal will stand a marvel of light-house construction.

The foundation of this light-house-to-be will consist of a huge steel caisson 108 ft. in diameter at the bottom, 50 ft. in diameter at the top and 80 ft. high, shaped like the lower portion of a cone and having a cylindrical base. This caisson will be built at a shipyard and then towed to its permanent location upon the shoal. The shell of the caisson will be double, of steel plates, with a 6-ft. space between the two walls, the plates attached to 24 upright inclined

plate girders dividing the space between the shell into 24 watertight compartments. It will also have a double bottom placed 7 ft. above the outer bottom edge of the caisson and the space between the two floors will be divided into 24 sections by trusses extending horizontally to within 8 ft. of the center. This will leave a space 16 ft. in diameter at the center of the caisson for the accommodation of an open vertical shaft extending from top to bottom. The steel plates enclosing this shaft will be attached to steel girders about 13 ft. one above the other, extending horizontally from the shaft to the inner edge of the 24 inclined girders; and these horizontal girders will act as temporary floor beams, dividing the caisson into five large circular rooms. When the caisson is ready for its difficult and dangerous sea voyage these rooms will contain the boiler, engines, pumps, derricks, dredging apparatus, concrete mixing machinery, water, sand and cement—all the different materials necessary for sinking and filling the caisson—besides supplies and equipment for the workmen.

Before leaving the shipyards, part of the space between the two outer shells and part of the bottom, also, will be filled with concrete, sufficient to cause the caisson to draw 21 ft. of water, then tug-boats will be attached and the portable light-house foundation will start on its journey. Should a storm overtake her en route, her draught will be increased by scuttling, so that only a small portion will be exposed to the wrath of the elements; then, too, should she go ashore, she would ground in deeper water, and could be floated again easily by pumping or by forcing the water out by air pressure.

Arrived at the shoals anchors and cables will be used to hold the caisson in position (Fig. 1), and immediately enough water will be pumped into the interior compartments to sink it till it rests on the

sands in 24 ft. of water, its top reaching 56 ft. above the surface of the ocean (Fig. 2). The edges of the caisson will sink into the sand for several feet. Water ballast will then be pumped into the 24 compartments above sea level, and to keep the floor horizontal in case of uneven settlement more water can be pumped into the walls on one side than on the other (Fig. 2). Then the process of sinking the foundation deep into the sands will begin. Open dredging, carried on through the central shaft, will be employed until the caisson has been sunk as far as practicable by this method. This will leave the 7-ft. space beneath the double floor of the caisson nearly cleared of sands but filled with water. The water will be forced out by compressed air, leaving a great circular chamber, with the shells of the caisson and of the central shaft forming its walls and the sands of the outer Diamond shoal its floor. Fig. 3 shows the means of descent into this working chamber and men therein assisting the hydraulic dredging machinery in excavating with powerful water jets, shovels and special tools. In this process the sand is forced toward the central tube, where it is pumped upward and discharged through the outer shell of the caisson by ejectors or sand pumps. Where large obstructions, such as wreckage, are encountered, it is proposed to remove them by means of grappling hooks. Divers, too, will assist in this work.

While the work of excavation is being carried on as rapidly as possible, the space between the two walls of the caisson will be filled with concrete (Fig. 3). Cement, crushed stone, granite blocks, boulders, supplies, etc., will be brought to the caisson on lighters and quickly taken aboard by steam hoisting engines, to be used as required. When the foundation has been sunk to a depth of 26 ft. below the surface of the sand, the workmen will abandon the air chamber and the work of filling with concrete will proceed (Fig. 4), walls first and then chamber by chamber from the bottom upward until at last all the machinery has been removed (Fig. 5) and the foundation stands a solid block of concrete and steel to within a few feet of the top, where a space will be left for a cistern of capacity for 15,000 gals. of fresh water, crew's quarters and coal and oil storage. The central tube up to the space for the cistern will be filled with wet sand.

An oval-shaped rip-rap apron composed of irregular granite blocks will be deposited on the sand to entirely surround the foun-

dation and to extend 75 ft. outward from its edge (Figs. 4, 5, 6). Small stones will be used to fill the spaces between the larger ones, and over all will drift the sands.

The light-house proper to be erected upon this foundation will be a steel plate cylinder with a slight batter from base to top and supporting at a height of 150 ft. above tide level a light of the first order. This superstructure will have an outside steel shell and a central steel tube to contain the spiral stairway, chimneys and ventilators. The outer shell will be lined with a layer of concrete 4 in. thick placed upon wire mesh or expanded steel. There will be eight floors besides the lantern gallery and watchroom, used as follows: First, life station equipped with three lifeboats and crane for hoisting and lowering on the outside; second, four rooms containing fog-signaling apparatus and two oil engines; third, hoisting engine for operating crane, two provision rooms, bedroom; fourth, fifth, sixth and seventh, living quarters; eighth, Light-house Service room.

The sum appropriated for the light-house is the largest in the history of this country: \$750,000 for the structure and \$30,000 for lens and equipment. The light will be visible for a distance of 20 miles. Credit for this great engineering enterprise is due Capt. Albert F. Eells, of Boston, Mass., who has contracted with Congress to build the light-house at his own expense, operate it for a stipulated time and then turn it over to the government. Not only will the project afford a stable beacon for the guidance of sea-farers, but in case a vessel is unable to keep its course and is doomed to be driven ashore, if the captain steers straight for the light, help from the life-saving station may be able to reach those in danger. The light-house will also be made a wireless station.

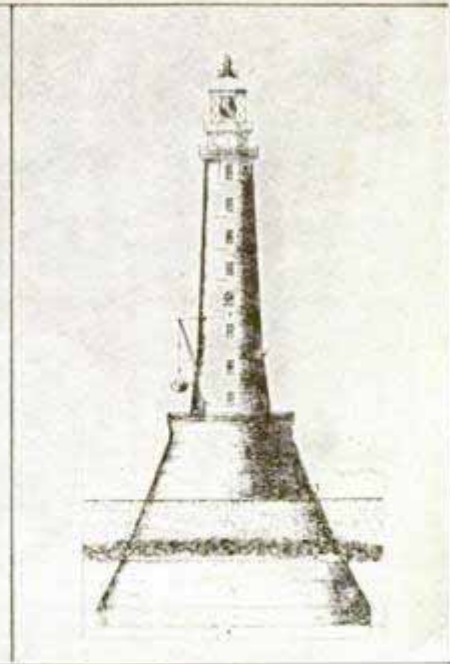
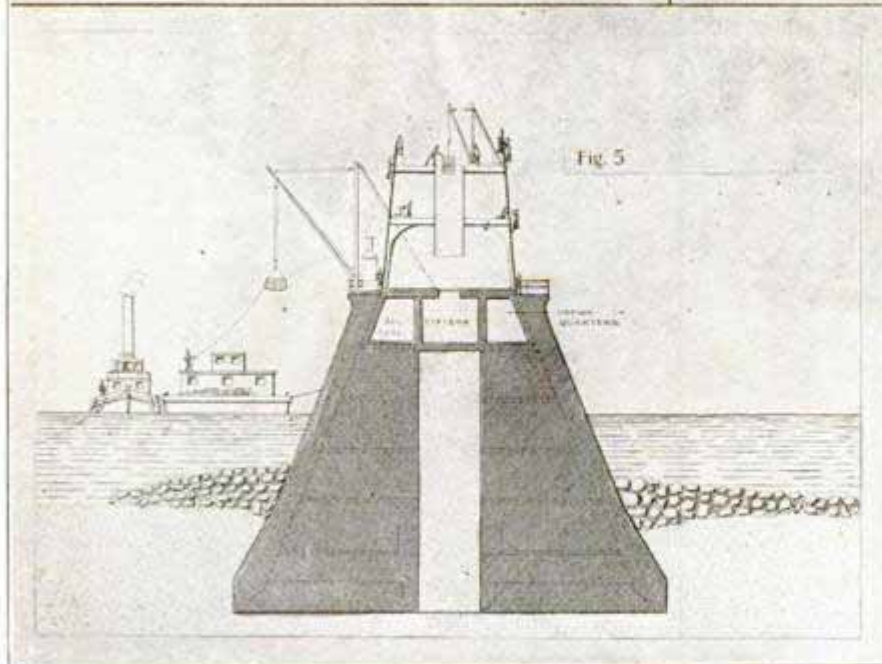
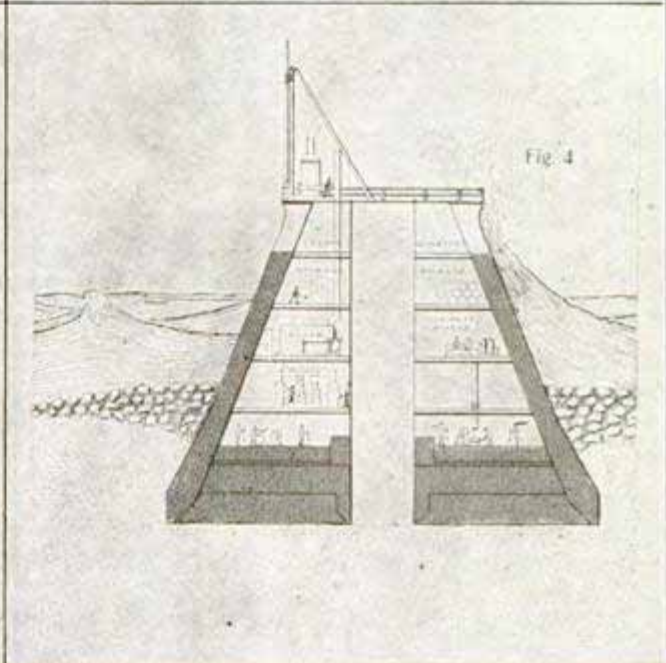
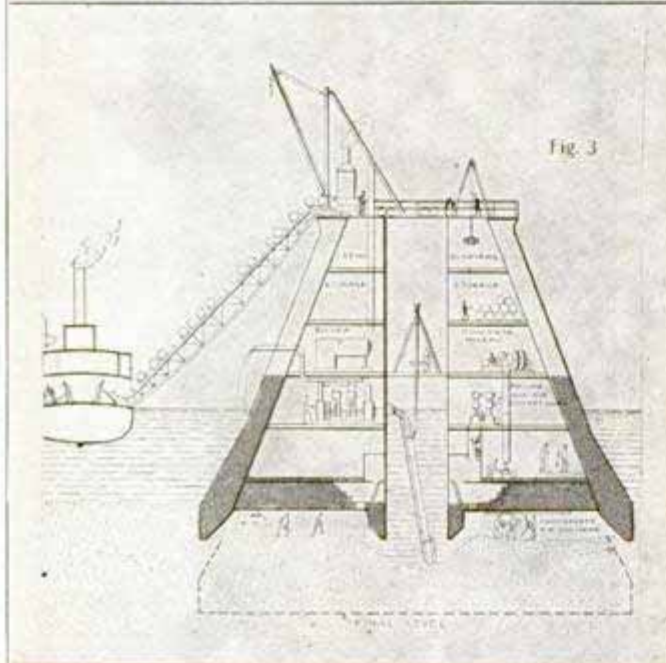
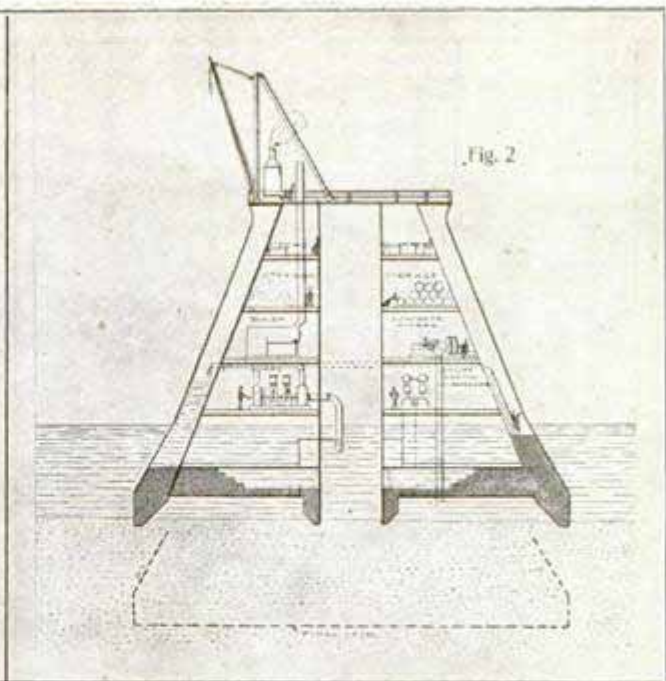
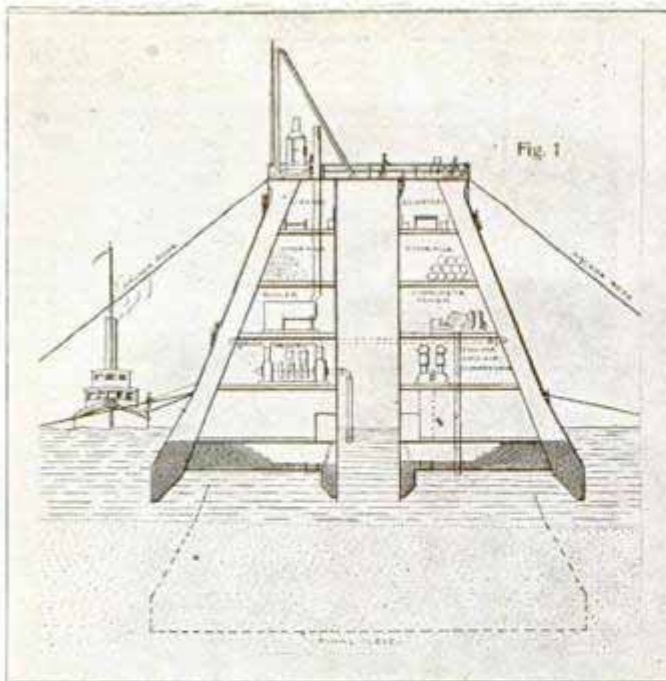
It is estimated that the weight of the entire structure with its contents will be approximately 27,000 tons; displacement of water, 10,000 tons; effective weight on the sands of the shoals, 17,000 tons, covering an effective area on the base of 8,960 sq. ft.; pressure on base from vertical weight, 1.9 tons per square foot.

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A pipe line for conveying California oil is being built across the Isthmus of Panama.

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For the season of 1905, domestic freight traffic on the Detroit river amounted to 53,639,086 net tons.



## SELF-PROPELLED FIRE APPARATUS ABROAD

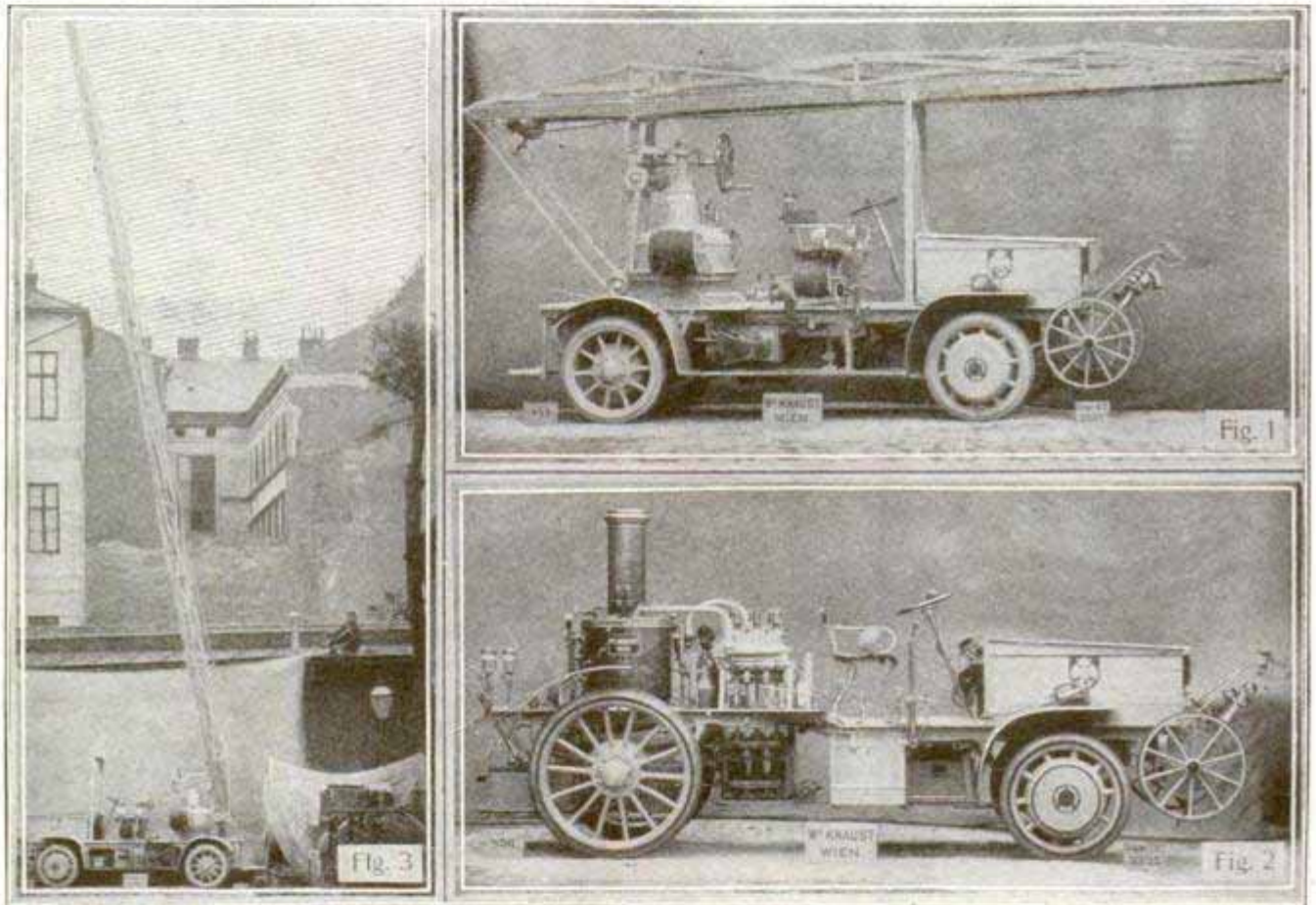
Austria, which as a country leads the world in the development of its fire departments, and Germany, where the subject is also receiving much attention, are rapidly adopting self propelled apparatus; especially in their larger cities. The motive powers are steam, storage batteries and gasoline motors. Several of the very latest types are illustrated by courtesy of the builders, Jacob Lohmer & Co., Vienna.

## WIND-MILL AIR COMPRESSION

By J. L. Pilling

There is no limit to the amount of air that can be compressed and stored to any given pressure, either in connection with light-ships, light-houses, or in fact, anywhere—afloat or ashore, using windmills for the purpose.

The air compressor can be connected direct to the windmill, or through pulley on windmill below deck to a belted compressor



**Figs. 1 and 3--Electrically Propelled Chemical Engine With Extension Ladder  
Fig. 2--Berlin Self-Propelled Steamer**

In Fig. 1 is shown a comparatively light piece, which is a combined chemical engine and extension ladder. The propelling power is electricity, from storage batteries carried in the box forward. Hose is carried under the driver's seat, at the side, and on a two-wheel hose cart which is placed in front. The ladder extends to 80 ft. when raised as shown in Fig. 3.

A self-propelled steamer which has gone into service in Berlin, is seen in Fig. 2. A supply of coal is carried in the box immediately in front of the driver, and the small hose cart is also found forward. In all these machines it will be noted the weight is carried low.

in the hold of the ship. Ample room is available for receivers in which to store the compressed air, and enough to last several days could easily be accumulated. Thus far the compressed air has cost nothing, only for the installation of the plant and normal wear and tear.

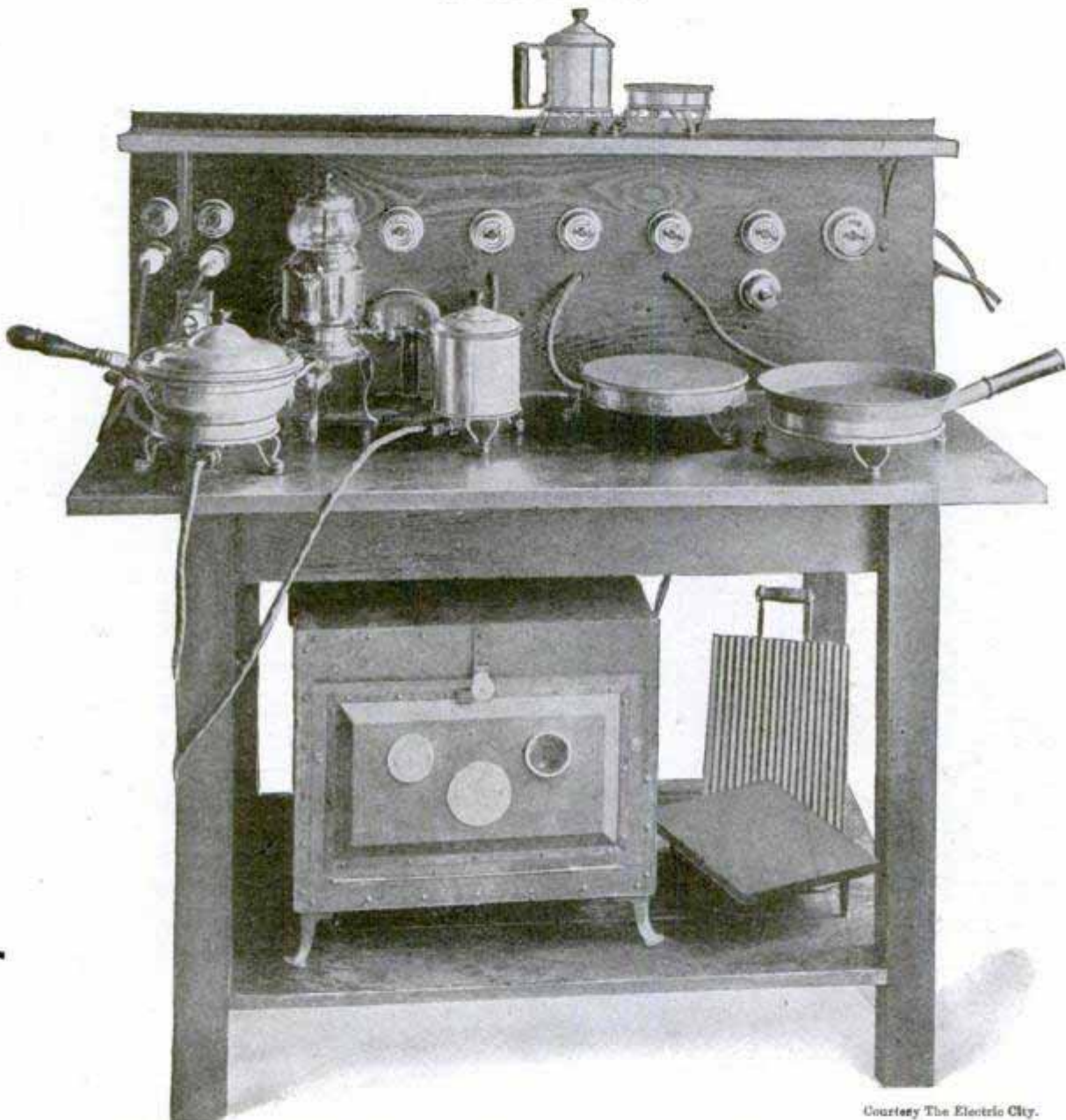
I would compress the air to 125 lbs. pressure per square inch at least, and connect an engine I have in mind direct to dynamo. Close to the engine I would have an upright boiler 36 by 72 in., reducing the air from 125 to 45 lbs., and reheating the same in the upright boiler mentioned, using crude oil or wood alcohol for the re-heating. By so doing the 45 lbs. could be raised to 90

lbs. or more, turned into the engine, and electricity generated thereby. So far, again, the cost has been nominal.

The time is fast approaching when a compressed air explosive engine will be in successful operation. (I speak advisedly.) A

very small amount of liquid explosive will be mixed with the air. Aldehyde, hydrogen, peroxide, and oxygen in due proportions will be used, the idea being to use as much air as is practical, taking the removal of the products of combustion into consideration.

## AN ELECTRIC KITCHEN



*Courtesy The Electric City.*

**Kitchen "Range" of Oak and Slate, Showing Oven, Water-Heaters, etc.**

Electricity, only a few years ago a mysterious agent of laboratory demonstrations and a name to conjure with, has in these latter days become so commonplace as to serve as a broiler of meat and a baker of biscuits. The family cook is no electrician, and has no need to be: all the electrical knowledge she requires is that necessary to turn one switch to boil coffee, and another to bake bread. Had anyone attempted such a demonstration little more than a century ago he would have been burned at a stake

with a wood fire as an evil genius whose very existence jeopardized the lives and health of the community.

The modern electric range for a small family does not require much space; it is built substantially and attractively of oak and slate, and instead of plumbago the kitchen maid brightens the "stove" with furniture polish. The electric range emits no smoke or gas, the fire is built in a second, and the terrors of the woodpile no longer haunt the small boy of the family. Instead

of splitting kindling he will be found working a wireless telegraph to another boy three blocks away, or doing things with his electric motor.

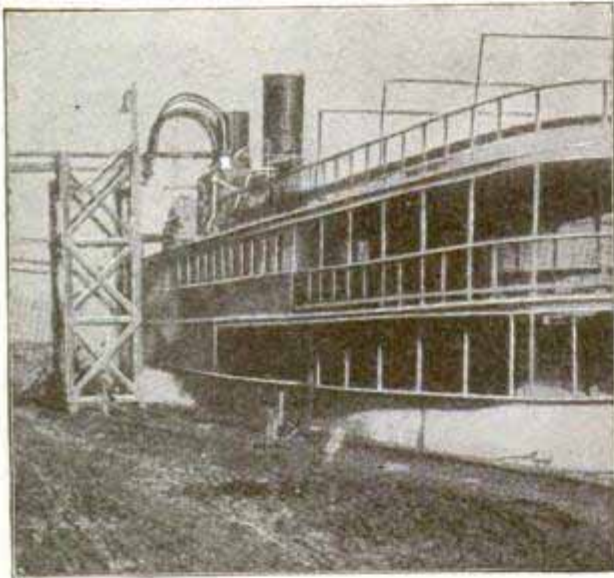
The electric dish-washer, and clothes-

drier, with the electric flat iron, are included in the furnishing of an electric outfit for the house; to which must be added the large and ever increasing list of other domestic utilities—and all electric.

## STEAMBOAT RUNS STREET CARS

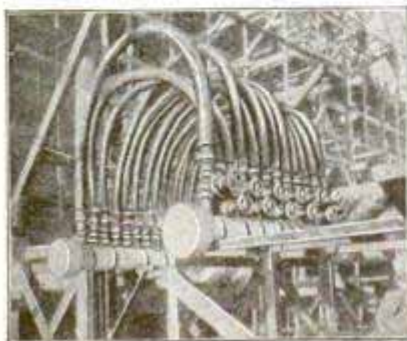
The electric cars of a great city being run with initial power from a steamer is one of the unusual things in power plant experiences; but this has actually been done for several months past. Incidentally it suggests a new source of revenue to boat owners during winter months when steamers are tied up.

The street car company at Baltimore, Md., at the opening of the past winter, had not been able to complete its power plant which was burned in the big fire. Business had



**An Aquatic Power Plant**

also increased until the cars were short of power. A new boiler house was building but would take all winter to complete. The shortage in boilers was solved by securing the use of the steamer "Lord Baltimore," which was tied up to the street car company's dock where its power plant is located. The steamer has about 1,500 b. h. p. The



Street Railway Journal says: "To utilize the steam from the boat a 10-in. tap was taken off from the main 10-in. header in the boiler room of the power sta-

tion, and this tap was extended to the water edge where the steamer is moored. The end of the 10-in. tap is supported at the edge of the pier on trestle work, where it terminates in a 10-in. manifold. On the ship side, supported on the upper deck of the steamer, is a second manifold 8 ins. in diameter. These two steam manifolds are connected together by a series of flexible copper tubes to allow for the rise and fall of the steamer with the tides, the arrangement giving a maximum range of 7 ft. The 8-in. manifold on the ship is connected by a single 8-in. header to the main steam drums of the ship's boilers. In order to give proper control over the auxiliary steam supply from the boat, a 10-in. stop valve was placed in the long tap connection just inside the station boiler room, and to avoid any possibility of bleeding the station boilers in the event that the steam pressure in the ship's boilers should drop below 200 lbs., a non-return automatic valve was placed in the tap connection near its outer end at the water edge."

## TELEPHONE NEW YORK TO LONDON

**Recent Discoveries Almost Insure a Successful Telephone Cable Across the Atlantic**

To "hello" from New York to London is literally a "far cry," but recent successful experiments, the result of electrical discoveries in cable making, give great promise of a trans-Atlantic telephone cable in the near future.

Professor M. I. Pupin, of the Columbia University, New York, has successfully telephoned over a distance of 250 miles under submarine conditions by inserting induction coils in the line at intervals of 2½ miles.

By the use of these coils over 2½ per cent of the current transmitted reached the receiving end, while with the coils cut out the efficiency was only 1-2500 of 1 per cent.

In transmitting currents through cables under water, many difficulties are encountered which are not met with in aerial transmission. The inductive effect of the water tends to generate a current in the opposite direction which results in a great loss of energy. Dr. Pupin in his experiments



produced this inductive effect artificially by passing the current through sheets of tin foil separated by parafined paper. This apparatus placed in an ordinary telephone circuit completely stopped all communication until the Pupin coils were introduced in the circuit when the conductivity was again established.

The induction coils used for this purpose are very small, being only 1 in. long and  $\frac{1}{2}$  in. diameter, which allows their introduction in a cable without any great difficulty. A cable of this kind between England and

1,000 miles long, electric-lighted to permit navigation at night and a speed of eight miles an hour will be allowed. Large ships could make the distance in five days. In case of war, the fleets of these two seas could pass from one to the other without restraint, and should the Bosphorus or the Gibraltar Strait be closed the movements of the Russian navy would not be affected. The canal would also be to commercial advantage, especially in the transit trade per vessels from Suez, Egypt, Greece and Turkey to north Europe and vice versa.



**Only Skilful Runners Can Stand This Test**

America would contain about 3,000 coils, which would make it more expensive than an ordinary cable, but the resulting revenue would soon compensate for the outlay.

The cable between England and France has been equipped with the Pupin coils which have increased its capacity over 100 per cent, and as Dr. Pupin has now given his attention to the trans-Atlantic cable it is hoped that this device will be in operation in the near future.

### PROPOSED 1,000-MILE CANAL

The Russian government proposes building a ship canal to connect the Baltic and the Black Seas. The canal will be nearly

### MOTORCYCLE AND SKI TANDEMS

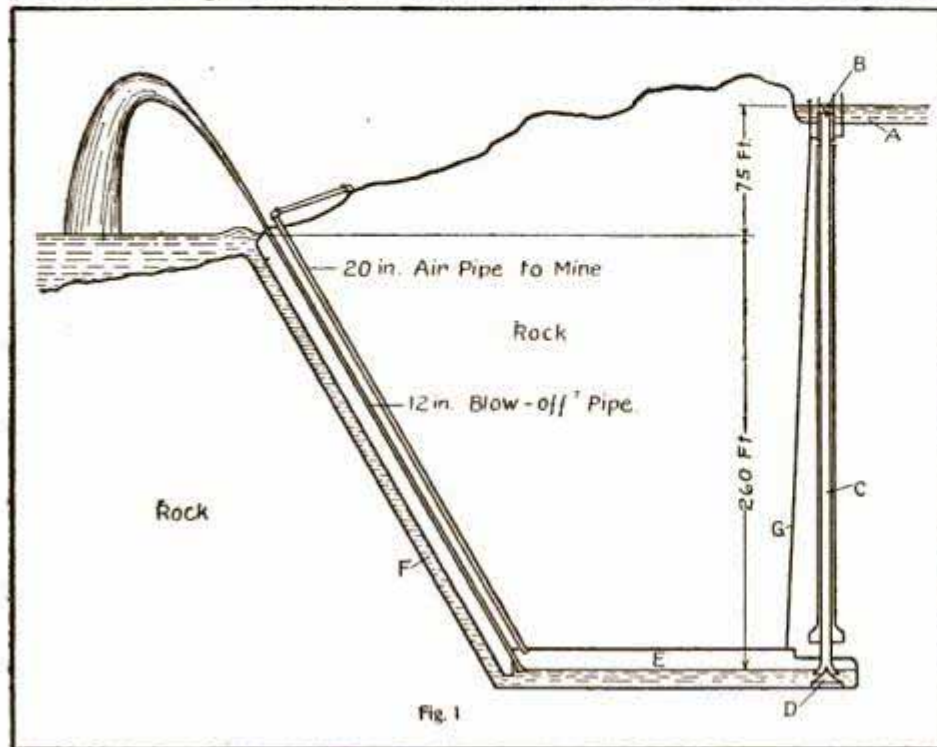
The motorcycle is used in Norway to increase the excitement and pleasure in the popular winter sport of ski-running. The runner yokes himself with the motorcycle by grasping with his left hand one end of a long leather strap, which is attached to the cycle. The motorist then starts up at full speed and the pace tries the skill of the runner to the utmost, as the tendency is to pull the body ahead of the feet.

A renowned Belgian surgeon has succeeded in growing new bone through artificial means, he claims. The experiment has been successful in cases of fracture.

## NOVEL HYDRAULIC AIR COMPRESSOR

118 Lbs. Pressure Obtained Without Pumping

Water power is usually converted to compressed air power by means of a water



wheel or turbine connected to an air pump, but at the Victoria mine, Mass., Michigan, the compressed air is obtained direct, without the use of either water wheel or compression pump. The Ontonagan River, at this point, has a drop of 75 ft. in three quarters of a mile, and the water is conducted from a dam by a race, A, Fig. 1, cut in the rock.

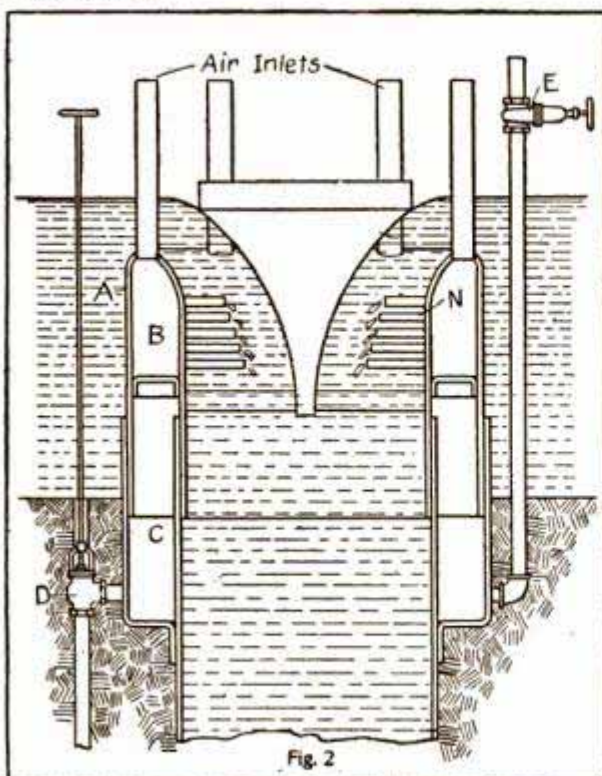
When the water reaches the end of the race it enters the opening B, and passes down a vertical shaft C, 5 ft. in diameter. The head, Fig. 2, has a number of nipples N, so arranged that the water in passing draws in air which mixes with the water and descends with it to the bottom of the

shaft, where it strikes the deflector D, Fig. 1. The air then separates from the water and rises in chamber E, where it is compressed to 118 lbs. per sq. in. From here it is conveyed by a 20-in. pipe to the mine where it is used to operate the drills and drive all the machinery. The total capacity of the compression apparatus is 3,000 hp., but the power consumed at the mine is considerably less, so a 12-in. blow-off pipe was installed as shown. The stream of water and spray ejected from this pipe greatly resembles a geyser and, when the mine is not

running, is often over 200 ft. high.

After delivering the air, the water passes up the inclined shaft F and continues on its journey. The supply of water to the shaft is regulated by the air from pipe G which connects with the chamber C, Fig. 2. Opening the valve D allows air to enter the chamber C which causes the shell, A, to rise, and stop the flow of water. When the valve E is opened, the air from chamber C escapes and allows the shell to sink, thus controlling the supply of water.

Now that this system of air compression has proved to be satisfactory, there will probably be more of these compressors in operation. There are many places where they could be used to advantage as the efficiency is 75 per cent, while the efficiency of a turbine and pump is only about 50 per cent.



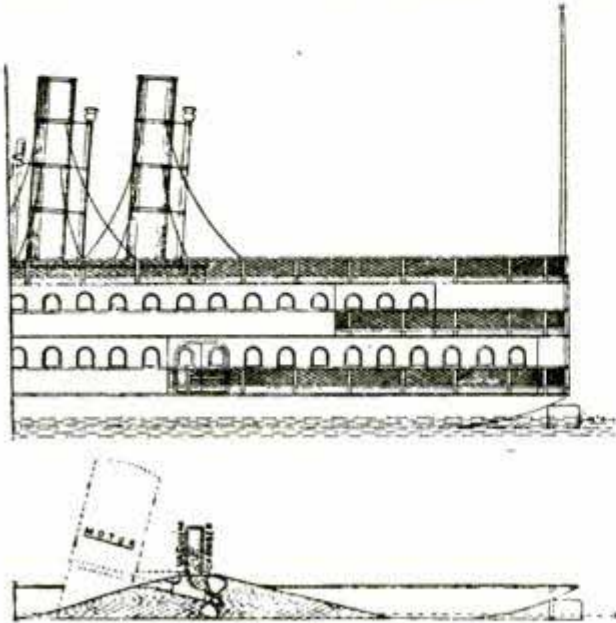
Automobiles will be carried on British battleships and cruisers hereafter. The cars can be handled by the boat derrick easily and motoring is popular in the service.

Dye-making from coal tar is the healthiest trade in the world, as the tar is a tonic and a tissue builder. The average life of the tar worker is 86 years.

## SHALLOW WATERS MADE NAVIGABLE

By a New and Simple Method--Uses Screw Propeller in Water Only a Few Inches Deep

A new method of using a screw propeller, with all its advantages, for the propulsion of large boats in extremely shallow



Method of Using Screw Propellers in Shallow Water

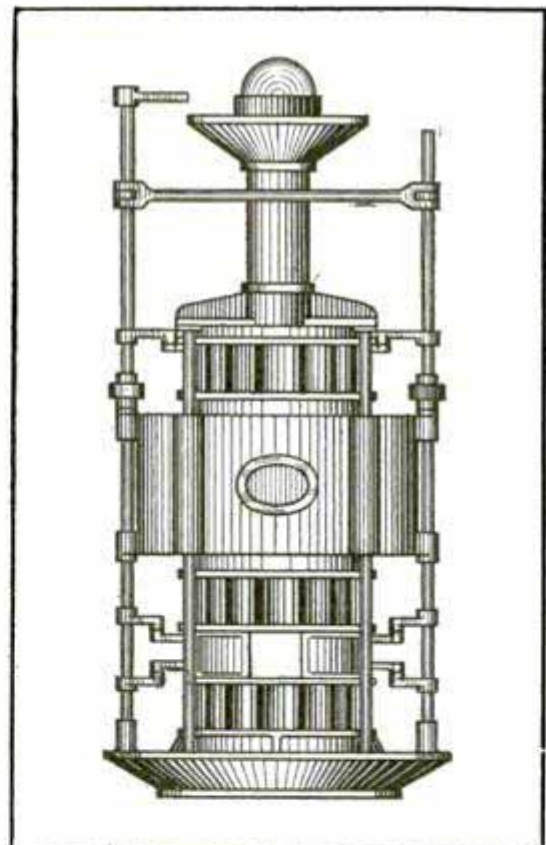
water, appears to be an entire success. Boats have been run under this method in as shallow water as 6 in. The system is being applied in boats now under construction for use in canals, rivers, lakes and the ocean.

The new idea is extremely simple. It consists of a bottomless arched wheel chamber, which may be carried as far above the water line as necessary. This wheel chamber is connected at the top to a secondary or vacuum chamber where a partial vacuum is constantly maintained when the boat is running, by means of a comparatively small vacuum pump. The American Shipbuilder says: "This, as will be seen, causes a solid pressure of water to surround the wheel, as well as to stand over and above the wheel. This pressure is equal to the depth the water may then be standing over it, in the column, giving the same solidity of pressure upon the wheel as if it were down under the surface of the water, an equal number of feet in depth, thus giving it solid water for a 'footing' at all times and proportionately more power in propelling a vessel through or over the surface water, insuring absolutely no slipping or racing at any time, and getting better results than if the vessel were deep in the water, so as to get

her wheel well submerged to secure this same solid water for a footing. The vacuum pump is run little, as is proved conclusively by the boats now in use, since the water once up remains in the column for hours. Of course it is not the same identical water, as the change is rapid and constant when the vessel is moving, but water is always there just the same."

## NEW WATER TURBINE

A 900-hp. water turbine, having three sets of blades, has been designed for driving electrical generators at Sewall's Falls, New Haven. The use of three sets of blades allows its adaptation to the variations in head which occur between the maximum fall of 16 ft. and the minimum of 12 ft. The upper and lower runners discharge downward and the middle one discharges upward. This tends to balance the turbine shaft and relieves some of the strain on the thrust bearing.



For Driving Electrical Generators

This installation, says the Electrical Magazine, is typical of what can be done with low variable falls and should provide material for others of a similar nature where recourse to steam or other power may be under consideration. The efficiency of this turbine is estimated at 75 to 78 per cent.

## MECHANICS ON THE FARM

### Opportunities for Reclaiming Wet Lands

The modern successful farmer is not content with simply knowing how to plough a straight furrow, or how many kernels of corn to plant in each hill, but realizes that he must keep abreast with the times to obtain the benefits of the increasing efficiency of scientific farming. Mechanics, engineers, chemists, and even bacteriologists, have given their attention to farm work and all have done much to improve past methods.

According to government reports, farm machinery is growing more complex each year and the cost of farm implements used in the United States is over \$100,000,000 annually, which goes to show that the knowledge of mechanics is indispensable to the modern farmer.

A knowledge of chemistry is also advantageous. Some lands which have been barren for years are now made fertile by a proper selection of crops and many soils are made productive by the addition of nitrates, phosphates, and other fertilizers. Even germs are sometimes used, the object being to increase the nitrates.

Engineering operations have also been a great help to the farmer, both in draining and irrigating. Many districts in the South, which have been swamps until recently, are now yielding splendidly, and the government reports show that there are 100,000,000 acres of land still awaiting this improvement.

The increasing value of land, and scarcity and high price of farm labor has resulted in the building of numerous agricultural colleges and experiment stations where much study and research is being made to produce more efficient equipment for the coming generation.

A field which is open to hundreds of bright young men is that of scientific draining of wet lands. These lands, when reclaimed, immediately double or triple in value, because of their extreme richness. The young engineer or mechanic who will study this subject can equip himself at a few hundred dollars' expense to do rapid and effective ditching, using horses to draw the machine.

A single illustration of this which recently came to the attention of the writer: In southern Wisconsin was a swale which extended for a mile and from 100 ft. to a quarter of a mile wide. In the spring it was always under water for weeks, and even in the dryer seasons was soft and swampy and unfit to work. One day a man

came along and made the various farmers interested in a proposition to run a ditch the entire length of the bad land. His charge of so much per rod for ditching did not come hard on any one owner. He brought a machine ditching outfit and ditched the entire length in three days. His profit amounted to \$300 or \$100 a day. It seems large, but the farmers could not have dug the ditch by hand, or with any of the ordinary means at hand for ten times that sum. The result was the perfect reclamation of more than 200 acres of land that previous to the draining could not be used or sold at any price, but which immediately was worth \$100 per acre, or more than \$20,000, even though the water had only commenced to run off.

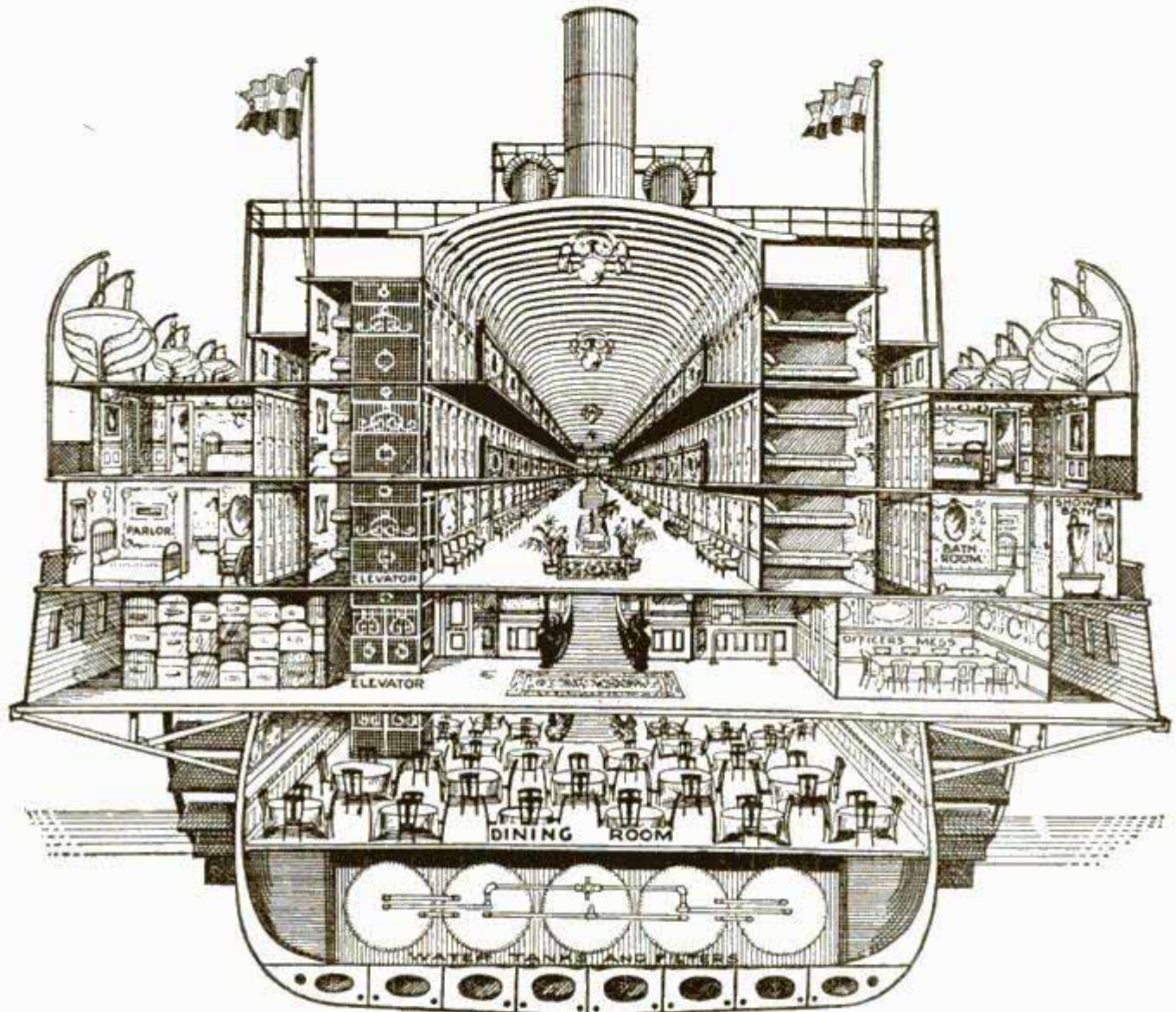
It may be interesting to know how one could draw any ditching machine through a bog where a horse would instantly sink to his knees, or worse. Two small steel cables, each one-half mile in length, were laid over the course, and attached to the ditching machine. The other ends were fastened to a strong winding drum securely anchored to some good sized trees. Sixteen horses were hitched to the arms of the windlass and when they started, the ditcher immediately showed results, leaving a V-shaped excavation 4 ft. deep and nearly 8 ft. across at the top. The work was completed as the machine progressed, and the slope of the sides being so slight, the ditch will become grass-covered long before the sides can wash and fill the trench.

This is only one illustration of thousands of opportunities in which young men of resources in doing things can undertake a line of work which gives large returns, and at the same time actually adds to the wealth of the community. There are many types of machines for drainage work, some of which may be better adapted to certain localities and conditions than others. This the operator must carefully study and decide for himself. Excellent steam-operated machines are being used with success.

Hundreds of thousands of acres have been reclaimed during the past three years, but for some reason the work has failed to attract the attention it deserves, possibly because so many of the operations have been on a large scale where thousands of low lands have been reclaimed in a single contract. There remains, however, plenty of opportunities for small work which does not require anything like the investment of the large ones, and which will pay the practical, competent young engineer big returns.

# QUEEN OF WORLD'S LAKE CRAFT

Nothing on Fresh Water Today Compares With New Lake Boat



In the April issue appeared an account of the magnificent Hudson river steamer—now building—which will eclipse all river craft in the world. The illustrations on this page and the next show the new passenger steamer of the D & C company, Detroit, which will cost \$1,250,000 and take rank far in advance of any lake craft in the world.

The big ship will be 400 feet long, 54 feet beam and 90 feet over the guards, and 22 feet depth of hold. She will be propelled by three cylinder compound engines of 7,000 indicated horsepower, turning feathering paddle wheels. The steamer will be supplied with eight cylindrical boilers and the craft will have a speed of twenty miles per hour. Between her decks can be stored 110 car loads of freight, while her

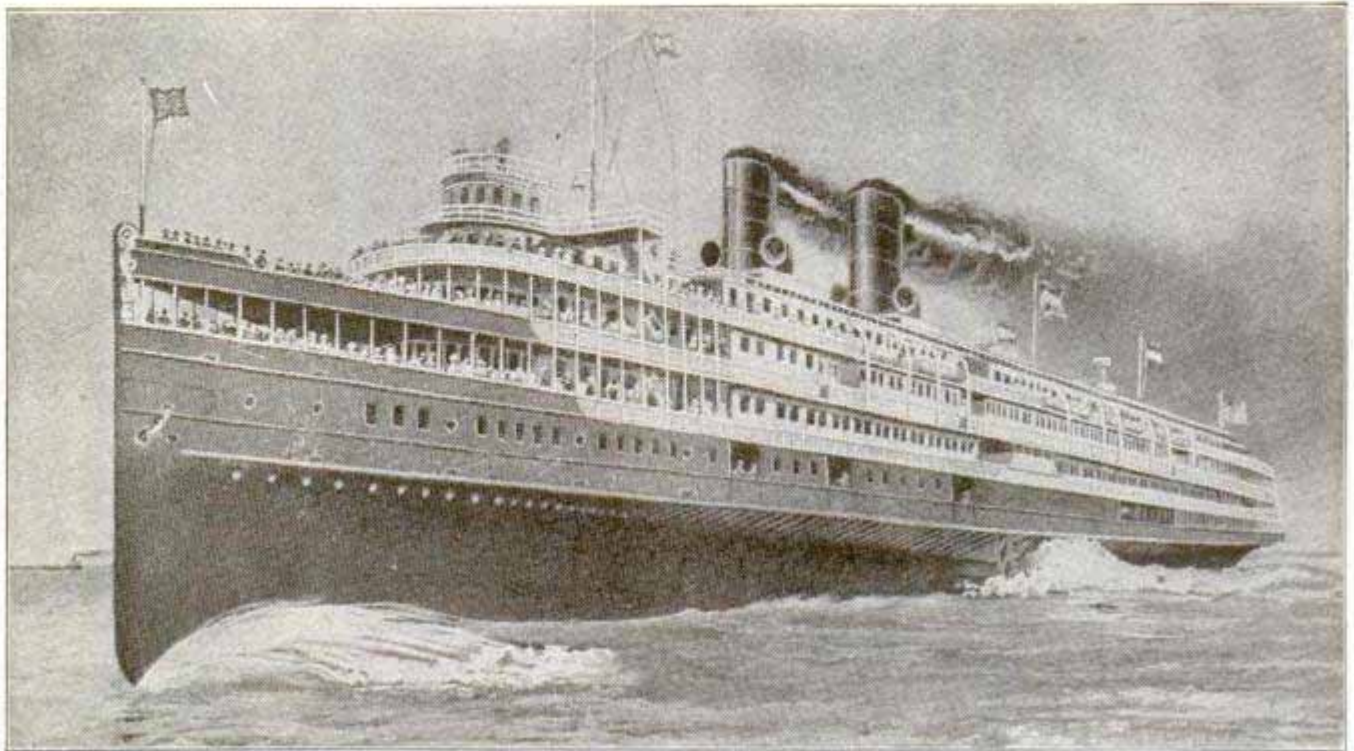
passenger excursion limit will be 4,500 persons.

The amount of material needed to construct and equip such a ship is of interest. In the building of the double hull, for there is a water bottom, 4,000,000 pounds of steel plate, angles, beams and rivets will be used, 700,000 rivets alone being required. Of wood, 1,600,000 feet of oak, pine, mahogany and other varieties will be needed. The joiner work will take 3,400 pounds of nails, while 2½ miles of steam heating pipes will be placed. Wireless telegraph and 1,600 electric lights are included in the electrical equipment.

A special feature of interest is the big steadying tanks, with a capacity of 100 tons of water ballast. This ballast will be used during heavy seas and prevent rocking

and pitching. This is the same system which is used on battleships to hold them steady while firing heavy guns. Other novel features are the passenger elevators, open

fireplaces, and private verandas opening from the parlors. These verandas have the same privacy and seclusion as does a veranda at home.



**MOST MAGNIFICENT LAKE BOAT EVER BUILT--Length, 400 ft.; beam, 54 ft.; from guard to guard, 90 ft.; horse-power, 7,000; speed, 20 miles per hour; freight capacity, 110 carloads; passenger capacity, 4,500; exclusive deck verandas opening from parlor staterooms.**



**For Locating Springs**

### MECHANICAL DIVINING-ROD FOR LOCATING WATER

The old village wizard followed by troops of wide-eyed children and half-credulous adults as he goes forth with his forked stick of witch-hazel to locate water has been deposed by a machine. The apparatus is the invention of a Swiss engineer and has a magnetic needle which oscillates violently when the instrument is placed above a spring

### RECIPE FOR VIOLET ANILINE INK

Dissolve 1 oz. of the best violet aniline in 4 oz. hot alcohol. When thoroughly dissolved add 1 gal. boiling water. The cost will be about 60 cents.

Pulverized glue is the best form for the small shop, as it can be prepared quickly as required, and thus will always be strong and sweet.

## DEMAND IN THE NAVY FOR ELECTRICIANS

**The Navy Offers Fine Opportunity for Men Skilled in Electrical Work--Description of the Training of Men in the Electrical Branch of the Navy**

There is an increased demand for electricians in the navy; not for specialists in any particular branch of electrical science, but for all around practical men, who can manipulate and care for the many types of electrical machines used for various purposes on a modern ship. Each new battleship, in turn, becomes the most complete electrical plant to be found anywhere. This seems incredible, and yet when power, variety and diversity of machinery is considered, it is an undoubted fact. Such a ship as the "Connecticut" (16,000-ton battleship), just completed at the navy yard, New York, will have some thirty expert electricians on board, to care for the electrical machinery and appliances, and it will require the complete attention of all these men to safeguard and manipulate this large power plant. There are six vessels of this type now approaching completion. This being the case, the navy must educate and train its own force, and this it does in two schools, yearly growing in size and importance. These schools are located in New York, and at Mare Island, Cal., and to one of these schools each new electrician enlisting in the naval service is first sent. No matter what the former electrical experience of the recruit has been, in these schools he will find new subjects for thought and study, and no man has ever completed his course without admitting that his electrical knowledge and usefulness has largely increased.

**Who the Students Are.**—Students at these schools are regularly enlisted men. Some come from ships, where they have shown aptitude for electrical work; some from power plants ashore, without previous naval service; some from telegraph offices; some from telephone companies, and some from schools of technology. Each finds something to learn, whether it is the various forms of "wireless telegraph" installation, or merely naval methods of accomplishing work in hand.

All enter on an equal footing with the rating of electrician third class, spend five months at the school, and complete the course in a rating determined by the ability and industry displayed by them.

**What the Course Consists of.**—The course

at these schools is unique, in that there are no classes. Instruction is individual. Little time is spent on what is an old story, and all possible time is devoted to what is new. The work is divided into four parts and the student is examined and qualified in each as soon as possible. These departments are:

(1) The theory class; devoted to those men who have never studied the principles of electricity, and to a description of the appliances used on shipboard. Many a man who has proved himself a good mechanic, and whose experience has been entirely practical, here learns for the first time reasons that control his methods.

(2) The mechanical class; where practical instruction is given in a machine shop. Here the student learns to file and chip, to handle the planer and lathe, to assemble and run a steam engine. Instruction is also given in the use of oil engines and storage batteries which are used for power at wireless telegraph stations.

(3) The practical class in electricity: puts into practice the elements learned in the first department, stands dynamo watches on the ship "Hancock," winds armatures, handles search-lights, and goes over each form of apparatus in use on shipboard. A large shop contains various generators, motors, and storage batteries and instruments for this purpose. Having now covered the ground of general electricity, the student comes to

**The Wireless Class.**—The equipment of this class is very complete. The question of the most efficient apparatus for naval ships having never been determined upon, it becomes necessary to be familiar with all, and complete sets of every important type are mounted for practical use. Every graduate becomes a wireless operator, more or less expert, according to his capabilities. There are many men in this country with a profound knowledge of the workings of wireless telegraphy, but few of these are operators; there are many capable wireless operators, but few have any real knowledge of their instruments. Those who complete the course in this class are therefore superior in all respects to the theorist on the one hand and to the mere operator on the other.

It can be seen that a man who completes the course in either of these schools must be a good practical electrician, and need never fear that he will be without work, while electricity is used as a power.

**Liberty and Recreation.**—The home of the men in the class on the East coast is on the

receiving ship "Hancock," at the New York Navy Yard, where they have their mess and keep their clothes. Leave of absence to visit the city, out of working hours, is frequently granted to the men of the school whose conduct warrants the privilege.

Books are furnished by the government, and attendance at electrical lectures in New York City and Brooklyn is encouraged. Entertainments on the receiving ship furnish amusement for those who cannot find it ashore, and the ship's library affords facilities for study and pleasure reading. A high order of conduct is demanded, so that the tone of the school is constantly growing better. This brings us to the future of the men undergoing the course of instruction.

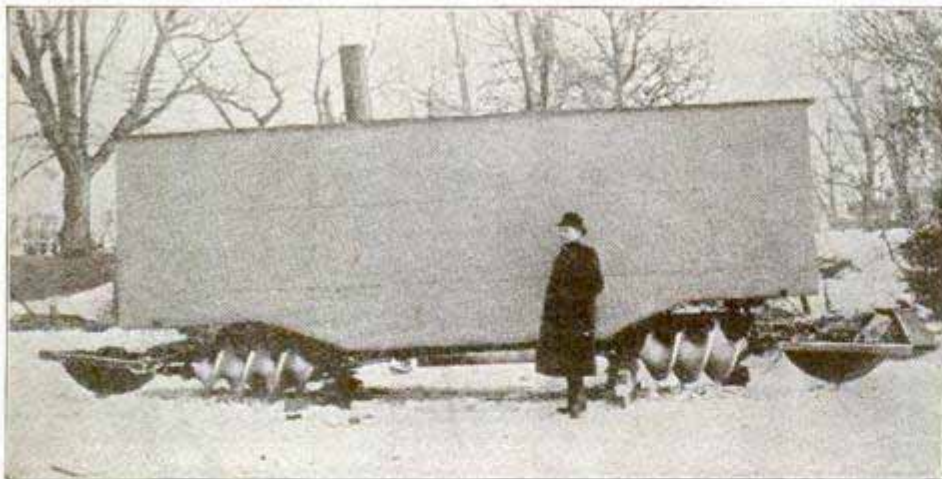
**Their Future Career.**—Upon the completion of their course in this school men are sent to ships and wireless stations. Any capable man can leave the school with a naval rating of electrician second class, and

the more successful as electricians first class. This leaves but one grade to be attained by faithful sea-service, that of chief electrician, who is in charge of the plant on board his ship, and deals directly with his officers. The pay of chief electrician with a permanent appointment is \$70 per month.

When all things are considered—the certain pay; the government's provision for food, lodging, medical attendance, all in addition to the pay of their rate; the gratuity on re-enlistment within four months of four months' pay; the increased pay with each succeeding enlistment; care in old age; the opportunity to rise to warrant and even to commissioned rank; the facilities offered them to always save their pay; the healthy life—it does not seem strange that interest in the navy is taken by capable young mechanics all over the land, who realize that in few lines of private employ are greater advantages offered.

## SPIRAL LOCOMOTIVE FOR ARCTICS

A Minneapolis inventor has constructed a locomotive for use in Alaska during winter. The machine is 22 ft. long, and propelled by two spirals, or worms, which are said to have produced a speed of 18 miles



**This Unique Locomotive Will Draw a Train of Sleds**

an hour over snow and ice. Steam was the engine power, but alcohol engines will be installed in the much larger locomotive now building for use next year. The inventor has a freighting proposition in Alaska, where the unique locomotive is expected to draw a train of sleds bearing 50 to 100 tons burden. In the locomotive illustrated the engines developed 42 hp. It is reported the machine readily climbed over rough ice and ordinary snow humps with surprising ease and success.

## INTERDEPARTMENTAL 'PHONE SERVICE AT NATIONAL CAPITAL

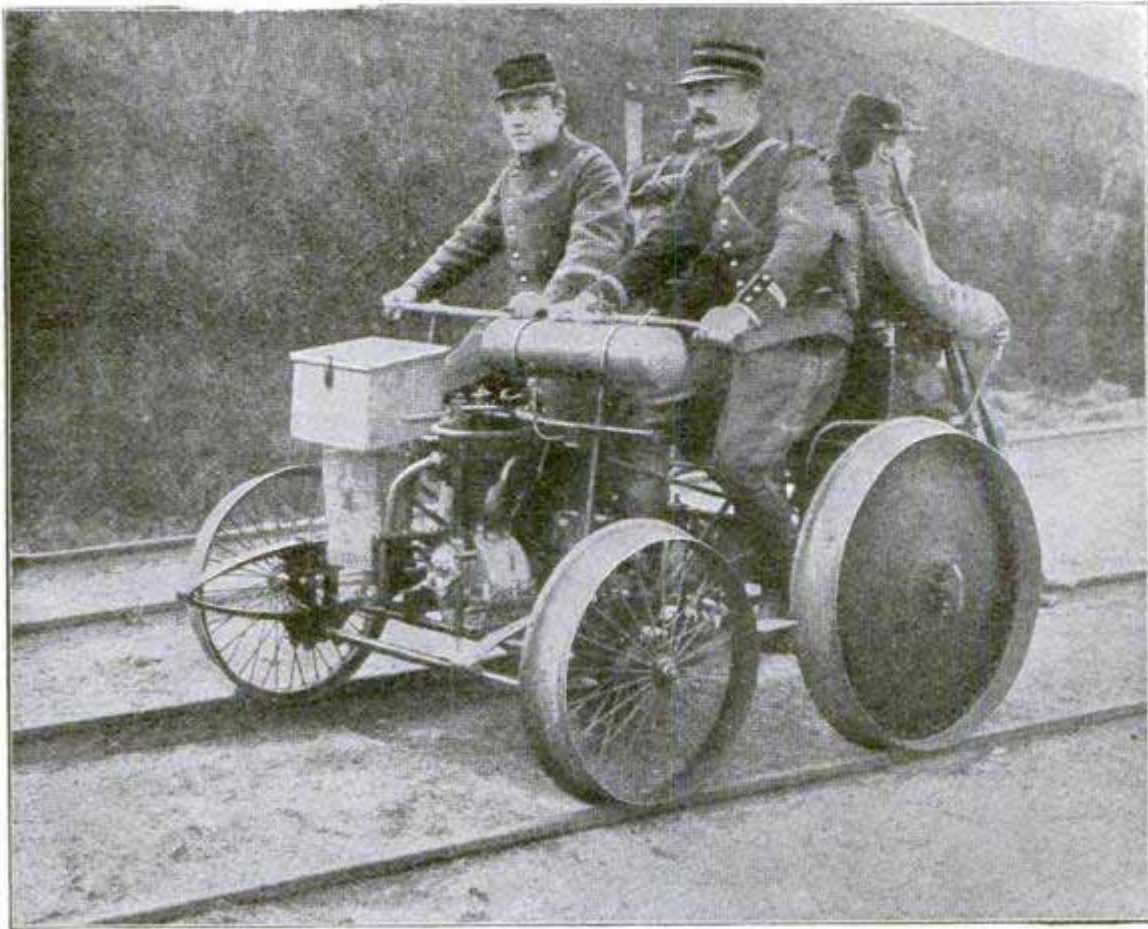
An interdepartmental telephone service with central switchboard located at the Department of Commerce and Labor, is to be installed by the government. With the new system a great reduction in cost will result and the clerks will have unrestricted privilege of communication with the various departments. One-fourth of the messages sent from the departments, it is said, are interdepartmental. A system of tie lines, consisting of wires leased from the local telephone company will be used. Fifty-one tie lines will be accommodated at the switchboard.

## TUNNEL UNDER SAN FRANCISCO BAY

A 12-ft. tunnel, nearly three miles in length, is to be run under San Francisco Bay. The tunnel will be built principally of concrete and used for conveying water from a great reservoir to be established in the Calaveras valley in the hills of Alameda county. A shaft 125 ft. deep will be sunk and the tunnel will be run through a bed of clay 95 ft. thick that underlies the bay.



# LATEST FRENCH MILITARY MOTOR-CYCLE ON RAILS



A new type of motor-propelled vehicle for military purposes is being tested in France. The machine is called a quadrant motor-cycle and is for use on railways. It has

two seats in front and two behind and is equipped with a 2-hp. motor. The speed is said to be  $18\frac{1}{2}$  miles per hour and steep grades are negotiated with ease.

## SUBMARINE DIVER DESCENDS 204 FEET AND LIVES

At what depth can a diver carry out his functions? How long can he remain under the surface? What is the effect of high air pressures on the human system? One well known firm of submarine engineers limits the depth of descent to 25 fathoms, or say, 150 ft., says Pall Mall Gazette. But operations have been carried out at greater depths than this, and perhaps the greatest distance below the surface at which a diver has succeeded in working is 34 fathoms, or 204 ft. This was accomplished by James Hooper, who descended to the ship "Cape Horn," sunk off Pichidanque, South America, and sustained a pressure of  $88\frac{1}{2}$  lbs. on every square inch of his body.

Another remarkable feat was that of Alexander Lambert, who recovered \$350,000 in gold coin from the steamship "Alphonso

XII.," sunk off Point Gando, Grand Canary, in nearly 30 fathoms of water, the actual depth of the treasure room being  $26\frac{3}{4}$  fathoms, or 160 ft. This man also performed the daring feat of stopping the flooding of the Severn Tunnel when a door in the drainage tunnel had been left open. The door was situated a quarter of a mile distant from the shaft, but equipped in his diving dress he crept that distance through a narrow passage full of water and closed the door. This plucky act enabled the pumps to overcome the volume of water which was flooding the working and allowed the completion of the tunnel.

A further interesting case of deep diving is that of Angel Erostarbe, who succeeded in recovering silver bars valued at \$45,000 from the steamer "Skyro," sunk off Cape Finisterre in over 30 fathoms. In this case the diver had to blow away portions of the vessel with dynamite.

## MODERN GLASS-COVERED HOUSE FOR WINTER GARDENS

The long, narrow glass houses used by so many market gardeners are obsolete. It is just as well to throw all the enclosed space under one roof, so far as success is concerned, and even better on the score of convenience. An Oregon man who tore down his old glass buildings and erected in their place one large, new building, 60 ft. wide and 150 ft. long, tells how he did it.

The foundation walls were of rough stones picked up from the fields and put in a trench 1 ft. deep till they reached ground level. On top of these was built a concrete wall 4 in. high and 6 in. wide. The house was built with one-fifth pitch gable roof, having sash-bars 32 ft. long on each side. This brought the ridge 15 ft. above the



Interior of Glass-Covered House

beds; and the side walls of glass were 3 ft. from the wall to the top of the plate. The south end of the building was covered with glass to a height of 5 ft., and the north end to a height of 2 ft.; the rest of the gables was closed up with lumber.

Four purlins, two on each side, were run the whole length of the house. Each of these was supported by 17 posts and the posts were tied and braced sidewise, and two braces near the south end used to brace the house lengthwise. The sash bars were  $1\frac{3}{4}$  by  $2\frac{3}{4}$  in., with upper corners rabbeted and the glass was 14 by 14 in. lapped  $\frac{1}{8}$  in., imbedded in putty and fastened by nailing a strip  $\frac{3}{8}$  by  $\frac{3}{8}$  by 10 in. long above each end. Eight courses of glass were laid and then a board 8 in. wide, which serves as a walk when it is necessary to repair the roof, was put on.

In the south end were made four doors, each 3 ft. wide and in the north end three

3-ft. doors and one 10-ft. door to admit a team and wagon when hauling manure for the beds. These doors provide the only means of ventilation necessary. When the temperature within is too high, the doors are opened until it is right.

Among the principal items of expense were: lumber, \$150; putty, \$17; concrete, \$8; nails and bolts, \$10; coal-tar (for painting wood-work), \$8. Besides these was the glass. In a large building of this kind the beds can be laid out to much greater advantage and none of the space is lost. The Rural New-Yorker says all the usual market products, lettuce, cucumbers, tomatoes, celery, cauliflower and cabbage plants, etc., may be grown with success.

## THE OPTICAL LEVER

Instrument Measures One Fifteen-Millionth of an Inch

Dr. P. E. Shaw, of England, has invented an apparatus which will make measurements three hundred times more refined than anything heretofore devised. The smallest dimension visible to the human eye, by the use of the most powerful microscope, is 1-25,000 part of an inch, which gives some idea of the minuteness of the new device.

It is not only a scientific curiosity but can also be put to practical use in measuring the vibrations of telephone transmitters, an accomplishment which has never before been successfully performed. It is possible that with this instrument the assumed movement of the particles in a wireless coherer can be detected and thus clear the mystery surrounding that inexplicable device. It may also displace the present apparatus for indicating the pulsations of the heart, as it would be much more sensitive.

The working principle of this apparatus is as follows: Suppose a lever were made with one arm one thousand times as long as the other; then a movement of the short arm would be multiplied one thousand times in the long arm, but a material lever of this kind would not be delicate enough for taking small measurements, so a beam of light is used. A small pivoted mirror in revolving an invisible distance deflects a beam of light on a scale and thus measures the deflection. The optical lever has another advantage over a mechanical lever in that the angle of deflection of the mirror is doubled in the beam of light.

# IVORY FAMINE COMING SOON

Strange Substance for Which No Substitute  
Has Yet Been Found

The properties of ivory are so remarkable that it is put in a class of its own as being different from any other substance. It is of organic origin but unlike most organic substances does not decay with age; indeed the best ivory improves with age and all the "hard ivory" is taken from the tusks of elephants which have died many years ago, sometimes many centuries. It seems strange that after all this seasoning an ivory billiard ball requires the greatest care, immediately after making, to prevent its cracking from sudden changes of temperature. They are usually kept in a room of even temperature five or six days after being turned, to avoid this danger.

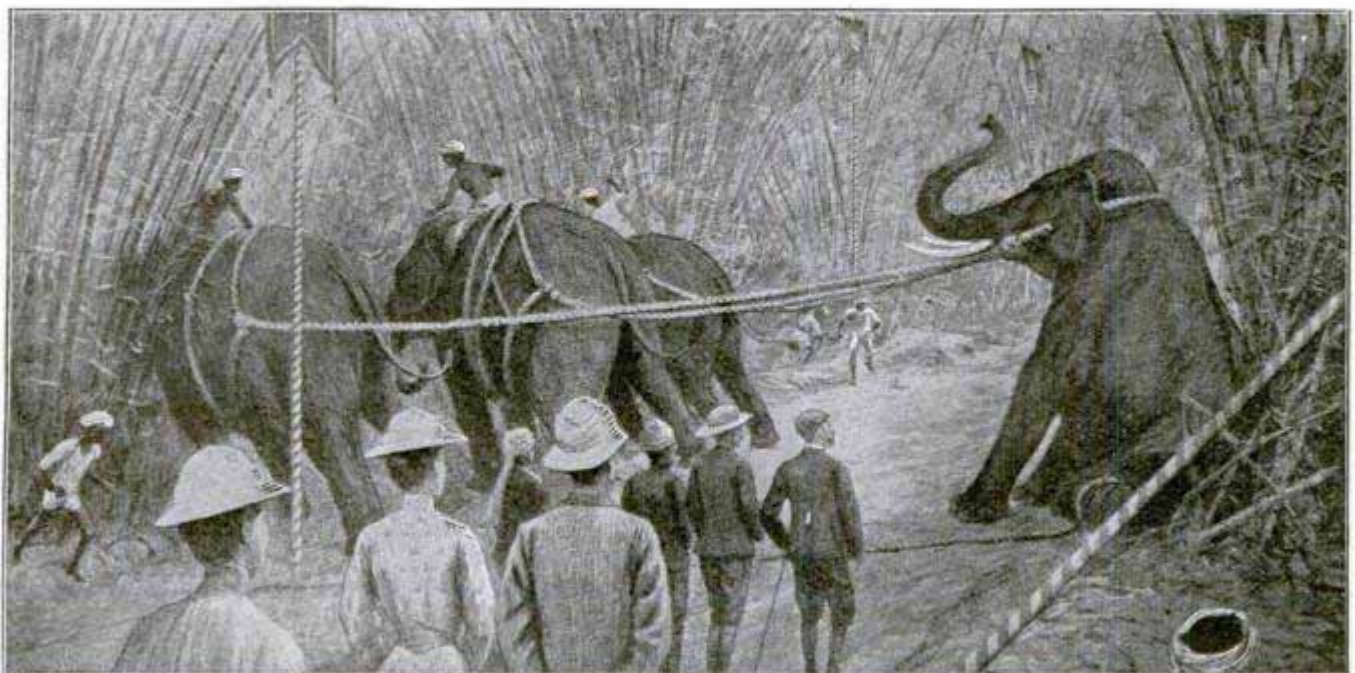
As a result of the excessive slaughter of the African elephant ivory is becoming very scarce. A standard size billiard ball today is worth \$14, where a few years ago the price was \$5 a set. This continual advance in the cost of ivory has led to the substitution of other substances, chief among which is celluloid, although a vegetable ivory has been discovered which promises to be of great value.

A certain celluloid composition has proved to be very suitable for pool balls but is not

elastic enough for billiard balls. Ivory, being the most elastic substance known, is used entirely in the manufacture of this article, and only certain portions of the tusks are used, the selection being made by experts in that line. If two balls of equal weight, one of rubber and the other of ivory, are dropped from say a height of 100 ft. upon some hard surface, the ivory ball will rebound higher into the air than the rubber.

Another unusual property of ivory is the character of its surface. It has a velvet-like touch possessed by no other substance of equal hardness, and an expert can instantly detect imitation ivory with the eyes closed. Professional pianists regard it as a necessity in the construction of piano keys and for this reason it is used almost exclusively in their manufacture. The general impression that all ivory turns yellow with age is incorrect as good ivory retains its creamy whiteness indefinitely.

The world's annual production is about 1,500,000 lbs., to secure which 70,000 elephants must be killed, in addition to the fossil ivory from eastern Siberia. The largest supply comes from Africa. In Abyssinia



Bringing In a Tusker

three-fourths of the proceeds go to the king's revenue, while the tusk hunter gets one-fourth. This encourages smuggling on a large scale, which involves burying the ivory in the ground where it becomes stained and sells for less.

The increasing scarcity in elephants' tusks has resulted in recent experiments with a species of nut which grows in South America. This nut has a hard covering greatly resembling ivory in many of its qualities and produces a vegetable ivory much less elastic than genuine ivory, but which has the essential characteristics required for piano keys, and manufacturers are eagerly hoping it will prove to be the long sought and so greatly desired substitute. The inventor who succeeds in solving the problem of artificial ivory will become many times a millionaire.

The Prince of Wales, who is making a tour of India, was entertained last month with an elephant drive. The illustration—from the London Illustrated News—shows the natives with three tame elephants dragging in a refractory tusker, just captured.

## PREPAYMENT ATTACHMENT FOR ELECTRIC METERS

A penny-in-the-slot gas meters have been common in England for a long time, and to some extent in the large cities here, but



the slot machine electric meter is something new. A silver dime is made the unit of sale, although the capacity of the coin holder provides for 20 at one time. You can drop a dime and your light will burn ten cents worth, or any number of

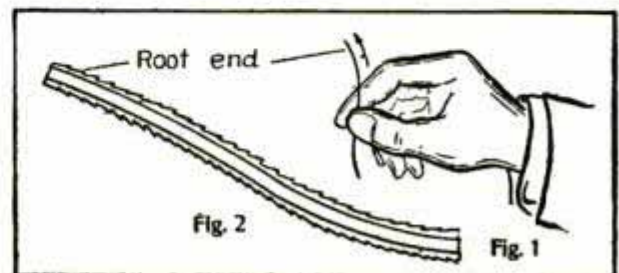
dimes up to \$2 worth. The indicator shows not only the amount paid for, but at all times the amount remaining to the credit of the consumer.

Every precaution has been taken to prevent beating the meter (as if a consumer ever beat a meter!), and any attempt to drop in dimes with a string or wire

attached with the intention to pull it out after doing duty, is doomed to failure. In such cases a sharp knife cuts the string or wire, and the meter gets the money, and tells the story besides.

## HAIRS HAVE TEETH

A person who does not know how a hair looks when magnified, would be very much surprised to know it is possible to tell which was the root end of a hair that had been broken or cut. This may be easily done by holding the hair between the thumb and



finger, as shown in Fig. 1, and moving the thumb up and down. The hair will then move in the direction of the root end.

A glance at the magnified hair, Fig. 2, will show the cause of this motion. The teeth along the sides of the hair act like ratchet teeth and allow it to move only in one direction. It is on account of the teeth that the horse hairs used in the manufacture of violin bows are not all laid in one direction. Half of them are turned end for end so that the bow will produce the same volume of sound on the up and down strokes.

## SHRINKAGE OF HEATED GRAIN

Great loss often results from shrinkage in weight of grain that has become heated. Corn in normal condition contains 15 per cent of water, but this year much of it contains 20 per cent. Supposing it were heated sufficiently to lose 5 per cent of this moisture, a 60,000-lb. car load becoming heated in transit would shrink 3,000 lbs. in weight, and the loss would be about 2 cents per bushel and the discount in price. In one instance two cars of corn lost 2,000 lbs. each in just 14 days' time.

Motor cars figured largely during the recent English elections, both sides employing a large number of cars in carrying voters to the polls. Speed regulations were ignored.

# ELECTRIC PEN THAT NEVER STOPS

**Marvelous Apparatus that Records Sunshine, Rain, Heat and Cold--  
Does the Work of Eight Men**

Of all the millions of people who daily watch the weather predictions, very few have any conception of the delicate and remarkable electric instruments which through an unbroken term of years, ceaselessly record the ever changing conditions.

In order to make the weather reports as they are recorded at present, the services of eight additional men would be necessary if such a thing as electricity did not exist. The thermometer would have to be watched constantly day and night, and observations taken and recorded every minute. The

tion possible, and electric wires carry the message of these busy workers down into a comfortable office below. The records which most interest the public are those which write the story of sunshine, cloud and rain; the direction and velocity of the wind; the temperature; and amount of rainfall. The records are written with an electric pen on long, narrow strips of paper, and while one of these collections of data and crooked lines are utterly meaningless to the visitor, to the experienced eye of the weather man it is like reading a book or newspaper. As will

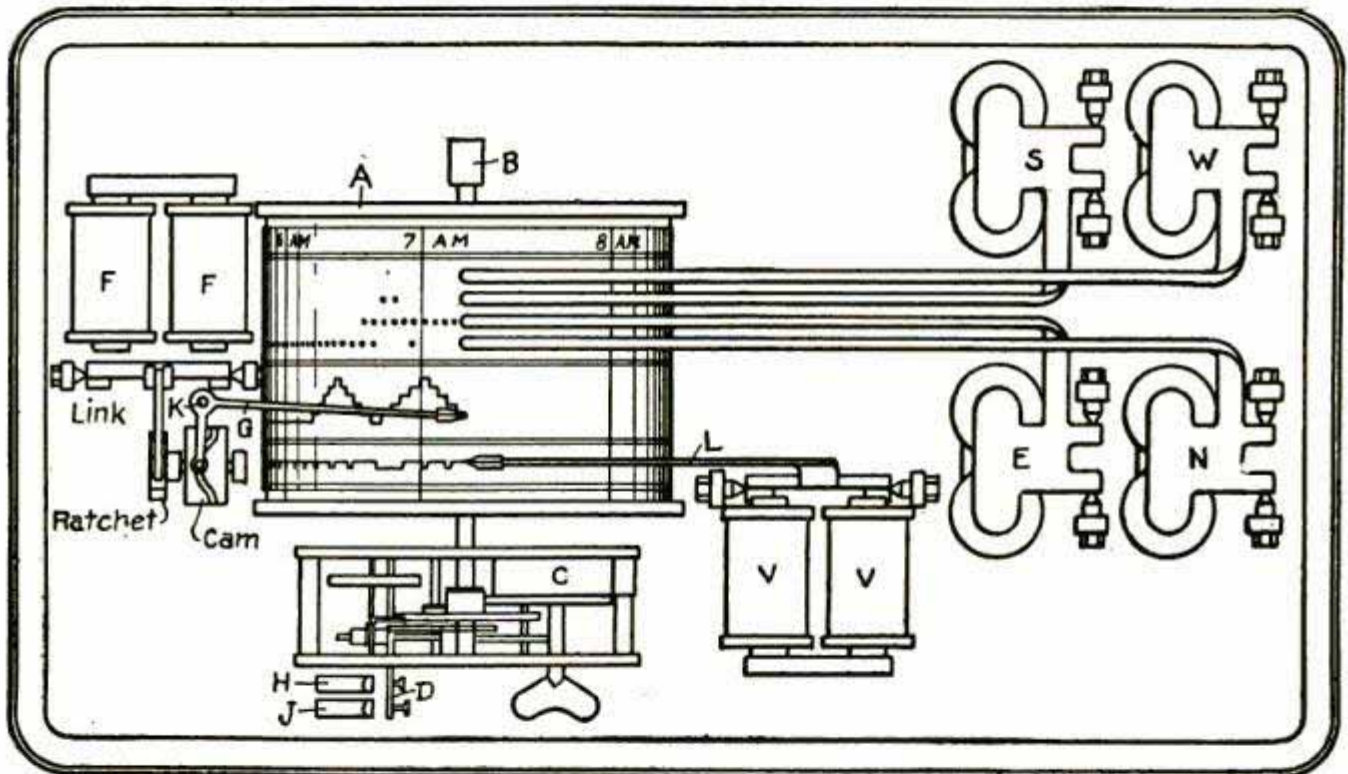


Fig. 1--Plan View of Wind, Sunshine and Rain Recorder

weather vane would require the same careful attention, as well as the anemometer which measures the velocity of the wind. The services of one man would be required to watch the sun and note the total number of minutes of sunshine each day, deducting the time occupied by passing clouds. Another man would have to watch the rain gauge and note the time of each hundredth of an inch in falling. The services of all these men would be expensive and liable to error, but electricity has proved to be a faithful, unerring servant which is always dependable and is supplied with very little expense.

The little 4-cup pinwheel affair, weather vane, thermometer, rain gauge, etc., are placed in the highest and most exposed posi-

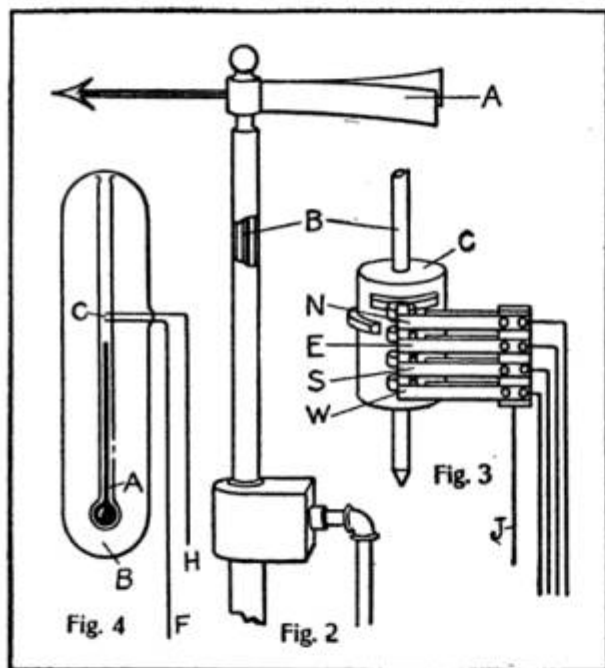
tion possible, and electric wires carry the message of these busy workers down into a comfortable office below. The records which most interest the public are those which write the story of sunshine, cloud and rain; the direction and velocity of the wind; the temperature; and amount of rainfall. The records are written with an electric pen on long, narrow strips of paper, and while one of these collections of data and crooked lines are utterly meaningless to the visitor, to the experienced eye of the weather man it is like reading a book or newspaper. As will

be described, the wind record consists of round black dots; sunshine, rain and clouds, of continuous lines. The utmost care is taken in the preservation of these records, which are frequently referred to as conclusive evidence in cases of litigation, where the question of the weather is involved. Important suits for damages are lost and won through the ability of one side to prove for instance, that no rain fell during certain hours of a certain day.

On entering one of the important stations like the Chicago weather office, the first instrument to attract attention is the wind, sunshine, and rain recorder. In this instrument, Fig. 1, the blank record is placed on a cylinder A, which is revolved by the clockwork, C. The shaft, D, makes one revolution

a minute and in doing so closes a circuit at H and J. The circuit closed at H makes the sunshine record, which will be described later on, and the circuit closed at J registers the direction of the wind. This is done by the four magnets, N.E.S.W., which are operated by the wind vane, Fig. 2.

This device consists of a large vane, A, connected by a shaft, B, to a cam, C, Fig. 3. This cam operates four brushes, N.E.S.W., which connect to the corresponding magnets in the recording instrument, Fig. 1. The circuit being closed once a minute, causes a current of electricity to flow through one of the magnets N.E.S.W., which pulls down the armature and makes a dot on the record. Thus if the wind is north, the current will pass through the brush N, Fig. 3,

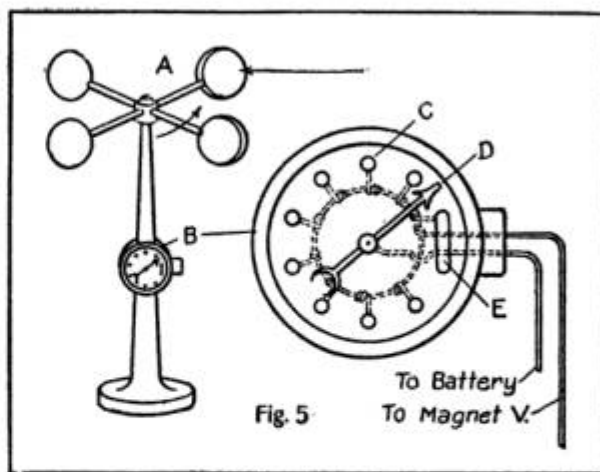


**Figs. 2-3--Wind Indicator**  
**Fig. 4--Sunshine Indicator**

and the magnet N, Fig. 1, making a dot on the record like those shown. The record is divided into hours and minutes and thus registers the direction of the wind at any given time. If the wind is northwest instead of straight north, the magnets, N and W, will both receive the current and two dots are made on the record.

The circuit closed at H is connected to the sun thermometer, Fig. 4. This instrument consists of a black bulb thermometer, A, Fig. 4, enclosed in a vacuum tube, B. The contacts, C, are open when the sun is not shining but in sunny weather the mercury rises and closes them. The circuit thus closed is connected to the magnet, F, which operates the link, Fig. 1, and revolves the ratchet one tooth a minute. This revolves the cam which causes the lever, G, to swing

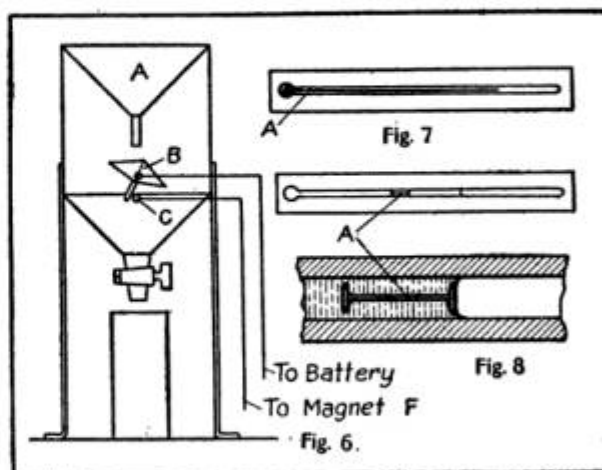
on its pivot, K, thus making the step-like mark on the record.



**Records Velocity of Wind**

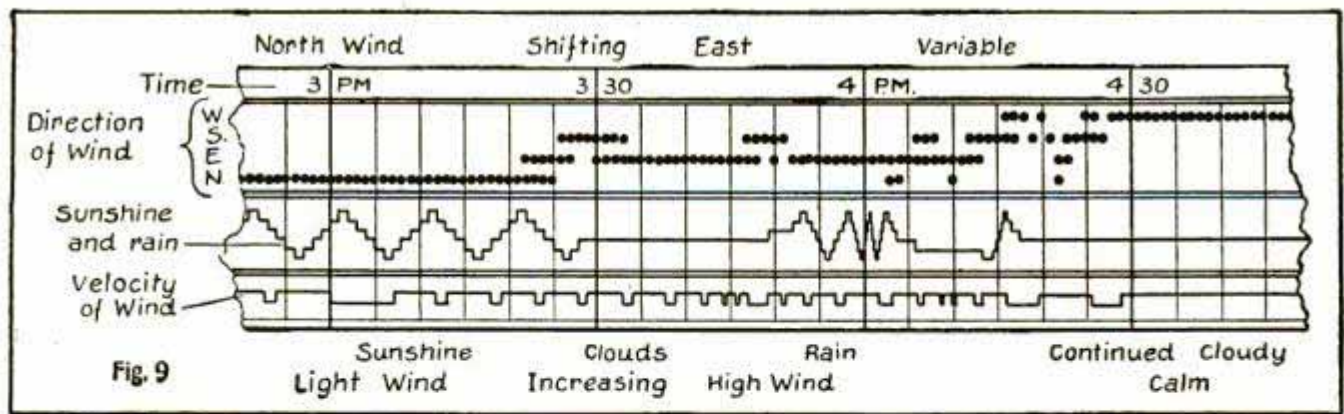
The velocity of the wind is measured by the anemometer, Fig. 5, which consists of four revolving cups, A, which transmit their motion to a hand on the dial B. This hand revolves once every 10 miles, and in doing so closes the circuit nine times. It will be noticed that one contact, E, is longer than the others. This differentiates every tenth mile in the record, as will be seen later, and thereby facilitates counting. The circuit thus closed passes through the magnet V, Fig. 1, which attracts the armature L, and makes an indentation in the record line as shown. The 10-mile mark is shown on the record, Fig. 1, a little before 7 A. M.

The rain gauge, Fig. 6, consists of a funnel A, and a tipping bucket B, which swings when it has received one-hundredth of an inch of rain. In doing so it closes the circuit at C, which connects with magnet F. The same magnet is used for recording sunshine and rain, but the records are not confused except when it rains and shines at the same time, which rarely happens.



**Fig. 6--Rain Gauge**  
**Figs. 7-8--Thermometers**

The difference between the sunshine and rain records can be seen in the sample



90 Minutes' Record of Wind, Rain and Sunshine

record, Fig. 9, which tells the whole story of a storm which occurred last month. At 3 o'clock the sun was shining and a light wind was blowing from the north, which shifted at 3:25 and became east. At 3:30 the sun disappeared and the wind increased until it became a 30-mile gale. A little sprinkling at 3:50 was followed by a heavy rain at 4 p. m. The wind then became variable and finally died down to a calm at 4:30.

The diagram of the circuits thus far described is shown in Fig. 10. The current is taken from two storage batteries, one of which is being charged while the other is discharging. The sun thermometer, rain gauge, wind vane and anemometer are on the roof of the building and connect to the recording instrument in the office by wires running through conduits. This diagram does not show how the temperature is recorded, as that is done in another instrument.

A bent tube is filled with a liquid, which expands when heated and moves a brush

over electric contacts. This causes magnets, in the recording instrument, to move a lever which traces a line on a cylindrical record. The recording thermometer is sufficiently accurate for all intermediate temperatures, but the maximum and minimum temperatures are taken with the thermometers shown in Fig. 7 and Fig. 8.

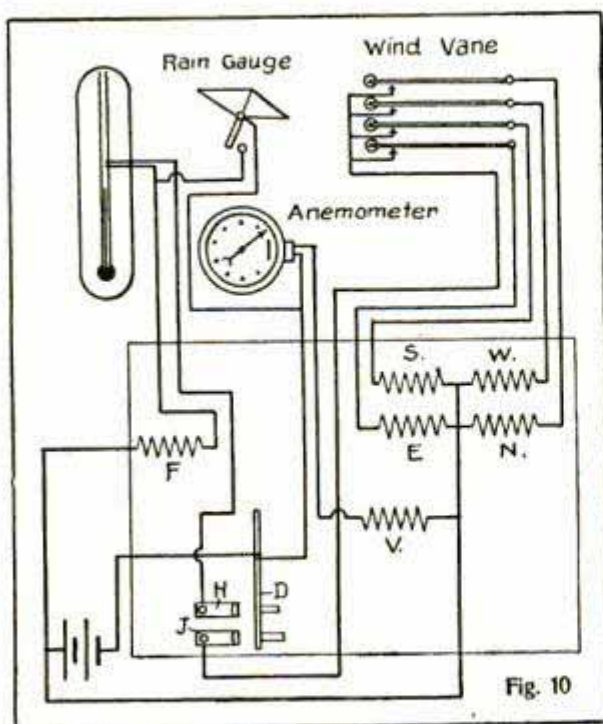
The maximum thermometer, Fig. 7, has a constriction in the bore at A, which causes the mercury to separate, leaving it at the maximum temperature. The minimum thermometer, Fig. 8, has a black glass indicator, A, which clings to the sides of the tube by cohesion. The liquid used is colorless alcohol, and in rising it passes the indicator without moving it, but the surface tension is too strong to allow the liquid to pass below the indicator, which is always left in the lowest position. Both of these thermometers are set by swinging, the operation being the same as that used in setting a physician's thermometer.

Chief of Weather Bureau Moore has announced that plans are practically worked out, which are expected to be utilized within a few months, which will enable the Bureau to extend its forecasts from one day to a full month.

## LOCOMOTIVE AS HOISTING ENGINE

A locomotive that had seen thirty years' service, instead of going to the scrap heap, is now serving as a hoisting engine. A pinion was placed in the center of the main axle engaging a large gear on a 20-ft. length of line shaft which extends out beyond either side of the boiler. The winches are supplied with sufficient power to lift 200 tons by a second reduction of gears from this line shaft.

This novel hoisting engine is used in connection with a marine railway capable of handling 4,000 gross tons.



Wiring Diagram

# MACHINERY PECULIAR TO LAKE STEAMSHIPS

By L. F. Wilson

The big engines of a large steamer is a favorite subject for illustration and description, but the no less necessary, special machinery of a Great Lakes liner would amaze the landsman. Perhaps the most striking apparatus is that for getting rid of the ashes from the fireroom, one or two decks below the water line. The idea is much the same in principle as the injector, the difference being that water instead of steam or air is the prime mover; and its velocity and inertia are depended upon to move the ashes rather than any vacuum created. The apparatus is called the "ash gun." Water under from 300 lbs. to 600 lbs. pressure is forced through a pipe, usually of about 2-ins. bore, to a nozzle which is directed upwards into a larger pipe which is run upwards to the ship's side above the water line, at an angle of about 45 degrees. Where the nozzle enters the larger pipe, there is situated a receiving box where the ashes are thrown through a hopper directly into the stream of swiftly moving water. The latter carries the ashes and clinkers up and out at high velocity. At the ship's side there is a hood designed to stop the stream and drop it quietly into the water. As this hood sometimes becomes choked the firemen raise it when out of port and allow the ashes to shoot far out at right angles to the steamer. The first stories to reach Europe of the first American ocean going steamer was of a craft which vomited fire and smoke and whose chief means of defense was a great stream of boiling water with which to repel boarders and scald the enemy. Had that craft carried an "ash gun" there would have been some real foundation to the rumor.

I remember of an instance where the ash gun was started through a mistake of one of the water tenders, while this hood was up, just as we were making port. The stream of dirty water and hot ashes quickly swept the pier of all passengers.

At each end of the steamer is situated a capstan engine. These engines are double and are placed under the deck and are directly geared to the capstan. At ports the first and second officers handle these engines entirely with the reverse levers; the engines being of the link motion style. Before coming into port, the engineer on duty turns steam into these engine leads and as

the links are left at center the reversing lever is all that is necessary to send them ahead or back. They are fitted with automatic water release so there is no danger of damage to the engine through condensation in the piping.

The blowing engines are next on the list. They are of a common variety direct connected or belted to the fans. These fans are used for ventilating the state rooms and for forcing the draft in the boilers. The refrigerating machines closely resemble the ordinary stationary installations.

Among the most important of the smaller engines is the steering engine. This is a double cylinder winding engine, so designed as to haul the tiller in the same direction as the wheel in the pilot house is turned, and stopping when the wheel stops. The electrical installation usually consists of two or more direct connected units generating a direct current. This current is distributed through the ordinary switch board to the lights and small electric fans, to the dish washing machines, etc. One of these units is in action continually and both are run on the same circuit when the evening load comes on.

In the crank room of the engine compartment are situated the pumps. There are pumps for washing the decks, for feeding the boilers, for pumping out the bilges, for fire and for other emergencies. Besides these there is of course the inevitable air pump for the condensers, and the cooling pump which forces water onto all the main bearings. The air pump and the cooling pump are direct connected to the cross heads of the main engine. The other pumps are independent and are duplex and sometimes duplex compound. All of the independent pumps are so piped that they can be interchanged; that is; the deck pumps and the fire pumps can be used as boiler feed pumps and vice versa. The water for the boilers is forced into a manifold and then piped to each boiler separately. Reducing valves for nearly all of the auxiliary engines and pumps are used to reduce the pressure of the steamer's boilers to a pressure more convenient for the small engines. Automatic force feed lubricators are used universally, both for cylinders and for bearings.

A very important little engine is the reversing engine. The reversing gear of the



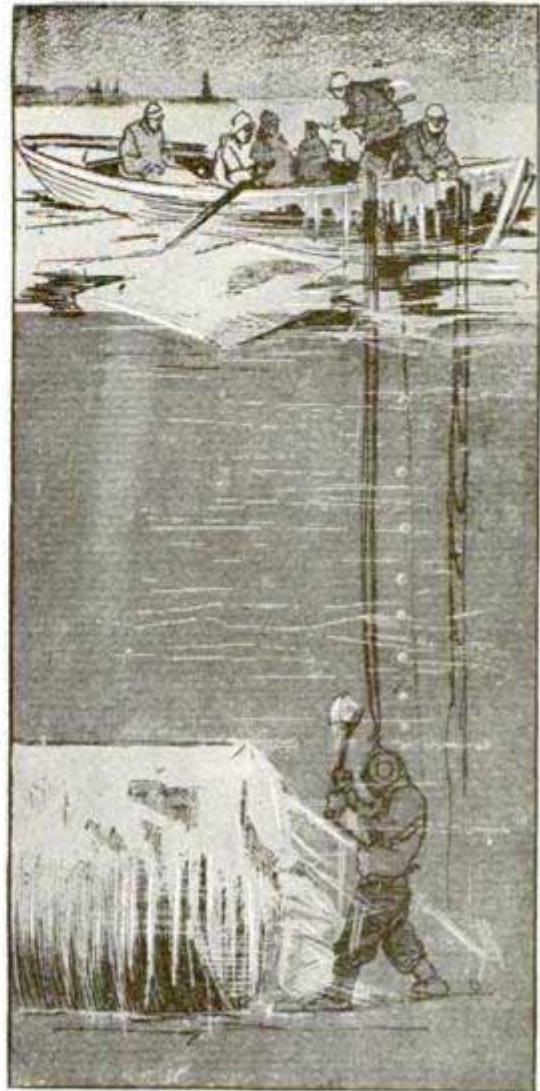
main engine is of the link motion type and is, of course, too heavy to handle by hand. The reversing engine is an upright cylinder whose valve is operated by the reverse lever in the controlling quadrant. When the reverse lever is pushed forward the valve of the little engine is pulled up, the piston follows, and by means of walking beams the links are slowly pushed over to the "go ahead" position. The position for shorter or longer cut-off is governed by the engineer independently by means of a hand wheel and screw blocks. On the gauge board above the controlling quadrant are the main boiler pressure gauge, the gauge registering the pressure from the reduced lines, the vacuum gauge, the revolution counter, and the chronometer. In fair weather the captain or mate on the bridge computes the speed of the steamer and also her position by means of the revolution counter whose registration is hourly sent to the bridge.

### PERILOUS WORK OF DIVER

Each spring when the wind blows from the northwest great masses of ice are piled up on the west shore of Lake Michigan. This ice field often extends out for one or two miles from shore, and is many feet in thickness. A large portion of the ice is ground into small pieces by the wind and waves, and these are drawn around the intake through which the city water is pumped. When these intake pipes become clogged the pumps are unable to draw any water and immediate action is necessary.

A diver is sent out in a boat and must go down in the icy water and clear away the obstruction. Frequently large pieces of ice become wedged and have to be chopped out

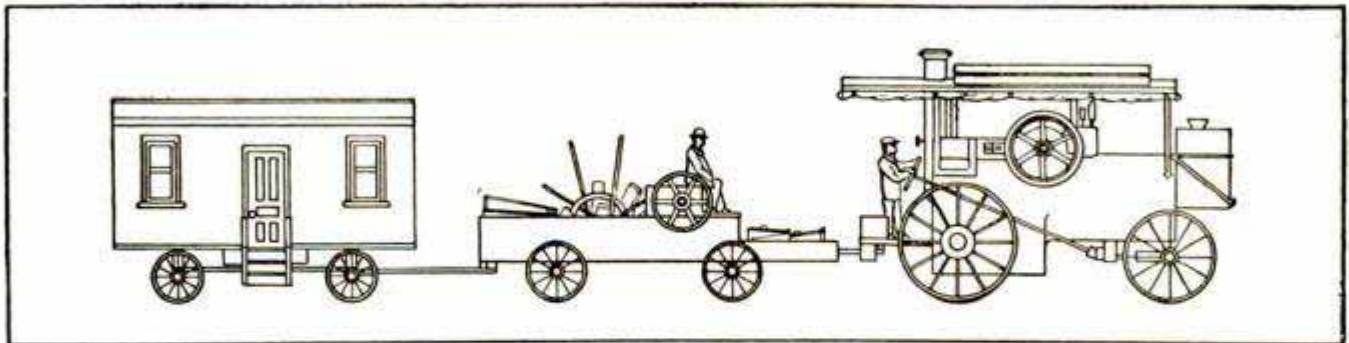
with an ax. The larger intakes are in the form of cribs, or piers built up from the bottom of the lake, but some of the pump-



Courtesy Chicago Journal.

Diver at Work

ing stations are supplied through immense pipes laid on the bottom. The illustration shows one of these with the diver at work.



### A BALING TRAIN

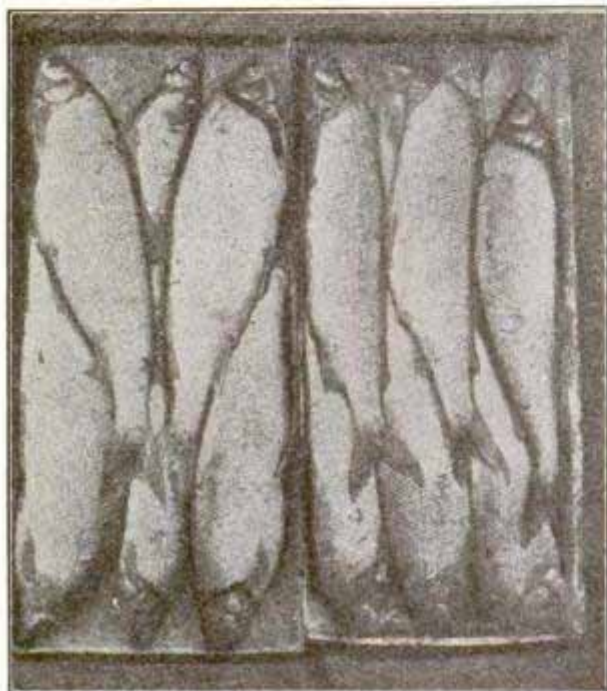
A hay baler in Indiana whose work takes him about the state has rigged up a wagon train in which he travels and transports his machinery. A traction engine serves as a

locomotive, a specially built wagon contains the baling machinery, and another wagon carries the boarding car in which the crew cook, eat and sleep.

## FREEZING AND STORING FISH

### How Our "Fresh" Fish is Preserved for Years Before Serving

A case in the courts recently where a fish merchant refused to pay storage on fish that had spoiled during the three years it had been in storage brought the attention of an amazed and scandalized public to this



Panned Fish Ready for Freezing

method of preservation. For years past most of the "fresh" fish served in our hotels and restaurants during a certain season has been preserved by freezing—the public did not know about it, that's all. However, for limited periods the method is excellent and it is only where the fish is carried over from year to year that the matter is open to objection. The process is as follows:

Only fish free from bruises and blood marks are fit for storage. Some species are split and gutted and others are frozen round. At the freezer they are emptied from the baskets and barrels in which they have been conveyed into washing troughs, where, as they pass from compartment to compartment against an incoming current of clear fresh water, they are thoroughly cleansed. At the opposite end of the trough they are sorted and "panned" according to size and kind. The panning process (merely laying the carefully graded fish neatly and compactly in flat shallow pans) is very particularly done as it adds much to the appearance of the fish after they are frozen. The pans of fish are then passed directly

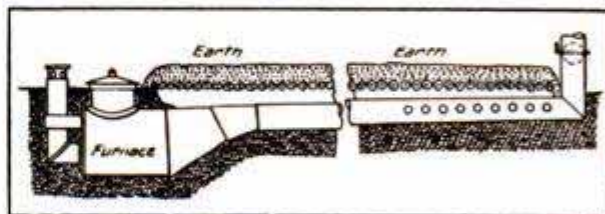
into the sharp freezer through a narrow aperture and are placed on the freezing coils. In 24 hours the fish are frozen in a solid block and the pans with contents are removed to the glazing room. Here pan and all is dipped into a melting tub, containing water, cold but still warm enough to loosen the fish from the pans, says the Cold Storage and Ice Trade Journal. Thence the pan goes to the knocking block and a blow on the corner turns out the fish in a solid frozen block. This block then receives a final coat of protective ice by passing through water in the glazer, and it is ready for the storage room. Here they are piled in tiers like lumber, the stacks reaching from floor to ceiling. As soon as opportunity offers they are boxed. The boxes, when stored, are elevated a few inches from the floor and strips one or two inches thick laid between them as they are tiered to allow the cold air to circulate.

From time to time the fish are examined for drying about the nose and when this appears they must be reglazed immediately. Nine or ten months is the greatest length of time fish can be carried in this way and kept in good condition.

## A HEATER FOR HOTBEDS

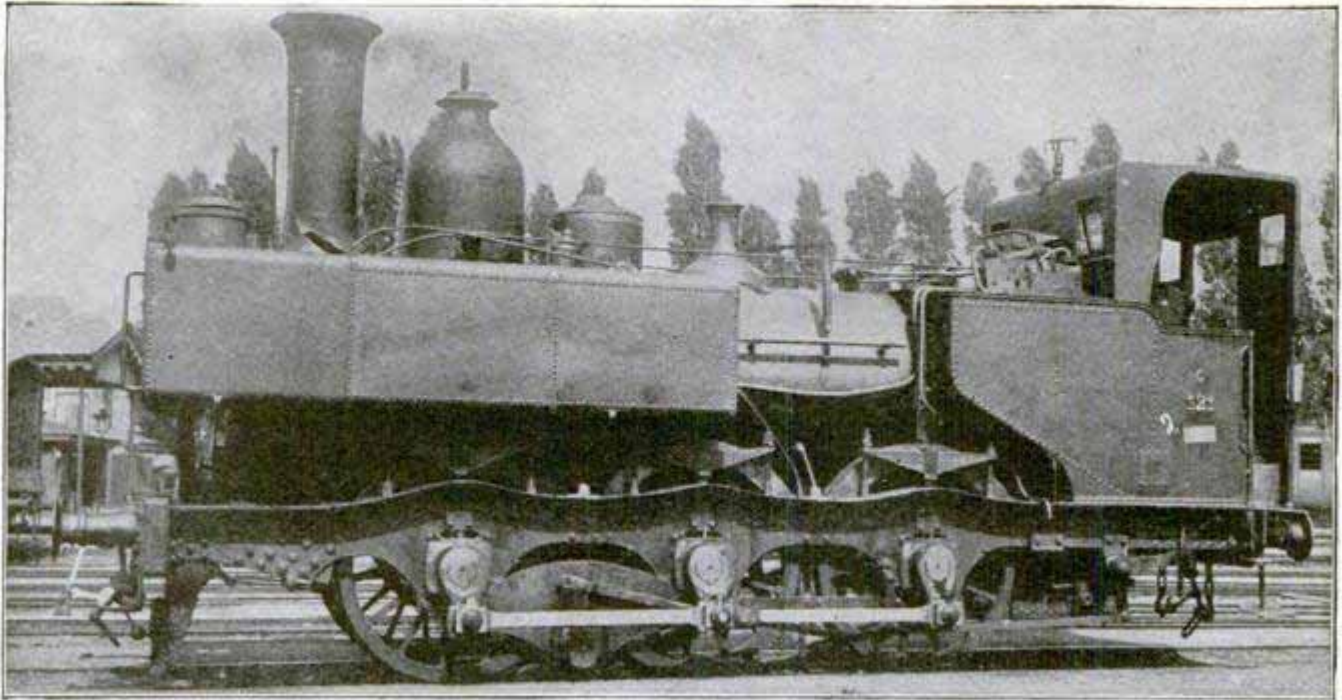
An apparatus for heating hotbeds, the invention of a Delaware man, consists of a furnace embedded in the ground and a long inclined flue for heating the bed. The distance between the flue and bed being greatest at the furnace, gives the adjacent parts of the bed no more heat than the most remote portions. The openings at the end of the flue also help to keep the heat evenly distributed.

The bed, about 50 ft. long and 10 ft. wide, is supported by cross poles, an air space being left between the poles and the flue.



The furnace is designed for burning wood, but any other fuel may be employed. The supply of air can be regulated by the adjustable openings at the furnace and the damper in the stack, so that the apparatus may be run during the night without requiring any attention.

## NOTABLE FOREIGN LOCOMOTIVES--No. 4



**AN OLD BELGIAN LOCOMOTIVE--**This engine is interesting in appearance, the water tank being arranged in front to distribute the weight evenly. The wheels have no brakes, but a shoe is lowered on to the rail and the whole weight of the engine can be forced upon it. This engine is used for shunting purposes near Brussels.

### TELEPHONES TO CALL EMPLOYEES

Many concerns which have frequent occasion to summon some of their most experienced men for emergency work outside of working hours are having the telephone company install phones at their residences. Street railway companies and railroads are doing this to a considerable extent. In the case of shop superintendents and foremen, they can often give the necessary orders without going to the works, besides the advantage of getting immediate action.

### RAILROAD TIES FROM JAPAN

The Pacific Coast is noted for its many vast timber belts, and for that reason it may appear a peculiar circumstance that oak railroad ties are now being shipped in great quantities from the Orient—Japan especially. Yet such is the case.

The big freight-carrying steamship "Hazel Dollar" is now on the way from Japan to Guaymas, Mexico, laden with oak railroad ties. This vessel is bringing 3,000,000 feet of ties. She is being closely followed by the large British steamship "Comeric" which brings 2,500,000 feet of these ties.

Up to the present time, the Pacific Coast had a monopoly in the manufacture of railroad ties, but the Japanese timber concerns are reaching out for the business and have succeeded in securing the contract for the American railroad now in course of construction at Guaymas. Other shiploads are to follow soon.

The producers of railroad ties on the Pacific Coast do not fear the competition of the Japanese. They claim that the oak ties have been given a thorough trial by the different railroads in the country and found to possess but little durability. The American producers aver that it is the extreme cheapness of the Japanese oak ties that causes any demand for them.

Alaska tin, it is prophesied, has a great future before it. It is now being smelted on a small scale at Seattle, Wash., and this smelter is soon to be enlarged to handle tin ore concentrated at Teller, Alaska.

A cheap 'phone rate is being agitated in England. The sum named is 24 cents a week and if this change is realized Great Britain will have one of the lowest rates on record.

## TRANSPORTATION FACILITIES IN ALASKA

### From White Horse to Dawson--A Novel Sleigh Ride in the Frigid Zone

Alaska is not alone the land of the gold-seeker; every year increasing numbers of tourists cross its frozen leagues in search of novelty such as is to be found nowhere else. Excellent transportation facilities are now afforded these persons by the White Pass and Yukon Route which maintains a mail, passenger, express and fast freight service over the government trail.

The regular route is by ocean steamer from Puget Sound ports to Skaguay and thence by train to White Horse. White Horse is 330 miles from Dawson and between these two points ply wheeled vehicles in summer and passenger sleighs in winter. The rate for



The Overland to Dawson, Y. T.

the sleighing trip is \$100 northbound and \$75 southbound. The distance is covered in a little less than five days, traveling only in day time and stopping at roadhouses over night. Accommodations at roadhouses are not included in the passenger's ticket. These places are well-kept, clean and comfortable. Meals are served at \$1.50 each and a bed costs \$1.00 per night.

The passenger sleigh will accommodate from nine to fourteen passengers, 1,000 lbs. of mail and express, and 1,000 lbs. of passenger baggage. Each passenger can take 25 lbs. of baggage free and must pay 30 cents per lb. for all in excess of this amount. Big fur robes and, in very cold weather, foot warmers, are furnished for the passengers' comfort. Relays of fresh horses are made each 20 miles and every possible attempt is made to avoid delay.

The rate for the wheeled vehicle transportation between White Horse and Dawson in the summer is \$125. Freight rates are 20, 25 and 30 cents per lb., according to class, with a special rate for shipments exceeding 10 tons.

## SOUNDING BALLOONS FOR AERIAL EXPLORATION

If man's dream of aerial navigation be sometime realized, a fore-knowledge of the element with which he must cope will be of inestimable value to him. In various parts of the world exploration of the air by means of miniature rubber balloons and with a view to ascertaining direction and velocity of air currents, temperatures and other atmospheric conditions is being carried on. The arrangement by which the self-recording apparatus for securing this data is carried up for distances more than eight miles above the earth and then caused to drop at the proper moment is very simple, but most ingenious.

The method was contrived by the noted meteorologist, Prof. Hugo Hergesell, of the University of Strassburg, who conducted a number of experiments with it from a vessel in the Mediterranean. The balloons used are not more than 7 ft. in diameter, of the best quality of rubber and are black in color, so they can be distinguished at long distances. They are inexpensive, an essential feature, as one balloon must be sacrificed at each experiment, says a writer in the New York American and Journal. Two balloons of the same size, but one containing a greater amount of hydrogen gas than the other, are sent up at the same time. The balloon containing the greater quantity of gas carries a buoy or float; the other balloon carries the thermometer and barometer. They are sent up connected by a light cord 150 ft. long. As the balloons ascend higher and higher and simultaneously are carried away from the point of ascent, the vessel from which the experiments are conducted starts in hot pursuit. A cloudless day with low wind velocity has been chosen and the tiny black specks can be seen a great distance. Suddenly the bag containing the greater quantity of gas, and which is of course the length of the 150-ft. cord higher than the other, is seen to burst and fall rapidly, dragging its companion with it until they float on the water and the vessel hauling alongside draws them to the deck. As will be understood, the purpose of the balloon carrying the float is to keep the other from reaching an altitude where it would burst and this it does because the greater pressure of gas against its envelope causes it to explode first and it falls.

In this way much valuable information has been gathered. The greatest height reached so far is 8.7 miles above sea level.

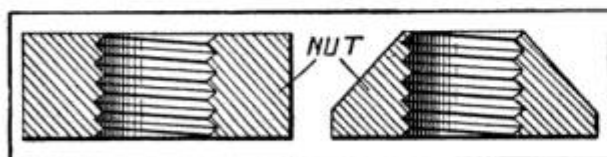
All the articles appearing in this department are reprinted in book form at the end of each year.

# SHOP NOTES

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

## A BOLTING KINK

A good way to bolt a plate or angle iron to some other structural piece, having bolts in it but so short that the nuts come just flush with the ends, and where you cannot take the bolts out to put in longer ones, is as follows:



Using Short Bolts

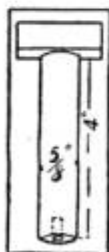
Countersink the holes in the plate or angle to be bolted on, then screw the nuts on an old bolt and grind them down taper to fit the countersunk holes.—Contributed by Thos. McIntyre, 407 Root St., Chicago, Ill.

## GOOD FLOOR POLISHES

1. Put a small quantity of spermaceti in a saucepan on the fire and mix with it enough turpentine to make it fluid. Apply to the floor a thin coat, using a piece of flannel for the purpose. Rub with dry flannel and brush the same way oak stains are brushed. The rubbing and brushing process, says the Practical Carpenter, take a long time, if properly done.

2. Dissolve  $\frac{1}{2}$  lb. potash in 3 pts. water in a saucepan on the fire, and when the water boils throw in 1 lb. beeswax cut up into small pieces. Stir until the wax is melted. If the polish is too thick when cold, add more water. Apply with a brush, painting the boards evenly, and when dry rub with flannel tied on the end of a broom.

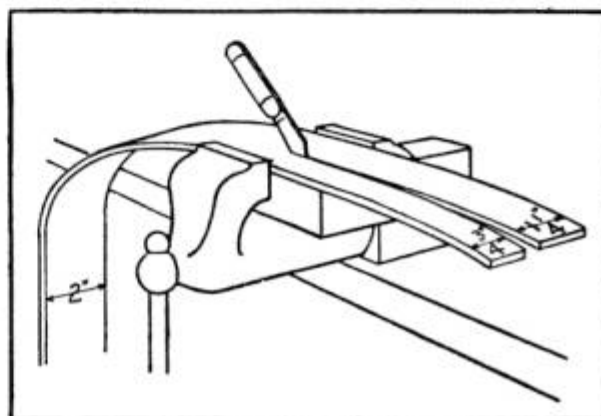
## TO MAKE A RIVET SET



To make a useful rivet set, take a square head bolt, cut it off 4 in. from the head and drill a  $\frac{3}{16}$ -in. hole in the bottom.—Contributed by Wm. T. Ackerman, 1311 Stockton St. Baltimore, Ind.

## HOW TO CUT A BELT

If one lacks the regular tools for cutting a belt a good job may be accomplished with only a knife, a vise and a block of wood. The wood should be the same width as the belt or a little wider and should be fastened in the vise about  $\frac{3}{8}$  in. below the top of the jaws. Drive the knife in the wood making the distance between the jaw of the vise and the knife blade, the re-

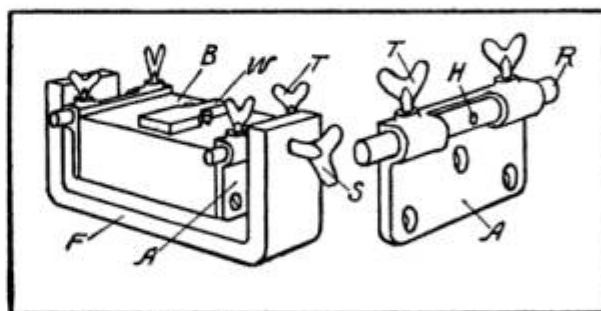


How to Cut a Belt

quired width of the belt. Then draw the belt through as shown.—Contributed by J. J. Hunziker, Cleveland, O.

## A JIG FOR FILING SMALL WORK

For the benefit of bench men or any one who has to file small work requiring a perfectly flat surface, the following device is described.



Jig for Filing Small Work

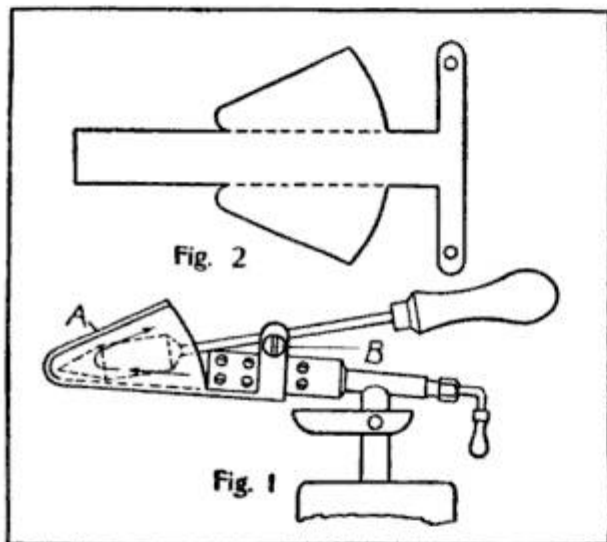
A block B, similar to those generally used for filing small work, is mounted in a frame F by thumb screws S which allow the block to swing and thus prevents rounding the ends of the work. The adjusting plate A

has a sliding rod R with a hole in the centre H to receive the pointed thumb screws S, the rod R being adjusted and held in place by the thumb screws T.

The frame F may be either of wrought or cast iron, and should have screw holes in the bottom to fasten it to the bench. The wood block B is fitted with pins to hold the work. The adjusting plate A can be made of brass or cast iron and the rod R and thumb screws S, T are made of steel.—Contributed by G. D. B., Springfield, Mass.

## SOLDERING IRON HOLDER FOR BLOW TORCH

A device for heating soldering irons very quickly and with little fuel consists of a sheet iron pocket A, Fig. 1, and a  $\frac{3}{16}$ -in. stove



Holder For Heating a Soldering Iron

bolt B for fastening to blow torch. Cut a piece of No. 18 sheet iron to the shape shown in Fig. 2 and drill holes for the  $\frac{3}{16}$ -in. stove bolt as shown. Bend the sheet iron as shown in Fig. 1 and fasten to the burner, and the heater is complete.—Contributed by G. L. Housman, Prattville, Mich.

## HOW TO SENSITIZE SILK

Prepare a solution by pouring 10 oz. boiling water on 50 gr. ammonium chloride and 30 gr. Iceland moss; allow to become nearly cold, then filter. Soak the silk in this solution for 15 minutes, let it dry, then sensitize it by soaking for another 15 minutes in a silver nitrate solution (20 gr. to the ounce) with a little nitric acid added. Dry the sensitized silk in the dark room and treat precisely as P. O. P. To obtain good results the printing should be very dark.

## HOW A STEAM TURBINE WORKS

The turbine mode of propulsion, which is so rapidly finding favor as a marine propeller, is most aptly described by the well-known figure of a pinwheel, says Marine Journal. The turbine, in fact, is a series of pinwheels, one behind the other, fixed to a shaft which turns with them. Now everyone knows that when a pinwheel is blown upon it revolves. For this motion in the turbine a jet of steam is employed. Fixed to the inside of the cylinder in which the propeller revolves is a series of stationary blades projecting into the space between each wheel and set at such an angle that they will deflect the stream of steam to strike the propeller at an angle which will give the most force.

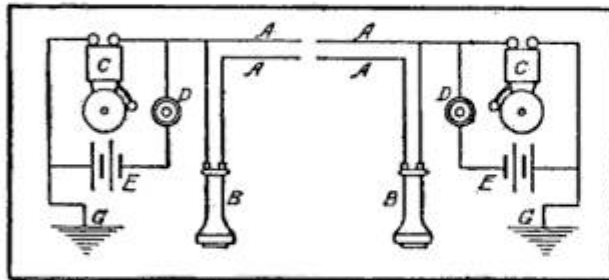
The Parsons turbine consists of a cylindrical case with numerous rings of inwardly projecting blades. Within this cylinder, which is of variable internal diameter, is a shaft or spindle, and on this spindle are mounted blades, projecting outwardly, by means of which the shaft is rotated. The former are called fixed or guide blades, and the latter revolving or moving blades. The diameter of the spindle is less than the internal diameter of the cylinder, and thus an annular space is left between the two. This space is occupied by the blades, and it is through these the steam flows. The steam enters the cylinder by means of an annular port at the forward end; it meets a ring of fixed guide blades which deflects it so that it strikes the adjoining ring of moving blades at such an angle that it exerts on them a rotary impulse. When the steam leaves these blades it has naturally been deflected. The second ring of fixed blades is therefore interposed, and these direct the steam on to the second ring of rotating blades. The same thing occurs with succeeding rings of guide and moving blades until the steam escapes at the exhaust passage.

## TO REMOVE BROKEN SECTIONS FROM A MOWER SICKLE

Place the sickle in a vise with the points of sections down. Screw the vise up tight enough so the sickle bar will not go through. Then with a heavy hammer drive the broken sections straight down. One stroke will remove each section, if properly made.—Contributed by J. J. Hogan, Parnell, Iowa.

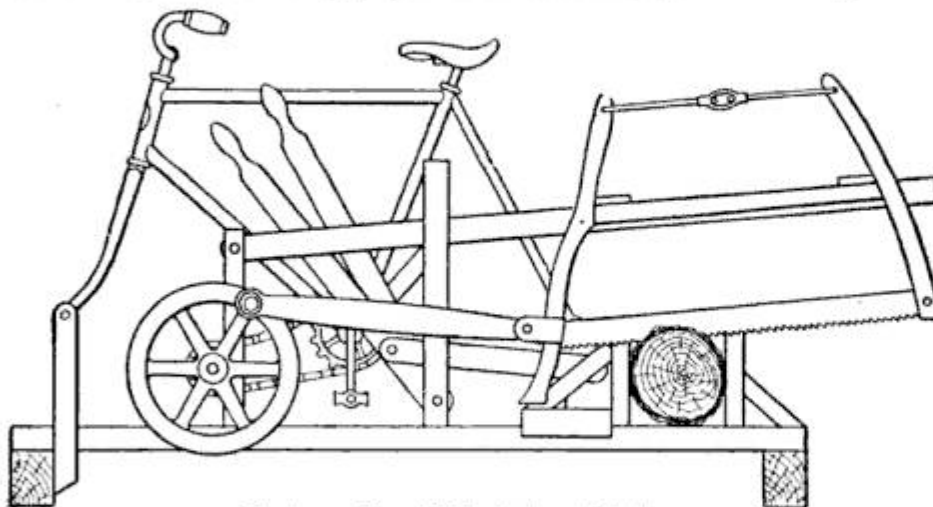
## SIMPLE TELEPHONE LINE USING RECEIVERS FOR TRANSMITTERS

An ordinary telephone receiver—the ear piece—can be used for purposes of transmitting and receiving on lines of reasonable distance. In this case a push button and



No Transmitters Used on This Line

call bell must be installed at each end of the line with which to make the call. A reader writes as follows: "I have always been interested in your shop notes and am sending you a diagram for a simple telephone. It consists of two receivers, into which the words are spoken and heard alternately, and a ringing attachment. It gives very good results, as I have one to a friend's house some 500 ft. away, which works as well as the larger, complicated telephones. Anyone can easily put up a line and make the connections by following the diagram shown. A 2-wire line is required, also grounding at each end. In the diagram, A, A, are the line wires; B, B, receivers which also serve as transmitters; C, C, call bells; D, D, push buttons; E, E batteries; and F, F, the ground connections. The cost of such a line, say 500 ft., is about as follows: 1,000 ft. No. 14 galvanized iron wire, 75 cents; 2 receivers, \$1; 2 sets call bells,



Reduces Hard Work to a Minimum

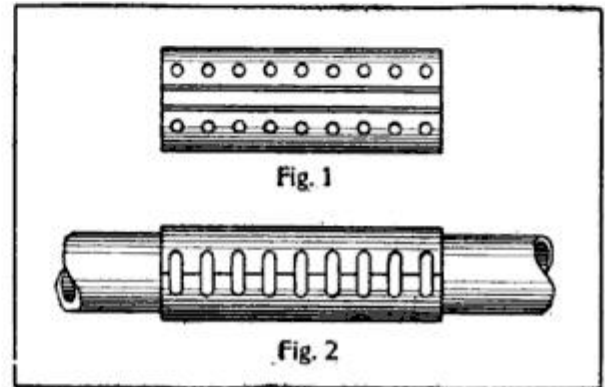
push buttons and four batteries, \$1.02; 18 insulators and 100 ft. No. 18 annunciator

wire, 66 cents. Total, \$3.43.—Contributed by Edward Band, 1232 Wrightwood Ave., Chicago.

## REPAIR FOR LARGE HOLE IN OUTER CASING OF AUTO TIRE

The materials required are a piece of old outer casing for the patch, of length and thickness according to the size of the hole; a lacing needle, and a piece of cord or tape to lace the patch on with.

Trim the ends of the patch so it will fit evenly on the tire and punch lacing holes in the sides so it can be laced over the tire. The outer casing and patch should be the same diameter. Put the patch over the tire and lace as tight as possible, then



Repairing an Auto Tire

put the tire on the wheel. Fig. 2 shows the patch laced on the tire.

## HOME-MADE FOOT-POWER SAW

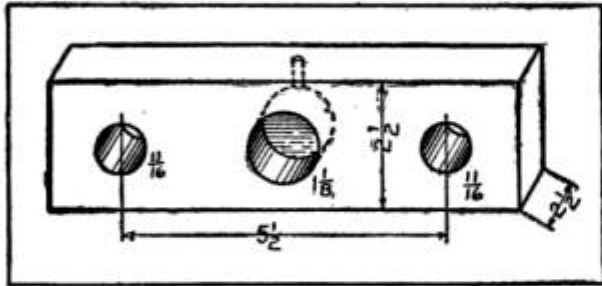
Instead of being a back-breaking, tedious hardship, sawing wood may be made a pleasant exhilarating exercise. Any person with even a slight knowledge of tools can make a foot power saw. The illustration will sufficiently explain how it is done. My machine was constructed from an old bicycle frame and buck saw, the reciprocating motion being obtained by the use of a crank pin and connecting rod as shown. The upper lever raises and lowers the saw and the lower lever

clamps the wood in position.—Contributed by E. Ponton, Northampton, Mass.

## SHOOTING OFF AIR PISTONS

When stripping an air pump for overhauling, it is often difficult to remove the air piston. A correspondent of Railway and Locomotive Engineering shoots it off.

The device which was used with 8-in. and 9½-in. air pumps consists of a block of machine steel 2½ in. square by 7¼ in. long,



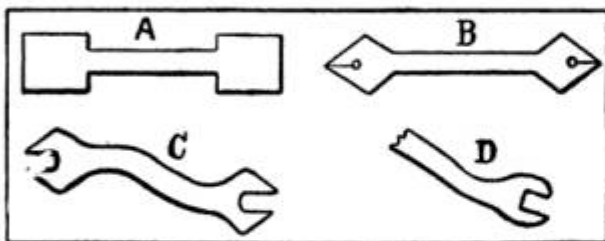
For Shooting off Air Pistons

having two 1½-in. holes 5½ in. apart for 5/8-in. bolts and a hole 1½ in. in diameter and 1½ in. deep, with fuse hole drilled through in the center of the block to hole for the end of the piston rod to slip in. Then a thimble full of gunpowder and a leather wad with some paper, if necessary, is rammed in. The block is bolted up to the air piston, some powder is put in the fuse hole and touched off with a heated rod.

The piston will be removed without burring the threads or breaking anything. It is well to set up a block to keep the piston from going too far.

## AN UNBREAKABLE S-WRENCH

Forge down a piece of old buggy spring as at A, then work it on the edge of an anvil to a diamond shape by stoving as at B. Punch a hole in each diamond-shaped part a little in front of the center and cut out to edge. Drive in a punch to spread the



Durable S-Wrench

jaws, and bend one each way sideways and work to shape on the edge of the anvil. Bend back straight and finish on the hardy, leaving jaws with a diamond corner as at C. This wrench will not break as those made in the usual way (D) often do. I find that old springs make the best wrenches.—Contributed by O. V. Simpson, Hersman, Ill.

## HOW TO GALVANIZE IRON

The two general methods of galvanizing are the dipping process and the electro-plating process. The dipping process is the one generally used, as it protects the iron and prevents it from rusting to a greater extent than the electro-plating method. There are some articles, however, which require electro-plating, especially when a very thin coating of zinc is required.

In the dipping process the article is first dipped in a solution of sulphuric acid. It is then placed in a solution of hydrochloric acid, and after drying is immersed in the molten zinc. Compressed air lifts are generally used for handling large work, and small articles are sometimes placed in perforated ladles. The troughs for holding the acids are usually made of wood, and the tanks for melting the zinc are made of steel 1 in. or more in thickness. The melting is usually started with lead, which melts first and surrounds the zinc. This saves time in melting and prevents over-heating the tank.

This process is very wasteful, as the amount of zinc deposited on the work is only about 53% of that put into the tank. Of the remaining zinc about 30 to 40% is converted into dross; 15 to 20% oxidizes and rises to the surface; and 5% or more evaporates.

The dross is an alloy of zinc and iron and, being heavier than zinc, sinks to the bottom of the tank and is often very difficult to remove. It is sold at a considerable loss and is used in making zinc oxide for paint. The skimmings are also sold, but the evaporated portion, of course, is a total loss.

A new process for galvanizing has been perfected lately which will probably be less wasteful than the one described. The new process is as follows: Pickle the article to be galvanized for a few hours in a solution of 1 part of sulphuric acid (concentrated) in 100 parts of water. Use a wooden or porcelain vessel for this process. Then scour the article with a brush, wash well and place in a solution of lime and water until ready for the galvanizing process.

Just before galvanizing immerse the article in a solution of zinc chloride and ammonium chloride until bubbles appear on the surface of the metal. To make this solution place zinc in hydro-chloric acid until no further action takes place, decant, and add sal ammoniac. Dry the metal with the film of bubbles on it on a heated iron plate, then place in a bath of heated zinc. "Be very careful not to overheat or 'burn' the



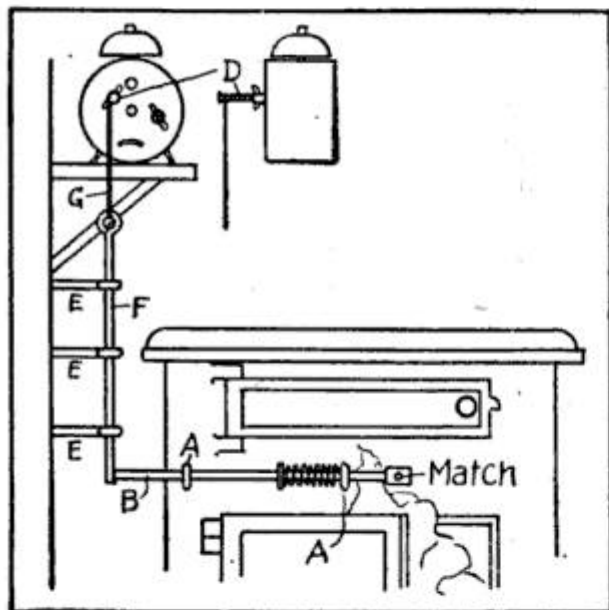
zinc," warns the Model Engineer, London, and to prevent the oxidation of the metal place either some sal ammoniac or charcoal on the surface. Withdraw the article from the molten metal and beat it to remove the excess of zinc.

This process is excellent for fittings used for yachts, water motors, etc., as iron castings thus treated will resist the action of water for a considerable time.

### TIME FIRE KINDLER FOR COOK STOVE

An alarm clock can be connected up to light a fire in the cook stove at the time desired, and thus save one getting up before the kitchen is heated.

Drill two holes in the stove and screw in two eyes (A A), then place a rod (B) with a spring in the eyes as shown. In the end of this rod drill a hole to receive the match. If the match is too small to stay in, use a wedge to hold it. On the eye in the middle of the stove solder a piece of



Time Lighter for Cook Stove

stiff tin, so that the match will be drawn against it when the rod is thrown by the spring.

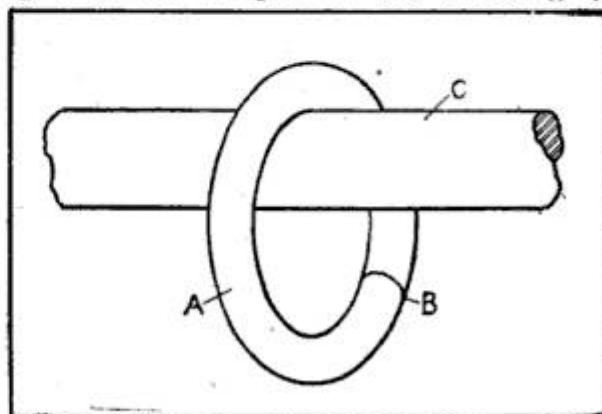
Solder a nail (D) to the key of an alarm clock and place the clock on a shelf near the stove. Under the shelf use three screw eyes (E E E) to hold a perpendicular rod (F) connected with the stove rod as shown, and with the alarm key by a stout cord (G).

Set the alarm for the time you want the fire kindled and have the kindling device in readiness, as illustrated. When the alarm runs down it will wind the cord G on the nail D attached to the key and thus pull rod F off of the end of rod B, which

will be thrown by the spring and so strike the match. A piece of paper, or other easily inflammable material, should be placed near the match so the flame will catch.—Contributed by O. E. Vessels, 313 E. Yorwood St., Indianapolis, Ind.

### TO KEEP SHAFTING BRIGHT

A good way to keep shafting bright is to cut rings either of fibre or leather and put two between each hanger and pulley—or three if they are very far apart. The ring (A) can be put on the shafting (C)



Leather Rings Keep Shafting Bright

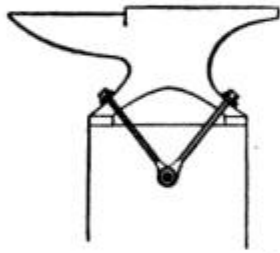
by cutting a slit (B) in one side. When the shafting is in motion the rings travel back and forth on it.—Contributed by W. J. Slatery, Emsworth, Pa.

### TO ENAMEL ALUMINUM

A coating for aluminum ware, aiming to produce a coloring of durable character or in rendering the surface adapted to enameling can be obtained by a process patented in Germany, according to Metallurgie, by a Mr. Lang. The surface is covered in the first instance with a solution of a quick-silver compound—as, for instance, chloride of mercury—and by this means a coating of aluminum amalgam is obtained. After this is removed a very active process of oxidation of the surface is said to take place, which action may be interrupted by strong heating, and the aluminum oxide will serve as a foundation for the enamel. If during the process of oxidation the metal is exposed to the action of chromic acid or other suitable chromates or to some other readily reducible substances, these compounds are at once reduced. The action of heat may also be employed to give different colored coatings, and the colors obtained may be gray, green, brown or black. They are said to resist the action of fire and render the aluminum more difficult to melt.

## DEADENING THE SOUND OF AN ANVIL

If the anvil block is wider than the base of the anvil, hew it down to fit, then bore a  $\frac{3}{4}$ -in. hole through the block 10 or 12 in. from the top. Make four  $\frac{5}{8}$ -in. bolts with  $\frac{3}{4}$ -in. eyes and a  $\frac{3}{4}$ -in. bolt long enough to



go through the block and take two eyebolts on each side. Make yokes of  $\frac{5}{8}$  by 1 in. stock and punch or drill  $\frac{5}{8}$ -in. holes in each end. Measure the anvil so as to have the bolts

hug it closely; put the  $\frac{3}{4}$ -in. bolt through the block, slip on the eyebolts, put on the clamps and nuts and tighten up. A correspondent of the American Blacksmith who devised this method, says that it will both hold the anvil securely and effectually deaden its ring.

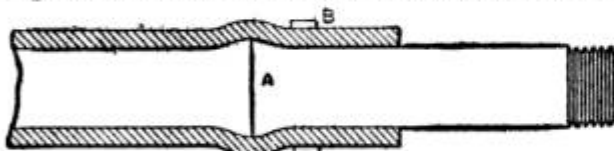
## CUTTING WINDOW GLASS

When a pane of glass is broken and you have no light to fit, a larger glass can be cut to size by the following method:

Moisten a cloth with vinegar or turpentine and wet the light where you intend to cut it. Break off a piece of a triangular file and proceed as with a glazier's diamond. Double A glass can be cut successfully in this way.—Contributed by F. Knospe, Clyman, Wis.

## TO KEEP STEAM HOSE FROM BLOWING OFF WHEN TUBES ARE BLOWN

Thread one end of a piece of  $\frac{3}{4}$ -in. pipe, 6 or 8 in. long, and heat the other end as hot as possible without burning. Put the pipe over the horn of an anvil and peen with a light hammer to a bell shape, as at A in



**Pipe Peened to Prevent Hose Blowing off**

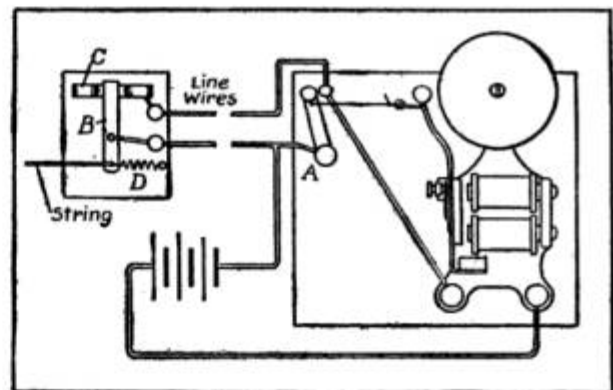
the sketch. Work the pipe into the hose and put on a good fitting clamp, as at B. The harder it pulls, says the Engineer's Review, the tighter it will get. Couple the hose to the steam pipe with a dart union, which makes an excellent hose coupling, and can be screwed tight with the hands.

## CONTINUOUSLY RINGING BURGLAR ALARM

A continuously ringing burglar alarm is a very simple affair, the only addition to the ordinary alarm being a one-point switch (which may be home-made) and a little wire, so if one has an alarm, this may be made without extra expense.

Connect up the alarm, battery and bell in the usual manner, but shunt in the one-point switch, A, as shown in the sketch. Then nearly close the switch and fasten the movable end to the tapper of the bell by means of a small copper wire soldered to it and a piece of string. (The string should not be omitted, for the switch, which works very easily, might be pushed off connection by the stiff copper wire.)

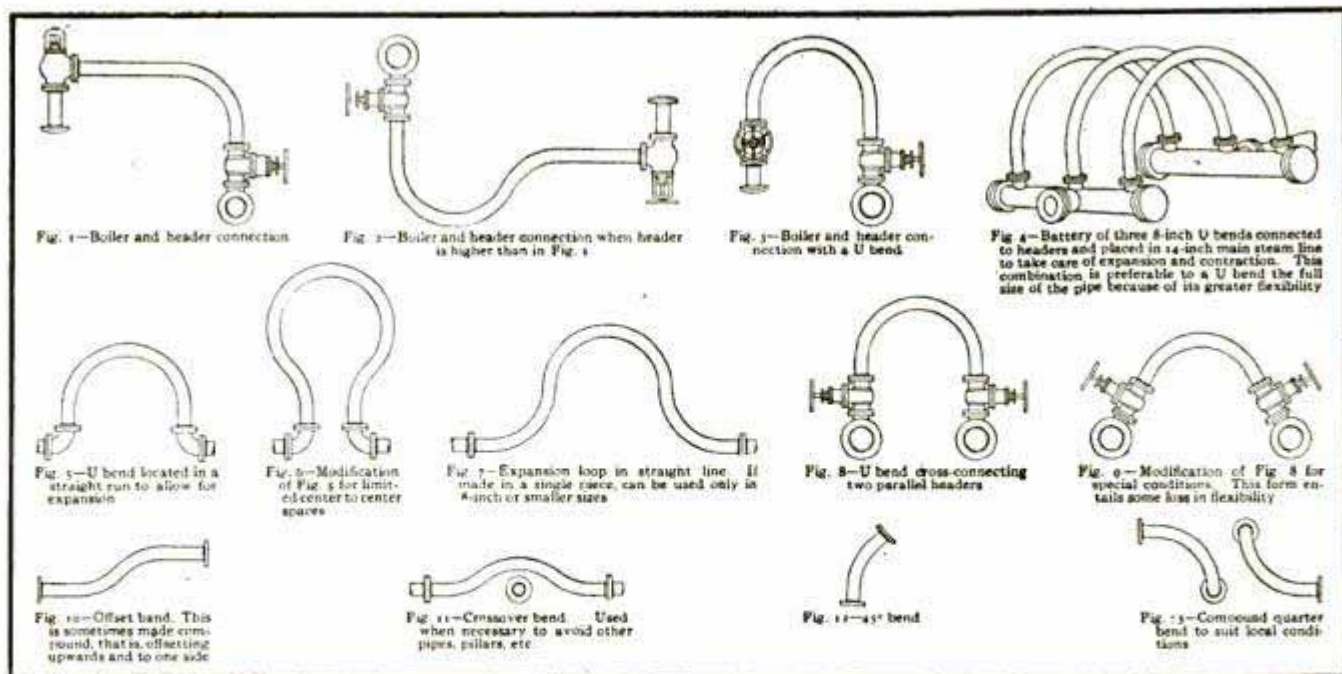
The arrangement that starts the alarm ringing is seen at the left. If a burglar in entering pulls the string the pivoted lever B will make contact with terminal C at one side and the bell will ring; and if in endeavoring to stop the alarm, he cuts the



**Continuously Ringing Alarm**

string, spring D will move the lever so that it contacts at the opposite side of the terminal and the bell will ring on. With the ordinary alarm, should a burglar hear the bell he need only step back from the string or close the door or window, if the string is attached to either of them, and the chances are that the bell would not be heard; but a loud bell ringing continuously is sure to awaken someone.—Contributed by Jack Stair, 258 E. Market St., York, Pennsylvania.

Before putting screws in soft wood fill the holes with thick glue, or if glue is not convenient, put powdered resin around the holes and heat the screws before driving. The Practical Carpenter says this will keep the screws from working loose under strain.



Common Forms of Pipe Bends

Courtesy Valve World.

## COPPER PLATING WITHOUT A BATTERY

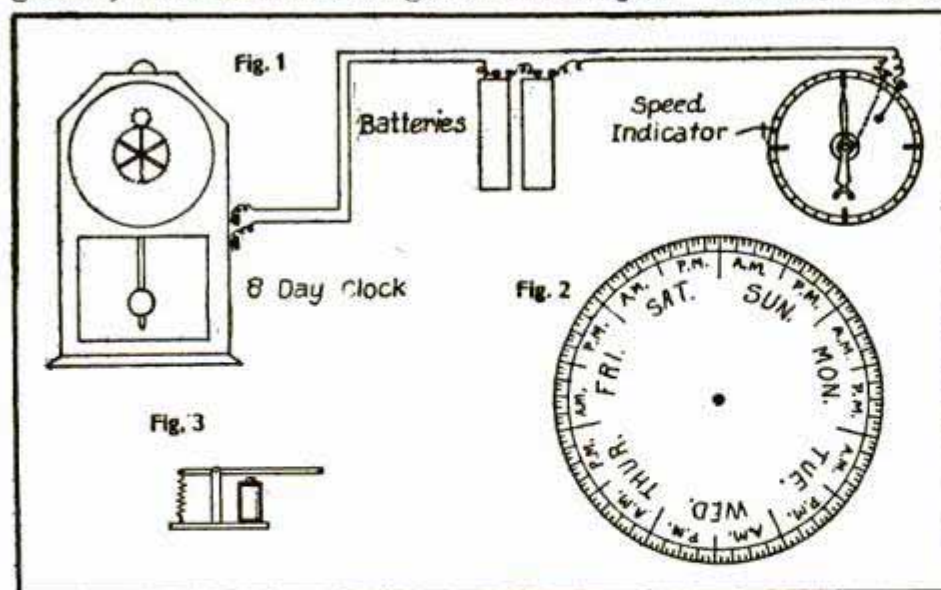
Make the plating solution by dissolving 1 oz. sulphate of copper (blue vitriol) in 6 oz. water and then adding  $\frac{1}{2}$  oz. sulphuric acid. Get a piece of zinc about  $\frac{1}{8}$  in. thick and 2 in. square and solder to it at its center one end of a piece of copper wire 18 in. long. Then wrap a thick rag around the zinc, tying it close. This is the plate.

Carefully clean the tin, iron or brass article to be plated, so that it is free from grease; sand and soda is good for this pur-

touches it will immediately coat the metal with copper, and the longer you rub the heavier the coating will be.—Contributed by Ira Emery, 12 E. Simpson St., Dayton, Ohio.

## TIME INDICATOR FOR PLANTS

The time indicator illustrated was originally used in a mill to show the actual number of hours the mill ran throughout the week. The device could be adapted to other plants for the same purpose.



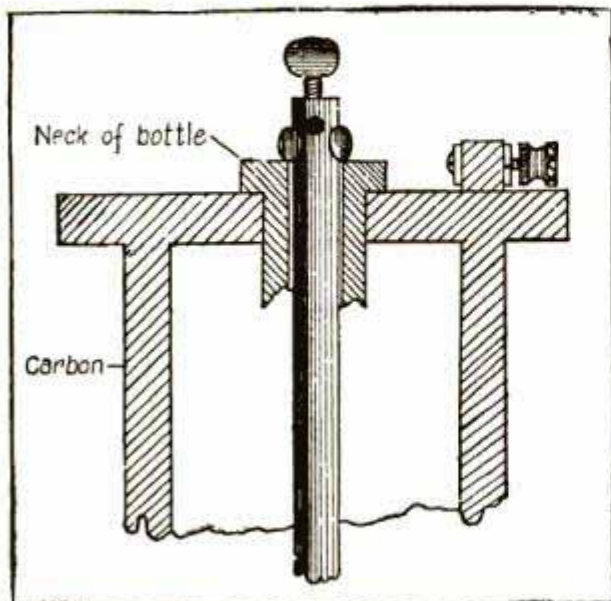
Time Indicator for Plants

pose. Now fasten the other end of the wire to the article. The wire must be bright in order to make a good connection. Dip a sponge in the plating solution and rub it over the article. Wherever the solution

Figure 1 consists of a speed indicator, two batteries and an eight-day clock. When the mill is shut down the hand of the indicator points upward and when the mill is at proper speed the hand points downward. A small cog-wheel, having eight cogs is fastened on the hour stem of the clock, says a correspondent of the American Miller, and the other cog wheel has 112 cogs. The small wheel turns around twice in 24 hours, and the larger one makes one revolution in seven days. A chart (Fig. 2) is fastened on the large wheel and is punctured by the magnet (Fig. 3) every time the hand on the indicator passes the button in either starting or stopping.

## SUBSTITUTE FOR BATTERY INSULATOR

Sometimes the porcelain insulator which insulates the zinc from the carbon in a carbon cylinder battery becomes lost or broken,



Improved Battery Insulator

and if one cannot be procured right away, here is a good substitute. Get a bottle with a flange on the neck, break the neck (A) off and insert the zinc (B). This insulator will be just as good as a porcelain one.—Contributed by W. J. Slattery, Emsworth, Pa.

## HOLDING PISTON RINGS WHILE FILING

In filing piston rings to fit, the following scheme for holding them will be found convenient:

Lay the ring on a 12x14x1½-in. board as shown in the sketch, mark holes A and B



To Hold Piston Rings

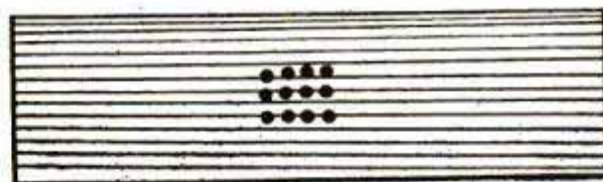
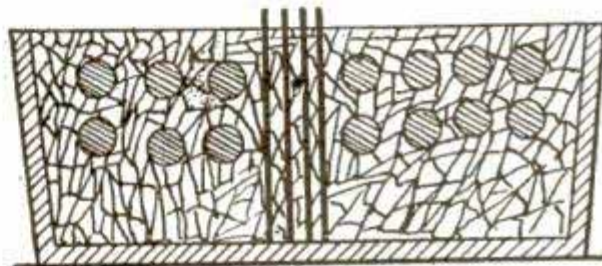
and drill for ¼-in. pins, snug fit. Do not drill clear through the board. Make three ¼-in. pins large enough so that when in place they will be ⅛ in. below the top of

the ring. Make a wedge of ¼-in. stuff 3 in. long with ¼ in. taper on that length. Lay the ring on the board, touching pins A and B, and drill hole H so that in placing the wedge the ring will be forced against A and B.

By having several holes ¼ in. apart, rings of different diameters can be held in place on the board while filing.—Contributed by F. Clausen, 121 Vine St., Ravenna, Ohio.

## TEST WIRES IN BOX ANNEALING

Where the method of annealing by packing the pieces in an iron box with powdered charcoal and subjecting the whole to the heat of the furnace for a length of time suited to the work and then allowing to cool slowly is employed, test wires should be used to determine when the contents of the box are red hot. The wires should be ⅜ in. in size and run down through ¼-in. holes at the center of the cover of the box.



Test Wires in Box Annealing

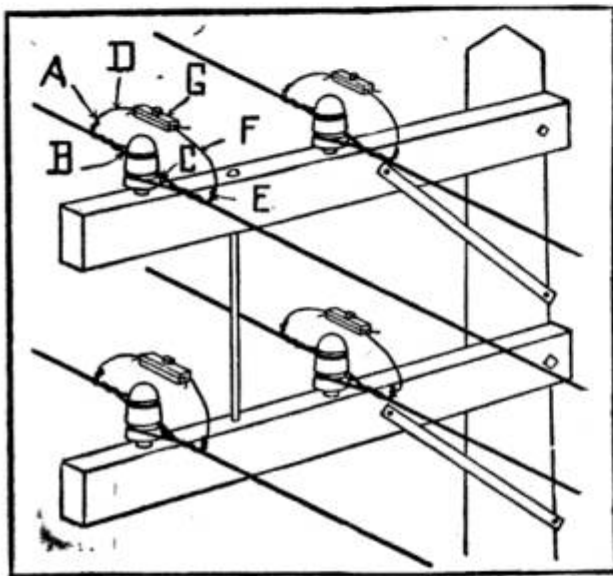
None of the pieces should come nearer than 2 in. to the box at any point, for if the box is cast-iron it will take the carbon from the steel, says the American Blacksmith.

When the last layer of pieces is packed in the box so they do not come too near the box nor less than ½ in. of each other, fill the box with charcoal, place the cover in position and seal with fire clay. Run the test wires through the cover to the bottom of the box and when the fire clay is dry, place the box in the furnace to heat. Give it time to heat through, then remove one of the test wires. If the wire is red hot for its entire length, the contents of the box are of the right temperature. If the wire is not red hot, let the box remain a time, then draw another wire, proceeding this way until you pull a wire that is red hot. After a few trials one will be able to gauge the time required without the use of the wires.

## TEST POLE FOR RURAL TELEPHONE LINES

A test pole at the city limits for testing rural lines when there are many of them connecting with the city wires is a great convenience, says the American Telephone Journal. When heavy iron wire is used for the farmers' lines it is very difficult to make a test when the line has to be opened and later a splice made for closing the connection.

The test pole should be located at the city limits and to separate the farmers' lines from the city leads definitely, the wires should be dead-ended upon double grooved insulators. In making the dead end



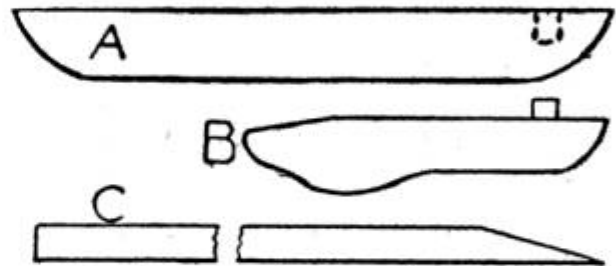
For Testing Rural Lines

leave the end of the wire about 1 in. long projecting from the final turn of the spiral used for fastening. To this projecting end solder a soft copper tie wire 14 in. long. Arrange each of the four ends terminating upon the two insulators in this way. Then join the copper wires for the city and country ends of the line by means of test connectors, to allow the line to be quickly opened and closed again after the test is finished. The copper tie wire is flexible and can be bent into any desired form. It is also easy to make a transposition at this pole, if necessary. Referring to the illustration the arrangement of the connections on the test pole is as follows: Line ties B, C, have long ends A, E, to which are soldered copper extensions D, F. The line is carried through by connector G.

To keep plaster of paris from hardening so quickly mix it with vinegar instead of water.—Gordon M. Backus, Hackensack, N. J.

## TOOL FOR REMOVING DENTS IN GUN BARRELS

A good tool for removing dents in gun barrels is made of two pieces of  $\frac{3}{4}$ -in. half-round iron, one piece (B)  $3\frac{1}{2}$ -in. long and the other piece (A) 5 in. long. Put the



For Removing Dents in Gun Barrels

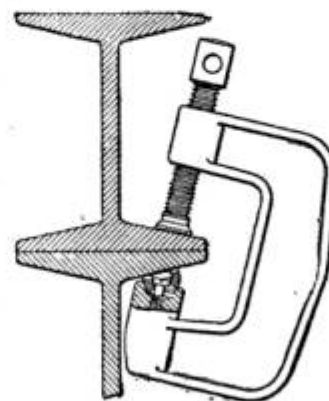
pieces together and file them down until they are slack at the muzzle of a 12-oz. gun barrel. Put a  $\frac{3}{16}$ -in. rivet in the longer piece  $\frac{1}{2}$  in. from the end, and in the short piece drill a hole in which the rivet will fit loosely to keep the pieces together in the barrel.

File the  $3\frac{1}{2}$ -in piece oval, as in the sketch, and make a short taper wedge so as not to stick too tight in the spreader. Now place tool in the barrel opposite the dent (short piece next to dent), warm the barrel on a hot iron at the dent, put oil on the wedge and drive with a light hammer. The dent will come out very easily. A good size for the wedge is about 18 in. long and made of a suitable stock.

With a little care and good judgment, writes a correspondent of the American Blacksmith, very bad dents can be removed with this tool.

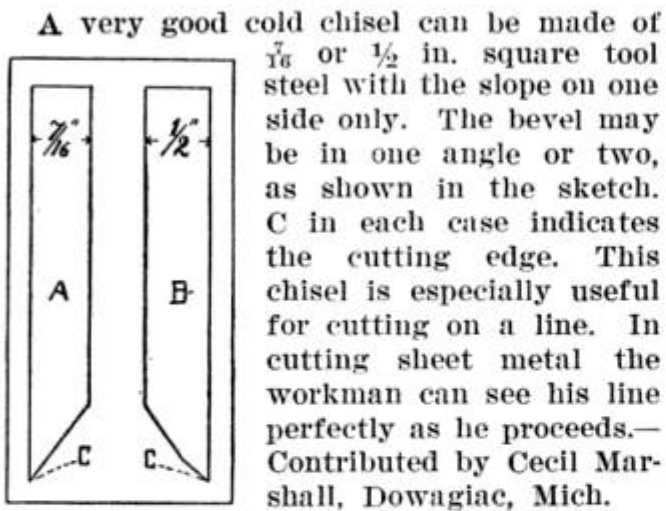
## SCREW CLAMP WITH SPHERICAL BEARING

For holding objects that do not present parallel surfaces, such as I-beams, etc., the clamp illustrated is useful. It is made of a steel casting, says Machinery, and has an I cross section with stiffened back, and if sprung can be brought back to proper shape when hot, like forged ones. The spherical bearing on



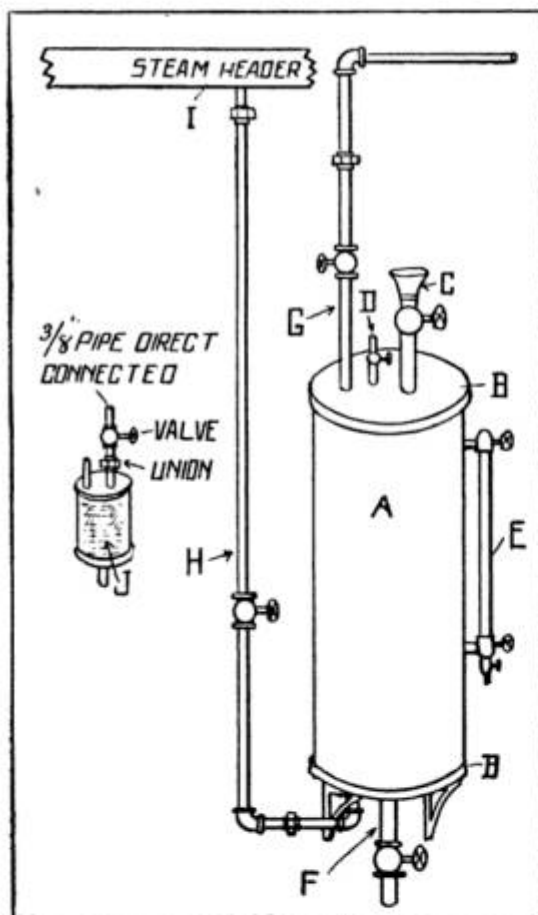
the under jaw allows all the adjustment out of parallel that is ever likely to be called for.

## CHISEL FOR CUTTING ON A LINE



## SUCCESSFUL LUBRICATING SYSTEM

The illustration shows a self-lubricating system rigged up by myself for an engineer who has used it successfully for the past



Simple Lubricating System

five months and claims that it works like a charm. The reservoir is filled with oil, then the steam is turned on slowly and as there is no perfect circulation, it condenses at the bottom. The oil, being lighter than water, floats on top, while the pressure

keeps raising the water and at the same time forcing the oil through the feed pipes to the lubricators and oil cups. The connections to the lubricators and oil cups are made with  $\frac{3}{8}$ -in. pipe with a valve close near cup.

The parts indicated in the sketch are: A, piece of 4-in. pipe, threaded on ends, used for reservoir; B, caps for 4-in. pipe tapped for fittings as shown in the illustration; C, funnel connected to valve and nipples, for filling reservoir with oil; D, air-cocks; E, gauge for oil; F, drain for drawing water from reservoir when filling; G, oil feed to cups and lubricators; H, steam feed to reservoir; I, steam feed from boiler; J shows how the connections are made to lubricators and cups.

The reservoir has to be filled about once in every two or three weeks.—Contributed by Joseph A. Burkhart, Emsworth, Pa.

## CONVERTING A GAS ENGINE INTO AN AIR COMPRESSOR

An old automobile gas engine was converted into an air compressor by a correspondent of the Engineer's Review, who found it all that was required for his needs. He drilled and threaded a hole through the head and screwed on a check valve as at A, Fig. 1. Then, as the combustion chamber destroyed the efficiency of the compressor, he placed a piece of hard wood

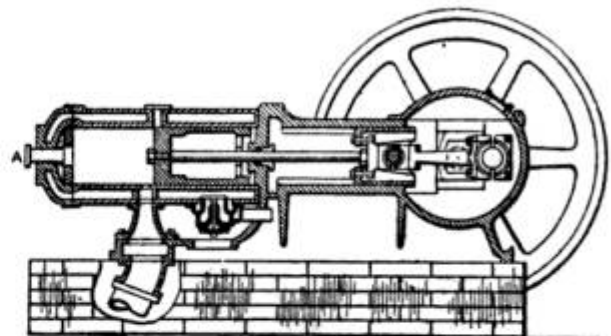


Fig. 1--Gas Engine Converted into an Air Compressor

most as thick as the combustion chamber was deep, behind the crank brass nearest the cylinder. This caused the piston to move nearer the head of the cylinder giving the minimum clearance. Small clearance is essential in a compressor, as the compressed air remaining in the clearance must expand to atmospheric pressure before more air can be drawn in; and by the time this has taken place the piston has traveled a good part of its stroke.

Another time, at a stone quarry where a large engine had just been installed in place of a 50-hp. engine, the same writer converted the smaller engine into a compressor to supply air for running drills and hoisting engines.

The engine, for the purpose of starting, had its combustion chamber connected to a tank

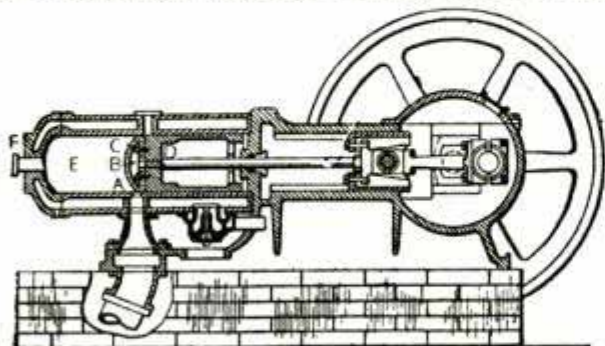


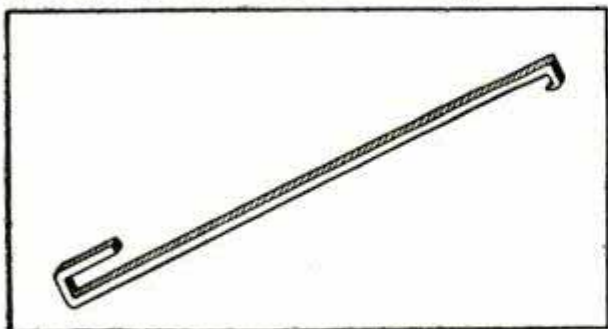
Fig. 2--False Head Bolted to Piston

containing compressed air. This pipe was closed at the engine by a hinge valve, having an opening and closing lever attached. The "locking sheet" arrangement was taken off and a coil spring substituted. On account of the spherical form of the combustion chamber, E, Fig. 2, clearance could not be reduced, as in the other case, by using a block behind the crankpin brass. Instead a hollow hemisphere, B, was cast and bolted on to the end of the piston with the balls A and C, packing the joint so no air could get in. The expense did not exceed \$5.

## ROOF HOOK FOR SHINGLING

An old hack tire will make the best hook as it is flat and will lay down on the roof out of the way of the chalk line, but a rod of iron may be used, if preferred.

Make the middle part 5½ ft. long; turn a hook 1¼ in. each way at the upper end and

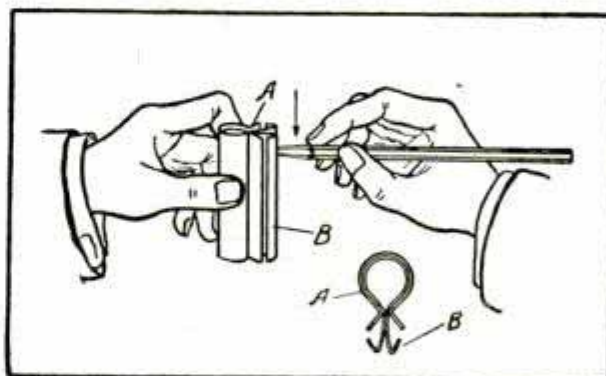


Roof Hook for Shingling

make the point sharp so it will hook over the comb, when the top of the roof is reached. At the lower end turn down 2½ in. and up 6 in. so that it will hold a 2x4 in. timber for a scaffold, says the Practical Carpenter. To use, merely hook end A in the shingle lath.

## A HANDY PENCIL POINT SHARPENER

This device, which will be especially appreciated by draughtsmen, consists of a metal holder A, which can be made out of



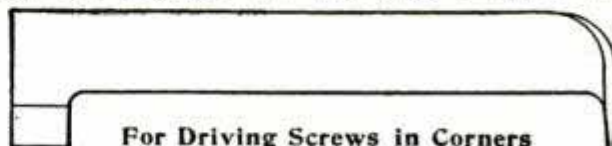
an old Spencerian paper clip, and a piece of fine emery cloth B, with the edges folded over as shown. To use it the pencil is placed in the crevice and moved up and down, giving a sharp chisel point. A round point may be made by revolving the pencil between the fingers while sharpening.—Contributed by J. R. Sourby, Chicago.

## HEAT-RESISTING BRONZING LIQUID

For a liquid to mix with the bronze mix one part clear baking varnish with from two to three parts turpentine. When the surface is to be sized and the dry bronze rubbed over it, mix any good slow-drying varnish of the same nature as baking varnish with an equal quantity of turpentine, and when the surface is sufficiently tacky rub on the bronze. A fair bronzing liquid to mix with either gold or aluminum bronze, says the Plumbers' Gazette, may be made of any light-colored varnish and two to four parts of turpentine.

## HORIZONTAL SCREW DRIVER

A screw driver for use in a corner or other awkward place may be made of sheet steel as shown. In the one I made the



For Driving Screws in Corners

length was 4 in., the width 5/8 in. and thickness 1/8 in. The screw blade is 3/8 in. wide.—Contributed by Gordon M. Backus, Hackensack, New Jersey.

## HOW TO BUILD A SMALL PILE DRIVER

In many cases where a pile driver is needed it is cheaper to build one than it would be to buy or rent one. Such a driver can be built by four men in two days at a total cost of \$102. This estimate is for a driver with a 1,200 lb. cast-iron hammer, the "leads" or "gins" that guide the hammer to be made of 4 in. by 6 in. sticks 30 ft. long, and the rope that raises it, 1-in. manila.

One end of the hammer rope is fastened to the nippers that clutch the lugs on the hammer; the other end of the rope passes through a pulley and around a wooden drum 12 in. in diameter. At one end of this wooden drum is fastened a wooden "bull wheel" 60 in. in diameter. Another rope is wound around this bull wheel and a horse hitched to the rope. The horse can easily raise the hammer to the top of the leads where the nippers are automatically tripped, allowing the hammer to fall. Only one pulley block is used. The use of the drum and bull wheel not only reduces the number of the blocks required, but does not consume the power of the horse in friction to such degree as pulley blocks would.

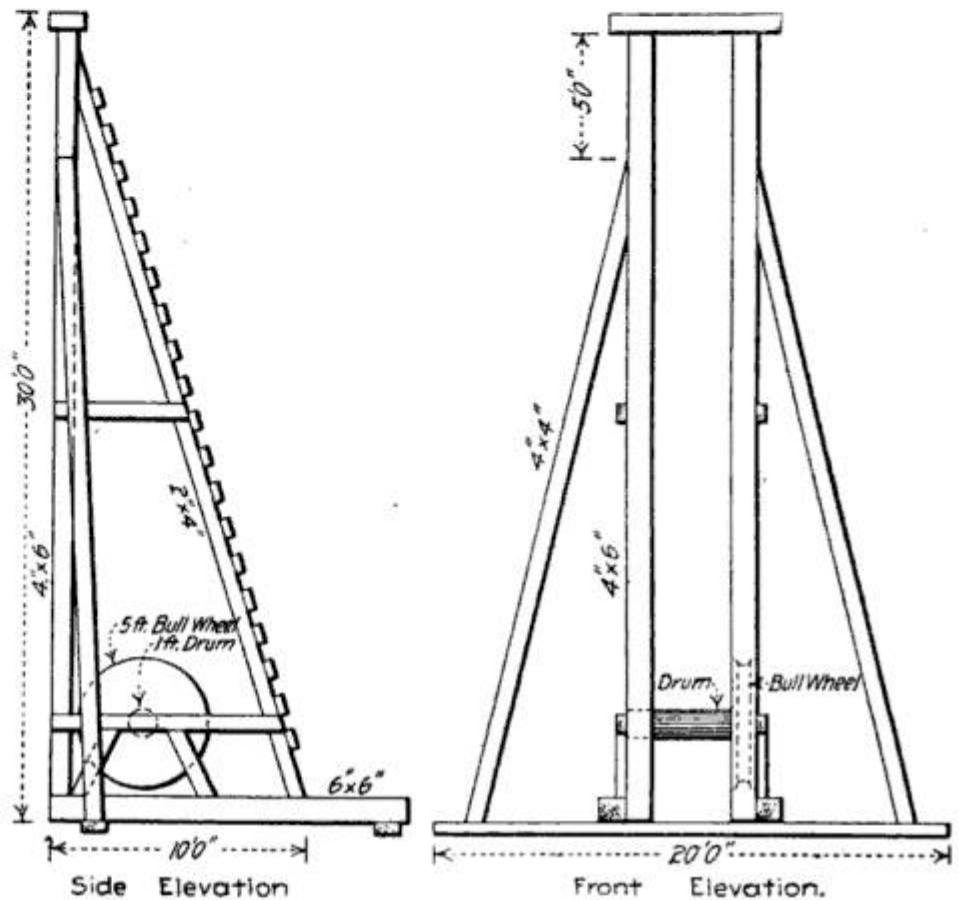
To build this pile driver the following bill of lumber will be required:

Piece.	in.	in.	ft.	ft. B. M.
2—	4x	6x30	(leads)	120
1—	6x	6x 4	(cross-piece)	12
2—	6x	6x16	(base)	96
2—	2x	4x32	(ladder)	43
2—	2x	4x 2	(ladder rungs)	24
2—	4x	4x26	(sway braces)	64
1—	2x	4x20	(long front sill)	13
1—	2x	4x14	(short rear sill)	3
1—	12x12x	4	(drum)	48
30—	1x12x	6	(bull wheel)	180

Total .....603

Also about 24 bolts, 1/2 by 8 in., and a few pounds of nails. Shape the drum out of a 12 in. by 12. in. stick and leave it square

where the bull wheel is to be fastened on. At each end cut out a wooden axle 4 in. in diameter and 6 in. long, and fit them to wooden bearing blocks, daubing well with grease. Make the bull wheel by spiking together five layers of 1 in. by 12 in. planks,



A Small Pile Driver

each layer running in the opposite direction to the one under it. Spike three of these layers together and mark a 5-ft. circle on them, then cut out the 5-ft. wheel with a keyhole saw. Spike another layer of plank on each side of this wheel and saw to a circle 5 ft. 8 in. in diameter. These outside layers form the rims of the wheel and keep the "bull rope" from sliding off.

The items of expense for the driver should be, approximately, as follows:

700 ft. B. M. lumber at \$20.....	\$14.00
Bolts and nails .....	2.00
Labor .....	18.00
1,200-lb. hammer .....	50.00
1 pair nippers .....	5.00
1 snatch block .....	3.00
240 ft. 1-in. rope .....	10.00

Total .....\$102.00

To operate the driver three men, a horse and a boy to drive the horse will be required, the daily cost, counting the horse at \$1, being \$9. Nine piles per day with an average penetration of 6 ft. can be driven



with it, says Engineering-Contracting. A driver of this kind must have a level runway on which to work, and if the ground is irregular, scaffolding must be put up.

## SPEED AND POWER TRANSMISSION

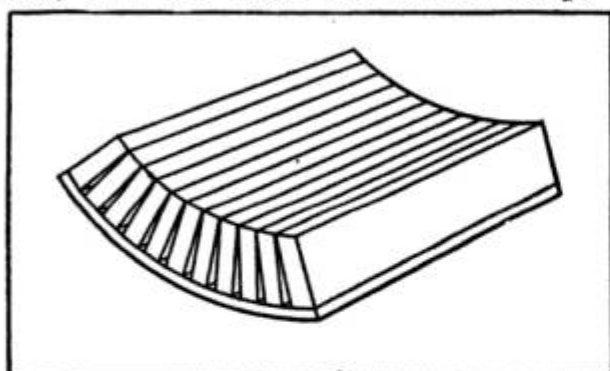
The factor of safety for a pulley may be greatly above the speed at which the belt will transmit power, owing to centrifugal force, says the American Machinist. At 5,250 ft. per minute, laced leather belts transmit a maximum of power; and riveted belts at 6,325 ft. per minute. Supposing a belt could be run safely at a speed of 9,250 ft. per minute, it would transmit an amount of power scarcely appreciable.

## STEAM FITTERS' CEMENT

Dissolve 1 part, by weight, rubber or gutta percha in sufficient carbon disulphide to give it the consistency of molasses, then mix with 6 parts, by weight, linseed oil and leave exposed to the air for 24 hours. Then mix to a putty with red lead. A less brittle cement is made by using oxide of iron in place of red lead.

## AN ADJUSTABLE SANDPAPER BLOCK

A good sandpaper block, which is especially useful for pattern makers, can be made from a pine block about 1 in. thick and a piece of new leather belting. Glue the leather to the block and, after it has dried, saw the wood in narrow strips as



Pattern Makers' Sandpaper Block

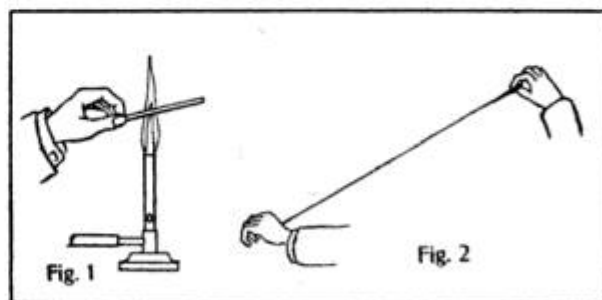
shown. This makes a block which can be held straight or curved.—Contributed by R. B. Gregg, La Fayette, Ind.

When on a hurry-up job your belt will not pull the cut you desire, says Machinery, just hold a piece of tar soap on the inside of the belt while it is running and it will soon pull all right.

## SIMPLE PRINCIPLE USED IN MAKING DIES FOR SMALL WIRE

How to Make a Hole  $1/1000$  of an Inch in Diameter

Those who are not familiar with the operation of drawing glass tubes will understand how it is done from the illustration. The glass is first heated in the flame of the Bunsen burner, Fig. 1, and then stretched out as shown in Fig. 2. A small tube may be



Drawing Glass Tubes

stretched several feet in this way and so reduced in size that the diameter at the middle is no larger than a fine thread, but the hole through the center is not closed in doing this. By placing the broken thread in water and blowing in the other end, bubbles are seen to come from the small end, showing that the bore has not been closed.

In making dies for fine wire it is found impossible to make a drill small enough, so the smallest size jeweler's drill is used and the steel is then heated and drawn the same as the glass. In this way dies have been made for drawing wire  $1/1000$  of an inch in diameter.

## MAKING OVER PHONOGRAPH RECORDS

Owners and users of phonographs and the amateurs who enjoy making records will find the following kink of interest:

For scraping the record or making a blank of it a knife is usually furnished with the machine, but a simpler and more convenient way is to rub the outside of the record with kerosene oil, then rub with a cloth or the bare hand until all of the cuts are erased and the cylinder is perfectly smooth. Then wipe it with a dry cloth and leave a few minutes to dry. Remove any rings from the hand before rubbing so as not to scratch the record, and do not try to record on the cylinder until it is perfectly dry.—Contributed by W. Carey Smith, 5 S. Fulton Ave., Mt. Vernon, N. Y.

## EASILY MADE SAFETY DEVICE FOR BOILER

The water level in a boiler gage is often very indistinct as the light in a boiler room is usually not very bright. Add to this the fact that rings of dirt often form on the inside of the glass, due to the water level remaining nearly constant, and it will easily be understood how the fireman sometimes allows the water to become too low, as the rings of dirt thus formed appear quite like the water level.



Fig. 1

In looking at the gage the fireman usually gives a quick glance at the place where the water level ought to be. If the water is only a little too low the ring of dirt would not be misleading, but if the water is way down in the bottom of the glass he seldom thinks to look there and mistakes the ring of dirt for the water level and fatal results often occur.

To avoid this danger make a screen, Fig. 1, and fasten to the glass at such a distance that the rays of light in passing through the water will be focused on the screen as shown in Fig. 2. The screen may be made of thin wood, card board or tin painted white, and the clips can be made of wire or sheet metal. The rays of light are not refracted very much in passing through

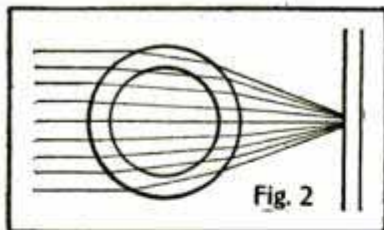


Fig. 2

the glass above the water level but in passing through the water are converged to a bright white line on the screen which can be seen from the farthest end of the boiler room. An occasional wiping of the dust from the screen will keep it in order.

## ENAMELED SLIDE IN FURNACE DOOR

Sometimes in tending the furnace I have thought that the slide in the ashpit door was open when it really was not. To avoid this mistake, I enameled the part that slides back and forth white, and the rest of the door I enameled black.—Contributed by Gordon M. Backus, Hackensack, N. J.

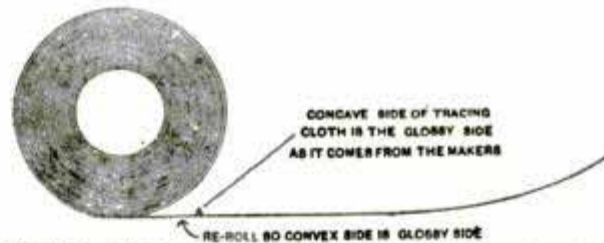
## TO PAINT STEEL CEILINGS

For painting a metal or steel ceiling, do not use a gloss paint, warns the Carter Times, because it becomes dirty and looks worn as soon as a flat paint.

A good method is as follows: Dust off all dirt and clean any grease spots from the metal. Put on a first coat of pure white lead, half raw linseed oil and half turpentine, tinted to the color you desire to finish with. When dry, coat with a mixture of pure white lead, thinned to the right consistency with pure turpentine, and tinted as before. Stipple this coat as you proceed. Let the decorative work be according to the price to be received. Cheap work will not pay on a steel ceiling.

## TO MAKE TRACING CLOTH LAY FLAT

The reason tracing cloth curls up at the edges so inconveniently is because when manufactured it is rolled with the concave



side the glossy side. The drawings are made on the glossy side, and then when they are filed away in drawers they will not lay flat, and when put into the printing frame the edges are apt to get folded down and look bad on the prints. If the tracing cloth is rerolled with the dull side out, says a correspondent of Machinery, and then left for a time the edges will curl down instead of up, which is much more convenient.

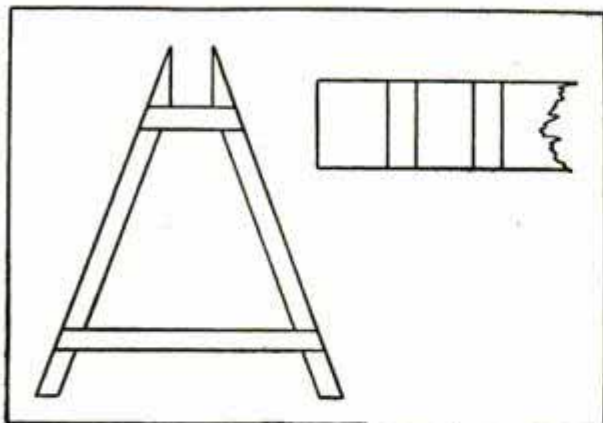
## KEEPING SHOW WINDOWS FREE OF FROST AND MOISTURE

A simple and effective way to keep frost out of show windows is to bore a small hole— $\frac{1}{2}$  in.—in the framework directly below and another directly above the glass. For a very large window bore two holes top and bottom. The holes give free circulation of the air and make the temperature of the glass outside and in more nearly equal. If it is impracticable to bore holes, rubbing the glass with alcohol frequently will help.

For moisture in windows, place a small box of lime directly under the glass. The lime will absorb all the moisture.

## PORTABLE SAW HORSES

In moving from one job to another the carpenter will find portable saw horses a great convenience. The usual form of saw



Portable Saw Horse

horse is very awkward to stow away or to move. The sketch shows the construction of a portable horse recommended by a correspondent of the Practical Carpenter.

## GRAIN OF LUMBER IN PATTERNS

Quarter-sawed lumber is the best stock to use for thin patterns that have no ribs to hold them straight, but it is not always easy to get. Quarter-sawed boards are cut radially (Fig. 1) and to cut more than a few from each log would waste the material. One can tell a quarter-sawed piece by examining the grain at the end, says the American Machinist, and it pays to use it if possible as it will not warp under many changes of atmospheric conditions.

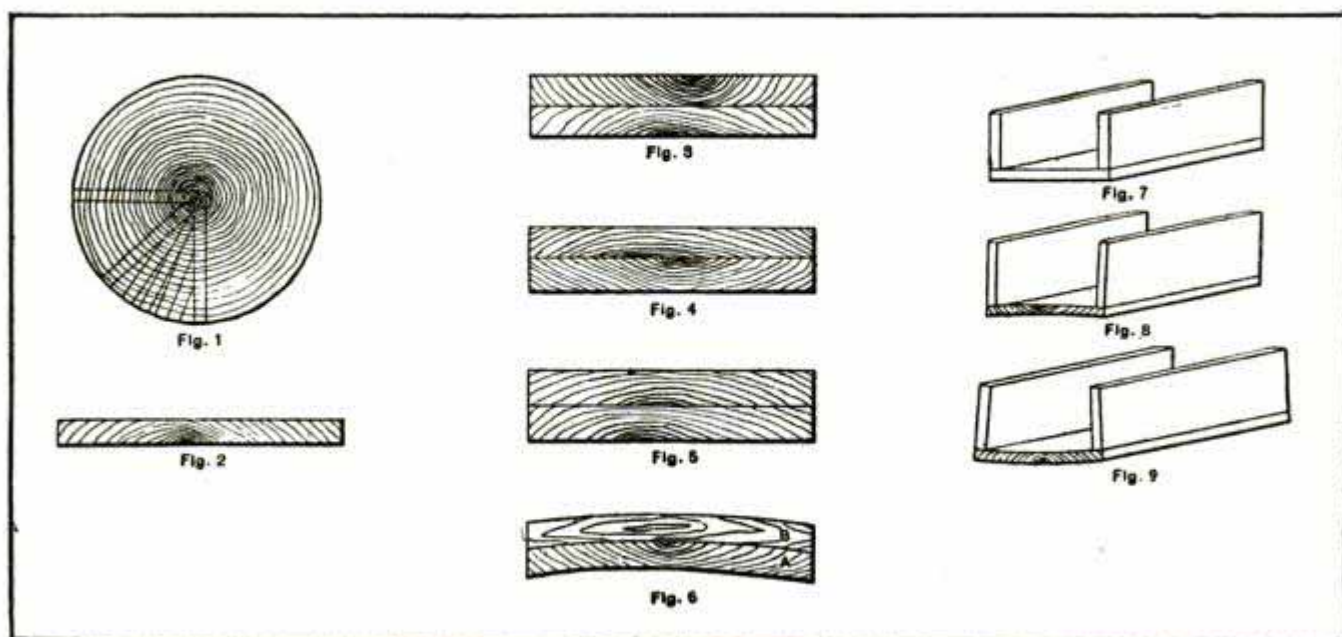
Lumber for patterns should be carefully

selected. A board like Fig. 2 will not stay straight long. Fig. 3 shows how to lay two pieces with regard to the grain when gluing them together. The warping of one piece will counteract that of the other, and the joint will not open readily on the edges as it will if the pieces are laid as in Fig. 4, or Fig. 5. If one piece is glued across another the effect shown in Fig. 6 will result, unless the glue does not hold or the piece splits in shrinking. Board A pulls enough in shrinking to bend board B in its length. With absolutely dry lumber of four or more thicknesses cross grain is effective.

A pattern like Fig. 7 is more serviceable made with length of the bottom piece running from one rib to the other, as the bottom will stay straight and the side will always draw. If made like Figs. 8 and 9 you will get the effect shown, which will distort the ribs so that the pattern will not draw. When the grain of the wood can be put in to run in the same direction as the line of draft, a slight warping will not affect the drawing of the pattern. This cannot always be done, because patterns so made would be weak in vital parts.

## HOW TO CLEAN FELT HATS

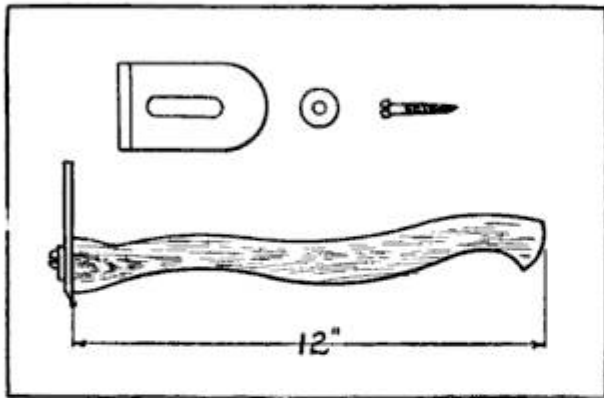
To clean felt hats use weak ammonia. Brush the hat thoroughly while dry, then brush over with the ammonia, using a sponge for the purpose. Treat the whole of the outside and the leather lining as well. Renew the ammonia solution when it is made dirty by the sponge being dipped in so frequently.



Grain and Shrinkage in Pattern-Making

## HOW TO MAKE A GLUE SCRAPER

Nearly every wood-worker has a glue scraper, which is generally made from a

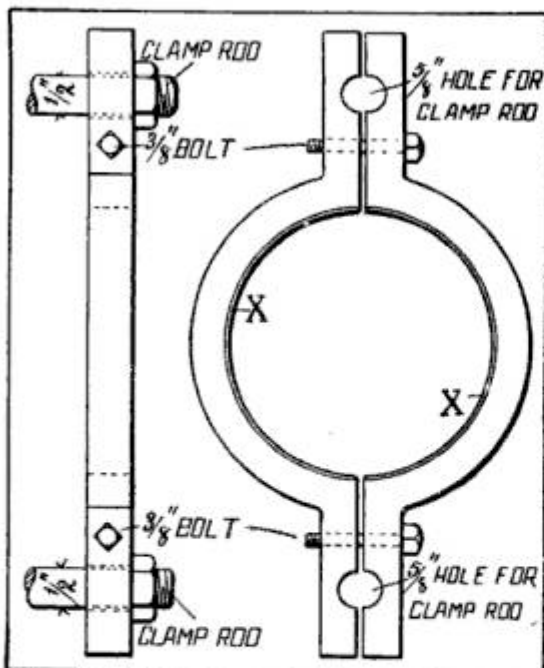


Handy Glue Scraper

strip of iron or a flat file, but a better one can be made as shown in the illustration. The handle is made from a piece of hard wood  $1\frac{3}{4}$  in. by  $1\frac{1}{2}$  in. long by 12 in. The blade is made of an old plane bit and is fastened to the handle by means of a screw and washer.—Contributed by R. B. Gregg, La Fayette, Ind.

## CLAMP FOR LEAKY PIPE

Having had considerable trouble with a pipe that was leaking badly, I used the clamp illustrated to remedy matters. The pipe was 3 in. diameter, screwed into the side outlet of a tee, partly broken off, and



Good Pipe Clamp

about 4 ft. under ground. The pipes could not be taken up very well for threading (had no dies) as one piece was under a rail-

road track and the other under a building. The clamp has been in use satisfactorily for three months.

Referring to the sketch, Fig. 2 shows the two pieces of the clamp held together on the pipe by two  $\frac{3}{8}$ -in. bolts. The  $\frac{5}{8}$ -in. holes are for the  $\frac{1}{2}$ -in. clamp rod to go through as shown in Fig. 1.

To apply the clamp put Fig 2 around the leaking pipe and clamp rod (Fig. 1) around back of tee and through  $\frac{5}{8}$ -in. holes (Fig. 2). Use some good packing between the shoulder of the tee and the clamp, and screw up on clamp rod. Next screw up the two  $\frac{3}{8}$ -in. bolts. If the clamp is beveled on inner edges, X, it will hold the packing better. The pressure on the leaky pipe was 5 lb. per square inch. The clamp was made and put on in three hours.—Contributed by Fred. Wm. Keller, Mannheim, Ill.

## METHOD OF TINNING A SOLDERING-IRON

Dress the iron down with a smooth file in the usual way, then heat it warm enough to melt a tallow candle. Rub a candle over the surfaces of the iron and it will be found to work fine.—Contributed by C. E. Faulks, 65 Block F, Pueblo, Colo.

## COLORING SHELLAC VARNISH

To color shellac varnish black, add lamp-black; for red, use Chinese vermilion; and for blue, use Prussian blue. A very good quality of blue cannot be obtained. Have all coloring matter dry and finely pulverized. To mix, add the coloring matter to a little of the varnish and work to a smooth paste. Then add varnish, and alcohol if necessary, in proper quantity to make the mixture spread nicely.—From Practical Pattern Making, by F. W. Barrows.

## MALLEABLE CASTINGS RUST MORE THAN STEEL

Malleable castings buried in the earth will rust even more than steel, says the Iron Age. The skin and immediate interior of a malleable casting is practically a rather open steel. It is crystalline in structure also, due to the original placing of the crystals of the white iron, before annealing, perpendicular to the surfaces; and so moisture can penetrate it quite a ways.



## YOUNGEST RAILROAD PRESIDENT IN THE WORLD

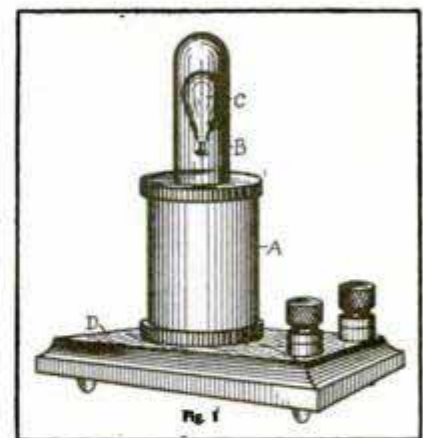
The youngest railroad president in the world is Carleton Kinney, nine years old, official head of the Venice Railroad Co., which operates in Venice, Calif., twelve miles from Los Angeles. Carleton has charge of the general management and operation of the line, and his brother Innes Kinney, 13 years of age, is chief engineer. The road is two miles long, laid with light T-rail to 18-in. gage. There are two locomotives built at Los Angeles, after the model of the big standards. They are oil burners, carrying 160 pounds of steam; weight, 6 tons each; diameter of cylinders, 5 in.; stroke, 7 in.; 6 drivers, 20 in. diameter; height to top of

stack, 57½ in.; maximum speed, 25 miles per hour. Each engine will draw 5 cars, which, loaded, weigh a total of 16 tons. Fuel consumption ¼ gal. of oil per mile.

The cars are 20 ft. long, steel frames, open type, reversible seats, accommodate 12 passengers. A round trip is made in 3 minutes; fare 5 cents. The father of the boys built the line and turned it over to them.

## HOW TO MAKE A GALVANOSCOPE

A galvanoscope for detecting small currents of electricity can be made from a coil of wire, A; a glass tube, B, full of water; a core, C; and a base, D, with binding posts as shown. The core C, which is made of iron and cork is a trifle lighter than the water it displaces and will therefore remain in the top of the tube normally; but as soon as a current of electricity passes through the coil, the core is drawn down out of sight. The current required is very small as the core is so nearly balanced that the least attraction will cause it to sink.



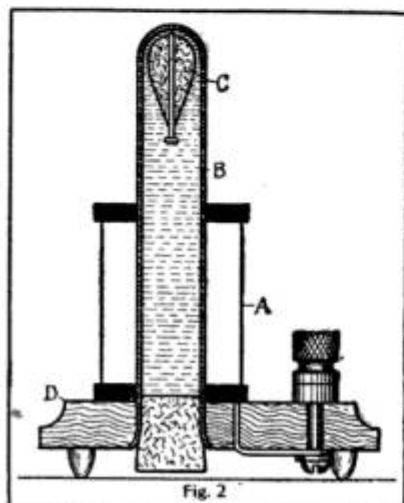
The glass tube may be a test tube as



Pres. Carleton Kinney (at right); Chief Engineer Innes Kinney (left)

shown in Fig. 2, or an empty developer tube. If one has neither a test tube nor developer tube, an empty pill bottle may be used. The washers at the ends of the coil can be made of fibre, hard rubber, or wood; or can be taken from an old magnet. The base may be made of wood or any other insulating material and should have four short legs on the bottom. Make the coil of single covered wire about No. 18 and connect ends to binding posts as shown in Fig. 2.

The core is made by pushing a small nail through a piece of cork. It should be made so that it will rise slowly when



placed under water. Some filing may be necessary to get the weight just right, but it should be remembered that the buoyancy of the core can be adjusted, after the parts are assembled, by pressing the cork in the bottom of the test tube. This causes compression in the water space and specially of the upper cork, reducing its displacement and causing it to sink. The lower cork is then slowly withdrawn, by twisting, until the core slowly rises. The instrument will then be adjusted ready for use.

Connect the binding posts to a single cell of battery—any kind will do as a slight current will answer. On completing the circuit the core will descend; or put in a switch or push button on one of the battery wires. If the button be concealed where the operator can reach it, the core will obey his command to rise or fall, according to his control of the current. This is a mysterious looking instrument the core being moved without visible connection to any other part.

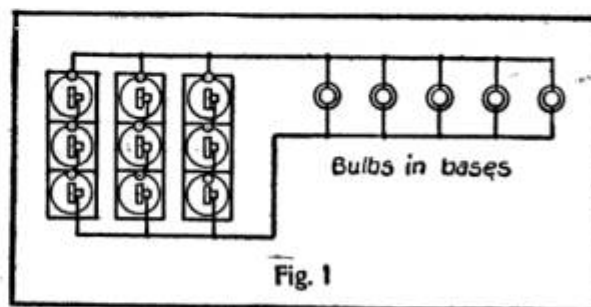
## HOW TO MAKE A NEW LANGUAGE

Any one possessing a phonograph can try a very interesting and amusing experiment without going to any expense. Remove the belt and replace with a longer one, which can be made of narrow braid or a number of strands of yarn. The new belt should

be long enough to allow crossing it, thus reversing the machine. This reverses every sound on the record and changes it to such an extent that very few words can be recognized.

## MINIATURE ELECTRIC LIGHTING

Producing electric light by means of small bulbs that give from one-half to six candle power, and a suitable source of power, is something that will interest the average American boy.



These circular bulbs range from one-quarter to two inches in diameter, and cost 27 cents each complete with base. They are commonly known as miniature battery bulbs, since a battery is the most popular source of power. The one-half candle power bulbs are usually  $2\frac{1}{2}$  volts and take one-quarter ampere of current. It requires about three medium dry cells to operate it. However, there is now upon the market a battery consisting of three small dry cells connected in series, put up in a neat case with two binding posts, which sells for 25 cents. This is more economical than dry cells, as it gives about 4 volts and 3 amperes. It will run as large a lamp as  $3\frac{1}{2}$  volts, one candle power, for some time very satisfactorily. More than one lamp can be run by connecting the bulbs in parallel, as indicated by Fig. 1, which shows the special battery with 3 dry cells in the case, and the two binding posts for connection with the bulbs. In this case it is also advisable to connect several batteries in parallel also, so as to increase the current, but maintain the constant voltage. Thus, the individual cells are in multiple series, i. e., multiples of series of three. By keeping in mind the ampere output of the battery and rating of the lamp, one can regulate the batteries as required. It must be remembered, in this connection, that any battery which is drawn upon for half of its output will last approximately three times as long, as if drawn upon for its total output. Thus, in any system of lamps it is economical to

provide twice as many batteries as necessary. This also supplies a means of still maintaining the candle power when the batteries are partially exhausted, by connecting them in series. However, this must be done cautiously, as the lights will be burnt out if the voltage is too high.

Persons living in the city will find an economical means of lighting lamps by securing exhausted batteries from any garage, where they are glad to have them taken away. A certain number of these, after a rest, can be connected up in series, and will give the proper voltage.

In conclusion for battery power: Connecting batteries in series increases the voltage, and slightly cuts down the current or amperage, which is the same as that of one battery; while connecting batteries in parallel increases the amperage, but holds the voltage the same as that of one cell. Thus, if the voltage and amperage of any cell be known, by the proper combination of these, we can secure the required voltage and amperage to light any miniature lamp. And it might be said that dry cells are the best for this purpose, especially those of low internal resistance.

For those having a good water supply there is a more economical means of maintenance, although the first cost is greater.

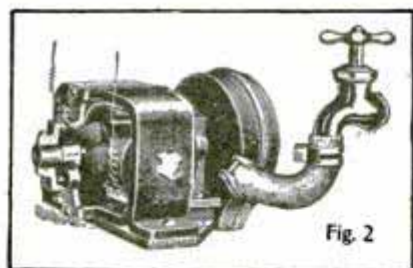


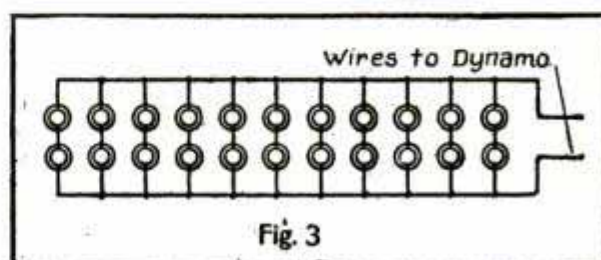
Fig. 2

Fig. 2 will show the scheme. A small dynamo driven by a water motor attached to a faucet, generates the power

for the lights. The cost of the smallest outfit of the kind is about \$3 for the water motor and \$4 for the dynamo. This dynamo has an output of 12 watts, and will produce from 18 to 25 candle-power, according to the water pressure obtainable. It is advisable to install the outfit in the basement where the water pressure is the greatest, and then lead No. 18 B. & S. double insulated wire wherever needed. The dynamo can also be used as a motor, and is wound for any voltage up to ten. The winding should correspond to the voltage of the lamps which you desire to run. However, if wound for six volts one could run parallel series of two 3-volt 1-candle power lamps; making, as in Fig. 3, 11 series, or 22 lights. If wound for 10 volts, it would give 1½ amperes and run four 6-candle power lamps. Thus, it will be seen that any candle power

lamp can be operated by putting the proper number of lights in each series, and running the series in parallel. So to secure light by this method, we simply turn on the water, and the water consumption is not so great as might be imagined.

For the party who has electric light in his house there is still an easier solution for the problem of power. If the lighting circuit gives 110 volts he can connect eleven 10-volt lamps in series. These will give three candle power each, and the whole set of 11 will take one ampere of current, and cost about the same as a 32-candle power lamp, or 1¼ cents per hour. Simply con-



nect the miniature circuit to an Edison plug, and insert in the nearest lamp socket. Any number of different candle power lamps can be used providing each lamp takes the same amount of current, and the sum of their voltages equals the voltage of the circuit used. This arrangement of small lights is used to produce a widely distributed, and diffused light in a room, for display of show cases, and for Christmas trees. Of all these sources of power the latter two are the most economical, and the latter of these two has in its favor the small initial cost. These lamps are by no means playthings or experiments, but are as serviceable and practical as the larger lamps.—Contributed by Lindsay Eldridge, Chicago.

## TO PHOTOGRAPH A MAN IN A BOTTLE

Neither a huge bottle nor a dwarfed man is necessary to this process, as it is merely a trick of photography, and a very amusing trick, at that.

First, photograph the person to be enclosed in the bottle against a dark plain background and mark the exact position on the ground glass. Let the exposure be just long enough to show the figure distinctly. Place an empty bottle against a dark background and focus it, arranging it to have the outlines of the bottle enclose those of the man. Let this exposure be about twice the length of the first and the desired result is obtained.

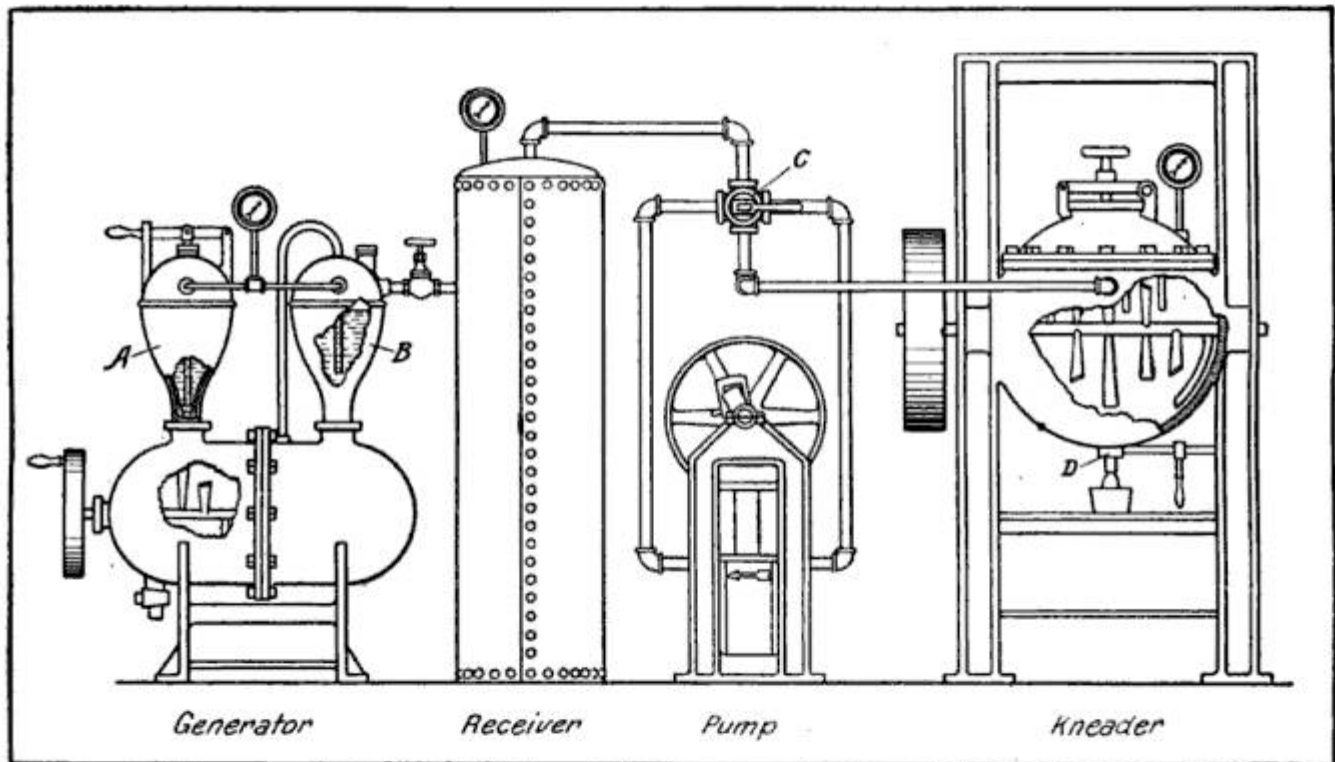
# MECHANICALLY RAISED BREAD

Charged with Gas Under 100 Pounds' Pressure

Most of the bread made at the present time is raised by yeast which is not a chemical like baking-powder and soda, but a plant, or germ. When placed under the microscope it is seen to consist of innumerable little chain-like forms which grow by increasing the number of their links, and then breaking apart. These yeast germs must be alive or the bread will not raise, and for this reason, yeast which has been put in boiling water will not work. The yeast plant feeds on the flour in the dough and in doing so decomposes it and liberates a gas (carbon dioxide)

gas under pressure just the same as soda water.

The gas generator also is similar to that used in the manufacture of soda water and consists of a lead-lined mixing chamber with two tanks above, also lined with lead. A crank and fly-wheel revolves the copper mixing paddles as shown. In charging the generator a quantity of marble dust is placed in the mixing chamber and some sulphuric acid is poured into tank A. Tank B is partly filled with water which purifies the gas as it bubbles up to the surface.



Machine that Does the Work of 100,000 Yeast Cakes

which forms bubbles in the dough and causes it to raise. The heat of the oven expands these bubbles and also drives off a portion of the gas which has dissolved in the dough; this gas being very soluble in any substance containing water.

In the yeast process the dead germs are always left in the bread and cannot be removed. This may be avoided by using baking-powder or soda instead of yeast, but there will then remain some chemical compound of sodium, a substance less desirable than the dead yeast germ. Mechanically raised bread contains neither of these as the gas is produced chemically in a separate chamber and the dough is charged with this

Raising the lever on tank A opens the lead seated valve and allows some of the acid to fall on the marble dust, the motion of the paddles thoroughly mixing the two. If the generator were not lined with lead, the acid would attack the iron walls. When the marble dust and sulphuric acid unite a gas is formed (carbon dioxide) which passes from the generator to the receiver.

The receiver is simply a galvanized steel tank where the gas is stored ready for use. It is then pumped into the kneader where it is charged into the dough after which the surplus gas is pumped back into the receiver by turning the 4-way cock C.

The dough is prepared as follows. About



two barrels of flour pass into the kneader from a chute leading from a rotary sieve on the floor above. A sufficient quantity of water and salt is then added and the top is fastened down tight. The paddles are then set in motion and a valve is opened in the pump which causes the air to be exhausted from the kneader. This process continues until all the air has been extracted from the dough, and then the gas is pumped in under 100 lbs. pressure.

In a few minutes the dough is tested by opening the stop cock D which is only a  $\frac{3}{4}$ -in., but the stream of dough measures  $1\frac{1}{2}$  or 2 in. in diameter, the rapid expansion being caused by the gas. When the dough is light enough the pump and paddles are stopped and the dough is drawn off into pans ready to bake. This is done with great rapidity as it takes less than a second to fill one pan.

### POLICE BELLS FOR PATROL BOXES

A police alarm and signal system has been proposed for Chicago in which a gong in any patrol box may be rung from the central station, thus calling an officer to the box to receive orders by telephone. In this system provision can also be made to connect with the public telephone exchange, thereby increasing the service of the department.

The plan is really an enlargement of the fire bell to summon volunteer fire departments. In this case one or all the policemen traveling beats could be notified in a moment. Suppose a criminal is escaping in a certain direction; in two or three minutes all the policemen in that part of town could be notified and searching. The big gong is placed above the patrol box, to be used only in emergencies. It can be heard one block on a business street in the day time, and several blocks on residence streets or at night.

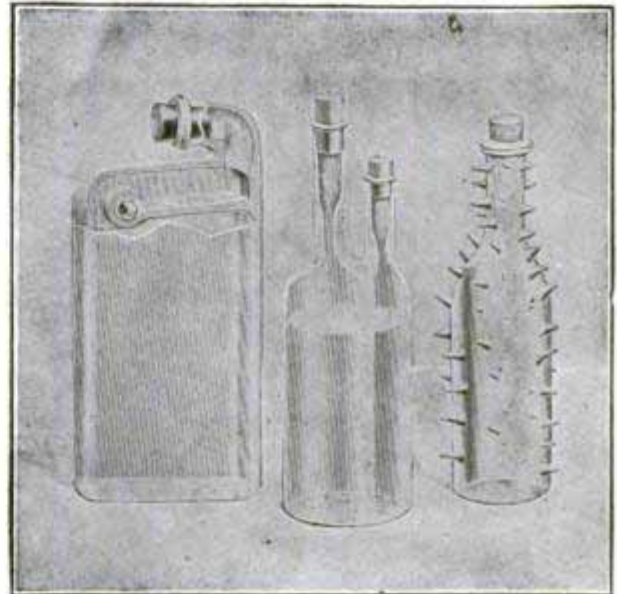
This device has been in successful operation in St. Paul, Minn., where there are 683 miles of wire used in the circuits, including 300 miles of underground wires. Among the most important advantages claimed are these:

Device for calling a patrolman on his beat to a box at any time, day or night, by means of the alarm gong. Concentration of all telephone batteries at the central line station, thus dispensing with about 4,500 cells of battery and cost of maintenance.

Independent lines which secure absolute privacy in communication. A power to transmit two or more calls simultaneously without possibility of confusion. The fact that a broken line wire will throw only one box out of service, whereas, in the old system, a broken wire would throw out half a district.

### SPECIAL BOTTLES FOR POISON

All chemists know that, after using their reagent bottles for some time, they become familiar with the location of each bottle and can make their selection without reading the labels, as readily as a typesetter can choose the various letters with his eyes closed.



Poison Bottles

This system is conducive to order and rapidity, but becomes dangerous when applied to bottles containing poison, as any mistake would lead to fatal results. The habit of locating bottles in this way has become so general that a French inventor has designed the bottles shown in the cut. The first bottle has a ball valve which prevents pouring out the contents except when the bottle is in a position which makes the label visible. The peculiar construction of the neck would also distinguish it from any ordinary bottle.

The second bottle has two necks as shown. The constrictions in the necks prevent pouring out the contents unless both corks are removed, thus allowing air to enter the space above the liquid. The third bottle needs no explanation and will possibly be given the preference on account of its simplicity.



Tidal Wave Sweeping Up the River

## A CHANCE FOR INVENTORS

The illustration is from a photograph of the great tidal wave that twice in each 24 hours sweeps up the Petitcodiac river from the Bay of Fundy. At Moncton, New Brunswick, 30 miles back from the ocean, where the picture was taken, the wave rolls up the river in a solid wall of water 10 ft. high, moving rapidly with tremendous force, and instantly swamping any river craft unfortunate enough to be caught in its path. Thousands upon thousands of horsepower go to waste daily, as no inventor has yet succeeded in devising any means for harnessing this great force.

## YOUR GAS LIGHTED OR TURNED OFF WHILE YOU SLEEP

This convenient gas light controller consists of clock work and a spring, which, wound once a week, will light or put out

the gas at any hour you may previously set it for. Not only this, but it will turn off part of a group of lights at any fixed hour, leaving the others burning; it may also be used to turn lights on for a given time, say in the evening, then, putting them out for the night, will turn them on again for a certain length of time in the morning.



Just as an alarm clock is set to ring at a certain hour, so arms or hands are set on a wheel having the time marked on its rim. This wheel is geared

into others back of the clock and the whole device is fastened to the chandelier or burner. A tiny flame, always kept burning, is used to light up with.

## NEW WINE-COOLING MACHINE

Very recently a new wine-cooling device was invented by Frederic T. Biolette, of the agricultural staff of the University of California. The contrivance is confidently expected to have far-reaching effects on the great wine producing industry of California.

The machine consists essentially of a copper tube 220 ft. long, and  $1\frac{1}{4}$  in. in diameter, through which the wine is pumped, and which is inclosed in a canvas irrigating hose 4 in. in diameter through which cold water runs in a direction opposite to that of the wine. The capacity, (that is to say, the quantity of wine which can be cooled within a given time) of any cooler of this type will depend upon the number of degrees which the wine is lowered and on the difference of temperature between the wine and the water. Though the contrivance is by no means expensive, it could be made for little more than half of present cost if it were possible to use iron pipe instead of copper tubing. The immense wine industry of California is very much interested in this new cooling device.

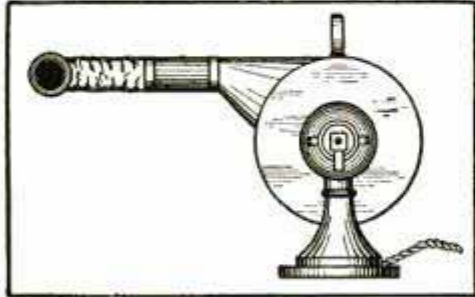
## SMOKELESS CARTRIDGES FOR FRENCH ARMY

A new cartridge issued to the French infantry is absolutely smokeless. It's bullet is a cigar-shaped cylinder of bronze and revolves at a speed of 3,000 turns per second during its flight. At 800 yds. it is said to have sufficient power to penetrate a mass equivalent in bulk and resistance to six men standing one behind the other.

# What the Inventors are Doing

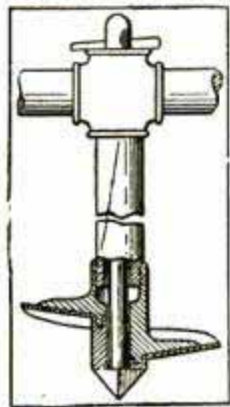
**ELECTRIC HAIR DRYER.**—This machine is a combination of an electric heating coil and fan which discharges

warm air from the funnel shaped nozzle. The nozzle is connected to the fan by means of a flexible tube which allows controlling the direction of



the warm air. This device will thoroughly dry the hair in five minutes at a cost of little more than one cent.

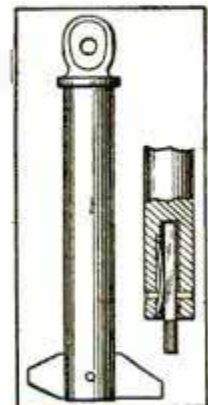
**LAND ANCHOR.**—There has long been a demand



for a strong anchor to hold guy ropes or cables, and one that can be easily driven into stiff ground. The Toy brothers of Sidney, Ohio, are practical mechanics and invented the anchor shown here-with. Its especial features are the reinforced spiral and the simple and effective method of interlocking the tubular socket members which embrace the spiral. A comparatively light stay-rod can be used, because in screwing the spiral into the ground all the strain is on the

pipe which surrounds the stay-rod and is screwed into the upper socket member. When the spiral is sunk a sufficient distance, the pipe is removed by unscrewing it from the socket.

**IMPROVED COUPLING PIN.**—The loss of coupling pins from couplings on street cars is a serious item of expense to the car companies, to say nothing of the incidental damage resulting from the displacement of pins when cars are running on steep grades. Many companies use two pins, one for emergencies and sometimes both will jump out of place. F. A. Stuhlfeier of the Chicago Union Traction Company devised the pin shown here to meet this difficulty and after long tests it has proven its efficiency. The pin is made slightly longer than the common pin, and its lower end is slotted to receive a steel dog which is pivoted to the bar and when hung vertically forms the point of the pin. When the dog is turned horizontally a flat spring which is let into a recess in one wall of the slot, presses against it and keeps it from dropping



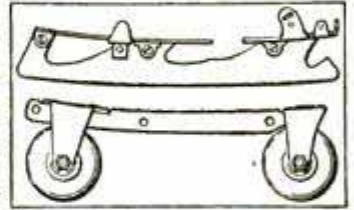
to a vertical position, thus locking the pin in the coupling. These pins cost but a few cents more to make than the common pin and save many times their extra cost, because they cannot jump out.

**COMBINED ROLLER AND ICE SKATE.**—This is an all the year round skate invented by John Old-

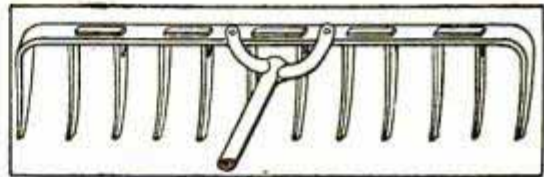
field of Chicago. By a simple form of hanger, the ice runner may be removed and the bar carrying the rollers, attached.

The skate is light but strong and rigid in each of its forms, and the cost of the combination is but little more than the roller skate

alone. Mr. Oldfield has started the manufacture of his skates and has more orders than he can fill with his present shop capacity.



**HAND RAKE.**—Here is an illustration of how easy it is to improve old forms of tools and devices. The hand rake is one of the oldest known implements, and hundreds of patents have been obtained on same, but Henry Vesperman of Steubenville, Ohio, has gone all inventors one better and produced a rake that he thinks cannot be beaten for simplicity, strength and durability. It is made of wrought iron



or can be stamped out if desired. The head is a single flat bar with its ends tapered and bent down to form the end teeth. Holes are punched through the head in pairs and between each pair of teeth recesses are formed. Through these holes are driven the prongs of the U-shaped teeth and the backs of the teeth fit snugly in the recesses. To prevent the teeth from coming out, they have on their sides tapering lugs, the wedge-shape of which facilitates driving in the teeth. The head is heated before driving the teeth and when cool, the latter are tight.

**CAMERA SHUTTER FOR LANDSCAPE WORK.**—This is a new invention recently put on the market. The Amateur Photographer says: The shutter is made to automatically clamp on the hood

of the lens, and does not interfere with any other type of shutter that may be mounted between the combinations. A blade acting on the principle of the drop shutter is so controlled by spring tension and pneumatic release that the blade rises slowly as it exposes the sky portion of the plate, and passing more rapidly over the landscape portion it closes instantaneously—just the motion that a skilled and careful operator of the old school would give with the hand and lens cap. The shutter can be regulated from "time" to the fractional part of a second.



**INSECT DESTROYER.**—Here is an ingenious and effective insect trap invented by A. S. Bean of New Plymouth, Idaho. Two wooden blocks are connected by wire springs and have



dark cloth applied to their adjacent faces, a space being left for the insects to crawl between the blocks when seeking a hiding place. The wires embrace the trunk of the tree at a convenient height for the fruit grower to reach. At intervals he strikes the outer block with a hammer or mallet, thus crushing insects, cocoons and eggs. If desired, the cloth may be saturated with

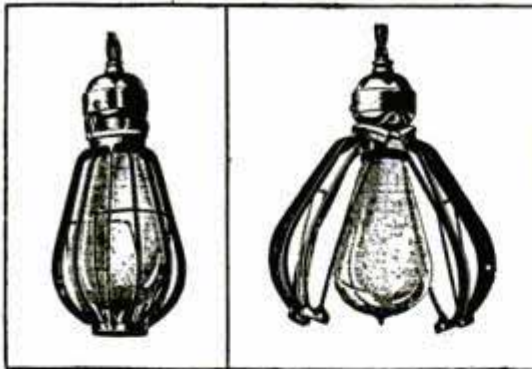
diluted fruit juice made from spoiled fruit, thus making the trap especially attractive to insects. The devices are cheap to make, easy to apply, don't hurt a young tree and are not injured by weather.

**READY MADE HOUSES.**—Ready made houses for campers are built in this country, but an English concern makes a full line of small buildings for the city man's country home. The list includes



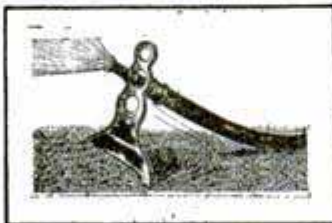
greenhouses, numerous types of poultry and dog houses, large incubators, etc. Some of these portable houses are on wheels so they can be moved about the place as desired.

**NEW LAMP GUARD.**—This guard is made in two sections, of pressed sheet steel with no solder



or wires to break, and with the least shadow possible.

**HANDY HOSE HOLDER.**—A new holder just put on the market; simple and self explanatory. Made of galvanized iron. Set in an instant to throw at any angle; will not change when set.



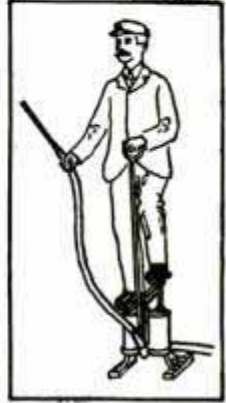
**THE DRY DOCK DEWEY** is progressing safely but more slowly than expected, and is not now expected to reach Manila before the end of the year.

**URANIUM ORE AVAILABLE.**—Consul Ledoux reports from Prague that uranium ore can now be secured from the Austrian Government mines of Joachimsthal, Bohemia. For post parcels the cost is \$3.32 per pound; in larger shipments according to the assay, 50 per cent ore at \$2.22, and 60 per cent ore at \$2.66 per pound. The Austrian authorities inform Mr. Ledoux that the residue, pitchblende, is not available for sale.

**MAGNETIC TACK HAMMER.**—The head is tempered to retain its magnetism permanently and the shape of the claw affords an excellent leverage when drawing tacks. The claw also serves as a screw driver.

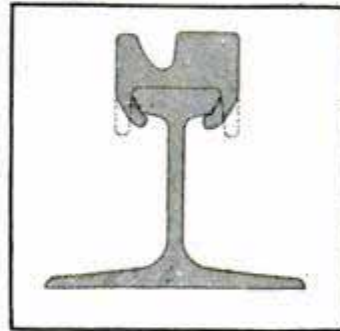


**A PEDAL PUMP.**—This is a recent English invention, which an Irishman said was a "hand pump worked by your feet." The London Plumber says the pump will lift water from a depth of 25 ft. Where there is no lift, as when the water is taken from a tank, etc., it will throw a stream to a height of 40 ft., and an extremely active and heavy person can force the water up to 60 ft. for a short time. The operator balances himself by a post rising from the pump, and alternately shifts his weight from one foot to the other. This would seem to be a rather exhausting exercise. It occurs to us the rotary motion of a bicycle gear might be better. Has any of the "Pop" readers ever made such a pump?



**CHANCE FOR INVENTORS.**—A satisfactory portable cooking stove for South Africa is yet to be produced, says the South African Gazette. A stove which a farmer can carry in a wagon, with a few feet of piping, for quick setting up, would find a ready sale, as would another pattern which could be fixed some few feet from the wall in the middle of the room. This should have a large oven for roasting meat and a large boiler for keeping water hot all day, the fire being capable of being quickly kindled at little cost of wood, owing to its scarcity. American, Scotch, Swedish, and French firms have all essayed to produce the requisite article, but failed, the nearest approach to the requirements being the Scotch "Dover" make, but without feet. The stove should not be liable to breakage, and should be sold at a low price and produced in three sizes—Nos. 6, 7, and 8.

**NEW COMPOUND RAIL.**—An English firm is turning out a new type of compound rail for steam and electric roads. The rail is rolled in two parts; the head or upper part of the rail is attached to the girder by running a machine over the track which has two side bearing rollers which bend the projections shown by the dotted lines in and around the head of the girder. When the upper portion wears out—and that is where rails wear—the worn section is removed by a cutting machine, and a new head is put on at an estimated saving of over 50 per cent.



**THE NOVELTY NEWS.**—An extremely interesting and unique illustrated monthly, devoted to all the new novelties as they appear. It is the only publication of its kind, and is full of information for people who deal in, manufacture, or buy the latest American and foreign novelties. The address of the Novelty News is 171 Washington St., Chicago.



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Radiumite Strop and Razor Sets de Lux, \$2.50—regular price \$4.00. Radiumite de Lux Razor or Strop separate \$2.00 each. Postage and packing 15¢ extra. For sale at drug and hardware dealers, etc.

**BRACERS** — Our new product. Successors to the suspender. Weight, 4 oz. Keep the shoulders straight, the chest out, the form erect and give a manly attractive bearing. Greatest comfort. Prices 50¢, \$1.00, \$1.50 postpaid, or at most dealers. Give chest measure.

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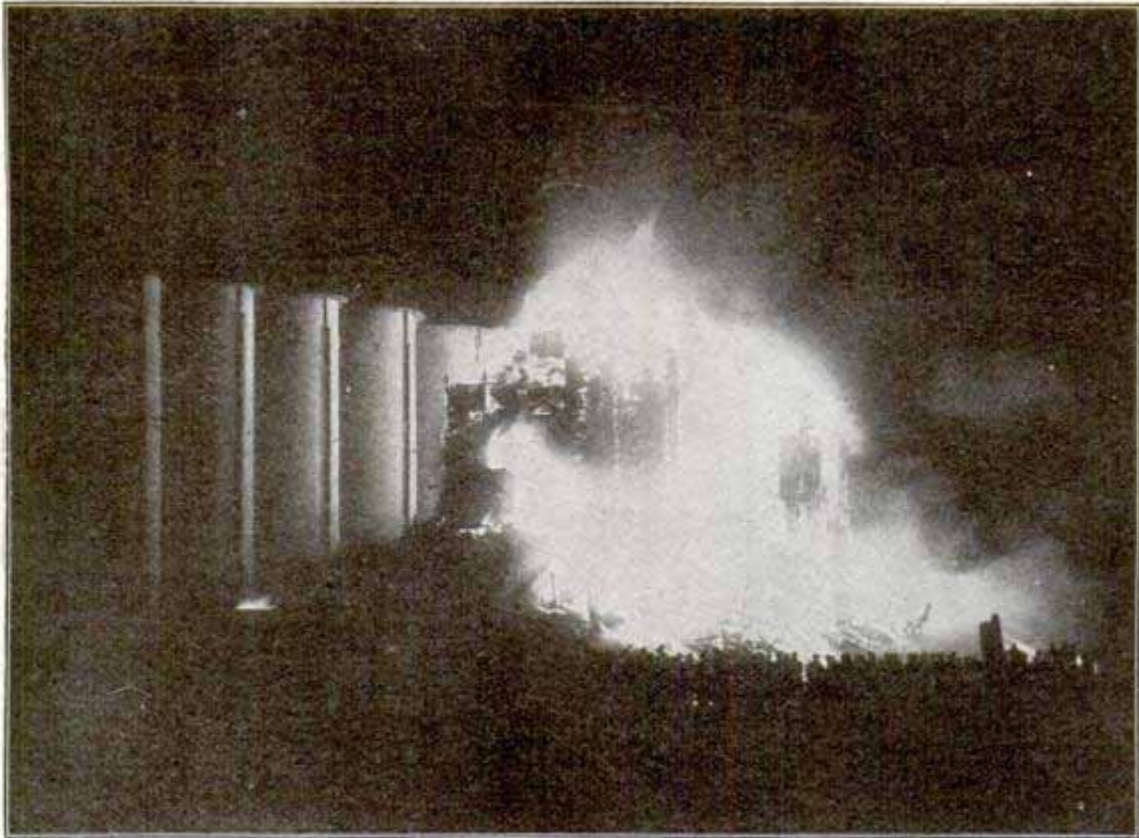
No. 7 describes very comprehensively just these kind of tools. It will prove very valuable to any man.

Write for it to-day.

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## SUCCESSFUL FIRE TEST OF CONCRETE ELEVATOR.



Courtesy Grain Dealers' Journal.

**Burning of Peavey Elevator at Duluth on Night of February 17.**

A mammoth elevator, 185 ft. high, costing \$300,000, burned at Duluth. The heat was so intense windows half a mile distant were cracked, and firemen could not approach nearer than 300 ft. Great timbers were carried high into the air and far out over the

ice of the bay. The 970,000 bu. grain in the concrete tanks escaped injury, although the shell of the tanks next the elevator became red hot. After the fire, experts examined the grain to a depth of 40 ft. and reported it in good condition.

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All brass screws. Friction, Belt or Governor drive.

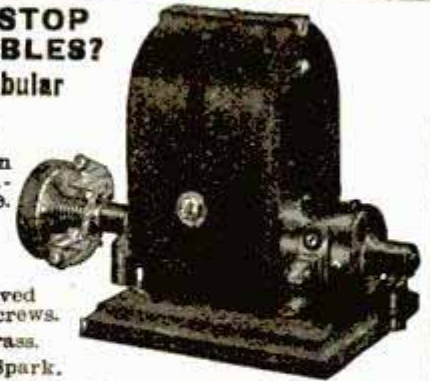
Brush-holders removed without loosening screws.

All parts polished brass.

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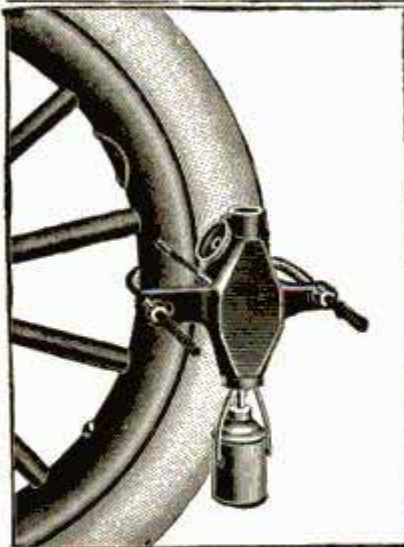
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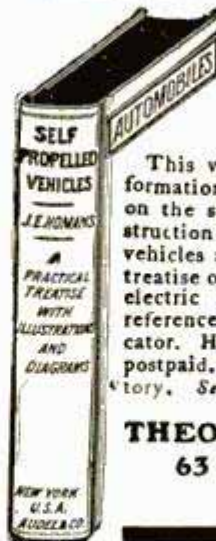
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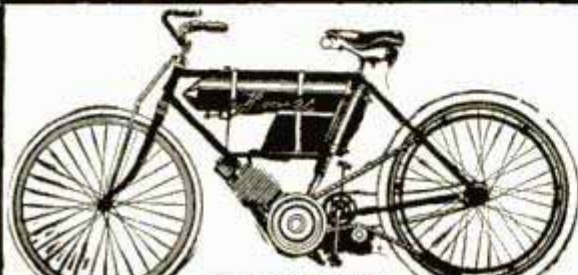


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**SAILOR STRUCK BY LIVE TORPEDO, LIVES.**

—A live torpedo shot from the receiving ship "Franklin" during torpedo practice in the harbor at Norfolk recently, struck a sailor who had been sent out in a launch to act as marker. The propelling machine failed to guide the missile as intended and after a series of wild evolutions made straight for the little boat, smashed through its side and struck the sailor in the back, hurling him into the water. The torpedo did not explode from the impact, but turned downward and stuck in the mud. The sailor was taken to a hospital.

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**200 I-8 H.P., 110 Volt, 60 Cycle**  
Westinghouse, Alternating Current Motors, each **\$13.50**

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**FOR GAS AND Gasolene Engines**

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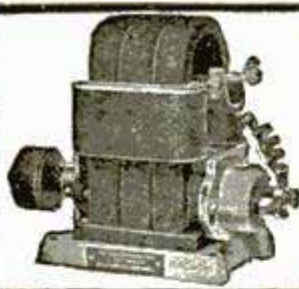
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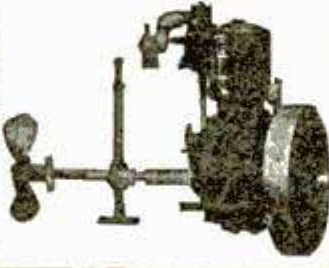
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### High-grade MARINE and AUTOMOBILE ENGINES

2 to 30 H. P. 2 and 4-cycle,  
latest improvements; best ma-  
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### MAGICIAN MYSTIFIED BY HIS OWN TRICK.

—Helms, the magician, had a queer experience the other evening. It was between the acts, writes Mr. Helms to our editor. "I was preparing my second act, 'Thirty Minutes in Spiritland,' in which I use 'The Talking Skull,' which is used on a pane of glass across two chairs. It has a movable jaw, figures out people's ages, cards that have been drawn, etc., by moving its jaw and making the spirit raps inside the cabinet. In preparing the act, I went to my dressing room to get the skull, which was on a table. When I got to the room, imagine my surprise in seeing the skull move its jaws and deliberately move from one end of the table to the other and finally jump from the table. The skull is made of papier mache, is hollow and has a hole at the bottom which was left there by the manufacturer. When the skull jumped from the table the secret of the mystery was easily explained: a good sized rat leaped from the opening in the skull. I generally place the skull on its side for reasons of my own. The rat must have been on the chair in my dressing room and my sudden appearance frightened it and it crawled into the hole of the skull, which tipped over into its regular position, making the rat a prisoner. In trying to get out and getting the weight of the skull on its back it moved the jaws and also made the skull move across the table until it fell off, dropping the skull to the floor, releasing the imprisoned rat, which ran into a hole near a hallway. My papier mache skull has a dent in its cranium. Talk about miracles and your spirit power, etc., I certainly was mystified at the sight, until I saw the power behind the throne."—The Sphinx.

**TO STOP MOUSE HOLES.**—Plug up the hole with common soap, as rats, mice, roaches and ants will not attempt to go through it, not liking the taste.

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**Erie 2 h. p. Power Outfit**  
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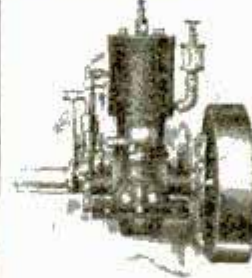
## THE JUNIOR AUTO MARINE MOTOR.

1 1/2 H. P., Weight, 58 lbs.

Price, \$35.50 Engine Only.

2 H. P. Engine Only

Price, \$47.50



Has more good points of merit than any Engine on earth. Fewer parts and less complicated; runs with absolutely no vibration, is noiseless, and controlled by one lever. Our guarantee for two years is sufficient evidence of Merit.

Our line of Junior Stationary Engines is equally as good. "NONE BETTER," and a circular of either can be had for the asking.

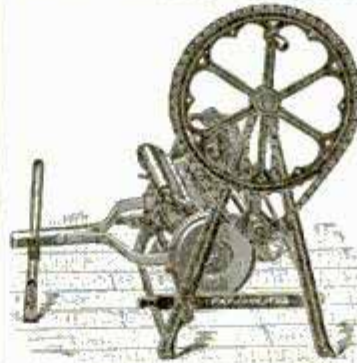
Address, stating your wants plainly,

CHAS. P. CROUCH & CO.,

472-488 CARROLL AVE.,

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## The Ideal Lawnmower Grinder



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

Write for full description and prices  
**TODAY.**

THE ROOT BROS. CO. - Plymouth, Ohio

This Shows Our  
**"Vim"**

## Butt Spark Magneto

We make other Types for

Butt and  
Jump Spark  
Ignition

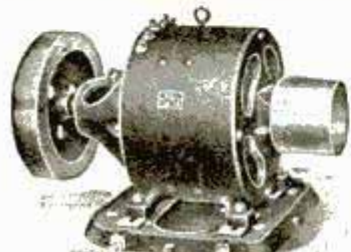
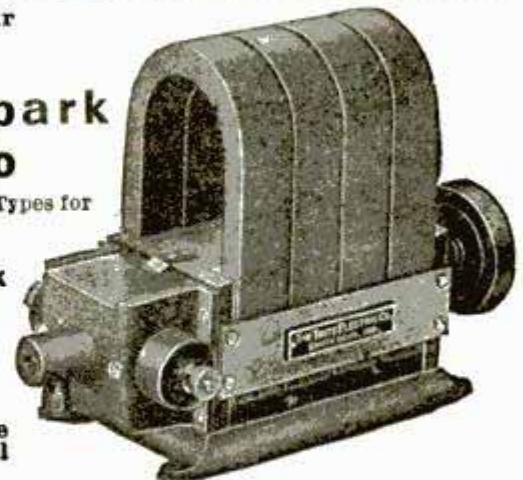
Also

**COILS**

of all kinds. Write for prices and full information

The TRITT ELECTRIC CO.

UNION CITY,  
INDIANA.



SPECIAL

## GAS ENGINE GENERATOR

Steady light from an ordinary Gas or Gasoline Engine. Write for Bulletin.

Rochester Electric Motor Co.

**Uncle Sam Satisfied**

The following is clipped from the "Washington Post" of March 8, '06: "The submarine torpedo boats Porpoise and Shark completed most satisfactory gasoline engine endurance tests in Narragansett Bay last week, running for six days and proving their ability to run over 500 miles in case their electric engines became disabled."

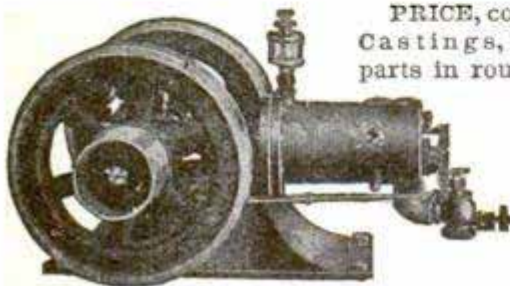
The above named torpedo boats and 25 others in the navies of the U.S., England, Japan and Russia are equipped with "Otto" marine engines 200 H.P. each. Surely a powerful endorsement of "Otto" quality.



**OTTO GAS ENGINE WORKS, Phila., Pa.**

**STANDARD OF THE WORLD**

**CASTINGS FOR 1/2 H. P. GASOLINE ENGINES**



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

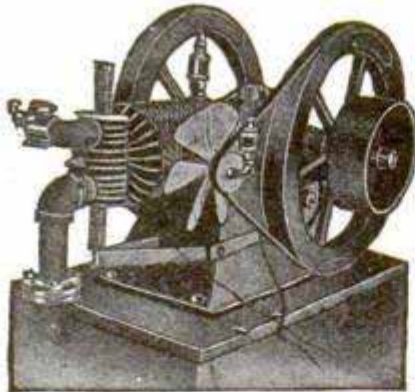
**\$15.00**

Send for Booklet on Stationary, Marine and Bicycle Motors. Also Castings for same.

**L. W. GILLESPIE & COMPANY, - Marion, Ind.**

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

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



Write for Agency. Gasoline tank in base or outside.

**Air-Cooled Motor Co., - Lansing, Mich.**

**ANIMAL SURGERY** has attracted considerable attention recently and many persons owning valuable or dear pets are availing themselves of it. Difficult operations are successfully performed; nor this only, but dogs or cats may be fitted with glass eyes, wooden legs, false teeth, etc. No attempt, however, has been made to beautify the ugly visages of some of the thoroughbreds.

**1 1/2 H.P. \$48.00**

**ABSOLUTELY THE FINEST ENGINE ON THE MARKET**

Notice the neat design and the round base which insures higher base compression; higher base compression means more speed, and more speed certainly means more power. Only three moving parts; so simple a child can run one at any time in any climate. **WE HAVE THEM—**

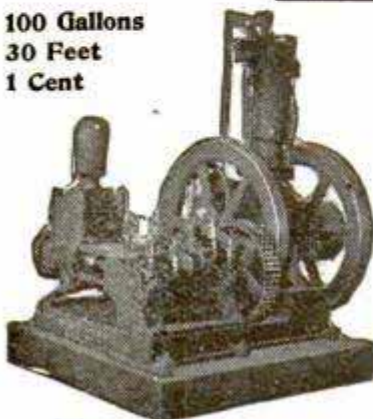
From 1 1/2 H. P. to 16 H. P. Send for Catalogue P—it's FREE. Write for Agency.

**THE BURDICK-PUTNAM GASOLINE ENG. CO.**  
565-567 Decatur St., ST. PAUL, MINN.



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100 Gallons  
30 Feet  
1 Cent



**Fairbanks-Morse Domestic Water Supply**

Provides all the conveniences of city water works at moderate cost.

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

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Monroe Street, Chicago, Ill.

Please send me Illustrated Catalogue No. W 449 Gasoline Engines.

I may want.....h. p. to.....

Name..... Street No..... State.....  
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# HAVE YOU USED AN "I D" EMERY HOLDER?



If not, why not? Get it now and save TIME, PAPER, and PATIENCE. The "I D" paper-holder will hold either emery cloth or sand-paper, and should be used in all cases where a good finish or polish is desired. When the cloth wears out, it can be very easily and quickly replaced. (See Cut.) By using an "I D", corners and grooves can be

reached that are invariably skipped over with the ordinary "block of wood." Its uses are not confined to a shop only, but will be found very handy around the HOME or FARM for making general repairs. In the kitchen it will remove rust and soot and can be used as a knife sharpener. Has a thousand other uses too numerous to mention. Sample by prepaid mail, 14 Cents. Better order today.

THE I D MANUFACTURING CO., Box 300, Tonica, La Salle Co., Ill.



## DYNAMO CASTINGS

Sets of Material or Finished Parts for the  
**FRANKLIN MODEL DYNAMO**

PRICE \$3.50 AND UP

Will light six 6 c. p. lamps  
Write for illustrated booklet 8

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and its books, as well as back numbers, and any other book or periodical you want.

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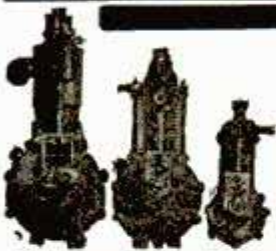
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MARINE. STATIONARY. PORTABLE.

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

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**1 1/4 H.P. Bike Motor, \$7.50**

CASTINGS WITH DRAWINGS

We also have a 2 1/4 H. P. set of castings. Send stamp for catalogue and full particulars.

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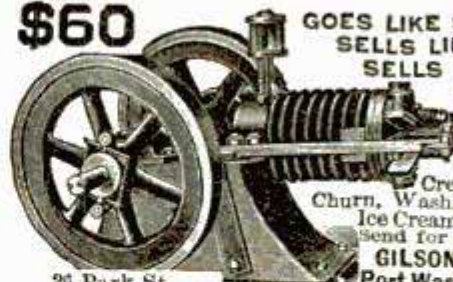
Auto, Marine and Stationary. Booklet on Request

We sell blue print drawings of either 2 or 4 cycle type.

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2930 Hancock St., Phila., Pa.

**\$60**



GOES LIKE SIXTY  
SELLS LIKE SIXTY  
SELLS FOR SIXTY  
**GASOLINE ENGINES**

for Pumping,  
Cream Separator,  
Churn, Washing Machine,  
Ice Cream Freezer, etc.

Send for catalogue.  
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I would like to act as your agent in the shop or works of

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If you have no agent in this plant send me full particulars with statement of commissions paid.

Name \_\_\_\_\_

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FOOT AND HAND POWER

# Wood Working Machinery

For Carpenters, Cabinet Makers, Wagon Builders and Wood Workers Generally

Machines for Scroll and Band Sawing, Rippling, Cutting Off, Mitering, Rabbeting, Grooving, Gaining, Dadoing, Beading, Edge Moulding, Boring, Mortising, Tenoning, Turning, Etc., for Working Wood in any manner.

ENTERPRISING MERCHANTS ARE QUICK TO SEE  
THE SUPERIOR MERIT OF OUR MACHINES : : :

Machines Sent on Trial. Send for Catalogue "A."

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Seneca Falls, N. Y.



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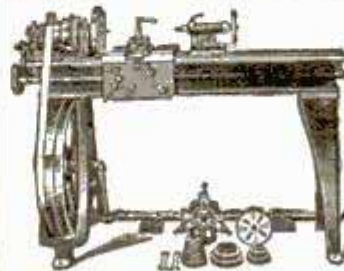
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STAR HACK  
SAW MACHINE

Cuts up to 4 1/2 inches in diameter and adapts itself to all kinds of work. Takes care of itself when making cut, and stops when the work is done. No tool that we have ever made has given better satisfaction. Price \$25.  
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### B. F. BARNES' ELEVEN-INCH SCREW CUTTING LATHE

For foot or power as wanted. Has power cross feed and compound rest. A strictly high-grade modern tool. We also build a 9-inch lathe. Descriptive circulars of each lathe upon request.

B. F. BARNES CO., Rockford, Ill.

NAILED A KNOCKER.—A certain party, who had over-indulged, stole a hammer and was arrested. To the judge he said:

"I don't know what in the world I wanted with a hammer, and really didn't know I had it in my hands until the police sergeant stopped me on the street and asked me if I was going out driving. I had several 'large and juicy' under my belt and thought when the sergeant stopped me I was talking to the whole police department.

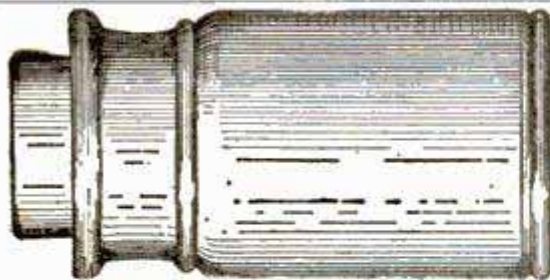
"'Naw, I'm not going out driving. What's the joke?'"

"'Well, what are you doing, trying to make a hit?' the sergeant asked me.

"'Say, give me a tip; what are you driving at?'"

"'I believe you're a knocker. I'll have to nail you,' he said.

"'And that's the first time I discovered I'd stolen a hammer.'"



## HASTINGS COMPOUND

Guaranteed to stop Sparking. Money refunded if it don't. Put up in convenient form, 3 3/4 in. long x 1 3/16 in. diam. We have enough confidence in Hastings Compound, to mail a full size sample stick, upon receipt of six cents to cover postage.

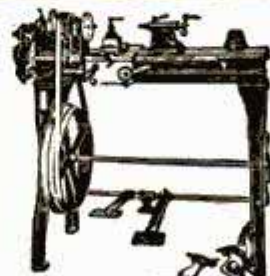
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### LITTLE GEM CEMENT BRICK MACHINE

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

A. D. MACKAY & CO., • 84 Washington St., • CHICAGO, ILL.

# \$25



### FOOT AND POWER LATHES 9 to 15 in. SWING

Circular B shows our new Screw Cutting Foot Power Lathes. Carroll-Jameison Lathes are guaranteed accurate and light running. Workmanship and material of high quality.

Our catalog will be mailed to any address. Shall we mail you one?

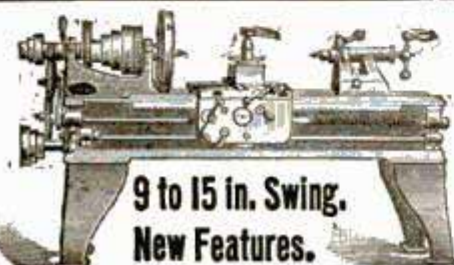
Carroll - Jameison Machine Tool Co.  
Batavia, Ohio

## If It's a Sebastian, It's a Good Lathe

BUILT UPON HONOR—ACCURACY, EFFICIENCY, MODERATE PRICES.

Foot and Power Lathes, all sizes. Send for Catalogue.

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9 to 15 in. Swing.  
New Features.

# PRESSED STEEL SHOP PANS

For Machine Shops and Foundries, Bolt Works, Etc.



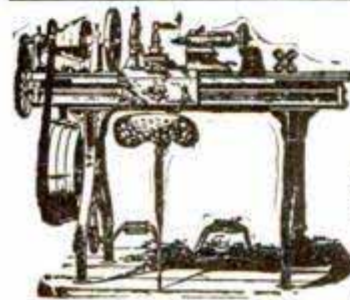
**THOUSANDS IN USE. DURABILITY AND SATISFACTION GUARANTEED.**

Made of any Gauge of Sheet Steel desired. Never goes to pieces, and always gives entire satisfaction. Try samples and you would not be without them at any price. Suitable for handling bolts, rivets, nails, screws, nuts, washers, castings, ore, quartz and other substances, and for use under lathes and drill presses to catch the turnings, trimmings, borings, oil drippings, etc.

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**WANTED** Engineers and all persons running belts, to write on their firm's letter head for liberal free sample prepaid of "Pulle-Y-Grasp" for Belts. State kind of belts.

**THE CARDINAL MFG. CO.,**  
Cleveland, Ohio.  
Sales Agent Wanted.

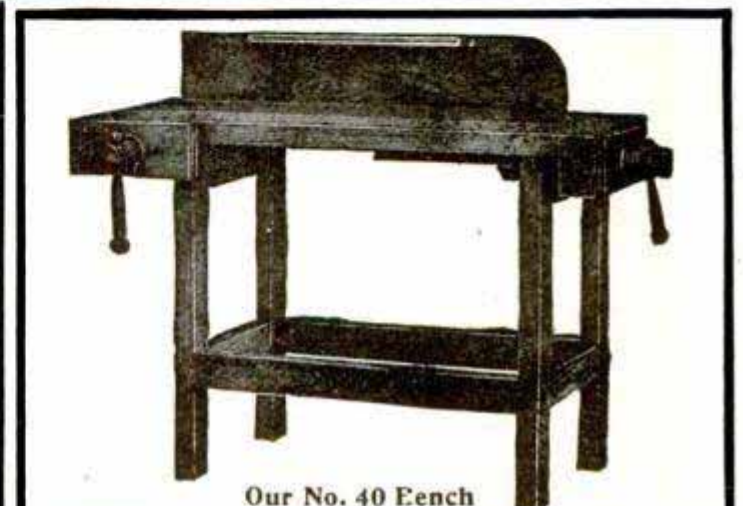


## LATHES

9 to 13 inch Swing

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

**W. F. & John Barnes Co.**  
100 Ruby St., : : Rockford, Ill.



Our No. 40 Eench

## Teach The Boys to Use Their Hands

Every boy ought to have a little carpenter shop of his own. He can earn money doing carpenter work for his family and friends and have lots of fun besides.

Our Youth's Manual Training Bench is a whole carpenter shop in itself for a bright boy. It is used in the best manual training schools in the country.

Bench 4 1/2 ft. long, 32 inches high, 20 inches wide—fitted with a 13-inch glued up maple top 1 1/2 inches thick, with 7-inch well for tools, fitted with two vices. Back board and tool rack as shown in illustration. Frame, glued up top, vices and tool rack all made of hard maple.

Our catalog gives complete information in regard to this and other manual training benches, and it shows a number of styles especially designed for manual training school use. Write for a copy.

**GRAND RAPIDS HAND SCREW CO.**  
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GRAND RAPIDS, - - - MICH.

**ELECTRIC BUTTON.**  
You press the button—the button will do the rest. Expose the button to your friend, he will be sure to push it and get a shock never to be forgotten. It's the greatest fun maker out. Price 15c., 2 for 25c. postpaid, with Big Bargain Catalog. Address

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

**PRESSED STEEL MFG. CO.**  
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**SPECIAL OFFER... 65c EACH**

PATENTED IN UNITED STATES, CANADA, FRANCE, GERMANY AND GREAT BRITAIN. PATENTS PENDING.

**READ THIS!**

**FOR THE NEXT THIRTY (30) DAYS** we offer readers of POPULAR MECHANICS ONE OF OUR WRENCHES, made with extra fine finish, at a special price of 65 CENTS each, postpaid to any address. We make this offer in order to introduce the "Hawkeye" Wrench to new readers who are not acquainted with its merits.

Order now or you may be late **The Hawkeye Wrench Co., Marshalltown, Iowa**

Our wrench has more uses than any other wrench made, and can be used as a pipe wrench, thread cutter, or nut wrench. For cutting threads it has 8 different dies.

Bolts before and after using the Hawkeye . . .

**SOLDERENE**

PATENT APPLIED FOR

**SOLDERENE**

Platinum, Gold, Silver, Etc., without the use of solder or acids. The old method of using bar or wire solder, acids, rosin and paste accomplished.

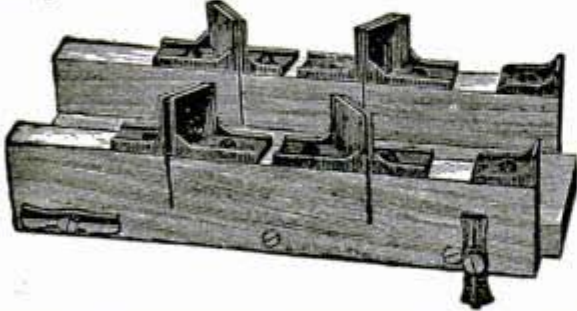
A new rapid flux and tin combined for soldering and mending Iron, Copper, Brass, Lead, Zinc, Tin. Solderene solders anything and everything that the

AGENTS WANTED. SEND TEN CENTS FOR A SAMPLE STICK.

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## Improved Mitre Box 80c



**THE IMPROVED MITRE BOX** is without doubt the best and most durable Mitre Box made for general work. The frame is made of hard wood, 1 inch thick, has adjustable iron saw guides for any thickness of blade; an ordinary cross-cut saw can be used as well as a back saw. At this price it is certainly a bargain and gives you an idea how low our prices are.

**WE MANUFACTURE THE CELEBRATED WIVANCO TOOLS.** If you have not already used them begin now and you will be surprised at the saving in cost and the satisfaction derived from using tools of high quality. Our 90 years of square business dealings and low prices, together with our regular guarantee of money back on all purchases not satisfactory in every respect, is sufficient reason for giving **OUR CELEBRATED WIVANCO TOOLS** a trial.

**OUR NEW 600 PAGE CATALOG NO. 90** gives a full description and prices of our complete line of tools for all trades.

Write for it to-day. **PRICES LOWER THAN EVER.**

Freight and express rates are lower from New York than any other city in America.

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Learn to do your own carpentry work around home—there's pleasure and profit in it—meanwhile you are learning a trade in which there is always a demand for skilled workers. Send this advertisement to us to-day and receive our 200 page hand book (FREE) describing our **CARPENTERS' COURSE**, and over 60 others, including Contractors' and Builders, Heating, Ventilation and Plumbing, Architecture, Architectural Drafting, etc. Write NOW.

**AMERICAN SCHOOL OF CORRESPONDENCE, CHICAGO, ILL.**

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Pop. Mech. 5-'06

**WIERD USE OF TELEPHONE.**—An unusual use of a long distance telephone was made by a young doctor who called up his sweetheart in Indianapolis. The brief conversation ended with a strange noise which the young lady could not understand, but which afterwards proved to be the report of the revolver with which the man killed himself.

**MOVING PICTURES OF NAVY.**—It is interesting to note how many things invented primarily to amuse, are eventually utilized for practical purposes. The recruiting department of the Navy have a series of extremely interesting pictures showing life on board ship, with the men drilling, working the guns, etc. The machine has been giving daily exhibitions during the past month at the recruiting station in Chicago.

## No. 602 NAPANOCH Pocket-Knife Tool Kit

Everybody's  
Pocket Tool Chest.



Leather Pocket-Book, 4 1/4 x 8 1/4 inches, containing **POCKET KNIFE, FILE, SAW, CHISEL, SCREW-DRIVER** and **REAMER.**

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

Made in America by skilled American mechanics.

**WARRANTED**

Sent postpaid on receipt of  
**\$2.25**

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

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

## LET ME SELL Your Patent

Booklet explaining how mailed **FREE.** Fifteen years' experience. Patent sales exclusively. If you have a **Patent** for sale, call on or write.

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## Keep Your Tool Room Emery Wheel True by Using DIAMO-CARBO EMERY WHEEL DRESSER



No. 1, 8 Inches Long... \$3.00  
" 3, 10 " " ..... 3.50  
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Send for Dresser Booklet with Testimonials

**THE DESMOND-STEPHAN MFG. CO.,**

**Urbana, Ohio**

# Going to Put It on the Market?

You have the article; we have the brains and the equipment for making it at the lowest cost.  
We manufacture and ship all kinds of Special machinery on contract.

**LET US ACT AS YOUR FACTORY**

**JOHN WISHART MACHINE WORKS, Engineers and Machinery Mfrs., (Inc.) 43 to 45 S. Canal Street, Chicago.**  
LONG DISTANCE 'PHONE, MAIN 839.

**WE WILL SEND YOU** One Vise,  
One Set **GENUINE**  
Armstrong Stocks  
and Dies,

One Pipe Cutter,  
One Wrench. All for handling pipe from  $\frac{1}{4}$  to 1 inch.

**ON RECEIPT OF \$10.50**

Send for Catalogue of Complete Line,

**ARMSTRONG MFG. CO., Bridgeport, Conn.**

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(Established 1868)

**WE MAKE A SPECIALTY OF YOUR WORK.**

**YOU HAVE AN IDEA** and require exact workmanship to fully demonstrate its **FULL POSSIBILITIES.**

**WE MAKE** a specialty of **MODEL MAKING, EXPERIMENTAL WORK** and **MECHANICAL ENGINEERING** of the highest character.

**YOU WANT THE BEST WORKMANSHIP—WE HAVE** the latest improved machinery and the highest type of engineering ability.

Tell us what you want, we may be able to help you and would be pleased to give you any information.

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**WE MANUFACTURE TO ORDER**

**DIES, TOOLS AND AUTOMATIC MACHINES**

**ALSO HARDWARE SPECIALTIES AND PATENTED NOVELTIES**

**ESTIMATES FURNISHED ON EXPERT MODEL WORK, SEND DRAWING OR SAMPLE.**

**BOOKLET FREE. WRITE TODAY.**

**Stamping & Tool Co.**

DEP. C LA CROSSE, WIS.

**MACHINERY AND SPECIAL PARTS BUILT ON CONTRACT**

New devices developed; successful experimental work done speedily; skilled labor; good facilities; good value for your money. **J. R. ENGELMAN MFG. CO.**

76 Hudson St. near Penn. Depot, Jersey City

## "Chicago" Lathe Dog and Drill Holder

A first-class combination tool for use in medium and light machine work. Will prove a time-saver on all work



Designed and Invented by Andrew Krus of Chicago

The tool is constructed so as to change instantly from a lathe dog to a drill holder, and can be used on all classes of work, whether taper or parallel; eliminates the necessity of using a new dog for each piece of work. The tool will be sent on trial to any responsible firm.

Manufactured and For Sale by **ANDREW F. KRUS & CO.**  
943 Elston Avenue, - CHICAGO, ILL.

## TAP AND REAMER WRENCH



**29c**

**29c**

Sent by mail (post-U. S. or Canada.

paid) to any part of Holds taps up to  $\frac{1}{4}$  in.

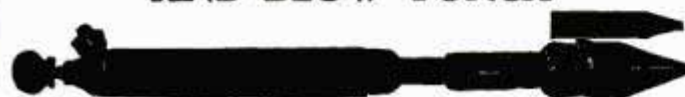
This wrench is very useful for holding taps, drills, reamers, etc. It has a compact chuck at one end and a center The ends of the shell and jaws they last.

are Tool Steel Order while

**PERIOLAT BROS.**

Canal and Randolph Sts., CHICAGO, ILLS.

## GASOLINE SOLDERING IRON AND BLOW TORCH



We can quickly cure you of the old time Soldering Iron and Gasoline Furnace habit, "by a single application" of a certain little green covered booklet that we have expressly prepared for such acts of benevolence. This document richly rewards the five minutes devoted to its perusal. Shall we send you such a "treatment?"

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**INDIANAPOLIS, IND., U. S. A.**

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We have a Patent Bureau of which it can be said: "Conducted So You Can Trust It;" just as this magazine is "Written So You Can Understand It."

We have been getting patents for the past twenty-five years, and hope to be in the same business for another quarter of a century.

We want the business of practical, hard-headed inventors---not the perpetual motion cranks. We charge moderate fees for services rendered, and do not care for the business of those who expect something for nothing.

Our booklet about Patents contains much information in small compass, and you can depend on it. Send for a copy.

POPULAR MECHANICS  
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Journal Building, : Chicago, Ill.

## THE OLD RELIABLE JESSOP STEEL

IS YET ON TOP AND THE VERY BEST FOR ALL FINE TOOLS  
WILLIAM JESSOP & SONS, LIMITED  
91 JOHN STREET, NEW YORK

**GIVES PATENT TO PUBLIC USE.**—A very unusual event occurred when the Pennsylvania railroad bought a recently issued patent, and dedicated it to public use. The patent was on an improved tank car, and was considered so good that the railroad paid the inventor a handsome price for his invention and then made it free to all to use in building and selling the new car. It is an example which is worthy of adoption by other railroads and should prove encouraging to inventors.

**WASTED INVENTIONS.**—It is a more common occurrence than most people would imagine, for two or more persons, who never saw or heard of each other, to invent the same thing: not only to invent the same appliance, but to actually invent the same identical thing in every respect.

The manager of a large iron works recently went into a wholesale hardware house where he was well known, and incidentally mentioned an improved hand saw which one of his men had just perfected after several months of study and work. The manager was very proud of the invention and said he was going to assist his man in getting it patented.

The hardware man listened attentively to the account of the saw, and touching a button whispered to his clerk who answered the call. In a few moments the clerk returned with a package which the proprietor handed to his visitor. To his great surprise, there was identically the same invention, already patented and on the market.

The incident is happening continually. The second inventor had spent \$50 in money and his spare time for several months inventing something which had already been invented and patented. What he should have done, and what the first step every inventor should take after getting his idea in shape ready to construct a model is to have a search made of all patents in the line of his invention, which any patent lawyer can do. The usual charge is only \$5 and is money well invested, for if the search reveals a patent already issued on the invention, the inventor can then save himself a lot of needless work, time and money. If the field is found to be open, then he is warranted in going ahead. Even if his invention follows along lines already patented, he would still have a chance to patent an improvement. In any event he is working intelligently, knowing what he is about when he has the report of the search and is not groping in the dark, as he is bound to do without the knowledge which the search affords. The time required in making an ordinary search is not more than ten days, and the fee does not often exceed \$5.

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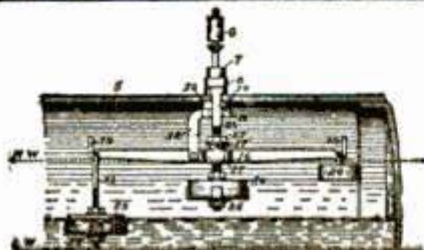
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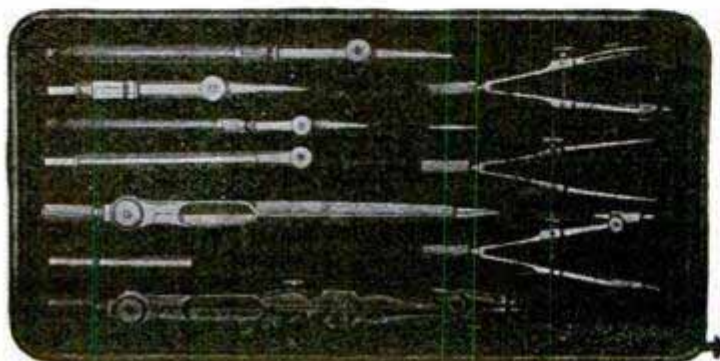


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"And from that day, for a year or more, this here snake, natcherly, never entered my head.

"But, by crinus, the next spring I found myself in that same neighborhood again, and, bust me, if a rattlesnake didn't come wrigglin' an' rattlin' an' boundin' toward me with as gay a welcome as a dog gives, and it riz up on its tail, my man, and licked my hand.

"Of course, I reckernized it by the scar of the old wound. I couldn't get rid of it. It follered me home, and that night, in the village, done me a good service. Along in the small hours I was woke up by the breakin' o' glass, and, rushin' downstairs, I found the snake had lashed a burglar to the table leg, while, with its tail out of the winder, it was a-rattlin' for the police."

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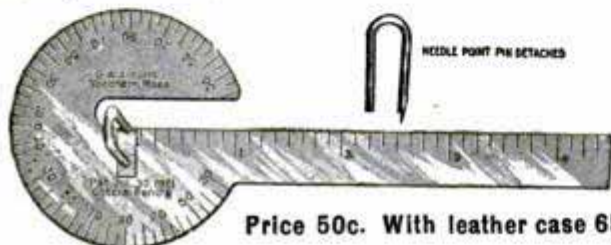


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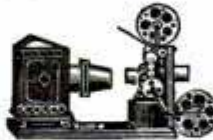
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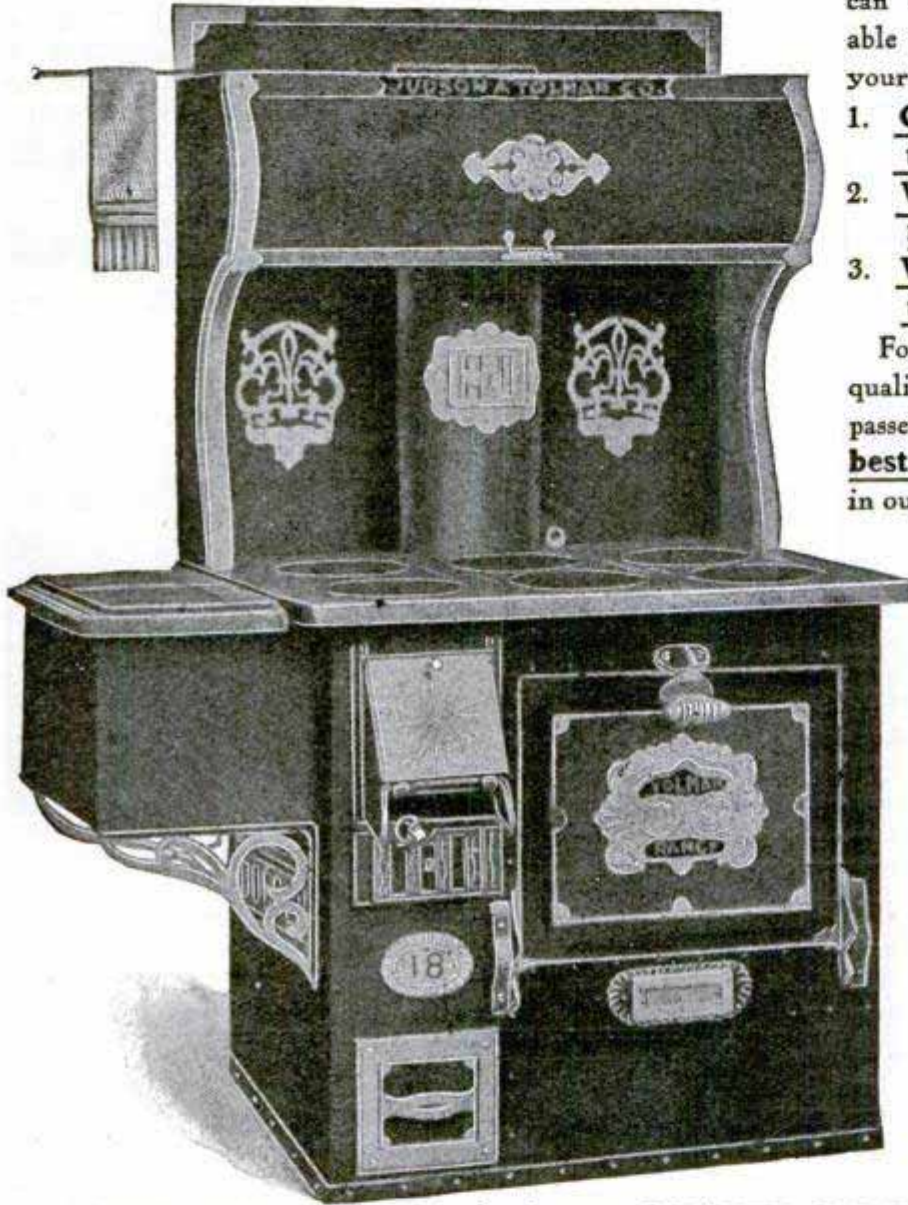
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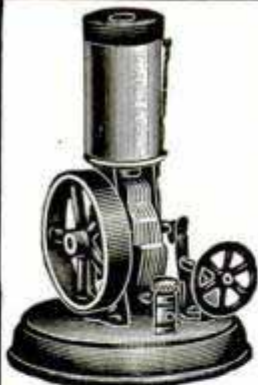
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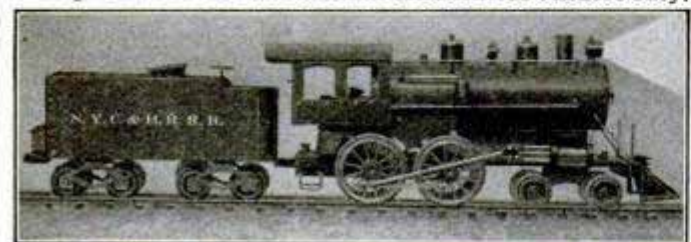
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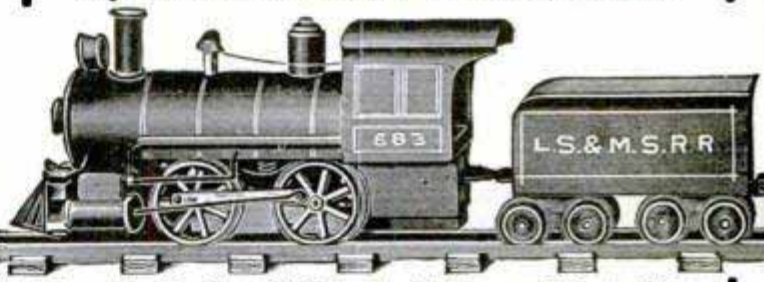
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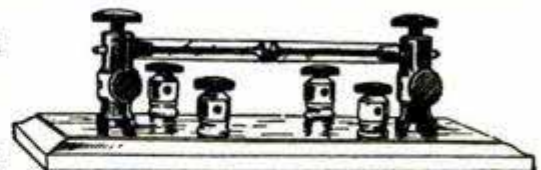
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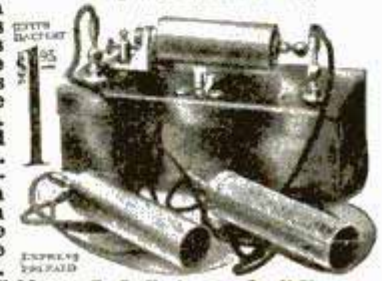
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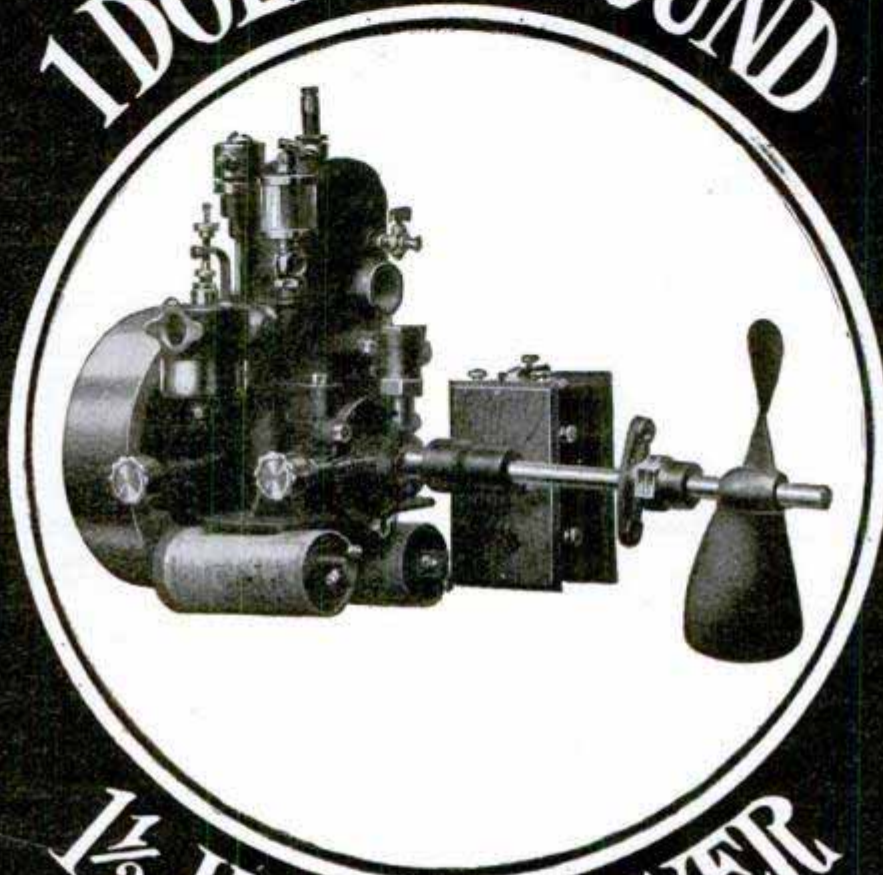


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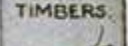
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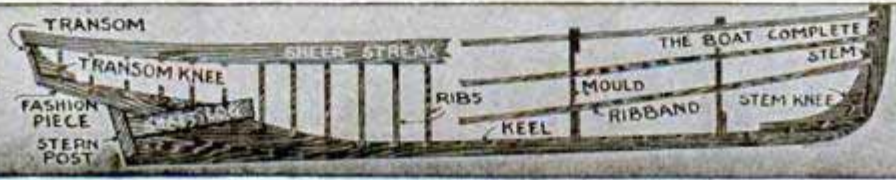
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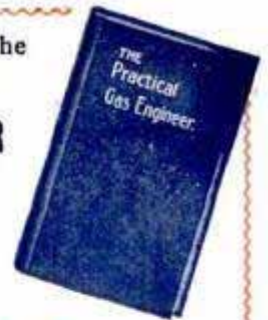
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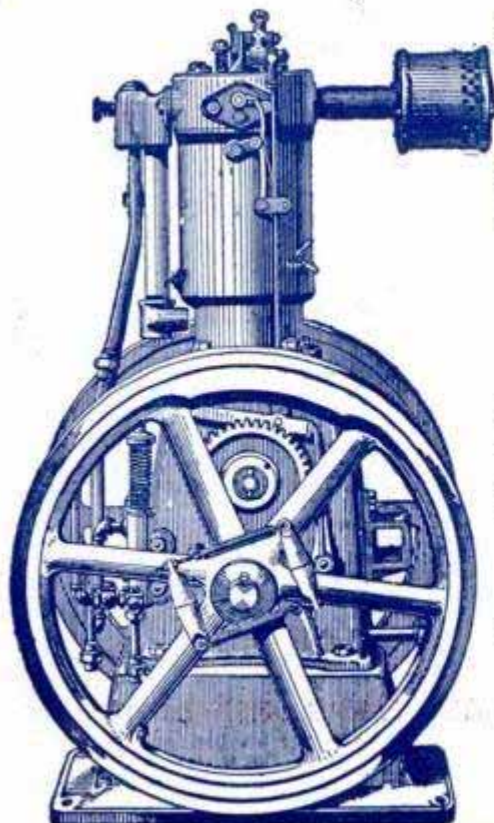
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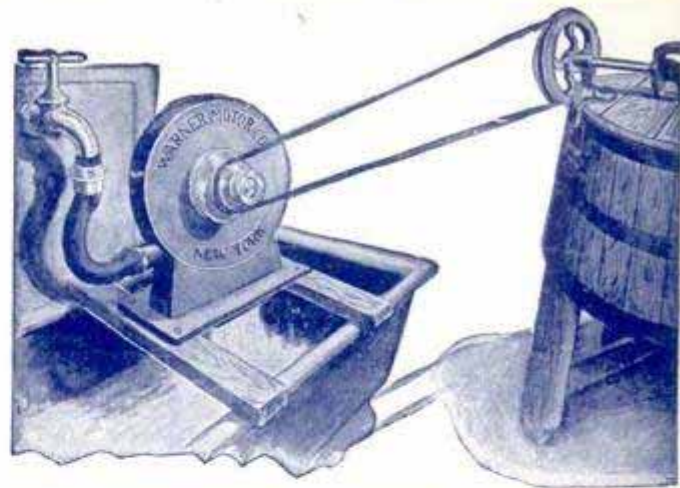
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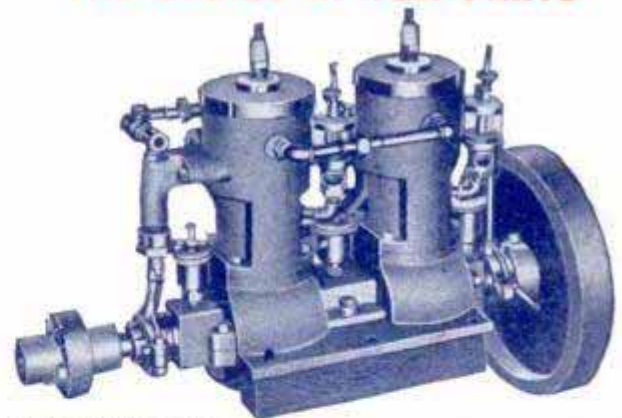
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