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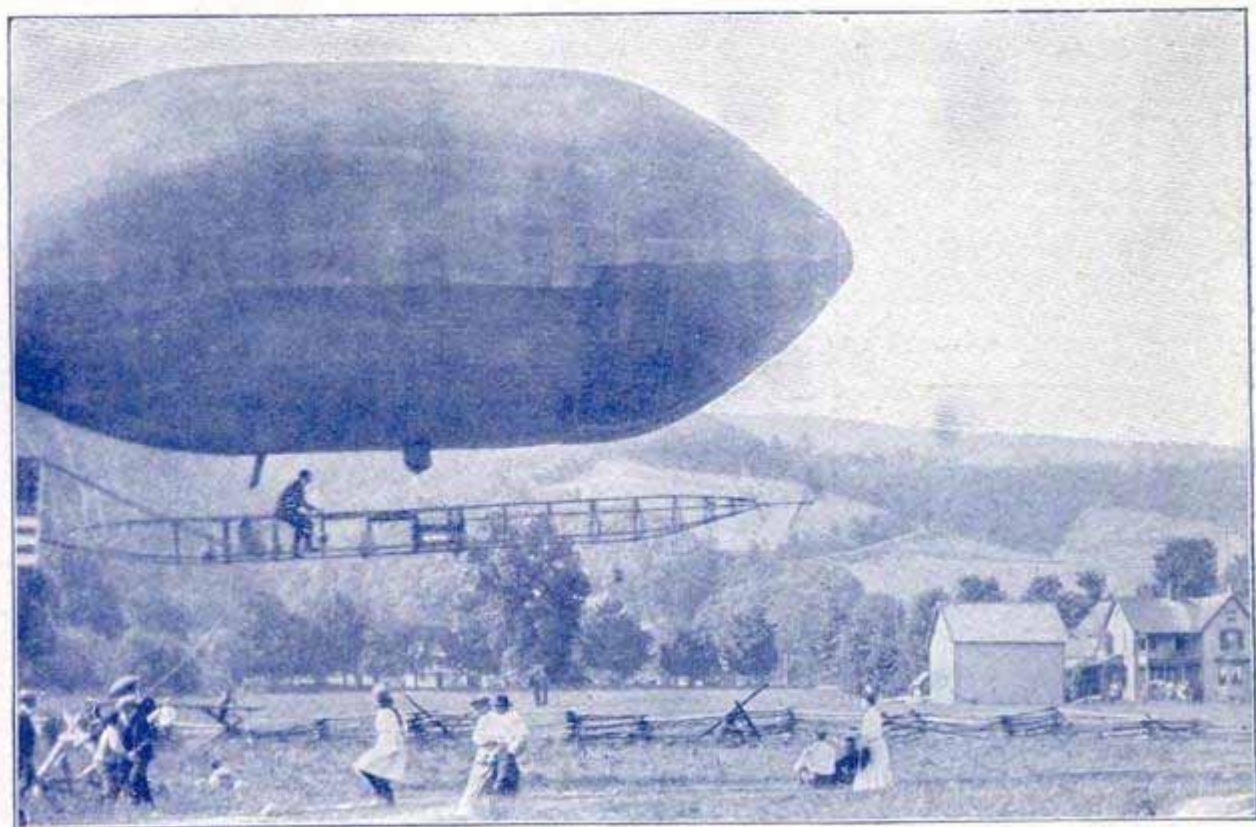
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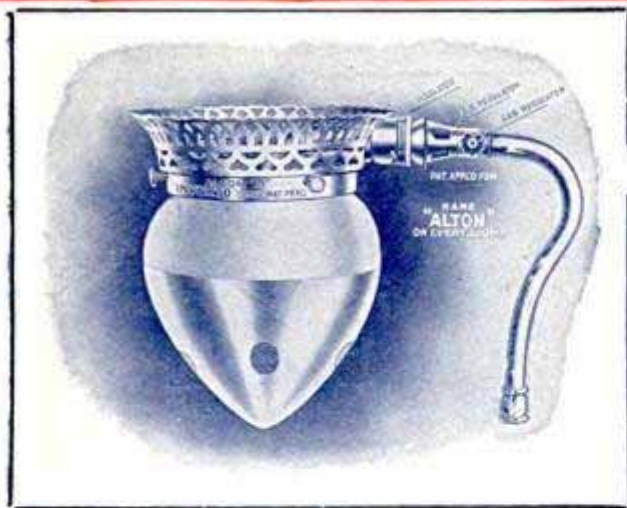
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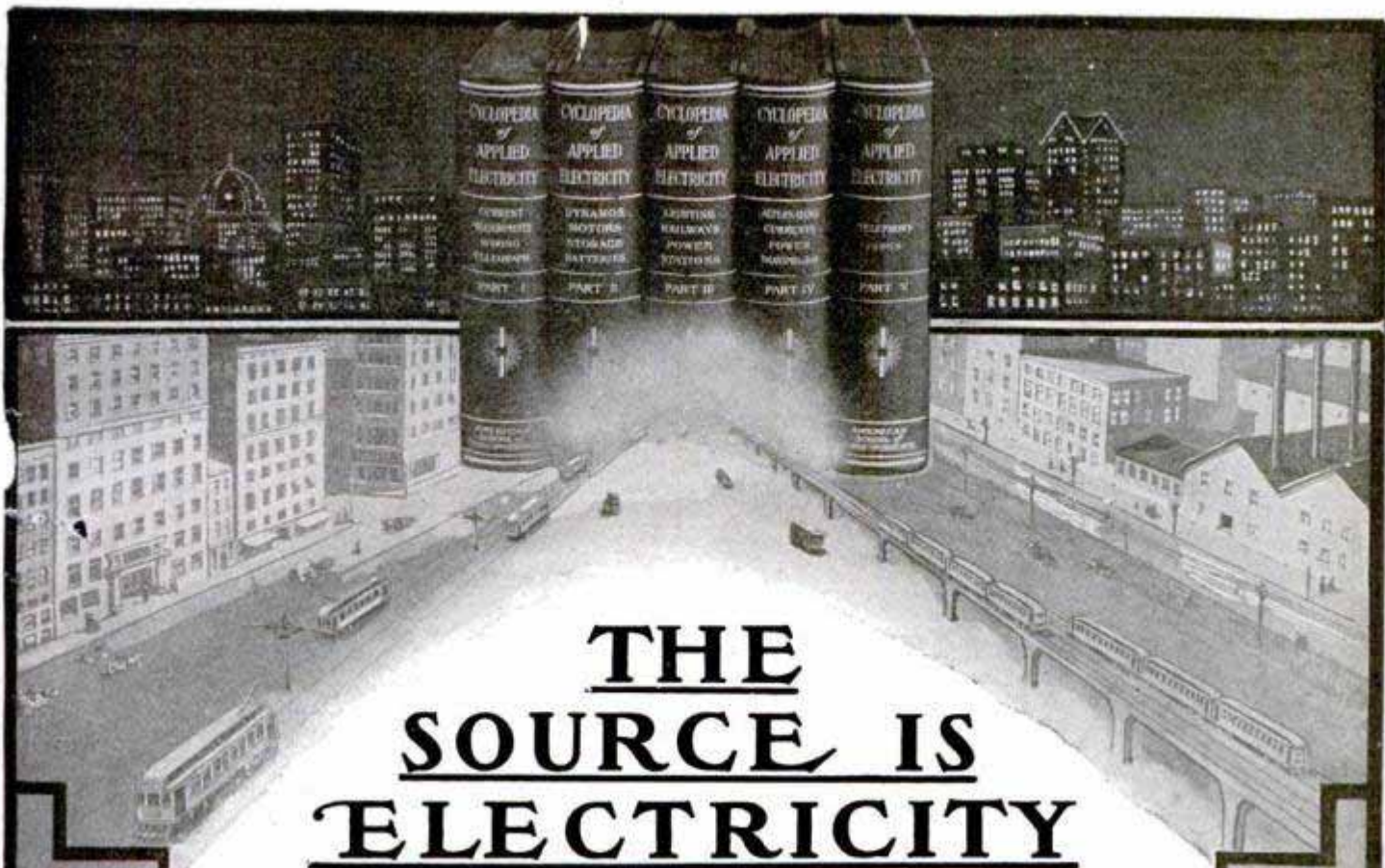
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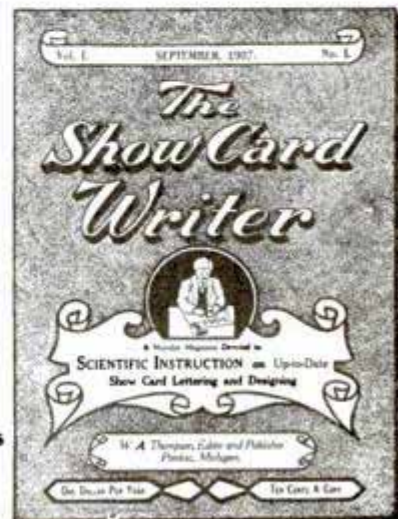
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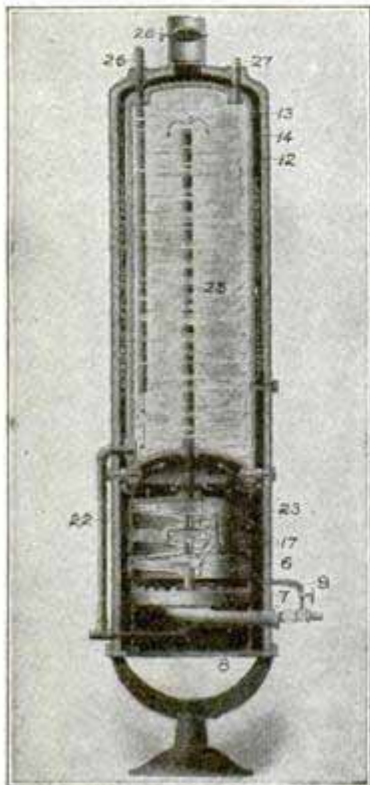
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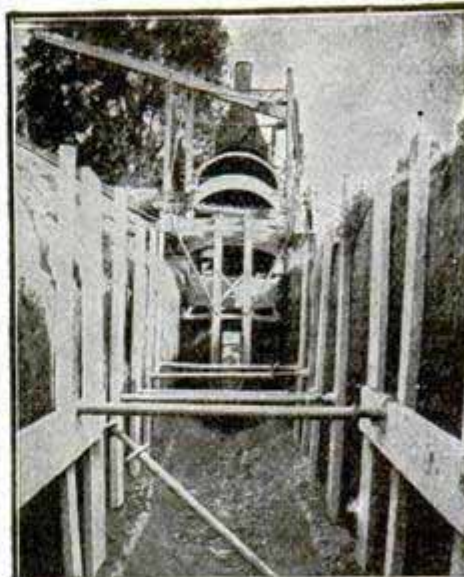
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I have dug in ground composed of gravel and boulders larger than a man's head, but it is not economical. I am satisfied that the machine will do the work of 100 men at one-tenth the cost of hand labor.

Yours truly,

J. E. Woods, C. E.

The Buckeye Traction Ditcher Co., Findlay, O.

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

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

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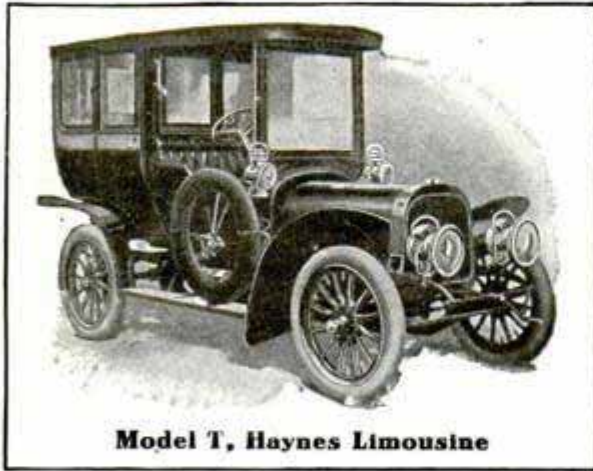
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HAYNES

RELIABILITY

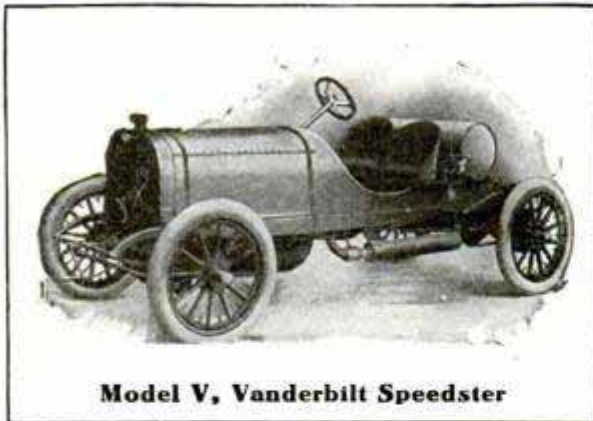


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Business Opportunities

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

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

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

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

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

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

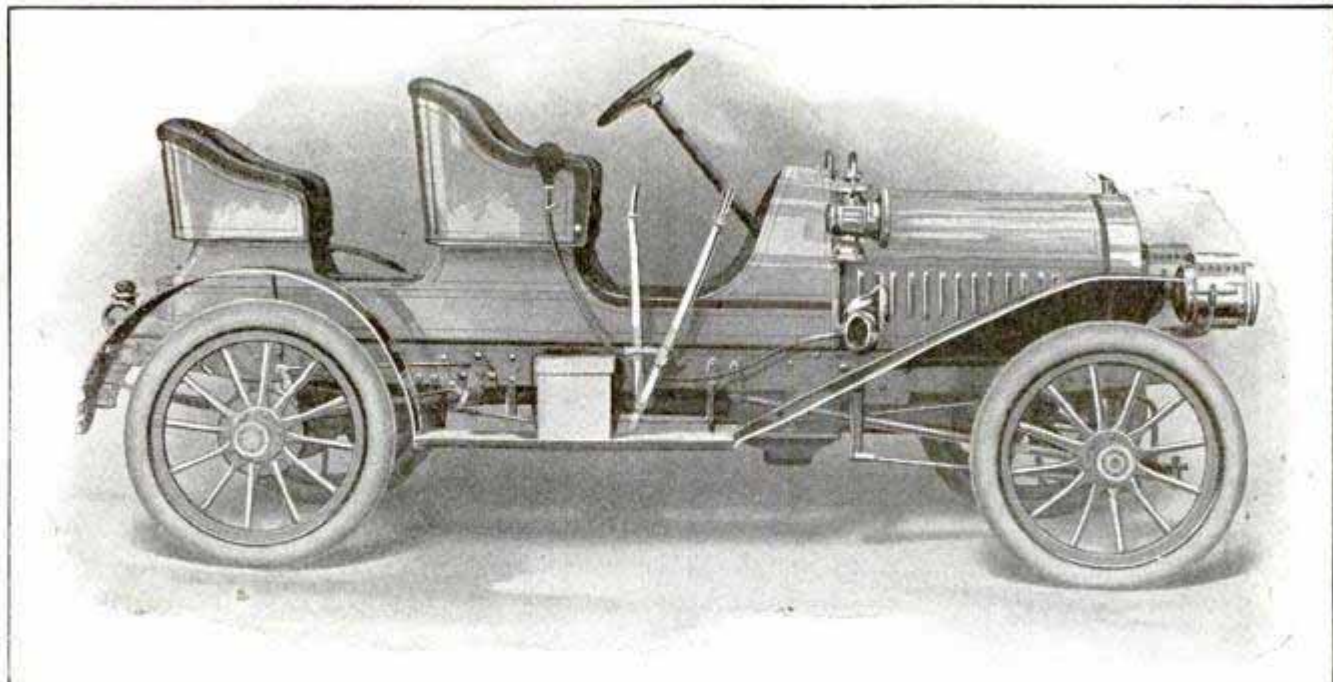
An electrical soldering iron in which the copper is quickly heated and will retain its heat.

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

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Mora Roadster

MECHANICALLY RIGHT.

The Most Wonderful WORLD'S RECORD Ever Made by a Motor Car

Was completed at the finish of the Chicago Motor Club's Reliability Run on June 28th.

Mora Racytype Roadster No. 184 finished on June 22d at New York City the severe four days' sealed bonnet contest, with a perfect score. Then with all seals intact started on Monday, June 24th, from New York City for Chicago, Ill., arrived in Chicago Thursday, June 27th, with all seals still intact, started in the Chicago Reliability Run Friday, June 28th, and finished this run with all seals still intact and with a perfect score except a delay of 20 minutes on account of a laundry wagon forcing the car into the curbstone to avoid accident, which badly bent the front wheels and compelled the driver to run very slowly to the finishing point. **Over 2,000 miles running without making one single adjustment or the use of a tool of any kind for repairs, under a sealed bonnet.**

A World's Record: This performance constitutes in every respect a world's record, and

is unquestionably the hardest and at the same time, from the buyers' standpoint, the most satisfactory test, to which it would be possible to subject a car. On an ordinary trip, even a non-stop run, there is an opportunity for the driver to make adjustments, and on such a trip any number of minor troubles might arise and be adjusted by a skillful mechanic, without materially delaying progress, but with the hood fastened down, the transmission, battery box and coils sealed up, there was absolutely no opportunity to make adjustment on any part of the power plant, and therefore the mechanical ability of the driver cut no figure whatsoever on such a trip. That the Mora went through 2,853 miles under such severe conditions as this simply proves its claim to being **Mechanically right.**

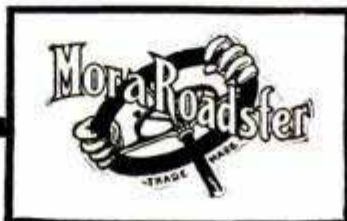
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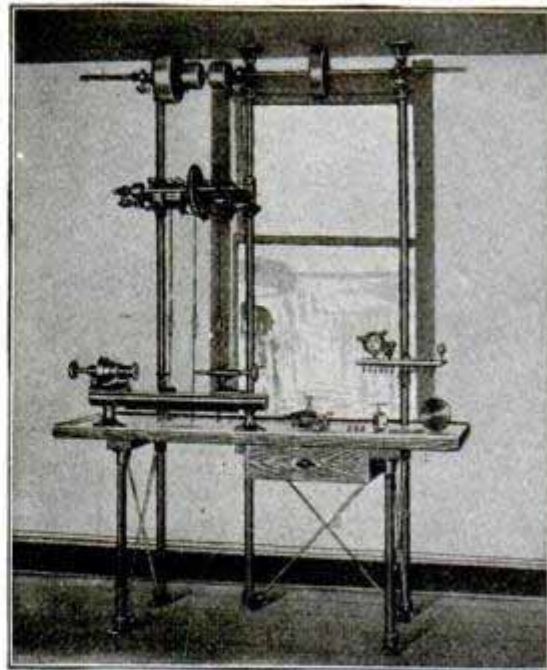
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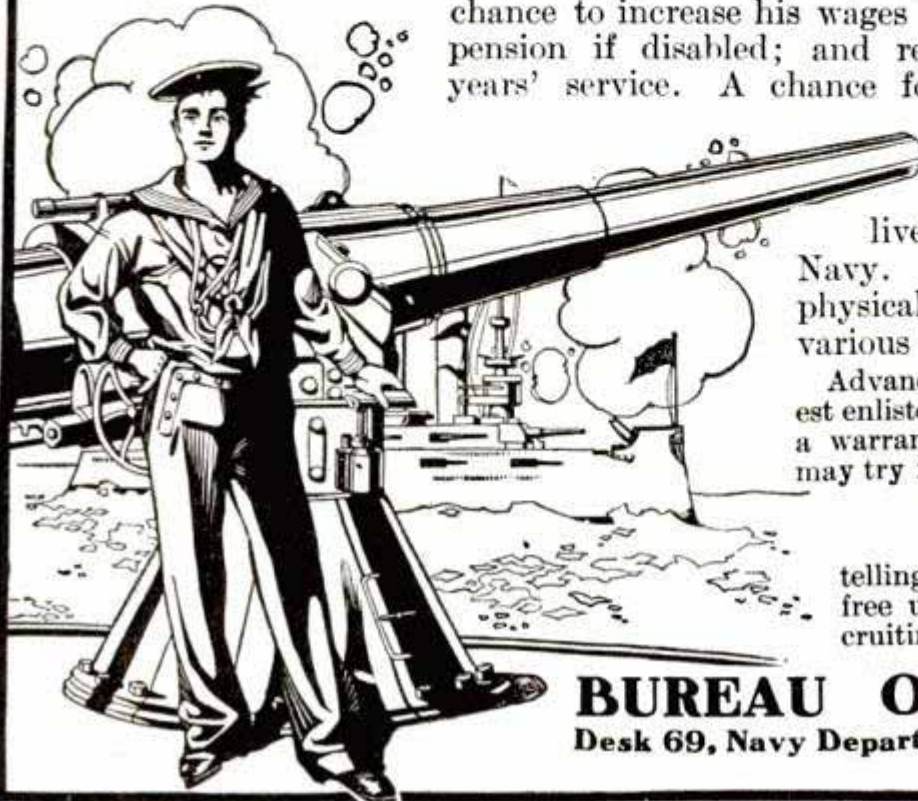
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There are XX chapters in all, XIX carrying you from the fundamental principles of electricity on through the various branches to a point where the careful student comprehends the complete designing, care and operation of a dynamo or motor, and I chapter on electric automobiles, outlining their construction, care and operation, and all about storage batteries and how to handle them. Each subject is carefully written and to the point.

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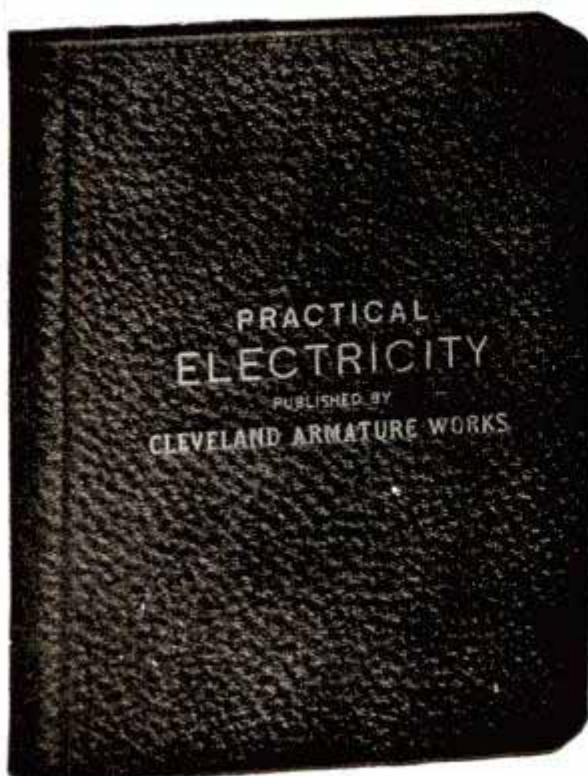
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I—Wiring	X—Counter E. M. F.
II—Electric Batteries. Electric Plating.	XI—Hysteresis and Eddy Currents
III—Magnetism	XII—Armature Reaction
IV—The Magnetic Circuit	XIII—Sparking
V—Magnetic Traction	XIV—Winding of Dynamos and Motors
VI—Magnetic Leakage	XV—Proper Method of Connecting Dynamos and Motors—Self-Excitation and others
VII—Energy in Electric Circuit	
VIII—Calculation of Size of Wire for Magnetizing Coils	
IX—Calculation of E. M. F.'s in Electric Machines	

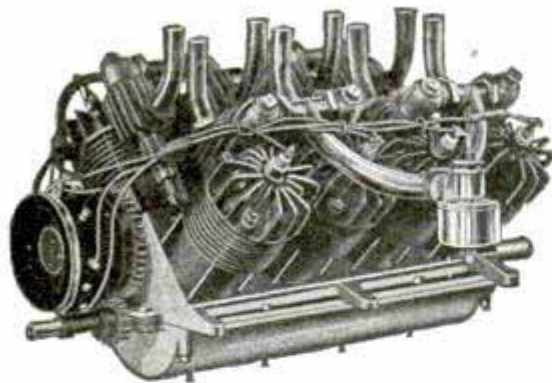
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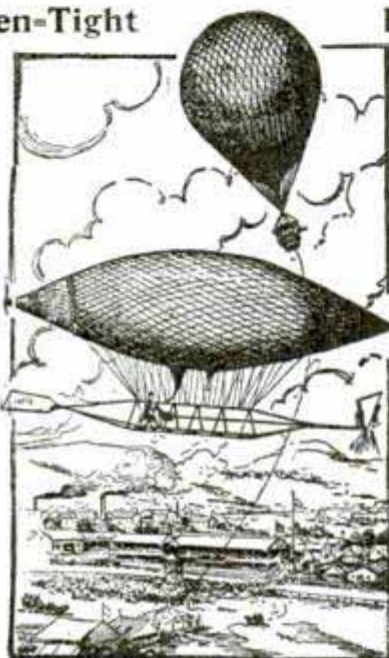
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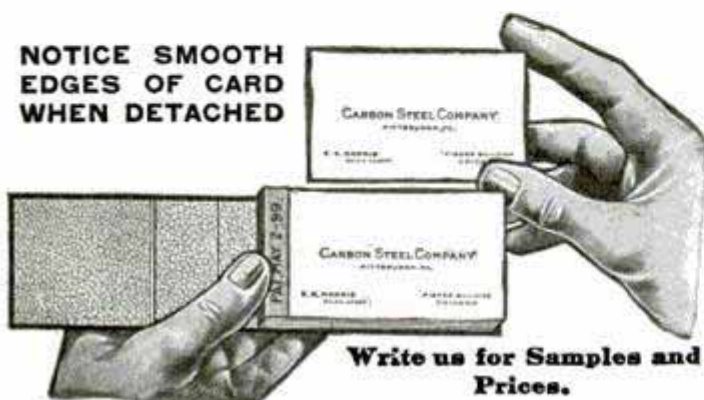
How to make, at an expense of not over \$5, an astronomical telescope which does as good work as instruments costing \$200; will be described and illustrated in Popular Mechanics for October, 1907. The article is written by a young man who made such an instrument, and with it he discovered a comet which had escaped the big observatories.

The work requires some time and patience, but is much easier than would be supposed.

High school classes graduating next year, and desiring to have something which will last indefinitely and be always useful in years to come, may find the above suggestion of advantage.

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POPULAR MECHANICS

Vol. 9. No. 9.

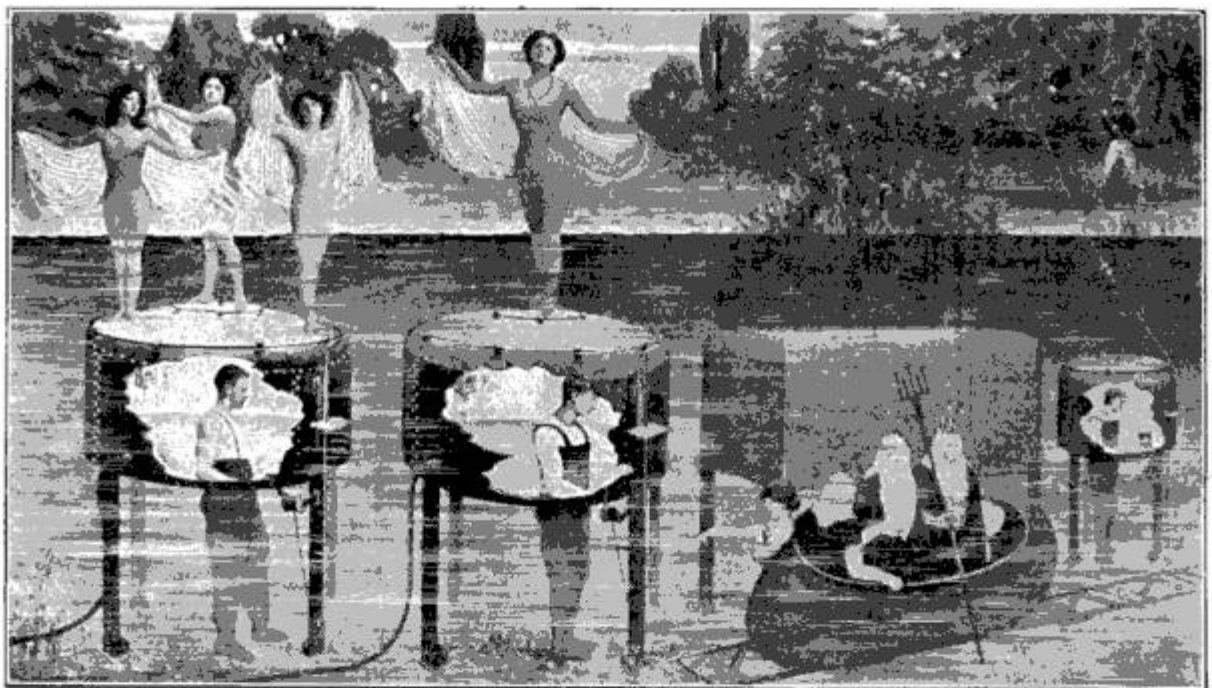
CHICAGO, SEPTEMBER, 1907.

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\$1.00 a Year

DIVING BELLS FOR MODERN MERMAIDS

How the Performers are Able to Remain under Water without Drowning

Spectators who have witnessed the mermaid act have been greatly puzzled to understand how the performers were able to remain under water a much longer period of time than a person could possibly hold his breath. The London Sketch tells how it is done, as follows: The principle is well shown by our combination of drawing and photograph. Each mermaid (or, in some cases, each set of two or three mermaids) has her own diving-bell. Before the curtain rises the mermaids take their stand under the diving bells, which are then lowered into the water. When the time comes for a mermaid to rise to the surface she holds her breath, ducks under the edge of the bell, rests a foot on the small platform shown at the side of the bell, and is raised to the surface by the attendant in the bell.



No Illusion, but Live Mermaids and Real Water

There is a special bell, also, for Father Neptune, his boat, and his party, and a small bell from which the comic man of the company catches a live dog at the end of his fishing line. The working of the device is easily illustrated. Take a glass tumbler and plunge it into the water, with the mouth perpendicularly down. It will be found that very little water will rise in the tumbler; but as air is compressible, it could not entirely exclude the water, which by its pressure condenses the air a little. The bells are made of boiler-plate, and have air-hose connections, telephone, and electric light. The mermaids are protected from cold by rubber under-garments, and their grease-paints are waterproof. Directions to the performers are given by telephone and by red and green signal lights. Many have thought the scene an illusion produced by an arrangement of mirrors; this should enlighten them.

TYPEWRITER WRITES WORDS AT SINGLE STROKE

A new typewriter will soon be put on the market which will write a complete word at one stroke. Twenty-two of the

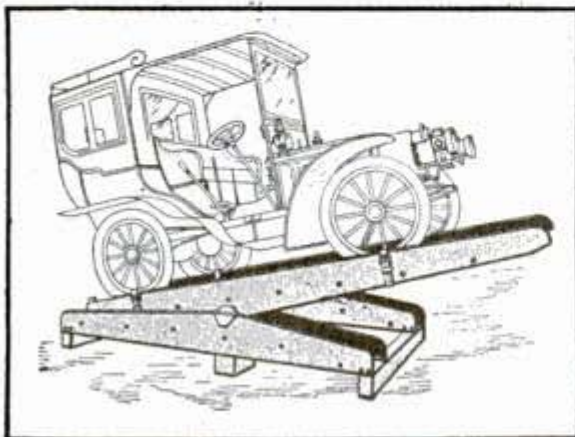


The Keyboard

short words most used in correspondence have been chosen, as indicated on the word-keys of the cut of the keyboard. The carriage shifts automatically by touching the proper key, and the platen revolves either forward or back in the same manner.

AUTO INSPECTION DEVICE

For purposes of repair or inspection, or for display in salesrooms, a Frenchman has invented the device illustrated. In operation the frame is secured with the long end on the floor. The car is run on, made secure, and a fastening released which allows the tilting frame and the car to tip as shown. The wheels run in a trough to allow an unobstructed view of the under side of the car.



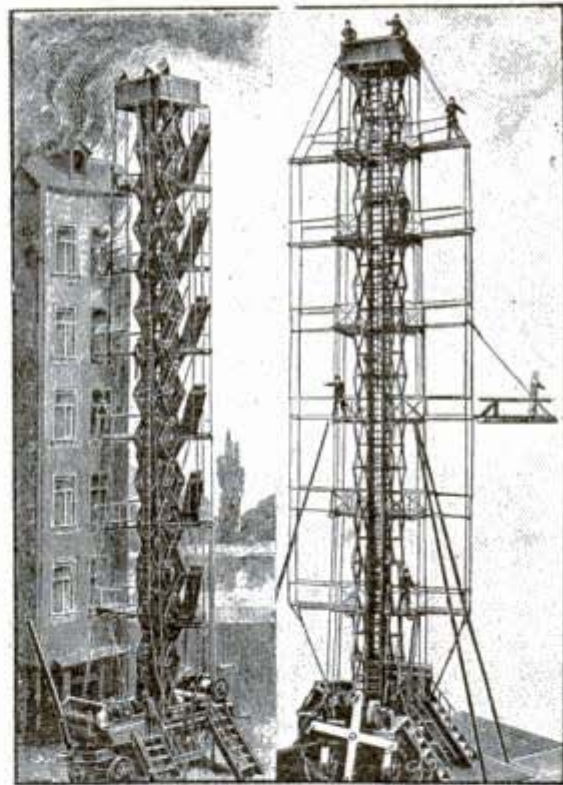
Handy for Repairs

A NEW FIRE TOWER

One of the latest inventions for fighting fire is the tower shown in the illustrations. The apparatus is mounted upon a car which can be used as an automobile or drawn by horses. Each pair of wheels has an independent steering device and their own motor, while a third motor is used to raise or lower the tower. Electricity is supplied by storage batteries.

The tower is built upon the principle of the accordion and can also be operated by hand, if necessary. The platform on top has flying bridges which are thrown out on either side to the various stories of a burning building.

A nozzle is placed on the upper plat-



Life-Saving Tower

form. It has a flexible connection with the ground and if the force from the water mains is not sufficient the truck has a special pump, operated by a motor, to raise the pressure as desired.

The tower makes a very compact body when it is collapsed. Outriggers on the base prevent any danger from top-heaviness when the apparatus is extended to its full height.

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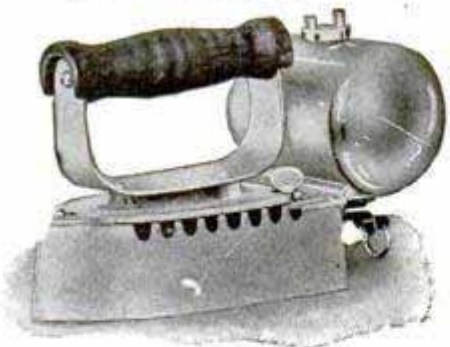
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Burns Gasoline or Alcohol.

In sending for our description and illustrated catalogue, please send us a rough draft, giving dimensions of your factory, shop, store or home and we will cheerfully send you an estimate for lighting, together with a few facts which will, at least, cause you to stop and think.

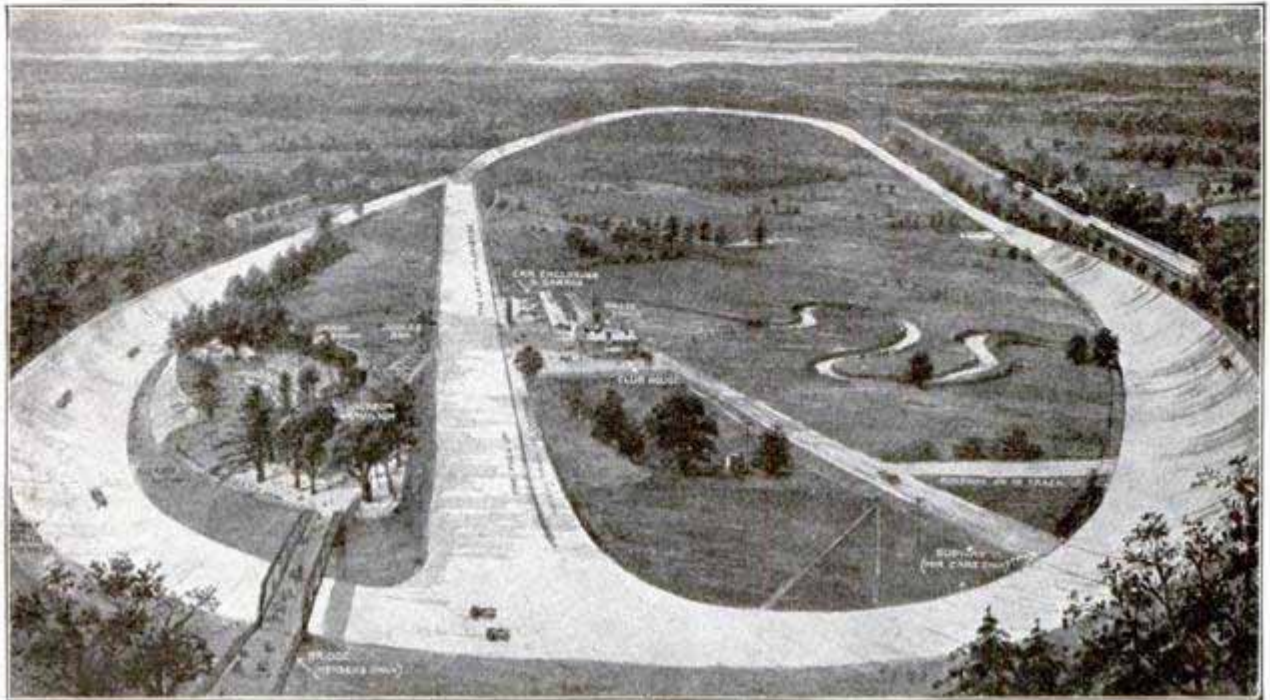
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ECONOMICAL, SAFE AND DURABLE A CHILD CAN OPERATE THIS SYSTEM

WHEN YOU WANT ANYTHING AND DON'T KNOW WHERE TO FIND IT WRITE POPULAR MECHANICS

MOST WONDERFUL RACE TRACK EVER BUILT

Speed of 120 Miles an Hour Possible—1,581 Miles in 1,440 Minutes Already Scored



The Great Race Course at Weybridge Station

Nothing in the way of a race course of ancient or modern times approaches the great autodrome of the Brookland, Eng., Automobile Racing Club. It is built to accommodate a speed of 120 miles an hour, and already S. F. Edge has a record of 1,581 miles in 1,440 minutes—24 hours—or an average speed of about 66 miles an hour.

This track is $2\frac{3}{4}$ miles long, 100 ft. wide, and at the curves raised to an ovaloid shape 28 ft. high. The entire course is covered with concrete 6 in. thick, in the making of which 200,000 tons of sand, gravel and cement were mixed. In the building 30 acres of forest were removed, a hill 50 ft. high and 700 ft. long dug away, and a river turned from its course. Seven miles of temporary railroad and 6 locomotives were required during the nine months of construction which cost \$750,000.

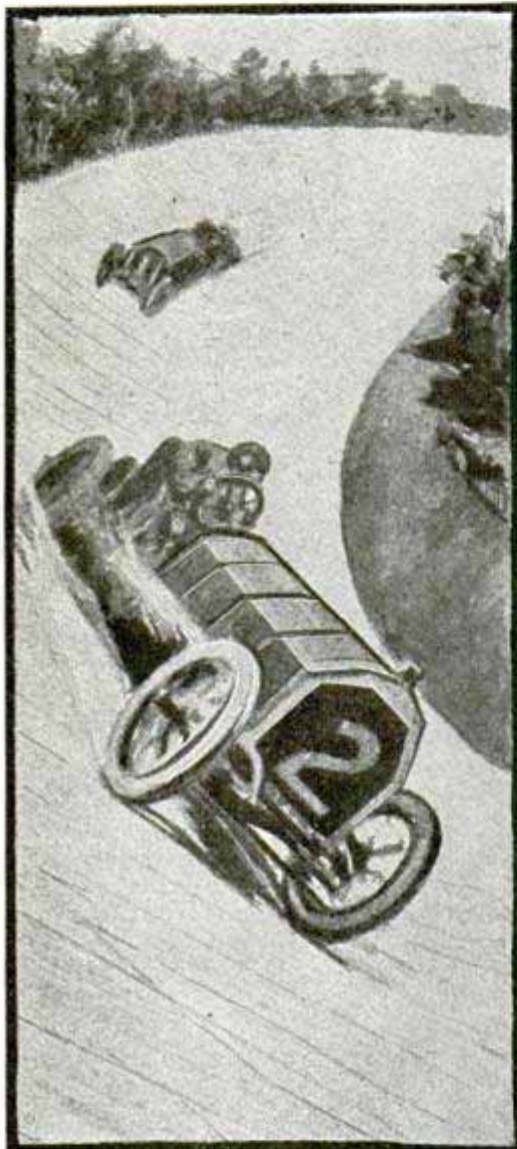
Grand stand seats on a hill within the inclosure will seat 30,000 people, and outside there is standing room for nearly a quarter of a million spectators. To protect them a double row of hand

rails, 15 ft. apart, extend around the track; between the rails policemen are stationed at frequent intervals. Electric signal boxes with sentries are located each 900 ft. No one can cross the track; visitors enter over a bridge, and automobiles through a subway. There are 28 large garages in the grounds.

The most powerful and fastest cars will be carried highest at the curves, at which moment the occupants will be nearly horizontal to the earth; the movement of the cars being similar to a pea rolled rapidly around in a bowl.

Commenting on the possibilities of the future the Motor Age says editorially: "Modern railroad locomotives have been, so far as speed is concerned, placed in not better than second place, and by the motor car. Imagine one car traveling continuously for 24 hours at an average speed of 66 miles an hour, and this on a circular track! What might be expected of this same monster were it to be turned loose on such a track as is furnished the locomotive? A railroad promoting company has

boasted it will carry passengers between New York and Chicago in 10 hours and has been laughed at for making such a wild statement. It is neither



Courtesy Motor, London

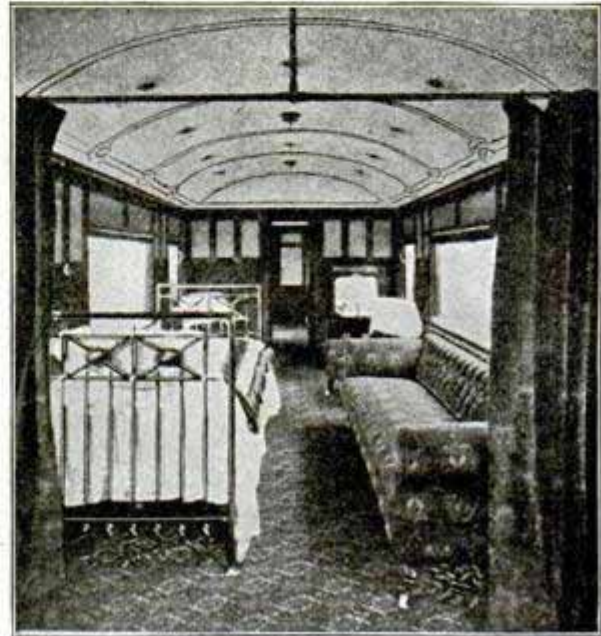
Taking the Curve

impossible nor improbable; it will happen within a very short time. It is not likely steam will be the motive power—it will be a fight between the adherents of electric motors and those of internal combustion motors, with odds favoring the latter.”

An average of 400 ft., board measure, of lumber, per capita, is used in this country against a European average of but 60 ft. Moreover, practically 75% of the cubic contents of a tree is lost in logging and in failure to adapt board lengths to the peculiarities of the tree rather than arbitrary rules of the trade.

ENGLISH FAMILY CAR

One of the English railroads has put in service new special cars for family use. These cars are 50 ft. long with a private baggage room at one end. The interior finish is expensive with



Like a Home Parlor

very handsome effects. One compartment has a regulation bedstead, which in case of illness can be suspended to reduce the jar.



Lanterns Mark the Course at Night

DARING WORK OF STEEPLEJACK

Rides to Work on Wire Rope 200 Ft. in Air

A Philadelphia plant has a brick stack that was until recently topped by a 2-ton metal cap in eight sections. It became so corroded that it was necessary to remove it. The stack is 13 ft. in diameter at the top and flares out. The only way to get to it was by passing through a 65-ft. underground flue to the interior of the stack, and then scaffolding up. This flue was so filled with soot and gases, that John Hassler and his assistant, who did the work, were twice nearly overcome as they carried in lumber for the scaffold.

After the steeplejacks reached the top they rigged up a tackle which connected with an iron chimney 200 ft. high and 75 ft. away. Access was had to the iron stack by an outside ladder and it was then an easy matter to transfer material and themselves.

THE CATALPA AS A LUMBER TREE

The catalpa was esteemed very highly by the Indians and old settlers of Indiana. The former traveled hundreds of miles to obtain the logs for their canoes. They were light, durable, easily worked, and did not crack or check with alternate wet and dry conditions.

The settlers used it for various purposes, in fact for almost everything, always taking it in preference to oak, walnut or ash. Plow-beams, hay frames, ladders, windmills and fences were all made of it. Early railroads used it for telegraph poles and it gave exceptional satisfaction, so much so, in fact, that the natural supply was soon exhausted. Efforts are being made to plant extensive forests of catalpa. Here are some of the things it does:

In 20 years grows 40 ft. high and 20 in. thick; in 50 years, 100 ft. high and 30 in. thick.

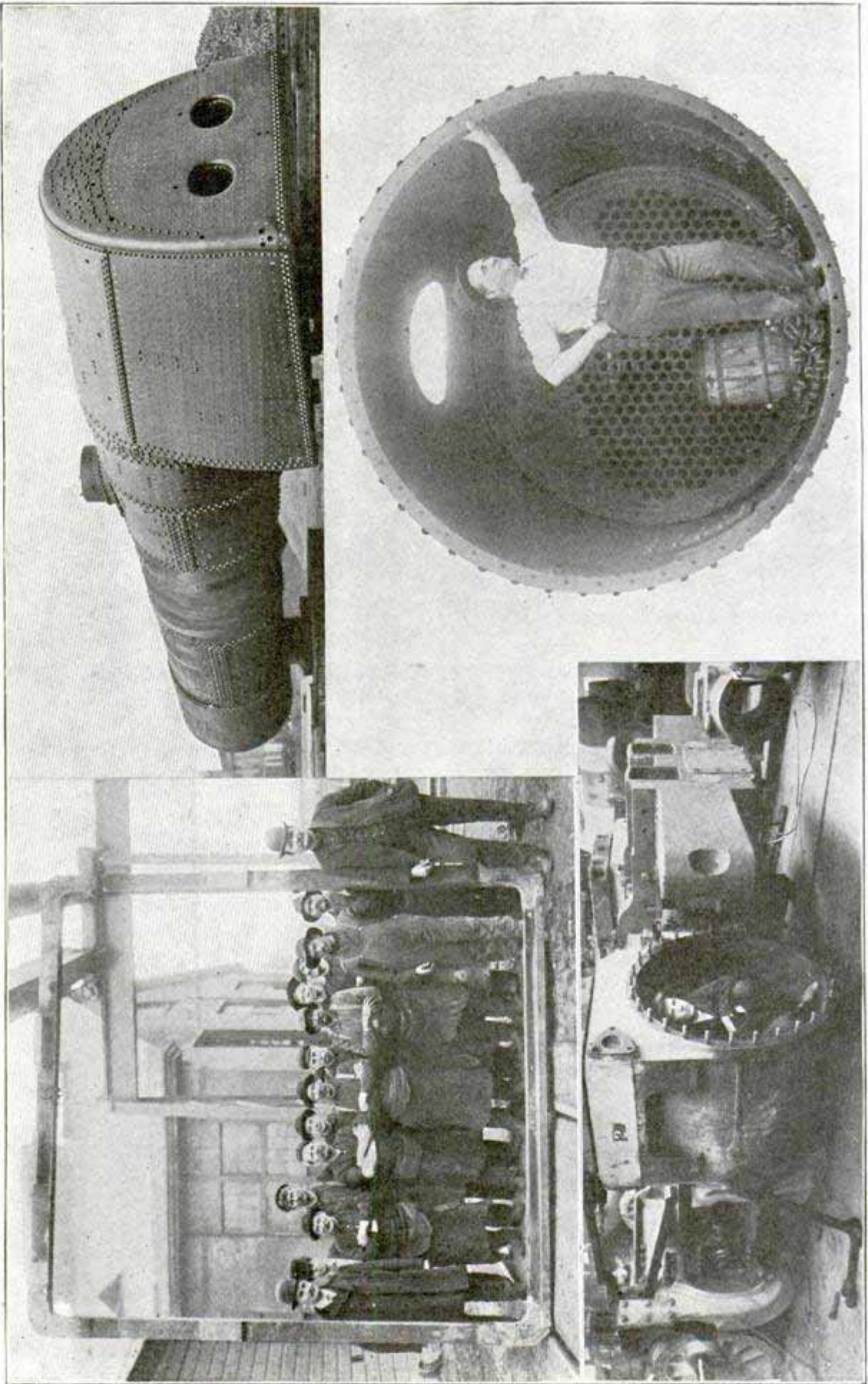
As fence posts it lasts 85 years; as railroad tie has lasted 32 years. In 12 years grows large enough for a telegraph pole. Makes excellent furniture, and book paper. An oak takes 12 times as long to grow and lasts only half as long in ground.

For a few hundred dollars a young man can buy cheap land and plant it with catalpa, which will be worth thousands of dollars by the time he is 45 years old.



PUMPED CARGO INTO THE SEA

The crew of a San Francisco tank steamer, carrying oil, imbibed too freely and became inebriated. Thinking to pump out the bilge water in the hold, they started what they thought were the bilge pumps, but which in reality were the ones which emptied the tanks, and as a result 5,000 bbl., or about 200,000 gal., of California oil were wasted.



HEAVIEST LOCOMOTIVE EVER BUILT

Will Haul a Train of Cars Two Miles Long, on Level Track

The interest of the locomotive world is at present centered in the three articulated compound locomotives now building at the Schenectady works of the American Locomotive Co. for the Erie railroad. These engines will be the heaviest and most powerful locomotives ever built and will break all records in locomotive construction. They are of the type known as the Mallet compound and will have sixteen driving-wheels, arranged in two independent groups of eight each. The high-pressure cylinders which are 25 in. in diameter by 28 in. stroke drive on the rear group of driving-wheels, and the low-pressure cylinders which are 39 in. in diameter by the same stroke drive on the forward group of wheels. The four rear pairs of wheels are arranged in frames which are rigidly attached to the boiler. The forward four pair of drivers are, however, carried in frames which are not rigidly connected to the barrel of the boiler, but which are in fact a truck; this truck swivels radially from a center pin located just in advance of the high-pressure cylinders.

The locomotive alone without tender will weigh 205 tons, and will haul on the level 320 loaded freight cars, or a train about two miles long. In the accompanying photographs are shown the boiler and firebox foundation ring and low-pressure cylinders of these immense machines. The boiler is over 43 ft. long and the inside diameter of the largest ring is 8 ft. It is provided with 404 tubes $2\frac{1}{4}$ in. in diameter, and 21 ft. long. The water alone in the boiler will weigh 42,700 lb., and the tubes weigh 23,700 lb. The firebox of this boiler would make a good-sized living room, being $10\frac{1}{2}$ ft. long and $9\frac{1}{2}$ ft. wide inside, and having a grate area of 100 sq. ft. The man standing at the right in the illustration of the firebox foundation ring is 6 ft. 3 in. tall, which gives a good idea of the immense proportions of the ring itself.

The first example of this type of locomotive in this country was the Mallet compound built by the same company for the B. & O. in 1904. This engine astounded the locomotive world at that time by its enormous size, but these engines for the Erie railroad will be as much heavier than their predecessor as that engine was than the largest locomotive of its time. The decided success of the Baltimore & Ohio engine, however, has proved the advantages offered by this type for exceptional weight and hauling power, and justifies this still greater development of the type.

These engines will be completed about the middle of next month and will be watched with interest by the whole railroad world.

COST OF COOKING BY VARIOUS MEANS

Tests made by cooking meat for one hour gave results for five different methods, as shown in the accompanying table:

Electricity, per hour.....	4.128 cts.
Coal, per hour.....	3.675 cts.
Gas, per hour.....	2.000 cts.
Gasoline, per hour.....	1.248 cts.
Kerosene, per hour.....	1.092 cts.

An investigation of the table shows that electricity would cost twice as much as gas. In most localities, how-

ever, the unit cost of electricity would be higher. Also the prices of gasoline and kerosene are very low for a good many places. It is usually considered that cooking by coal is cheaper than by gas.

The advantages of electric cooking are that there are no ashes, smoke, or soot, very little heat and no danger of explosion.

NEW METHOD OF REVIVING THE DROWNED

Surgeon Claims to Resuscitate Bodies which Have Been Six Hours under Water

If the discovery by Dr. H. K. Whitford, of Elgin, Ill., proves to be what he predicts, hundreds of lives will be saved every year. He declares he is able to revive human life after it has been submerged in water up to six hours.

The theory advanced by Dr. Whitford, and deemed not an illogical one by physicians, is an entirely new one. In speaking of his method, he says:

"It is impossible for a drop of water to enter the lungs of a person who enters the water alive. This is in contradiction to the time honored belief that the lungs of a drowned person are filled with water.

"The water striking the larynx causes a spasm which closes the lungs, and prevents the entrance of water for a period of nine days, until relaxation

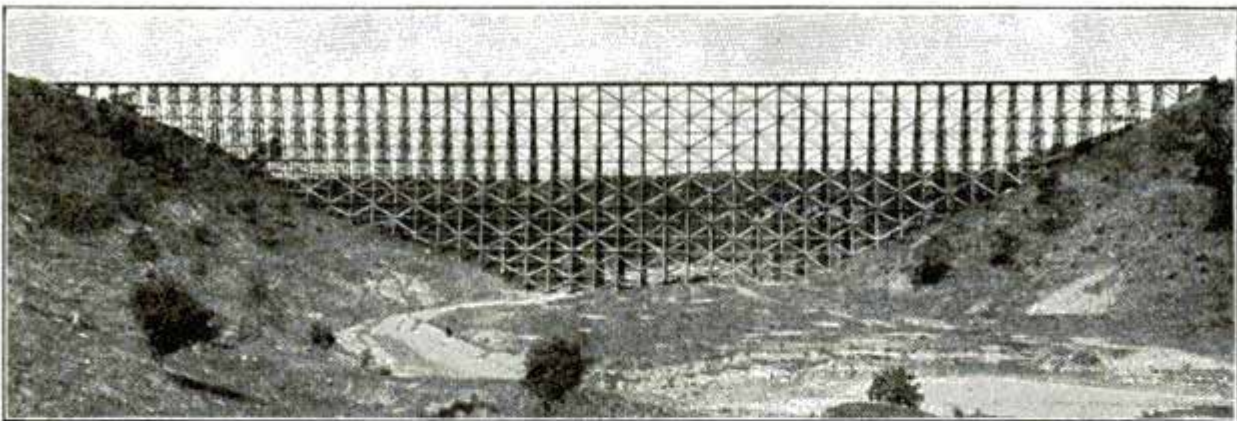
commences. Drowning, so called, is merely suspended animation, and not death.

"To restore animation I proceed first to thoroughly warm the body chilled by long submersion. This is accomplished with hot water, in which the subject is immersed for 20 minutes or longer. Following this, the old and ordinary methods of restoration are resorted to."

This process, he says, makes possible the saving of lives of persons who have been submerged for a time—not exceeding six hours. Dr. Whitford claims never to have failed in his method of resuscitation, and believes that it will be adopted universally.

There were over 300 deaths from drowning in this country from January to July 10, and before the snow flies this number will be almost doubled.

ELECTRIC RAILWAY BRIDGE 800 FT. LONG



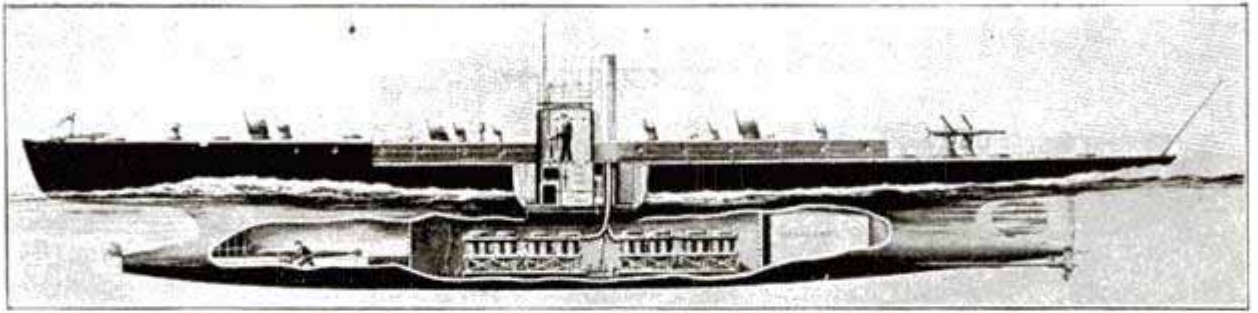
Largest Trolley Line Bridge Yet Constructed

The interurban electric railways are not only competing with the big steam roads, but are building tracks and bridges which formerly were attempted only by "railroads." An instance of this is seen in the illustration of the largest trolley line bridge yet constructed. This trestle crosses a deep ravine near Boone, Iowa, and is 165 ft. high and 800 ft. long. It is also

unusual, in these days, being made of timber.

Another interesting feature is the fuel supply. The power house is built over a coal mine.

The United States will build two battleships, each 3,000 tons heavier than any afloat, and to cost \$10,000,000 each.



NEW TORPEDO BOAT

"Waterclad" Subsurface Craft—Not a Submarine

A strange new fighting craft, the Burger subsurface torpedo boat, was tested by the Construction Board of the United States Navy. Neither submarine nor surface vessel, it is a combination of both. There are two distinct hulls connected by a "waist," with the engines, steering gear, torpedoes and torpedo tubes beneath the surface, out of sight and out of the reach of shot and shell.

Unlike a submarine, it will be able to go to sea alone, to hold a steady vision of the enemy, and to maintain a high speed—as great as 20 knots an hour. Unlike a torpedo boat, it has the quality of invulnerability, for all the "vitals" are nearly 5 ft. under the water line. The craft has been called a "waterclad."

The conning tower is the only vulnerable part when the boat is in action. It is covered with Krupp armor $4\frac{1}{2}$ in. thick, which furnishes protection against small rapid-fire guns. This tower is too small to be hit by the big guns except through chance.

The upper hull, the one that lies on the top of the water, is in effect a float, and is divided into separate compartments filled with cellulose. If a shell should go through one of the compartments the cellulose would expand at once and fill the hole, for that is the principal characteristic of the substance—no sooner does it become moist than it begins to swell.

In the heavily armored conning tower are the steering wheel and the signals to the engine and torpedo room. Through the tower rises the main air shaft terminating in a stack, through

which foul air and stray gasoline vapors may escape. Fresh air for ventilation and engine combustion is taken in through openings in the tower when the boat is in action. The exhaust for the engines is led up into the air stack. An armored ammunition hoist leads upward from magazine to after deck.

The offensive armament consists of a bow torpedo tube with three 21-in. torpedoes having a range of from 3,500 to 5,000 yd. and a speed of 35 knots. The torpedoes are discharged from the tube 13 ft. below the water surface. Two rapid fire guns on the upper deck serve to keep hostile torpedo boats and destroyers at a distance.

When the subsurface boat is not in action the upper hull will afford the usual conveniences for stowing boats and anchors, and for exercising the crew. Amidships, between the cellulose compartments on the sides, are arranged comfortable quarters for the officers and crew. Thus when fighting is not in progress the subsurface boat is much like any other. When the danger zone is approached, however, the crew get into the submerged hull. Then the greater part of the upper, or exposed, hull could be shot away without destroying the stability or efficiency of the submerged torpedo boat. The vessel is patented and costs \$250,000. Gasoline engines furnish the power.

The latest fad among the wealthy is hand-made cloth. This going back to hand-made goods in cloth, furniture and printing will probably be followed by other reversions.

MOVING A RAILROAD SIDeways

Down on the Panama Canal machinery must be made to relieve hand labor to the utmost, and if no machine is at hand to do the work required, the engineers have to rig up something even though the device is not described in the books. Such a machine is the patented invention of General Manager Bierd, of the Panama railroad. He had occasion to move many miles of track several feet to one side.

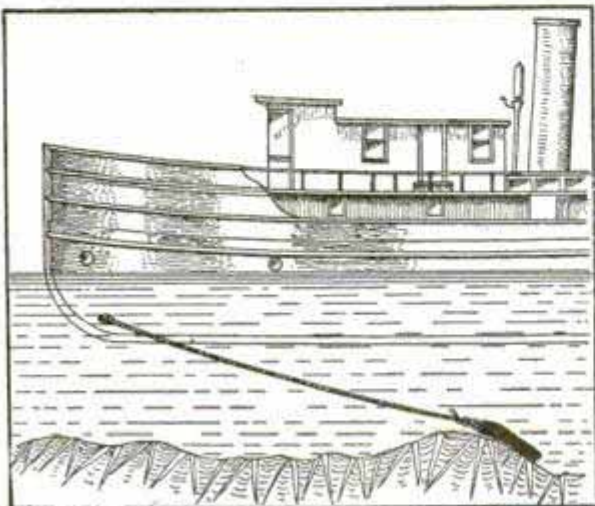
To do this he rigged up the machine shown in the cut which operates very much like a steam shovel with hooks instead of the shovel. Two lifts are made of each section, one rail length long, with a crew consisting of a foreman, engineer, fireman and four laborers. In 8 hours they move 6,000 ft. of track a distance of 4 ft. sideways at a cost of half a cent a foot.



Moved 6000 Ft. of Track 4 Ft. Sideways in 8 Hours

MACHINE DRAWS MAPS OF OCEAN BOTTOM

An instrument has recently been invented for recording the depth of water, and which makes a pen record

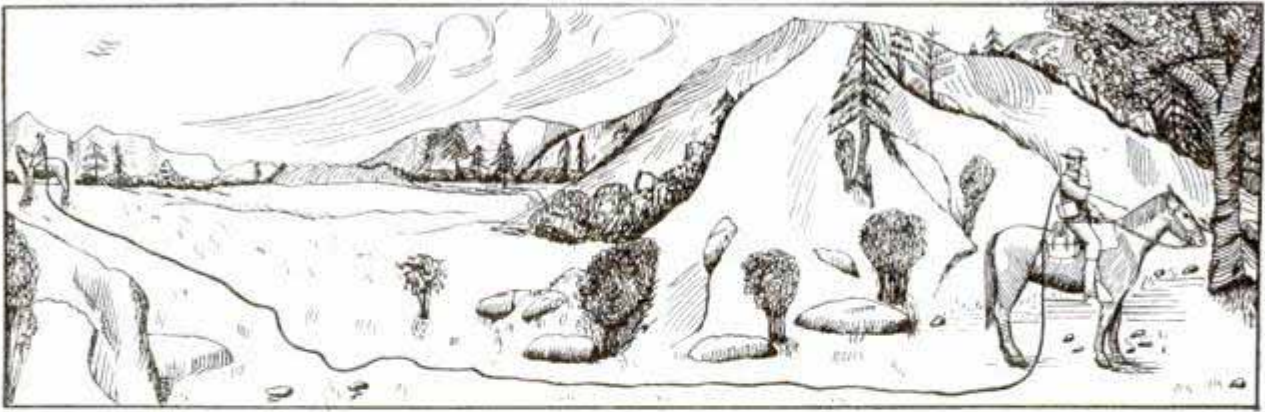


Records Submarine Elevations

something on the principle of the machine which records the rough places in a railroad track. A slab of metal attached to a rope is dragged over the bottom by a boat moving slowly. The other end of the rope extends over pulleys to the charting room, where a pen records the ups and downs, or peaks and valleys of the bottom, making a topographical map. Experts know how to translate these tracings into feet or fathoms. The results are much more accurate and vastly quicker than the old method of sounding with a hand line.

GOLD CARGO; DIDN'T KNOW IT

The captain of the "Ohio" sailed into Seattle with a gold laden cargo when the captain thought he had only sand ballast. The ship was partly wrecked at home, and after temporary repairs had to go to Seattle for docking. Several hundred tons of sand ballast were dredged near Nome and loaded into the hold. On arrival at Seattle its rich gold bearing qualities were accidentally discovered by a dock hand, who panned a shovelful and reported his find.



CAVALRY HORSES USED AS TELEGRAPH WIRES

Scout on Horseback Sends Telegrams to Distant Headquarters without Stopping

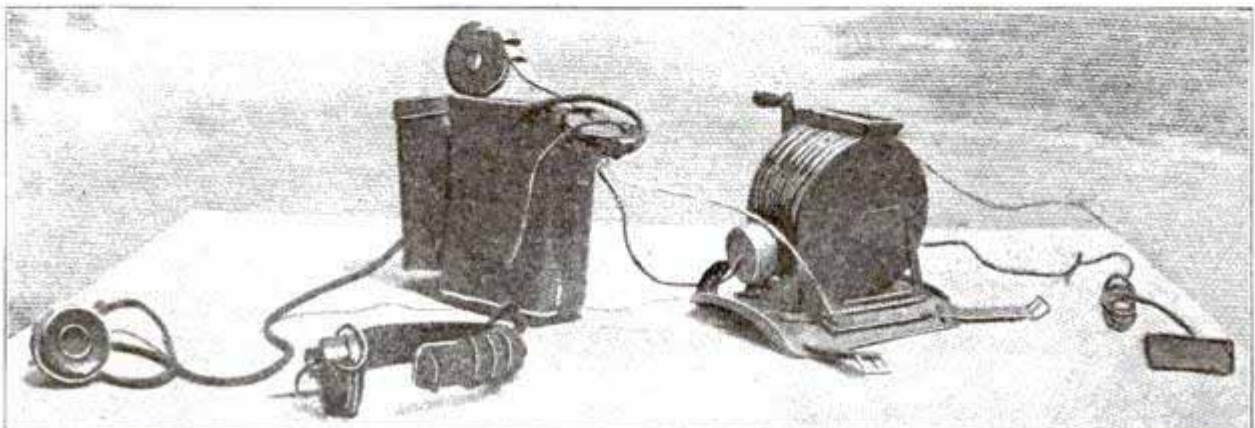
[The following is condensed from a detailed account by First Lieutenant A. C. Knowles, which appears in the Journal of the U. S. Cavalry Association for July.—Editor.]

The photographs shown herewith illustrate a combined telegraph and telephone system in which the horses are a part of the electrical circuit. The riders are equipped with breast reels, containing five miles of wire, and cavalry buzzers, or instruments for receiving and transmitting messages.

Heretofore when a mounted scout, equipped in this manner, desired to communicate with the main force, or headquarters, it was necessary for him to dismount and establish a connection by driving a metal pin into the ground. This completed a circuit through the line he was reeling out, his instruments, and thence through the earth to the home station. This, however, was very inconvenient, due to the necessity of dismounting. Also it was an impossi-

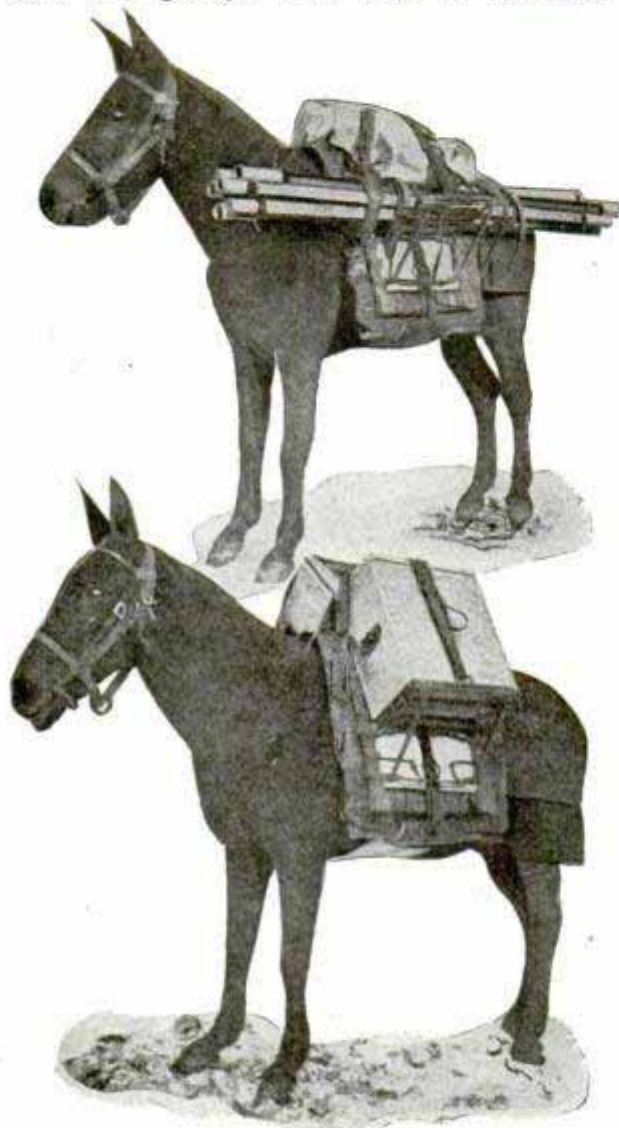
bility for the station at headquarters to get into communication with the scout except when the latter chose to drive the connecting pin into the earth.

Many experiments were tried, until finally those of Lieutenant Knowles were successful, and a system was evolved which works satisfactorily. When a mounted operator is sent out to accompany a reconnoitering patrol, or any body of troops whose duty takes them far enough away from the main force to make electrical communication desirable, constant connection can be had with them through the rider. It is not necessary for him to dismount to establish a circuit, for he can receive messages even while his horse is on a trot. This enables the officer at headquarters to call the party back after it is several miles away; change the order as to destination; or give any emer-



Buzzer, Head Piece, Transmitter and Breast Reel

gency order which may be necessary. Heretofore a mounted messenger had to follow at full speed to find and overtake the party, with loss of valuable



New Wireless Outfit

time when each minute counts. To accomplish this the body of the horse is made part of the circuit, by means of a small piece of copper placed next the skin—the hair having been shaved off, and the copper plate connected to the instrument.

As the horse always has one or more feet upon the ground, except possibly for an instant when galloping, a constant ground connection is obtained through its hoofs. Of the horses used few show any discomfiture at the unusual sensation and those that are restive soon become quieted and accustomed to the tingling, as the current passes through their bodies. The commander of the patrol may ride alongside and dictate a message or take the

telephone attachment himself and talk direct with headquarters. All of this can be done on a gallop, while the scouting force moves rapidly ahead.

Tests of this system were made over all kinds of ground—very wet, muddy, moist, perfectly dry and dusty roads and fields—and in all cases the tests were entirely satisfactory. The illustrations show two horses 5 miles apart and standing upon grass. Results were perfect and the receiver could be heard several feet away from the instrument.

The apparatus is very compact, being packed in two small cases and carried over the shoulder like a field-glass. One case contains the telegraphic instruments and dry batteries. The other carries the telephone attachment. The latter is connected by inserting a plug in the first-named case. On starting out the operator pays out an insulated wire which is allowed to fall on the ground. This wire is carried on spools each containing half a mile. On the return, if time and circumstances permit, the wire is rewound on reels fastened to the breast of one of the men.

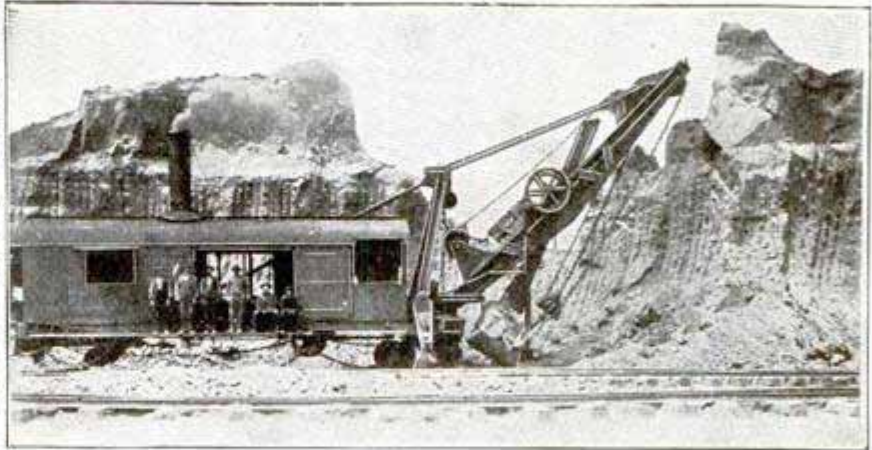
Wireless telegraphy will still play a most important part in field work, and almost the first duty of a signal corps is to set up the apparatus and establish communications after a base has been chosen. As in almost every other phase of army life, the mule has a very important duty in the wireless system, for it is upon his sturdy back that all the apparatus is transported. Recent improvements, however, have reduced the number of mules required to three: One carries the storage batteries, another the operating chest, and the third the extension mast, guys and antenna.

Pearls turned yellow by long wearing may be made white again by placing in a bag with wheat bran and moving them constantly over a coal fire.

The biggest cranberry bog in the world will occupy 500 acres in Massachusetts and will be artificially irrigated.

REMOVED A HILL IN THREE YEARS

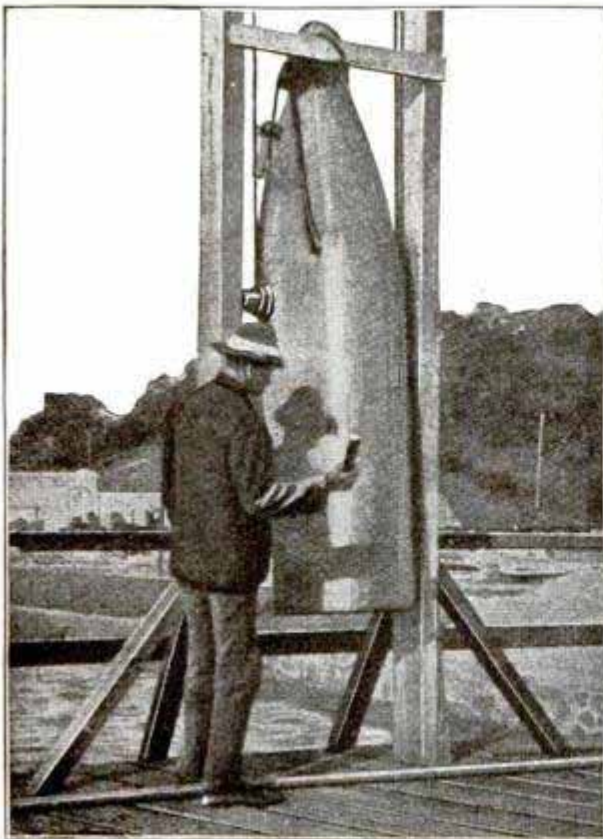
A manufacturing concern in Cleveland needed more room in which to build new factories, but a hill 800 ft. long, 500 ft. wide and 100 ft. high stood in the way. It was decided to dig away the hill and a big steam shovel has now finished the job after working for three years. The shovel deposited the dirt into small cars from which it was dumped into scows on the river, and then towed five miles out into the lake and again dumped.



This Machine Dug Away a Hill 800 Feet Long

METAL SHELL FOR BELL

One of the big projectiles intended for the mammoth coast defense guns tested at Sandy Hook, exploded while being transported thither. The metal shell or casing was but little injured, and when the public clock at the fort gave out, the shell was slung up and has been used as a bell ever since.

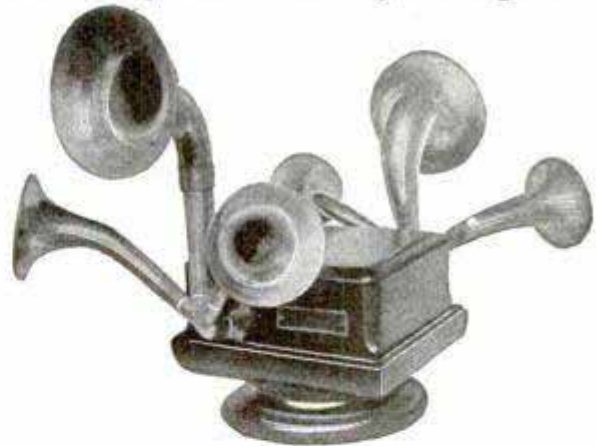


Ringing the Bell

The sound is a far reaching and peculiar one, quite unlike any ship's bell, and is produced by striking the shell with a piece of hard wood or metal. The bell "pounder" is a negro 80 years old who has been on the retired list some time but who refuses to leave, or allow anyone else to sound the bell.

MECHANICAL TRAIN CALLER

No matter how large a depot may be, the new system of calling the departure



Calls Departure of Trains

of trains announces the fact simultaneously in every part of the building. The instrument, which is called a telegraphophone, is really a telephone with one transmitter into which the caller speaks, and a large number of receivers connected with horns for magnifying the sound. It is the intention to place the receivers in all the various smoking, restaurant and waiting rooms where passengers congregate.

RAILROAD SAVES STARVING SHEEP

To Do So Abandons All Other Traffic

The Queensland downs of New South Wales are the richest sheep pastures in the world—except when one of the fearful drouths occur, such as hap-



Rescued From Famine

pened last year. At that time sheep valued at \$10,000,000 were threatened with utter extinction. Owners were in despair and appealed to the Government for help.

A narrow gauge steam railway traverses the district, and was used in saving the flocks. For weeks other traffic was abandoned, and everything in the shape of a car was pressed into service. As there was water at one end of the line, wooden tanks were built as fast as possible, placed on cars, filled, and kept moving constantly, carrying water all along the line. The sheep quickly learned that the sound of a locomotive whistle meant renewed life, and hundreds were killed beneath the wheels in their irresistible rush for the water

train. Hundreds of tons of molasses and sugar cane tops were shipped in to relieve the famine until the herds could be removed.

The sheep were brought out of the district in freight cars of every description. Thousands were too weak to walk and had to be lifted aboard by men. Once on a train it was rushed to destinations where there were water and feed.

During the few months of drouth more than 1,000,000 sheep, 7,000 horses and 6,600 cattle were carried on the little road. In all the history of railroading there never was an instance where a line was given up to work of this kind exclusively for so long a period.

MOUNTAIN CLIMBING SLED IN SWITZERLAND

There has been introduced in the Swiss mountains, for use during winter months, a mountain climbing sled, which is proving as convenient as the bicycle on level ground. The sled consists of two bobs and is propelled by pedals and gears and a sharp toothed wheel which is forced down into the hard snow of a path. The general construction requires no detailed explanation. Any person handy with tools can build one out of two worn out bicycles, and for use on frozen rivers, ponds or lakes it will be found capable of high speed.



Propelled Like a Bicycle

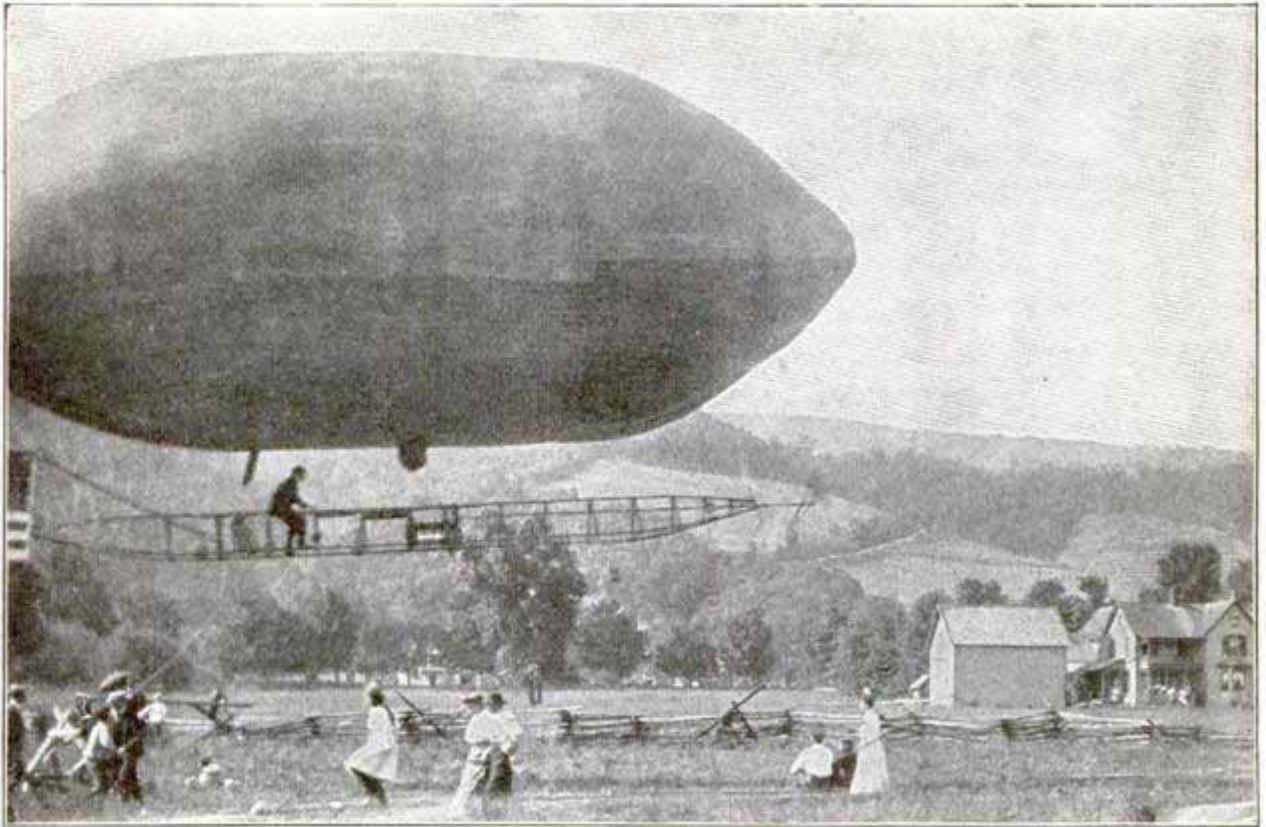


Photo Courtesy Curtiss Mfg. Co.

The above illustration shows Capt. T. S. Baldwin's airship starting on its flight near Hammondsport, N. Y. The gasbag is 52 ft. long and 17 ft. in diameter. The frame is 42 ft. long and 3 ft. high. This flight lasted 30 minutes, during which the ship rose to a height of 3,000 ft. and maneuvered successfully, alighting within a few feet of the starting place. The test was watched by prominent officers of the army.

TYING SACKS WITH WIRE

Millers are finding they can save time by tying sacks with a piece of wire instead of twine. The American Miller tells how to do the tying:

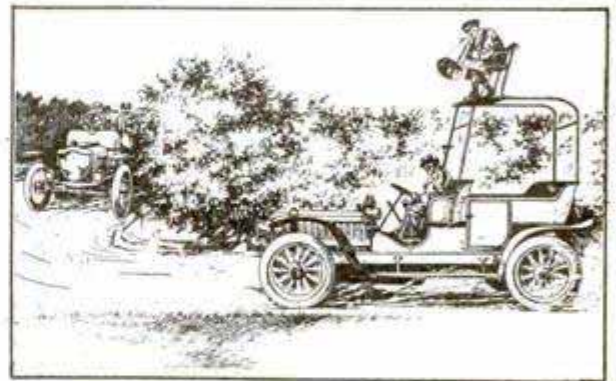
"Wrap the wire around the mouth of the sack twice, being careful to bring the second wrap so as to be below the first, in order to prevent slipping; then twist the ends of the wire twice, cutting the wire and bending upward, and the sack is tied. This can easily and quickly be done with the fingers and will excel all other ties and is easily untied."



"The public be," no not — but "informed" regarding all accidents hereafter. That is the latest order on the Harriman lines.

LOOK-OUT MAN FOR AUTOS

Owners of motorcars are experiencing trouble in England, owing to the many sharp turns in the road which are concealed by tall hedges. The effort to have the hedges cut down has raised

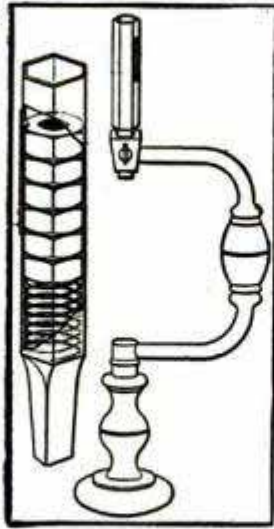


"Car on your Starboard Bow, Sir"

a storm of protest. The editor of Motor, London, facetiously suggests a look-out man on the car, preferably an old sailor, and pictures him as announcing through a megaphone "Car on your starboard bow, sir."

MAGAZINE WRENCH

For rapid work in changing tires during an automobile race the tool illustrated is used in France. The tool is nothing more than a socket wrench with sufficient length to hold the number of nuts necessary for one rim and with a shank made to fit any brace. As the nuts are received one by one they compress a helical spring in the bottom, and are retained by an automatic spring catch at the side, of the tool. Each time the spring catch is released a nut is ready for service.



BLIND OPERATOR EXPERT TELE- GRAPHER

Gilbert McDonald, of Maunie, Ill., occupies a unique position in the field of telegraphy. Blind since birth, he has nevertheless so perfected himself in the art, that he is a skilled operator,



Blind Since Birth, Expert Telegrapher

and is thought to be the only one in the world in active service.

When he was 12 years old he commenced to study the telegraph. His use of the code language was limited and to overcome this he wrote long lists of words on the typewriter, as they came over the wire. In the evenings his sisters would teach him the meanings of these words. Thus he enlarged his vocabulary to over 2,000 words.

McDonald uses the typewriter with dispatch, and when working the telegraph key can send over 40 words per minute, using either hand. He is assistant station agent, performing the usual duties of that position and weighing baggage by the sense of touch. He recently refused the post of instructor of telegraphy at the Illinois state school for the blind.

TILTING-BOARD PUMP

The tilting-board pump is a familiar sight in those parts of Bavaria where

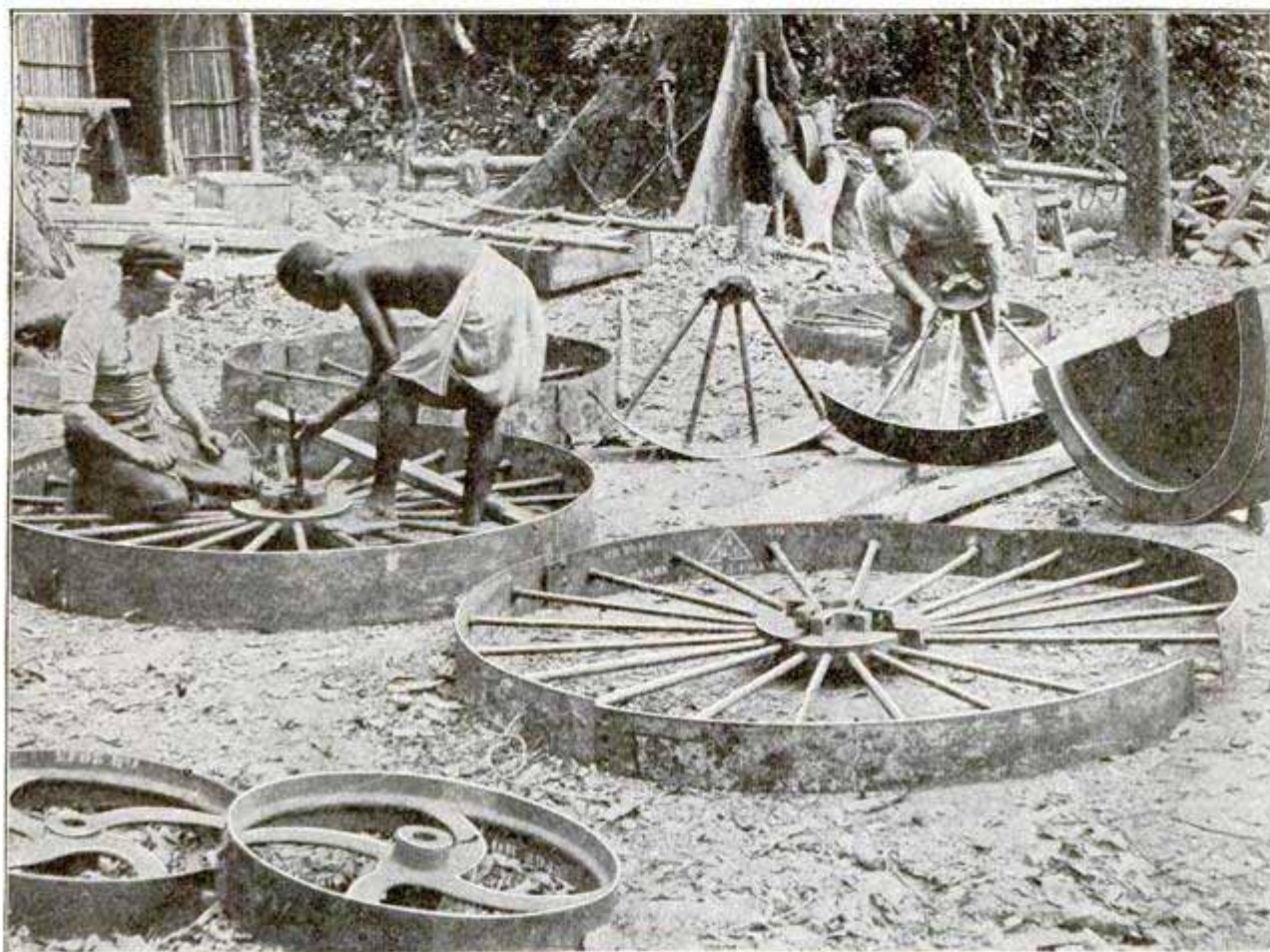


Teeter-Totter Pumps the Water

irrigation is employed. The pumpers stand face to face holding on to a cross bar, and by shifting their position, forward and back, cause the pump rod to work up and down. The movement should be regular to obtain the best results.

TRACTION ENGINES IN AFRICAN JUNGLES

**Worshipped by the Natives as Fire-Gods—Great Mining Operations
Impossible without these Trackless Trains**



Assembling a Traction Engine in the Jungle

In no savage land has such a magical change been wrought, mechanically as well as socially, as in West Africa, the land of fevers, wild beasts, treacherous natives—and golden reefs and streams. It is only quite recently that King Prempeh sat on his golden stool in Coomassie, the capital of Ashantee, and paved his palace yard with human skulls.

He massacred with every circumstance of horror, several white missionaries and traders, and the British sent an expedition against him. After a long and costly struggle, the blood-thirsty tyrant was overthrown and the whole territory of Ashantee thrown open to the gold-seekers.

Last year over fifty million dollars' worth of bullion and dust was taken

out of this region under circumstances that well illustrate the romance of gold hunting. Be it remembered that Ashantee is hundreds of miles inland from the West Coast of Africa, and Coomassie is fenced in with hundreds of miles of pestiferous jungles, and fever-haunted swamps, from which at dusk rise white steamy vapors, laden with death for the white man.

But the greatest problem of all has been that of transport. Pioneers saw that every little forest stream fairly ran with gold, and it seemed such an easy matter to pick up a fortune. Labor, however, was not to be had, for the West African savage is lazier than any other, doubtless by reason of the terrible climate. Soon the labor question became gravely critical, because

great corporations began to establish vast and costly plants in Ashantee.

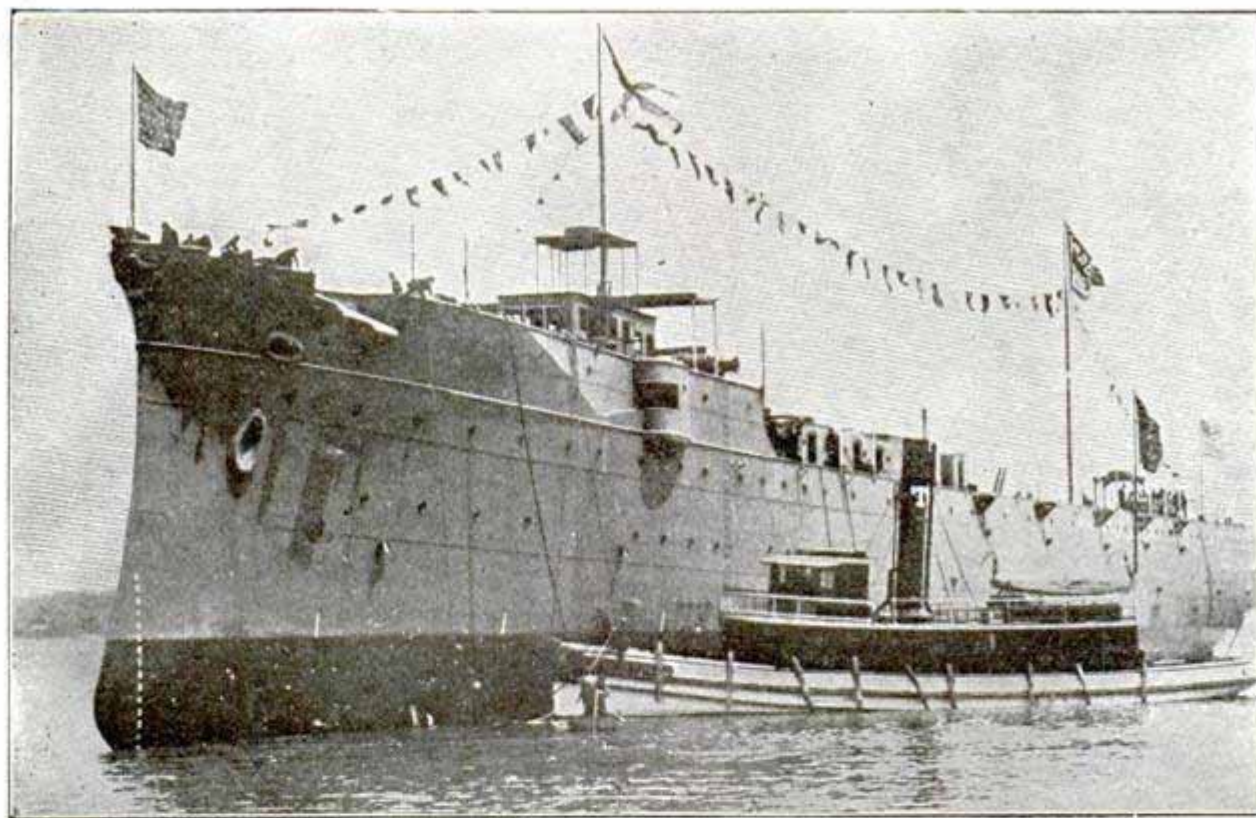
The wilderness had to be cleared and kept cleared. For in these luxuriant wilds a clearing of this month becomes a jungle the month following. And yet, despite all adverse conditions, West Africa grew in importance as a gold producer. The greatest problem of all was the question of transporting supplies from big steamers on the coast into the heart of this most difficult of countries. There was nothing for it, after many experiments with great trains of coolies who were paid fantastic wages, but to import broad-wheeled traction engines which, however, had to be built in convenient sections, so that they might be borne through the tremendous West African forests in man-carried loads.

All these would be dumped down

near the great mines, and then put together by natives under the superintendence of white engineers. The first engine, when set in motion was worshiped as a god for hundreds of miles around, mainly by reason of its great strength. Soon passable roads were cut through the wilderness from the coast, and big trains of broad-wheeled wagons passed to and fro carrying machinery, clothing, tools, provisions and a hundred and one necessaries for the thousands of white men now employed in West Africa's interior.

For besides gold there are other treasures in the shape of mahogany and teak forests, not to mention great deposits of tin. The traction engines, therefore, have solved the problem of West Africa's development and enabled many struggling properties to tide over their bad days.

NEW TYPE U. S. CRUISERS



The Birmingham Immediately after Launching

The latest type of United States cruisers, of which the "Chester," "Salem" and "Birmingham" are under construction; is seen in the illustration,

which shows the "Birmingham" immediately after launching. These sister ships will use turbine engines and are planned to be the fastest in our Navy.

FIRE DEPARTMENT WORK ON JULY FOURTH

Many fire departments have a special call assignment for companies during the 24 hours of July 4th. The system has been a success where it has been tried, and when properly planned and executed it has reduced the number of useless runs, besides always keeping heavily populated districts well protected with reserve companies.

When a first alarm is sounded, only a portion of the usual quota of engines respond unless the commanding officer rings for others. A second call brings the remainder of the companies which ordinarily would respond to a first alarm. A third call brings the teams which usually respond to a second alarm; a fourth call brings the third alarm teams, etc. If the fire grows to large proportions, the second and sometimes the third call is omitted, and the third or fourth alarm, as the case may be, sounded direct.

The average Fourth of July fire is usually a small matter, and as a rule a single chemical engine is sufficient to extinguish it. The alarm system described meets the emergency with one or two engines and saves the others from unnecessary hard runs.

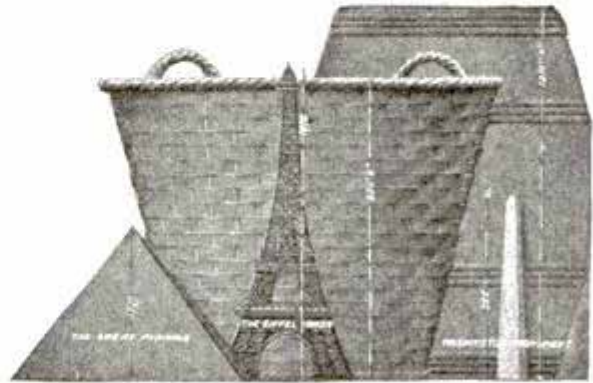
SUPREMACY OF WHITE BREAD

White bread is rapidly becoming the bread of the entire civilized world, and its use is increasing every year. Milling, a Liverpool journal, says:

The change is becoming more pronounced every year, but as the wheat production in the rye-consuming countries does not increase pro rata, it is throwing more demand on wheat from other growers. In the Far East the tendency to replace rice by wheat is another instance of the triumph of the latter. As knowledge grows dietary customs give place to more enlightened foods. Growers of rice and rye will become wheat producers, but probably not as fast as the consumers change from one to the other food.

GRAPHIC ILLUSTRATION OF U. S. WHEAT CROP

The wheat crop of the United States last year was 735,261,970 bu., a quantity difficult to comprehend. The Scientific American has made a graphic illustration of this by an imaginary basket 792 ft. in diameter at

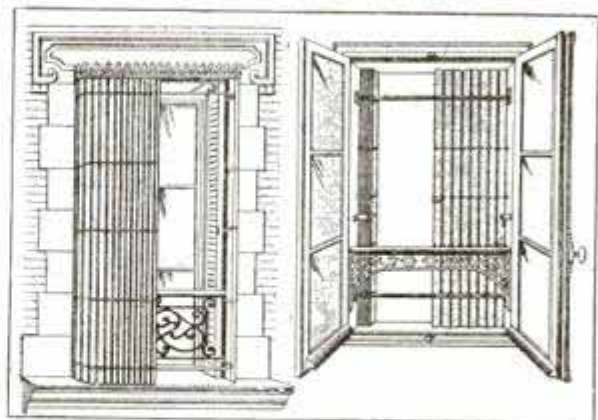


Wheat Pile 980 Ft. High

the bottom, 1,225 ft. at the top, and 980 ft. high; or about as high as the Eiffel tower. If made into flour a barrel 1,214½ ft. high and 962½ ft. at the widest part would be needed to hold it.

VERTICAL SLIDING WINDOW BLINDS

A novelty in the construction of window blinds for residences or office buildings comes from France. The blind is composed of vertical slats

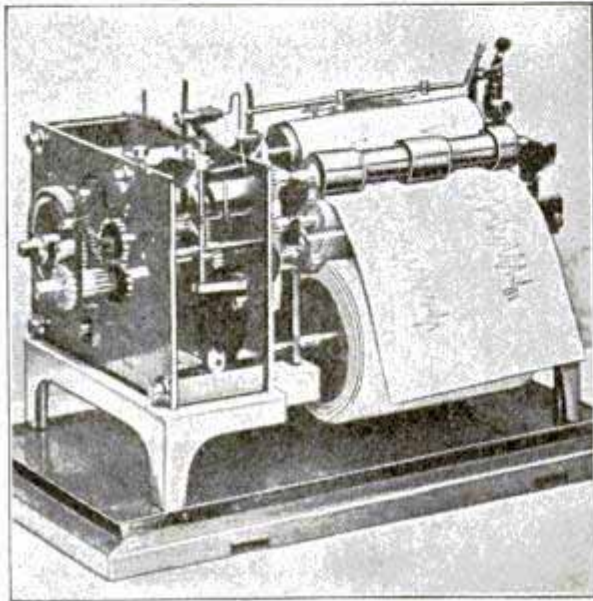


The Shutters Move Sideways

which are carried on two horizontal rods, and open and close by sliding toward or from the middle of the window. The slats remain in the position to which they are moved leaving an opening of any desired size.

MACHINE RECORDS ROUGH TRACK

A machine which when carried on a locomotive or car records the rough places in the track has enabled the Japanese narrow gauge railroads to increase the speed of trains from 24 to 35 miles an hour. The machine is



Pen Picture of the Jolts

not unlike the seismograph, which records the length and severity of earthquakes. When used on a railroad it records the place and "size" of the jolt caused by bad joints in the rails or other uneven conditions. The Japanese have even been able to locate soft ties in the track, which had escaped the inspectors.

These instruments are very expensive, being made at only one place in the world, and then only on special order. In size it is only 10 by 12 by 18 in., and weighs 33 lb. So sensitive is the instrument that on being drawn across an apparently smooth floor, it records the nailheads and knots in the

wood. The record is made on a sheet of paper which unwinds from a roll, and is written with ink by a sapphire pointed pen. Several of the recorders are in use in Europe and a road in this country has ordered one.

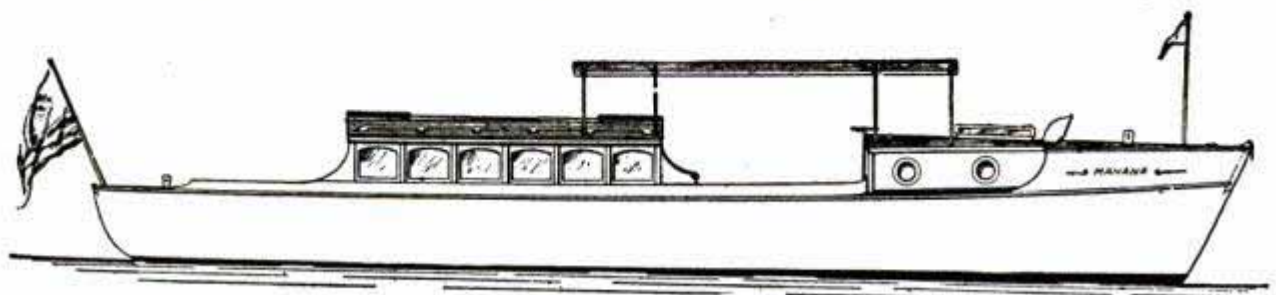
CEMENT AS METAL PRESERVATIVE

The preservative qualities of cement have been well demonstrated in maritime work during the past few months. The larger vessels on the Pacific coast have a coating of fine cement on the inside steel plates of the hull. Lately a number of these steel-hulled ships have been docked for repairs and the plates torn away. It was found in every instance that where a plate had received a cement coating it was as sound and bright as when first placed in position.

On the other hand, where a vessel had not been coated, the steel was pitted and corroded, and in some cases this honey-combing extended clear through the plate. The effect was further noticed on vessels which were only lined on the inside. The outside half of the steel was thoroughly "rotted," while the inside, protected by cement, was as bright and sound as when new.

HANDSOME CABIN LAUNCH

An extremely neat cabin launch has been placed on Lake Chautauqua. The forward cabin is occupied by the power plant and operator, with berth, and other conveniences and lockers for supplies. An awning with side curtains extends to the main cabin. The cockpit also has room for several chairs. The boat is 45 ft. long.



A Pleasing Idea in Motor Boat Construction

ENLARGING A TUNNEL IN SCOTLAND

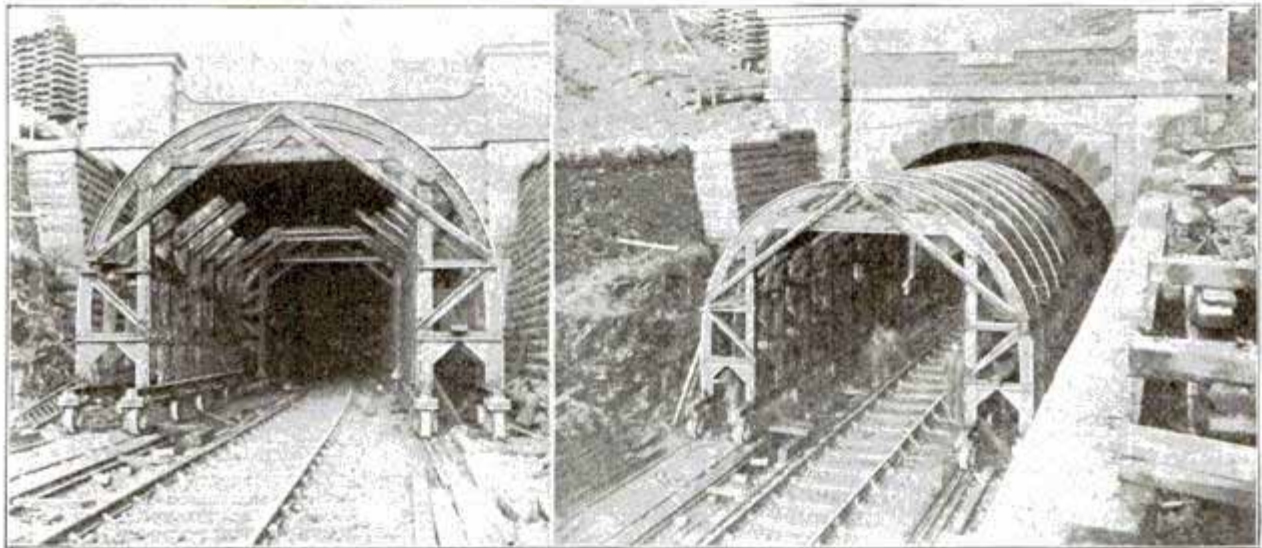
While Trains Run on Time

A tunnel on the Caledonian Railway, of Scotland, began to give trouble on account of the roof falling in. It was constructed 55 years ago and was driven through solid rock. Springs and the locomotive gases caused the stone to decay, greatly endangering the safety of trains.

It was decided to remedy this by lining the tunnel with brick and at the same time widen it from 24 ft. to 26 ft. 6 in. This was a difficult task to undertake without interfering with traffic, which was exceedingly heavy,

fill in with solid masonry to a height 12 ft. above the original roof line.

As the workmen tore away the soft rock it was deposited along the track and not removed until Sunday, as traffic was less congested at that time. As the rock was being removed a supply of brickwork and masonry materials sufficient for the next week's work was brought in. Compressed air was supplied to the shields at all times and the tunnel lighted by 300 electric lamps. The total cost of the work was between \$400,000 and \$500,000.



The Shields that Protected Workmen and Trains

some 200 trains passing each day.

First the double track system was removed and a single track run through the tunnel. Narrow gauge lines were laid on both sides of the main roadbed, and on these enormous shields were run in to act as protectors for the workmen. These shields conformed to the shape of the tunnel, as shown in the illustration, and were built of steel and wood. They served not only to protect the men, but supported the roof as well and kept the main line entirely free from obstruction, forming a tunnel within a tunnel.

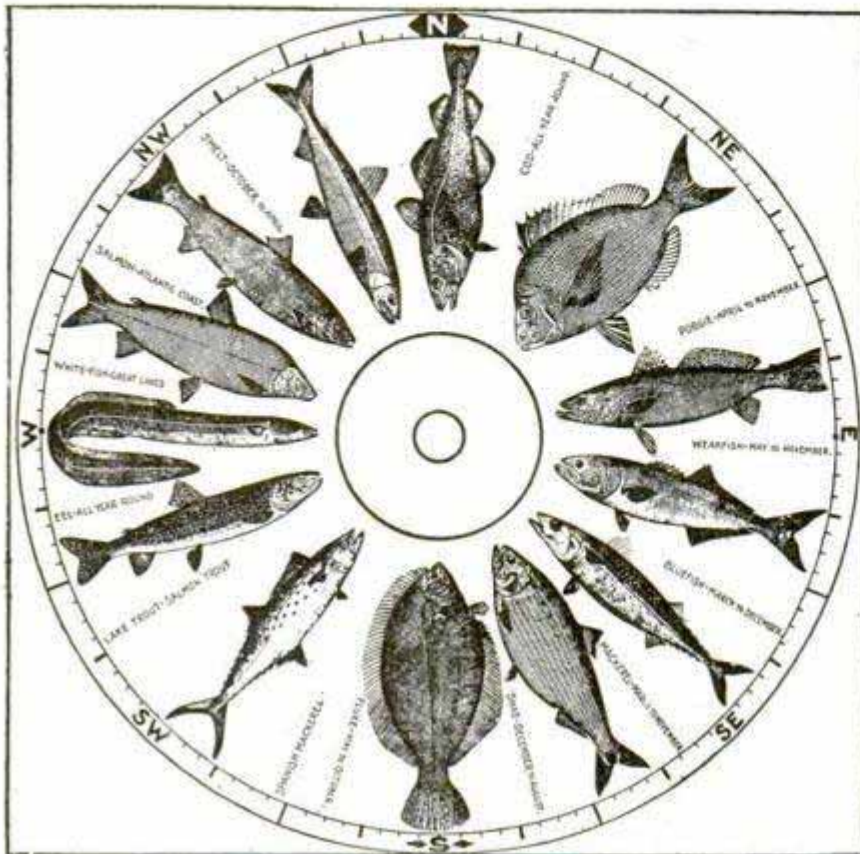
The roof and sides were lined with brick, generally six courses deep, although in some places where the rock was greatly decayed it was necessary to

LIFE TINTS FOR THE DEAD

The latest accomplishment in modern embalming is a preparation which when mixed with the embalming fluid imparts to the dead body what is said to be a life-like color. By using the proper quantity according to the age of the deceased the face is given the rosy hue of youth or the less pronounced color of adults. The preparation is non-poisonous, and renders the body firm without making it hard.

A new hotel which is being built in Paris for American guests will include the use of an automobile with each suite of rooms.

UNIQUE ADVERTISEMENT OF FISH DEALERS



An original and interesting idea has been made use of by wholesale fish dealers in New York.

With the compass points as a circular border the leading market fish are represented as swimming toward the center, in which is printed the name of the firm.

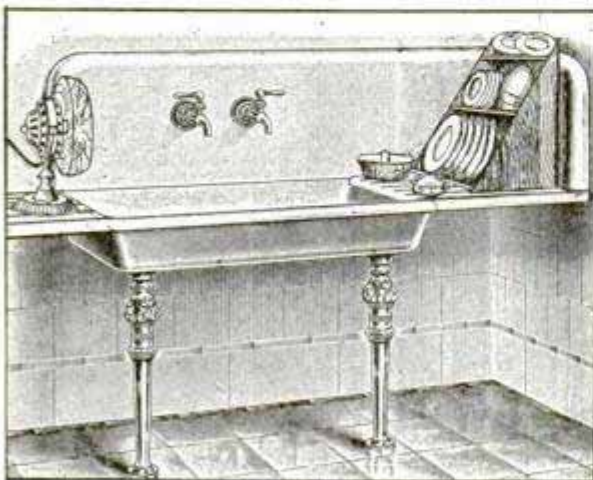
With the name of each fish is also given the months during which it is to be had.

When you purchase any of the fish named, in other months of the year, the chances are you are getting cold storage and not freshly caught fish.

ELECTRIC FAN IN THE KITCHEN

The utility of the electric fan is rapidly being extended from offices to residences and from the summer months to the entire year.

In the kitchen of residences the fan has proved even more welcome than in the office downtown of the owner. With a medium-sized fan, the position of which can be shifted by means of



Drying Dishes with Fan

a few feet of flexible cord, even the hottest kitchen is made not only endurable, but actually comfortable! It is a time and labor saver also; kettles, pans, and other metal utensils, as well as knives, forks and dishes, can be dried without wiping by placing the articles in the path of the breeze. With dishes the best results are had by using racks or movable shelves, in which the dishes are placed to receive plenty of air. When one side is dried it is only the work of a moment to reverse them and expose the damp side.

Where quick action is needed in the home laundry, hang the articles on a line directly in front of a fan and they will be dried quicker than under ordinary conditions out of doors. In the sick room a fan is far better than ice for cooling purposes, as immediate results are had and no dampness is caused as with melting ice.

The electric fan is going to become as much of a household necessity as the electric light.

JAPANESE IMITATING AMERICAN PIANOS

The dreams which American piano and organ manufacturers have had of big sales in the far East, as Western ideas and luxuries increase, have had a set-back. The Japs are making musical instruments right at home, with machinery built in Japan, and which is a counterpart of the best machinery used here. They now recall with regret sundry Japanese workmen whose willingness to work led them to volunteer to do anything and everything around the factory, and whose skill made them prize employes.

These same willing workers, possessed of valuable secrets of manufacture, are now the superintendents of piano and organ factories in Japan.

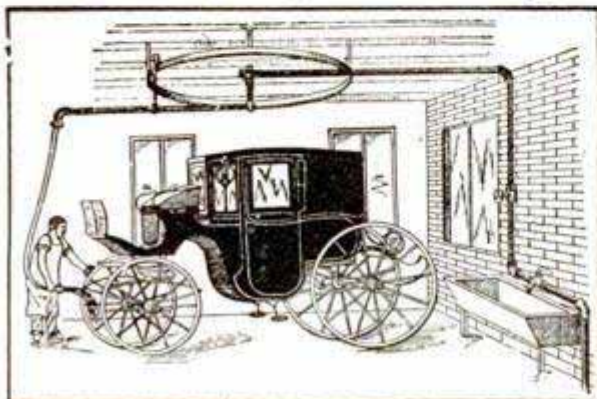
MELTED METAL RAN INTO THE SEA

Fire recently destroyed a cannery at Bellingham Bay, Wash., and \$75,000 worth of pig tin, solder and other metals were melted and ran into the sea. It is hoped a portion of this metal can be recovered, but it will have to be shipped back to the smelters and go through a refining process before it can be used.

OVERHEAD WASHING MACHINE

An overhead washing machine is a great convenience in washing vehicles.

It consists of a galvanized steel track upon which a roller, mounted upon the end of a long arm, travels. The prin-

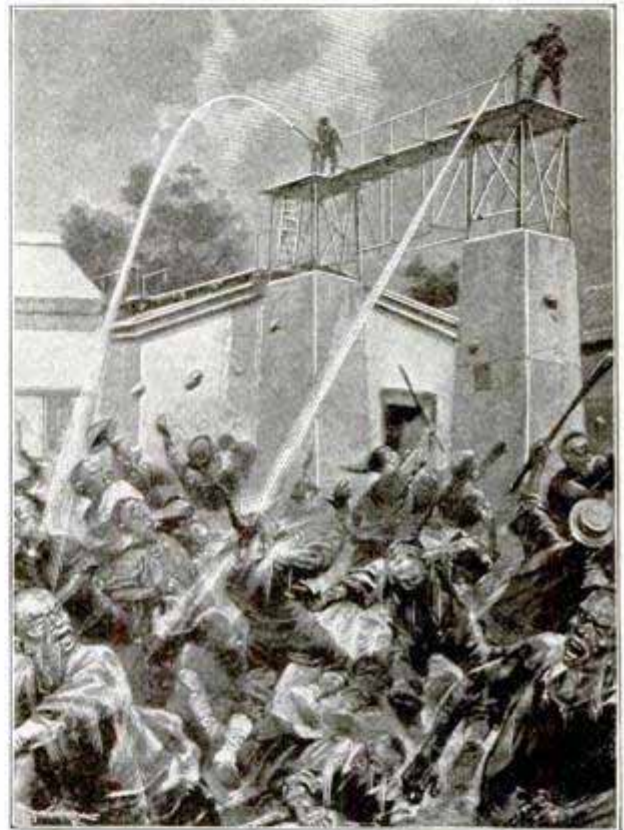


Handy Machine for Washing

cipal working parts are of brass, and the water-tight joints are specially constructed to not only wear well, but to prevent leaking.

A COLD WATER GUN

American fire departments have occasionally rendered good service in dampening the ardor of a mob, but in the South African mines the scheme



Shooting Coolies with Water

has been perfected and is constantly in readiness for use. The Illustrated London News says: "The water gun, a gigantic fire nozzle traveling on a high platform, commands the whole compound; and when a row begins among the coolies, this harmless but effective artillery is brought into play, always with excellent effect."

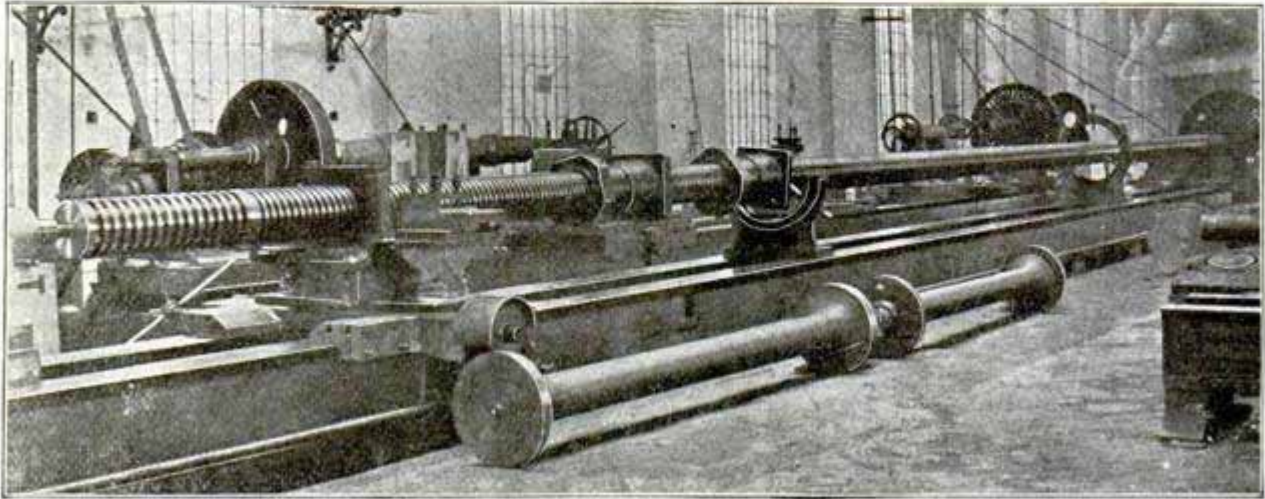
LARGE GAS HOLDER COLLAPSES

A large gas holder at Long Beach, Cal., collapsed and 700,000 cu. ft. of gas escaped. Nearby workmen were overcome and rescued with difficulty. The gas was carried on the wind for miles and the odor hung in the air for

hours after the accident. The collapse was due to the breaking of the reinforcing bands around the holder which had been weakened by the corrosive action of the moist, salt-laden sea winds.

SCREW 74 FEET LONG

A remarkable pair of screws for shear legs was turned out at works near Birmingham, Eng. Each screw



Enormous Lathe—Cutting Screw 74 Ft. Long

AUTOMOBILE ENGINE CLEANED WHILE COASTING

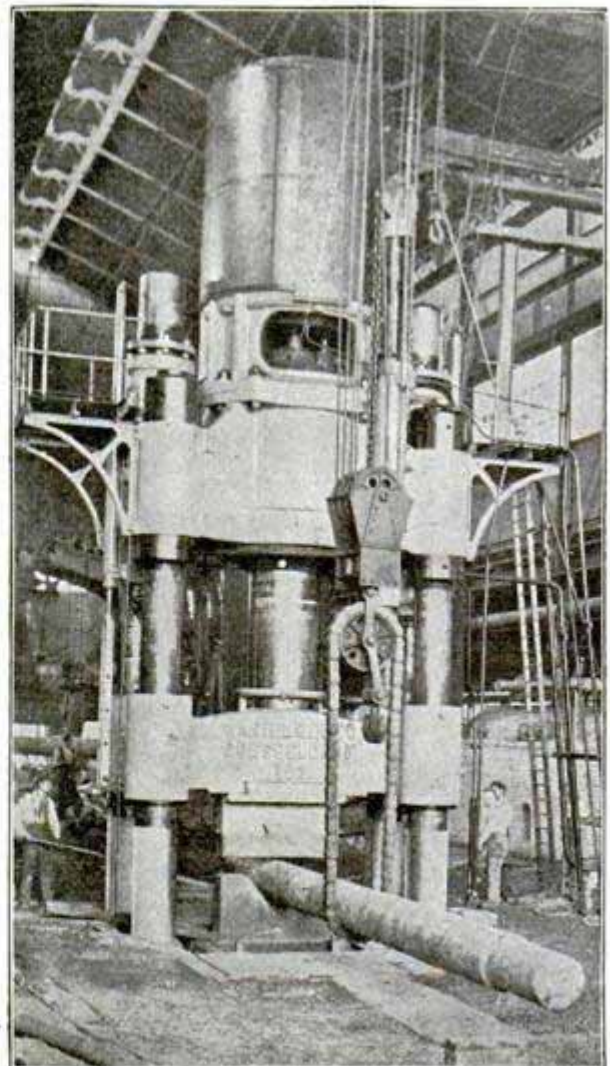
When coasting a hill of length, open the switch, open the throttle wide and leave in the clutch. This will draw full charges of carbureted air through the cylinders and expel the unburned gases from the muffler. This not only cools the engine, says Motor, but the spray of gasoline has a cleansing action on the valves and piston which loosens the burnt oil binding the deposits of carbon and dirt. Use care to always retard the spark fully and partially close the throttle before turning on the switch.

ALUMINUM TO PREVENT MERCURY POISONING

An Italian inventor has discovered a plan whereby the disastrous effects of mercury upon metallurgical workmen may be overcome. He has found that aluminum has a strong affinity for mercury and he proposes furnishing the laborers with light aluminum helmets, the breathing spaces being covered with a fine gauze made of aluminum wire.

The new ocean liner "President Lincoln" will be 616 ft. long, with accommodations for 3,750 passengers.

has a pitch of 2 in., diameter of $11\frac{1}{2}$ in., with a total length of 74 ft. It



Hydraulic Forging Machine

has gun metal bearings and will be used in 100-ton shear legs. One of these screws is shown in the illustration. At these works forgings up to 30 tons are machined and finished. In forging, the German hydraulic press illustrated is used.

PLOWING IN A SHIP'S HOLD

A common, everyday farm plow was used in unloading the cargo of the "Ammon" at San Francisco. The entire hold was filled with 1,500 tons of nitre, which had frozen into one solid mass and very hard. Explosives could not be used, and picks and shovels were too slow. As a joke a bystander suggested they better use a plow.

The captain, however, decided to try the plan, and bought a good sized plow, and by means of block and tackle and steam winch pulled it back and forth the length of the hold. The plow loosened the nitre as fast as a big gang could shovel it into the steel buckets. This is probably the only instance on record where a ship's cargo was discharged in this way.

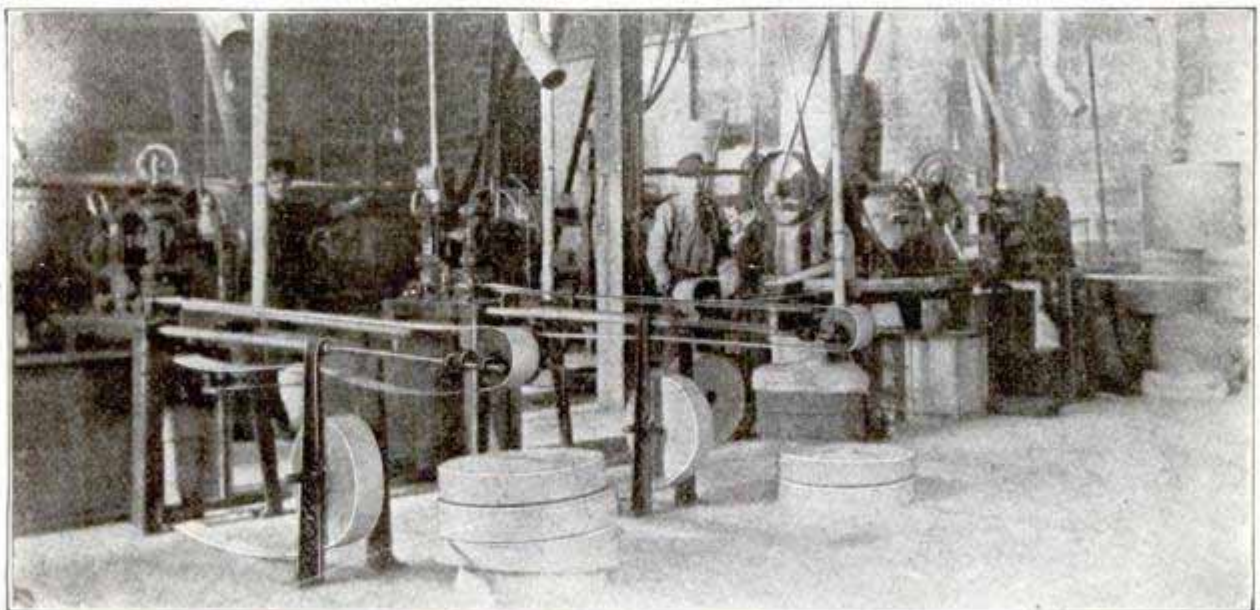
The lowest submarine so far is the "Octopus," which stayed down 39 minutes in 215 ft. of water off Boston Light. Although the pressure at that depth was enormous it did not leak.

MAKING 12,000 MATCHES A MINUTE

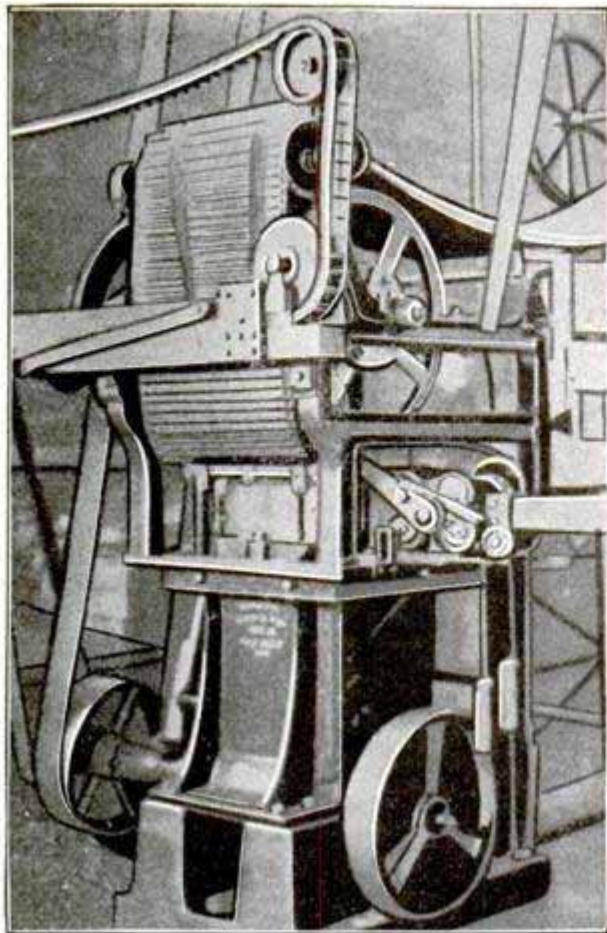
Twelve thousand a minute, or 7,200,000 in a day of 10 working hours is the record of the latest machine for making matches. The whole apparatus is 10 by 12 by 30 ft. in size, but it works with such rapidity that it has reduced the cost of production 50%. The machine is entirely automatic and from the time a match enters as a block of wood until it emerges, ready for packing, it is untouched by human hands.

Cork pine is used for the match timber and it is purchased in 2-in. planks. These are well seasoned, cut into match lengths, and fed into the machine by means of a block conveyer. The blocks pass under a battery of small knives. These knives are 48 in number and each one gouges down into the wood lengthwise with the grain and comes up bearing a match splint. Every knife cuts 250 splints a minute, and as each piece of wood is torn away the upper end is forced into a steel bar which has a number of perforations, each slightly smaller than the match.

The bar, which securely grips the splint, is a link that is part of an endless belt 500 ft. in length which takes fifty minutes to make a complete circuit. This belt carries the matches



Machines that Make the Boxes



The Match Machine

through a paraffin bath shortly after they come from the knives. The bath, or dip, makes them more inflammable. The paraffin is kept in a melted state by an ingenious contrivance which drains off the cooled liquid and adds more at a higher temperature.

The greater portion of the matches made now are of the noiseless type; that is, they have two tips. This tipping is accomplished by two rollers, the phosphorus friction material being put on by one and the chlorate of potash composition by the other. Both of these substances are kept melted in a reservoir and the rolls revolve in them at exactly the same rate of speed that the conveying belt travels, and as the match wood lightly touches the roll it is tipped with a small quantity of the igniting composition. Considerable time elapses between the dips, and the belt turns in various positions on its journey in order that each tip may dry to a regular shape. The extreme length of the belt is to allow the matches to become thoroughly dry before being packed.

Just before the belt completes the circuit each completed match is pushed from its holding bar by pins which fit each perforation in the latter. As they fall on a shelf an endless chain conveys them to the packing table, where they are placed in boxes, wrapped and sent to the shipping room. Only five packing girls, and two helpers, are required to tend one machine, doing the work which in the older processes required twenty-five persons with a much smaller output.

In the old style of match-making a veneer was pared from a basswood log. This was cut into splints 17 in. long, the length of eight matches. A number of these were piled in a veneer cutter and an 8-bladed knife making 150 strokes per minute divided them into sections. The matches were paraffined in a big screen drum which dipped in a huge vat. After being dipped they were straightened by one machine, placed in dipping plates by another, and tipped by still another device.

The operation of making the boxes is one that is almost as interesting as making the match itself. The box-board comes to the factory in large rolls and is there cut into sizes required for the various matches. It is then fed into the box machine and is stamped with the name of the company, cut to shape, and folded. The strip of sand paper on each side is made by passing a glue covered roller along the box and then throwing sand up against it.

Match-making by the new automatic machinery has already effected a saving to the consumer. Where formerly 100 matches were sold for a penny the consumer now pays only five-eighths of a cent for that number.

As was predicted a year ago, the craze for young employes is beginning to subside, and it is perceived that experience and reliability are better than mere youth. The age limit for entering the employ of the Pennsylvania railroad has been raised from 35 to 45 years.



Compressed Air Plant for Working Pneumatic Tools on Indian Locomotive

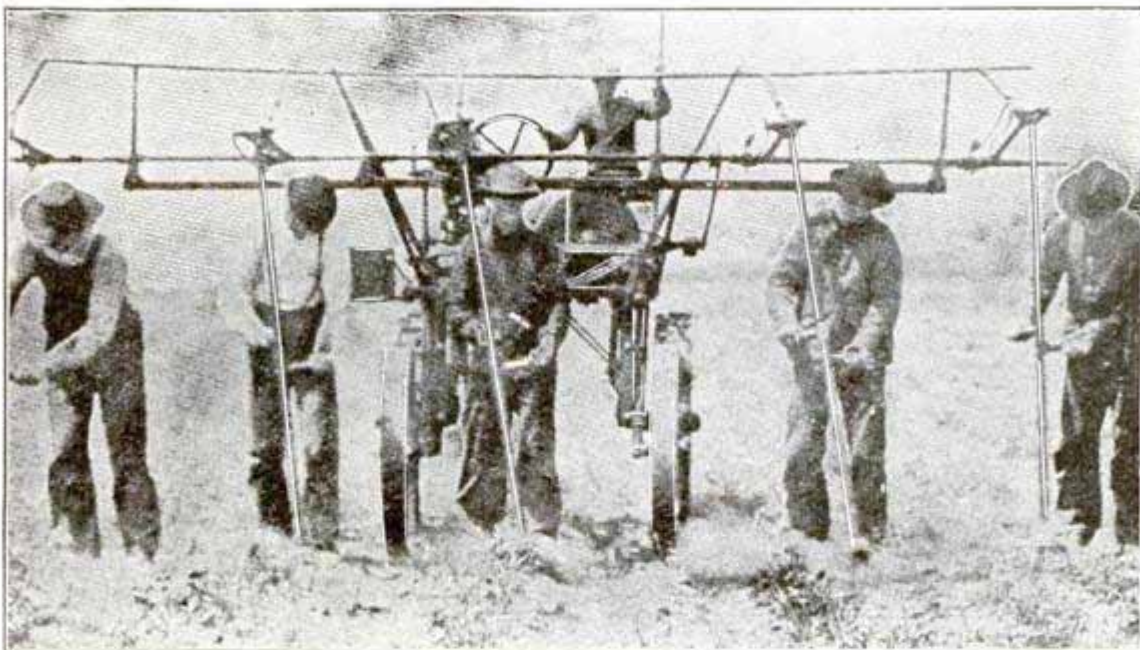
THE RAISING OF SUGAR BEETS

A Vast Industry Waiting for Labor-Saving Machinery

Sugar was made from beets one hundred years ago, but it cost as much to make one pound then as the grocer charges for 15 lb. now. While improved machinery has contributed its share to this reduction, an improved beet has done more, for 2,400 lb. of sugar is

raise beets indefinitely without destroying the land, as was once feared.

A sugar beet seed is really five to seven seeds in one—there's a fortune for a machine which will separate these germs without crushing—hence a vast amount of hand work becomes neces-

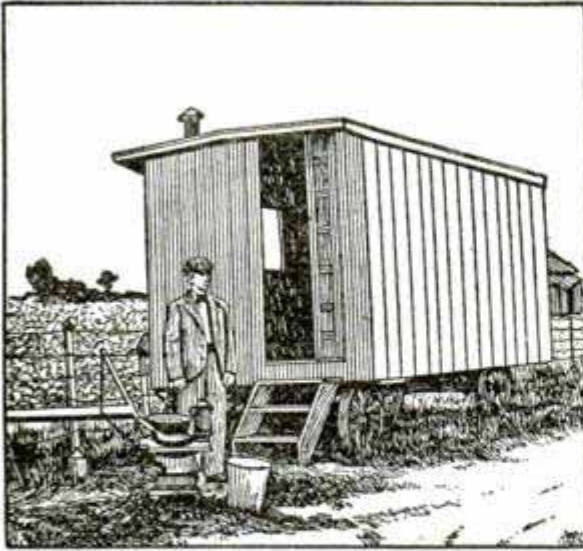


Mechanical Hoe for Working Sugar Beets

now obtained from one acre against 480 lb. in the early days.

When a beet sugar factory is built it means increased value for thousands of acres of land; in many cases an advance from \$10 to \$100 per acre. And this is permanent, for the department of agriculture has found out a way to

sary to thin beets soon after they come up. Here's a chance for another machine. Then there are from two to five hoeings. This, too, has been hard work, although a new machine hoer is being tried. This queer device is mounted on high wheels, and is driven by a gasoline engine. Several steel



A Portable House

shafts hang from springs and universal joints which permit movement in every direction. The lower end of the shaft has a steel disc which revolves rapidly. The operators guide this circular toothless saw where it will do the most harm to the weeds. The machine needs improving.

The harvesting includes three operations, lifting, pulling and topping. A sort of plow loosens the beet but it must be pulled by hand and the tops cut off. Many forms of beet harvesters have been constructed, but none has come into general use. The cost of hand harvesting is from \$5 to \$8 per acre. A practical harvester will certainly be worked out before many years. When harvested the beets should be hauled at once to the factory, or to the railroad for shipment. At the factory a system of siloing is employed when the shipments come in faster than they can be worked up.

The effort is to have the beet raisers plant at different times to spread the harvest time out as long as possible. The farmer is glad to join in this because of the large amount of hand work involved at certain periods of the beet's growth. In some states there are colonies of experienced beet workers who live in houses on wheels and move from one beet farm to another.

These houses will accommodate five people and cost \$75. The outfit includes a laundry stove, cooking utensils, woven-wire folding cots, mat-

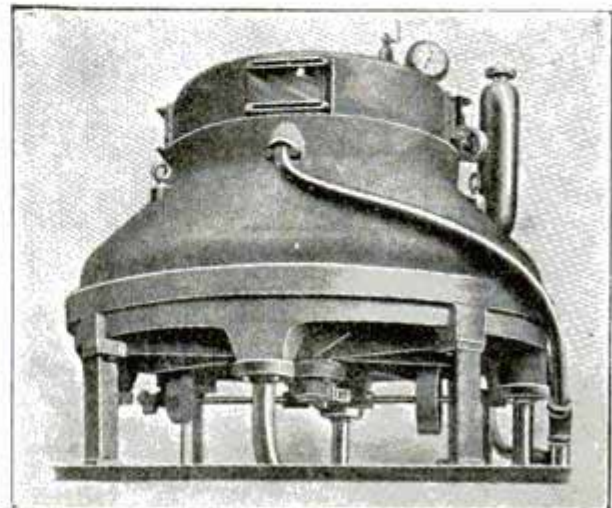
tresses and blankets. When the work for one farmer is finished he furnishes the teams to draw the colony to the next place or to the depot, if the distance requires transportation by rail.

The industry of beet raising in this country is a large and growing one. Last year the crop produced 312,900 tons of sugar, valued at \$28,162,800. The opportunities for the invention and improvement of labor-saving devices in this field are unusually inviting. The average cost of hand labor at present required on each acre of beets is \$20. Suitable machinery if it could be had, would reduce this figure at least one-half. This would mean a saving on the year past of \$10 per acre on 307,000 acres or \$3,070,000. The current yearbook of the Department of Agriculture, from which these facts are taken, devotes considerable space to beet raising.

VACUUM PROCESS FOR CONCENTRATING ORES

The new vacuum process for concentration of ores is attracting considerable attention, especially as the machinery is so simple it can be built in almost any machine shop, and in operation no skilled labor is required.

Oil and acid are mixed with the flowing pulp of crushed ore and water as it comes from the crushing mill. The oil attaches itself to the minute portions of mineral, but has no effect



Vacuum Concentrator



The above picture shows a view in Melbourne, Australia. The large building is the government warehouse and cold storage quarters, where fish, meat and produce are prepared for shipment to London.

upon the rocky particles or gangue. The whole mixture is then subjected to a pressure less than the atmosphere.

When the vacuum is applied the air and other gases dissolved in the milling water are liberated. These gases attach themselves to the greased mineral particles and rise to the top, carrying the ore with them in the form of a rich concentrate, which overflows into a pipe leading to a reservoir.

The rocky particles or gangue remain at the bottom and are thoroughly agitated until every bubble of liberated gas has carried its bit of mineral to the surface. They are then discharged through a waste pipe.

The Mining World, London, says: "The quantity of oil and acid required is not the same for all ores, but usually amounts to not more than a few pounds—say, from 3 to 10 lb. per ton of ore treated."

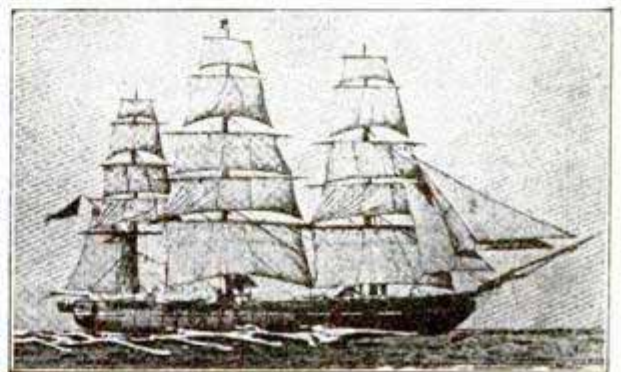
A large variety of oils and similar substances have been tried and found suitable, such for instance, as Californian crude oil, Texas crude oil, Texas residuum, fuel oil, Russian crude, Borneo, Sumatra, and similar cheap oils, tars, blast furnace oils, olive oil residues, oleic acid, kerosene, a variety of light oils and fish oils. The process is patented.

Burglars are using automobiles for making their "visits" and carrying off the plunder.

FARRAGUT'S FIRST VESSEL TO BE SCRAPPED

The old weather-scarred frigate "Saratoga" is to be destroyed. This was Admiral Farragut's first command, and since 1889 it has been the training ship for the Pennsylvania Nautical School, an institution maintained by the state for training the youth of Pennsylvania in the science and practice of navigation. During her cruises the "Saratoga" has visited all the prominent continental ports and places of interest in the world.

Four years ago it was necessary to completely overhaul her on account of the terrific storms that she had passed through. On the last cruise out six gales were encountered in thirteen days and it required every effort of the youthful crew to keep the old vessel afloat. When it was finally brought safe to shore, the naval authorities found that it would require too much money to put it back into shape again, so determined to sell it for old junk.

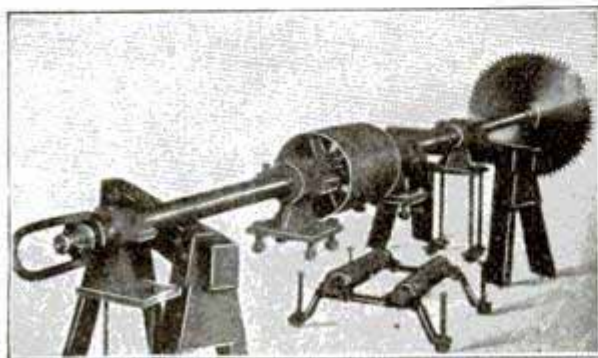
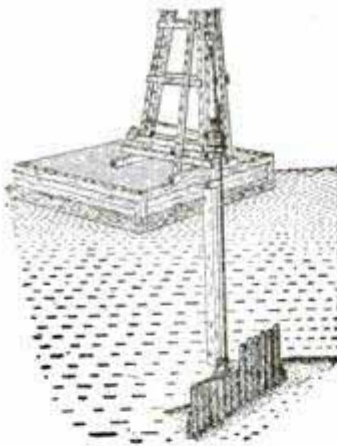


KILLED BY CHARGED FENCE WIRE

Death recently came to a ranchman of Bellegrade, Mont., in an unusual and peculiar form. A highly charged transmission wire, which crossed his ranch, became broken in some manner and one end fell across a barbed wire fence. The ranchman, not knowing of the break, attempted to crawl through the fence. His body completed a circuit to the ground and he was instantly electrocuted. His wife attempted to remove the body but was rendered senseless by the shock she received. Neighbors finally removed the corpse, but only after considerable danger to themselves.

CUTTING PILES UNDER WATER

The illustrations show a complete apparatus for sawing off piles as deep as 24 ft. below the surface. The first is a pile driver from which the hammer has been removed and the sawing mechanism has been substituted between the guides. At the end of the saw-shaft (Fig. 2) is seen a loop by which it can be raised or lowered. In the middle is a drum for belt, and just below it appear the rollers, which are to fasten to the guides to keep the belt in place. A spline through the whole length of the shaft makes the

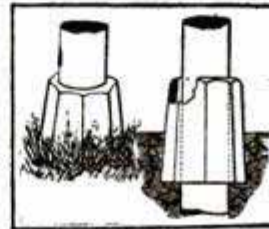


Shaft with Saw

saw readily adjustable to any depth within its range and also takes up any vertical motion of the pile driver due to motion of the water. The shaft is $3\frac{7}{16}$ in. diameter and counterbalanced by the timber shown in Fig. 1. For most piles a 42-in. saw is sufficient, and 10 hp.; for extra large piles, a 48-in. saw and 12 hp.

CEMENT BLOCKS PRESERVE POLES

To prevent deterioration of wooden poles at the surface of the ground, where decay usually begins, a French inventor uses a pair of cement blocks. These blocks surround the pole and extend 1 ft. into the ground. When locked in position cement is poured between the blocks and pole.



MAKING JEWELRY AT HOME

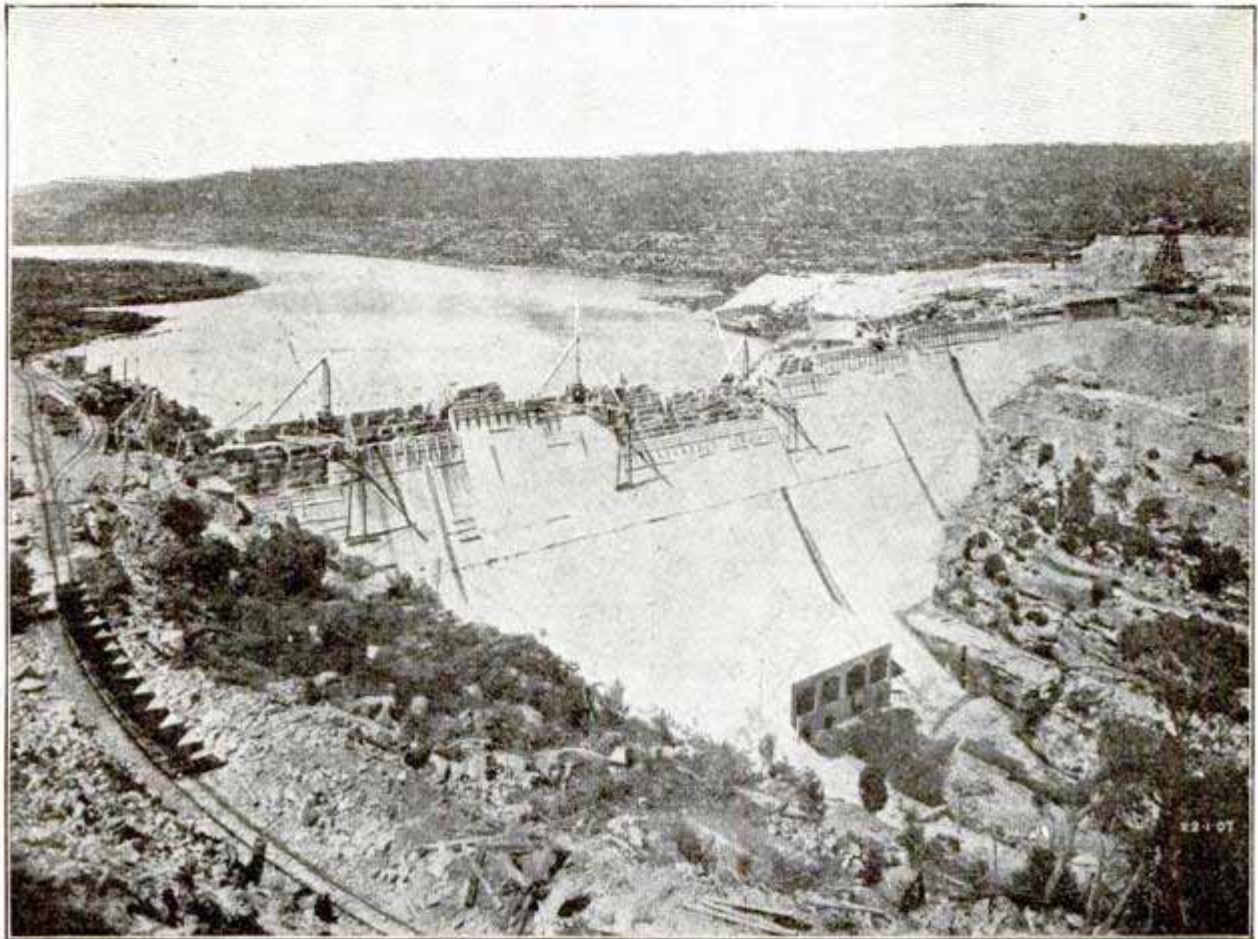
Thousands of women in Massachusetts and Rhode Island are earning a tidy sum each day without leaving their homes. The unprecedented demand for all grades of ornament has caused jewelry manufacturers to resort to every expedient to supply their orders. The practice of allowing the women to take home work, finish it and return it to the factory has grown up and is now one of the most extensive in the New England states.

Much of the work is simple and can be done by hand; for example, in the manufacture of the ring or chain purses which are so popular, a pair of pliers is the only tool used. The price for making one of these varies from 50 cents, for the small ones, to \$1.25 for the larger size. A fast worker can often make two of the smaller in a day.

Some factories have installed foot power presses in the houses and larger articles are made. Work is delivered and collected weekly or oftener, by an agent of the company.

SYDNEY, N. S. W., STOPS A BIG RIVER

And Diverts Its Waters to City Use



Great Dam and Reservoir

Courtesy American Traveler

Sydney, New South Wales, is a great consumer of water, and at intervals during its century of growth has reached out first for small streams, then lakes and small rivers, and now the entire flow of the Cataract river. The river has been brought to an abrupt stop in its course by the construction of a great concrete dam 811 ft. long and 192 ft. high. The dam is

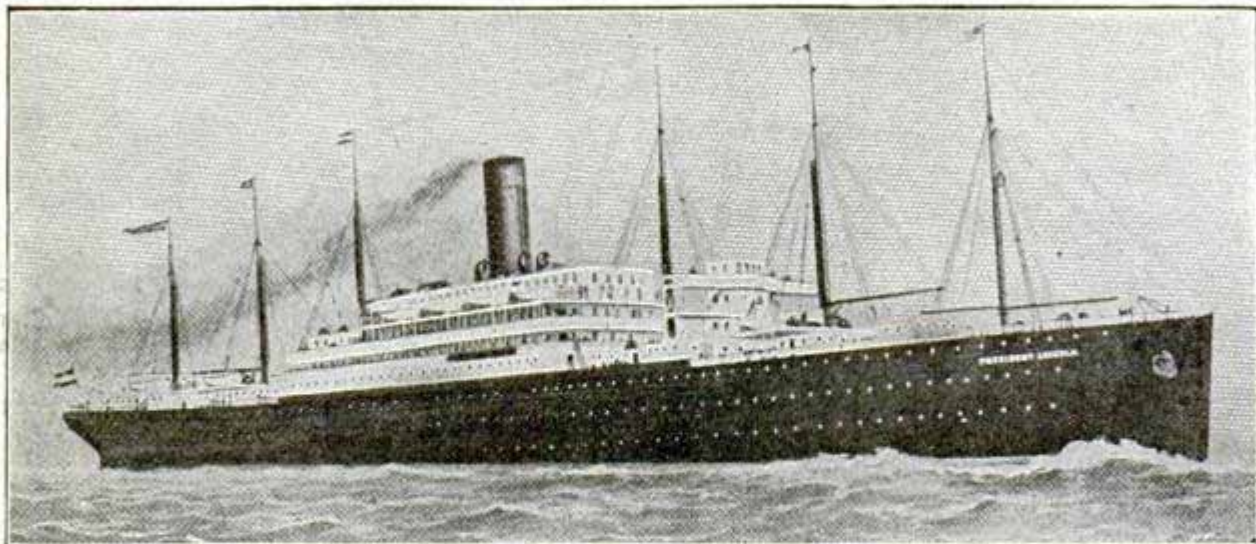
158 ft. wide at the base and 16½ ft. at the top and stores up the flood waters in a reservoir 150 ft. deep, covering 2,200 acres, and containing 21 billion gallons of water. The work, which was done by the government, occupied two years, cost \$1,500,000 and was accomplished with machinery brought from the United States and England.

HORSESHOES MADE OF ASBESTOS

Visitors to the volcano of Kilauea, on the island of Hawaii, generally ride on horseback, and in crossing what is known as the "pit," the horses suffer much from the great heat. The earth is so hot that the hoofs of the horses are not infrequently scorched. As some protection became very necessary, a clever blacksmith in Honolulu has re-

cently devised a very successful method by which asbestos may be used.

The idea is to provide the hoofs of the horses with an asbestos covering much after the fashion of the outer shield of iron-studded leather or canvas over the automobile tires. These hoof shields may be put on and removed at pleasure.



The New Hamburg Liner "President Lincoln"

RAILROAD CROSSES A MUD DESERT

Railroads are sometimes built under very peculiar conditions. This is the case with the Western Pacific Transcontinental line that is being constructed from Salt Lake City to San Francisco. The line runs 38 miles through a stretch of the Utah desert, where nothing but soft alkali mud is to be found. This "mud desert" seems to have no bottom and it was exceedingly difficult to secure a satisfactory footing for the roadbed.

The trouble was solved by a foundation made of heavy planking laid checker-board fashion. Temporary tracks were laid on this and ballast trains distributed their load upon the wooden base. The rails were raised, as

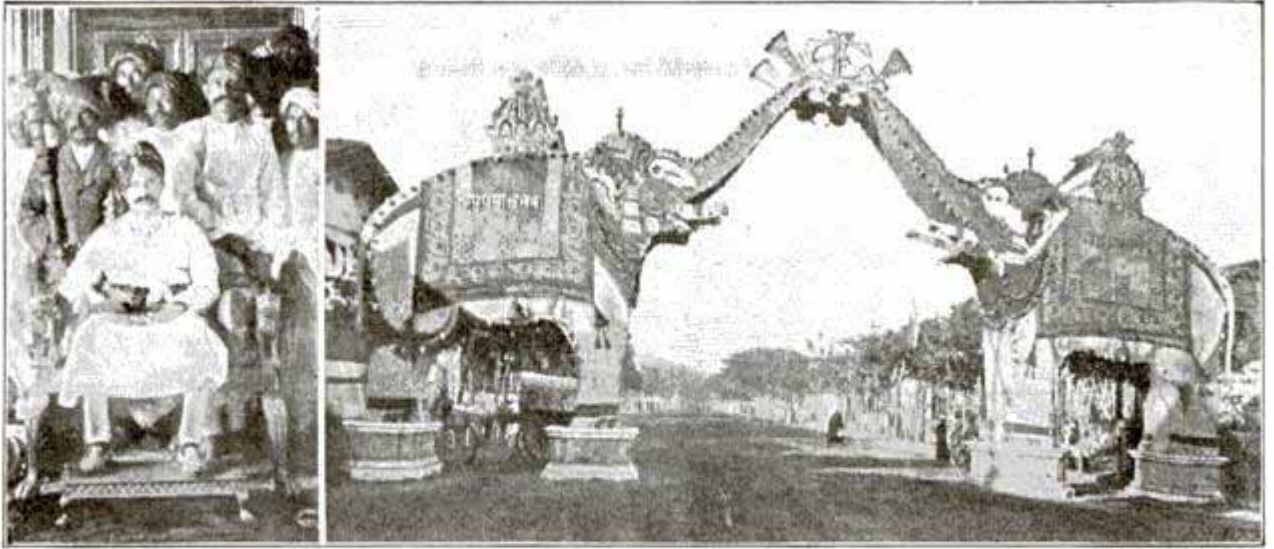
the depth of the ballast increased, until the proper grade was reached. The roadbed was then covered with cement and gravel, which formed a hard level surface for the tracks. The filling and mud of the desert practically excludes the air from the planking and insures it against decay for a long period of years.

COLONIAL WALL PAPER REVIVED

The wall papers brought from Naples a full century ago still remain with colors so fresh they promise to endure another hundred years, in many New England homes. So attractive are these quaint designs that wall paper makers are now busy copying them for 20th century residences. The designs are largely landscape scenes.



Tinted Shingles Are Now Made of Cement



Triumphal arch of great magnificence erected for the installation ceremonies of Prince Ranjitsinhji, the Jam of Newanager. The elephants were covered with costly tapestries, ornamented with gold and illuminated at night with hundreds of electric lights. The Jam rode through the arch in a silver carriage, wearing a red robe prepared for the occasion and destroyed immediately afterwards. The throne and canopy are of solid gold. During the ritual the Jam is required to hold a coconut in his hand.

LARGEST GASOLINE PASSENGER LAUNCH IN THE WORLD

What is believed to be the largest gasoline passenger launch in the world, says the *Journal of Electricity*, has been in regular service since January 1st, plying between San Pedro harbor and San Diego, Cal. The vessel is 140 ft. long, 22 ft. beam, with a draft of 10 ft. It carries 256 gross tons of cargo, and 260 passengers at an average speed of 14 knots per hour. The equipment consists of two 300-hp. 6-cylinder engines, which drive twin screws. It is said that the engines have never stopped for repairs since their first alignment.

GYROSCOPE WILL NOT EFFECT SHIP'S STABILITY

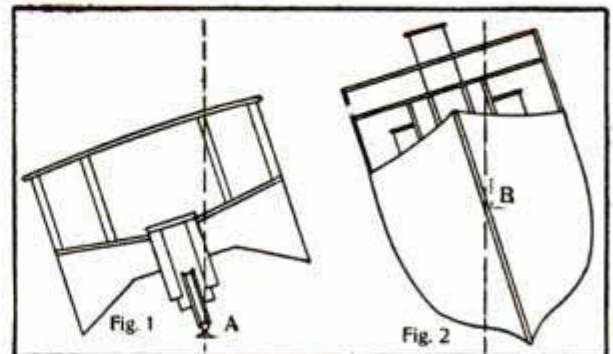
One of our subscribers explains why the vessel used by Sir Henry Bessemer and described in the article, "Cars Balanced on a Single Rail," of the July issue, would not maintain itself in a horizontal plane when fitted with a gyroscope:

A train of cars, such as Mr. Brennan's monorail type, have the wheels fixed so they cannot move to the right or left. As a result the center of gravity of the car will swing in an arc about the point of support. An ideal

condition for a gyroscope is the result, in fact, this is one of the principles of that mysterious apparatus.

The centrifugal force of the spinning wheel in a gyroscope applies its balancing force to the axle points, whether it be a pin point or set in a bearing attached solid to some other point. So, in the case of the single rail car, the double flange wheel at the point where it touches the rail takes the same place as the point that touches the floor in the toy top.

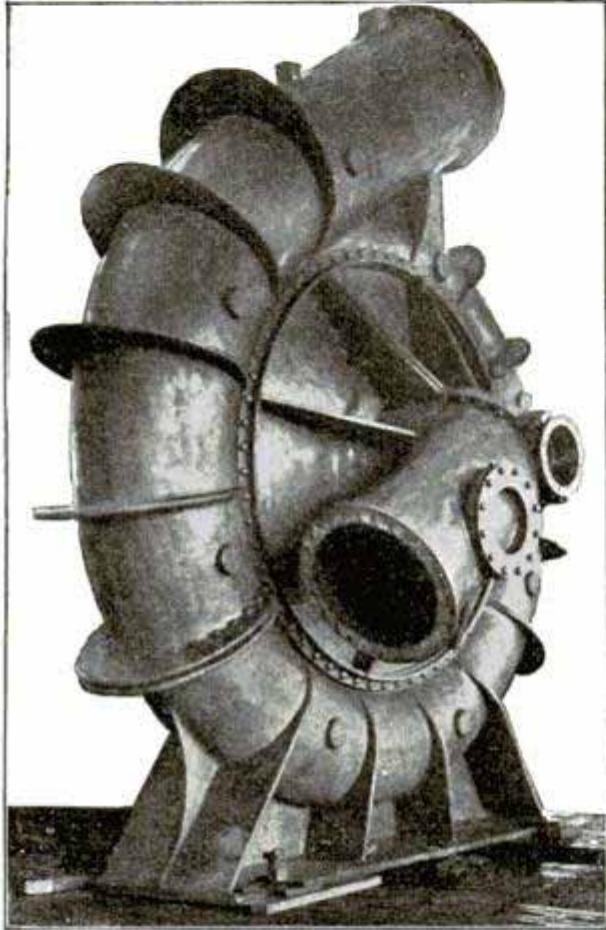
When the car is in a side wind, as shown in Fig. 1, the single rail, A, makes a solid point for the gyroscope to apply its balancing force. When a vessel is tossed about, or a side wind strikes it, the gyroscope's balancing effect is lost, as the keel of the vessel



has no fixed bearing and moves as well as the top, as is shown in Fig. 2.—Contributed by W. A. Waller, Lees Summit, Mo.

FIFTY MILLION GALLON CENTRIFUGAL PUMP

Two big centrifugal pumps have been built recently to irrigate rice fields in Southwest Texas. Each has a daily



Daily Capacity, 50,500,000 Gal.

capacity of 50,500,000 gal., or 35,000 gal. per minute. The impellers are so heavy no fly-wheel is required.

The water is drawn into the pump at the horizontal shaft and discharged through 36-in. nozzles. Note, in the accompanying illustration, the peculiar ribbed construction of the pump casings which gives great rigidity and strength.

A few years ago all the passenger cars on the New South Wales railroads had bars across the windows to prevent the passengers from putting their heads out. The passengers rebelled at the risk of being caged in a wreck, and the bars have been removed.

There are 10,460 saw mills in the United States. Pennsylvania has the largest number—714.

A MYSTERIOUS ISLAND

Denver Island is, at this writing, one of the San Juan group in Puget Sound, and was an extremely beautiful piece of land. A hustling real estate man sold it to Charles L. Tutt, a wealthy Colorado miner, who intended to erect a summer home in the midst of a beautiful park. When Tutt went to examine his purchase it wasn't there. He insisted he had been swindled, but witnesses were produced who swore it was formerly at the location stated. Tutt wanted his island—where was it?

Investigation proved it had completely sunk beneath the water during the San Francisco earthquake, leaving several acres of water but no land.

Recently the owner received notice that his island had come up again and he lost no time in getting there. The trees and foliage were all dead and slime covered the surface once green with grass, but Tutt had recovered his property and promptly christened it Denver Island.

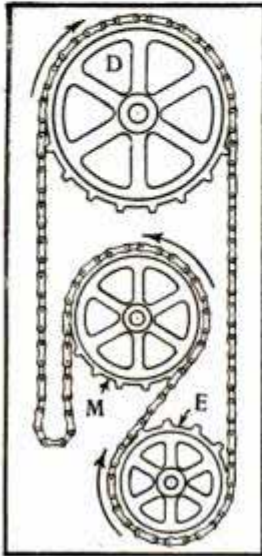
FISH SOAP HARMS NICKLE-PLATE

Fish soap as a cleansing medium is gradually being replaced by other more satisfactory materials, says the Brass World. A number of cases are known where the use of it has been the direct cause of nickel deposits peeling away.

In one instance it was found that the deposit came off notwithstanding all efforts to make it stick. The piece which was to be plated was first buffed and then soaked in a fish soap solution to remove the dirt collected in the corners. After soaking, it went direct to the plating bath without additional cleansing. As a result an extremely minute film of fish oil entirely covered the work and prevented the nickel from closely adhering to it. After the trouble was discovered and this film removed by placing the article in another bath, the peeling of the deposit entirely stopped.

SHOP NOTES

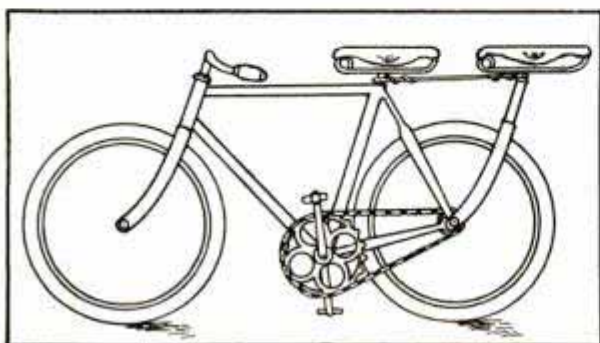
To Reverse a Chain Drive



Sometimes it is necessary to run a shaft in the opposite direction from the drive shaft, using sprockets and chain transmission. A simple arrangement of the sprockets as shown in the accompanying cut will give this result, says American Miller. In driving some elevators one extra sprocket wheel, E, was added, which caused the sprocket wheel D on the shaft to be driven to turn in the opposite direction from the sprocket wheel M, on the main shaft.

Extra Seat Attachment for a Bicycle

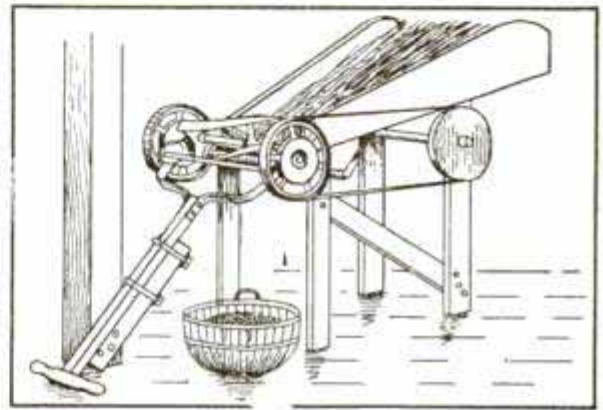
Take an old bicycle front fork and fit it on the rear axle of the bicycle outside the frame braces. For a brace to hold the seat in position I used a heavy piece of wire, as shown in the illustration. A seat and seat post were fitted in the fork just the same as in the bicycle frame.—Contributed by Randolph W. Seaman, Brooklyn, N. Y.



Showing Extra Seat Attached

A Lawn Mower Feed Cutter

When your lawn mower is not otherwise needed, clamp it to a post with cutting knives upward and build a box to fit up close to the cutting edge, as shown in cut. A belt wheel to drive the mower may be placed on both ends of



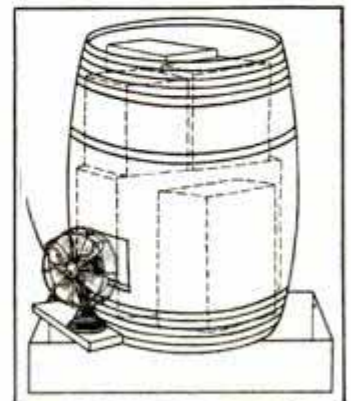
Cutting Feed with Lawn Mower

the shaft, but one will do, with a crank to turn it. Feed the material at an angle.

A Novel Cooling Device

A simple but effective method of securing a cool atmosphere in a certain basement, which is used for the storage of wine, has been adopted by the proprietor.

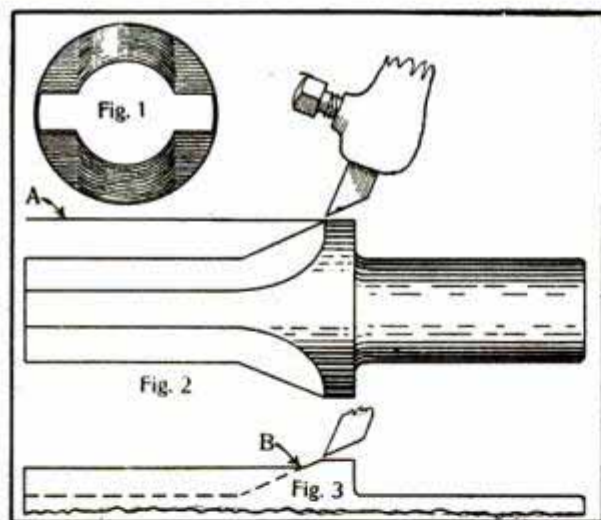
A substantial barrel is placed on top of a water-tight box of sufficient capacity to accommodate the drip from the melting ice, and three or four hundred pounds of ice are placed inside of the barrel. The latter is provided with a couple of auger holes in the bottom, to permit the escape of water, and a small



opening measuring about 8 in. square is cut in the side of the barrel, just high enough from the bottom to come directly opposite the blades of an ordinary 12-in. electric fan, supported on a shelf across the box. When in operation the fan draws a current of air down through the open top of the barrel and out through the square opening. The fan blows this chilled air through the basement and maintains a constant circulation, says the Electric City. The barrel is filled with ice once a day, and the result secured is satisfactory, the temperature of the basement being from 20 to 40° lower than that of the outside air.

A Kink for the Shaper

To shape a punch and leave a shoulder, set the work in the shaper vise with face outward and set stroke of

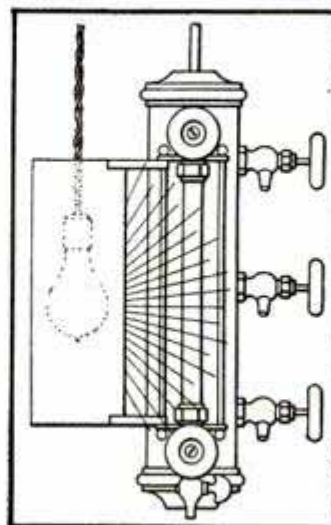


Shaping a Punch

the machine as shown by line at A, Fig. 2. When one cut has been taken and tool lowered for the next it will not begin to start the second cut until it reaches the point B, Fig. 3. Fig. 1 shows end view of the punch completed. This is a good kink for those that do not possess a milling machine.—Contributed by Arthur Benson, Chicago, Ill.

The ink of any steel engraving, no matter how old, will smear if exposed to the slightest friction.

Illuminating a Gauge Glass



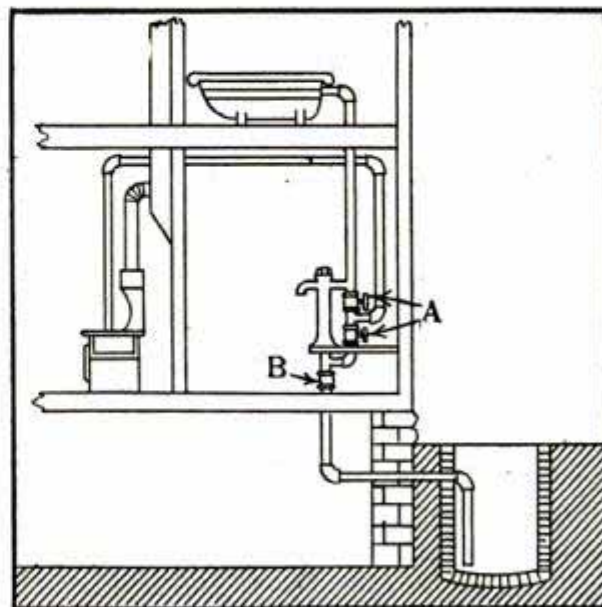
A method used by a writer in *The Engineer* for lighting up a gauge glass is shown in the sketch.

A tin tube 3 in. in diameter and 12 in. long, having a slot $\frac{3}{8}$ in. wide by 8 in. long in the side next to the gauge glass, is used. An 8-cp. incandescent lamp is placed inside the tube and throws a powerful light on the glass only.

Water Supply System

The accompanying sketch shows the plan of a water system I have used for the past two years which has given good satisfaction.

I can pump cold water to the reservoir on the stove, hot water from the reservoir to the bath tub or cold water from the cistern to the bath tub. Two globe valves are placed in the pipe as shown at A. One check valve is used at B.—Contributed by Laurice E. Fry, Mt. Sterling, Ill.



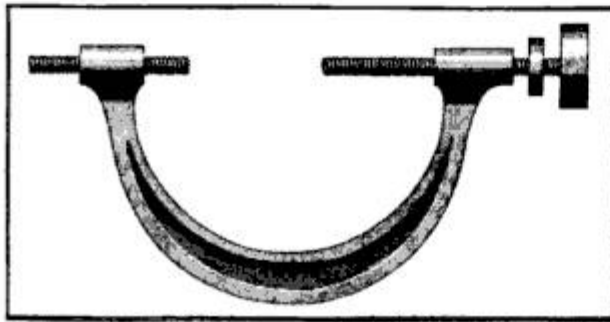
Convenient Water Supply

Repairing Plaster Casts

The following method for repairing plaster casts of all kinds has been tested by years of use. Coat the broken surfaces with thick shellac and expose immediately to alcohol flame until the alcohol in the shellac is nearly all burned out. Then apply the broken parts accurately to each other with slight pressure for a few minutes. —Contributed by Dr. C. E. Fraser, Jr., Rome, N. Y.

Adjustable Hand Gauge

For large duplicate work or to use in connection with turning blanks for twist drills or any large cylindrical work a gauge can be made amply large



Gauges Work up to 3½ In. Diameter

enough to take this work in and be adjustable to the smaller sizes as shown in the accompanying cut. The main frame is made of cast iron, using ½-in. cold rolled steel with about 20 threads to the inch for screws. On the longer screw fasten a milled head and place a lock nut between head and frame. While the gauge may be of any suitable size the one I made will gauge work up to 3½ in. in diameter.—Contributed by S. H. Heller, 723 Grant St., Akron, O.

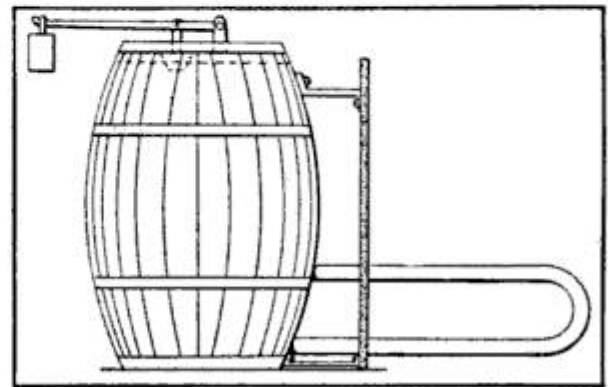
Deodorized Glue

One authority recommends the use of a teaspoonful of saltpeter to a pot of glue as a deodorizer, says Wood Craft. It is further claimed that it helps the glue to dry faster and become harder, nor is the strength and tenacity impaired in any way.

A Wooden Boiler

This is a novel way of using a wooden keg for a steam boiler. While it may seem absurd, I have one in good working order, says a correspondent in *Engineers' Review*.

I took a beer keg and ran a ¾-in. pipe out about 3 ft. and bent it to return,



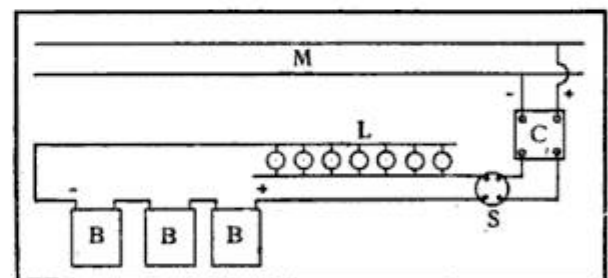
Keg Used as Steam Boiler

as shown in the illustration. This pipe was shoved into the kitchen stove which generated the steam. We ran a ¼-hp. engine attached to a small grindstone which was used to sharpen mowing machine knives on and it saved many a blistered palm.

While this was boys' work, it was more practical than many would think. The boiler was equipped with safety valve having an iron weight. Between the boiler and the stove a partition of asbestos was put in place to protect the boiler.

Charging Small Storage Batteries

A simple way to charge storage batteries such as are used in automobiles



Wiring Diagram for Charging Batteries

and for small electric motors is shown in the sketch. From the main wires, M,

connect through a cut-out, C; then to a switch, S. A number of lamp sockets, L, are connected in parallel so that any amount of charging current can be obtained by inserting one or more 16-cp. lamps, says a correspondent of The Practical Engineer. If only $\frac{1}{2}$ ampere is required, insert one lamp; if two amperes is required, insert four lamps, and so on.

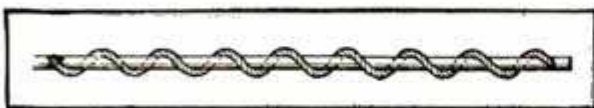
Screwing Flanges on Pipe

In our August number we described and illustrated "Screwing Flanges on Large Pipe." The following is even a better plan: It is unnecessary to tie the handle of the chain tongs to a post. The practical way to arrange the pipe and tongs would be to place the tongs as shown in Fig. 1, so that they will hold the pipe from turning, and then allow the handle of the tongs to rest on the floor, using the timber to turn the flange, says a correspondent in the Metal Worker.

Another way would be to allow the end of the plank to rest on the floor, and the workmen could use the tongs to turn the pipe into the flange, the flange being held stationary by the timber, as in Fig. 2.

A Rope Conveyer

A temporary conveyer which can be used in some cases by millers, especially in experimental work, when a regular conveyer is not at hand, is shown in the



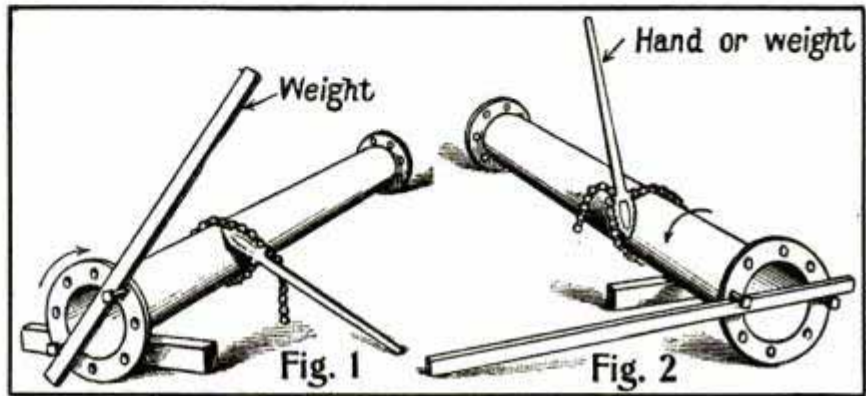
Conveyer May Be Any Length and Size

accompanying sketch. This simple way of making a conveyer is quick and will answer every purpose until a better one takes its place, says American Miller.

The conveyer can be made any length and size to suit the purpose. The shaft can be made of steam pipe. Fasten the rope with a crooked hook and nut. It will stay tight.

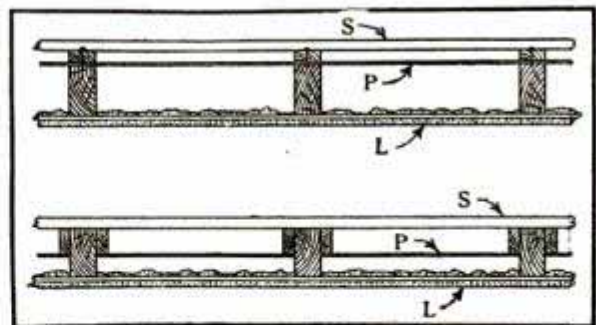
A Substitute for Back Plaster

In the construction of buildings it is always desirable to have a dead-air space in the walls, which is usually obtained by putting in back plaster. A



Use a Timber to Turn the Flanges

good heavy paper that is tough enough not to tear easily will serve the purpose just as well. Two ways are shown how this may be done. To use 32-in. paper and put it on vertically, as in Fig. 1, will cover two spaces. All laps should



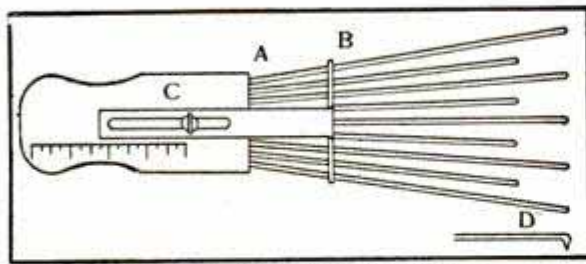
Two Tested Methods

be on solid bearings, says American Carpenter and Builder. Then strip with $\frac{1}{8}$ -in. pieces and put on the sheathing S in the usual manner. Fig. 2 shows another plan, but is not so good, as the paper, P, must be cut to fit the spaces.

Clean soiled playing cards by rubbing with soft rag dipped in a very little camphor solution.

A Device for Spacing Holes in a Belt

Use for a handle a piece of metal to which is soldered spring wire fingers, as shown in cut at A. These fingers

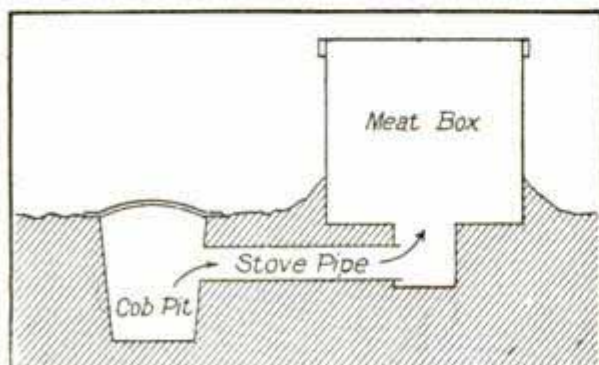


Can Be Set for Any Width Belt

pass through a sliding gauge, B, and can almost instantly be set for any width belt by the thumb nut, C, and scale marked on the handle. When set the fingers are at equal distances and are ready to be struck lightly or drawn over belt for marking. The ends of the fingers are turned down and sharpened, as shown at D, to give a point for marking.

Smoking Meat without Smoke House

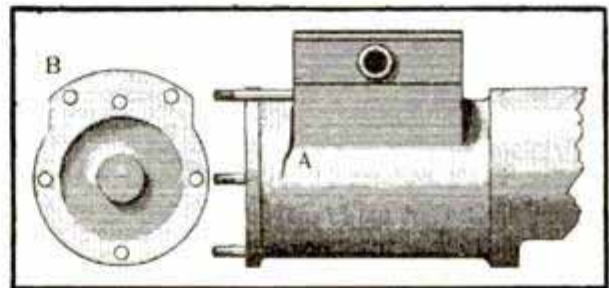
A novel way of smoking meat without a smoke house is shown in the sketch. Take a box about 4 ft. high and 2 or 3 ft. wide and remove both ends. Dig a hole in the ground about 2½ ft. deep and from this hole dig a trench the length of a stove pipe and 8 in. deep. At the other end of the trench dig a small hole and place over it the box. Put a joint of old stovepipe in the trench and cover it up, and bank up the box with earth, says the Dakota Farmer. Make a cover for the large hole from a piece of tin or an old stovepipe uncoupled and flattened out. After the meat has been in the brine



about two weeks take it out and put it in a tub of cold water for a day and night and then it is ready to place in the box. A fire made out of a few cobs in the large hole will do the work equal to a smoke house.

Repairing a Broken Cylinder

An engine cylinder that was cast to the main frame as shown in cut was broken at the point A right on top of the port, where the metal was so thin that it could not be repaired by putting on a patch. A cylinder head was cast with an extension, B, and by using some long stud bolts that screwed into the steam chest the crack was closed

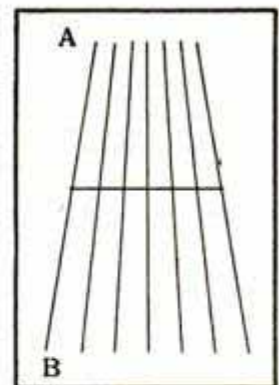


How the Crack Was Closed

and made the cylinder as good as new.—Contributed by C. R. McGahey.

How to Make a Special Divided Rule

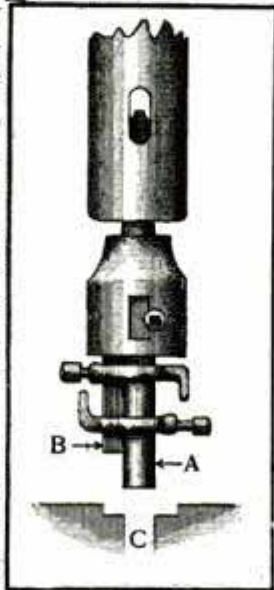
Take a piece of paper and lay out as many equal divisions as you wish the inch to have, making at point A less than an inch and at point B more than an inch in width. Draw lines between each corresponding point and with a rule find the width of an inch and cut the paper at this point.—Contributed by Allen Casey, Windsor, Conn.



Iron and steel may be cleaned of grease or paint by boiling in a solution of ¼ lb. caustic soda to 1 gal. of water. Mixture can be used several times.

Quickly Made Counter-Bore

Use a piece of round stock, as shown in cut at A, that will fit the hole in the work, C, and place in the drill chuck. Take a piece of square tool steel, B, the size of which is to be determined by the hole wanted, and clamp to the side of the round stock with two lathe dogs, as shown. The end of the tool steel, B, must be ground with clearance. This not only makes a counter-bore but serves to dress the work around a bolt hole to form a level seat for the bolt head and nut.—Contributed by Charles W. Partridge, New Haven, Conn.



Bending Angle Iron

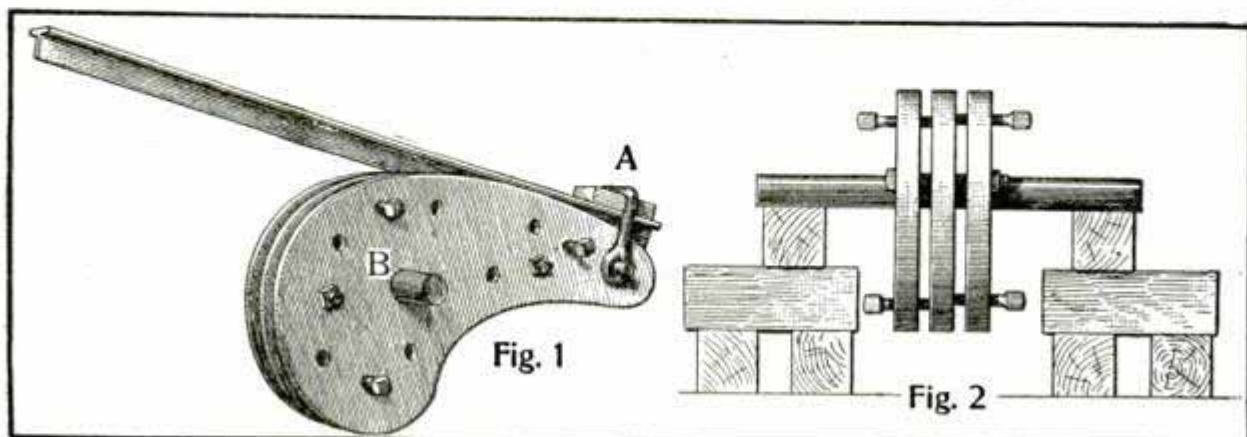
To accomplish the bending of a considerable number of angle irons ranging from 2 by 2 in. to 6 by 6 in., and to a radii ranging from 18 in. to 10 ft., some cast-iron plates were made 2 in. thick and about 3 ft. long, says a correspondent in the Blacksmith and Wheelwright. Three plates were found all that were necessary, and they were fastened together, as shown in Fig. 1, the plates being held together by two large bolts, and three set screws also

being put into each of the outside plates, so the distance between each of the plates could be adjusted at will. Holes were cored through the cast plates, which had no machine work whatever, and the clamp, A, is shown placed in one set of the holes. The other holes permit the clamp to be attached almost anywhere along the circumference of the jig. A piece of 3-in. shaft was put through another hole, B, which was located in the balance center of the jig. Blocks placed under the shaft, as shown by sketch, Fig. 2, permit the jig to be revolved so any desired portion can be brought uppermost.

In bending a piece of angle iron a portion of the jig is selected which is of the desired radius, the clamp is set, the angle heated, slipped under the clamp at one end and the flange is quickly hammered down to the desired degree of curvature. The distance between two of the plates is adjusted by means of the set screws, so that the web of the angle will just go between the plates. Then, when driven down by blows on the flange, the web is kept straight and in its proper shape by being forced between the iron plates.

When it is desired to bend the angle with the web outermost the jig is revolved bottom side up and the angle is heated and clamped as before and driven into that portion of the jig which is of the right concavity.

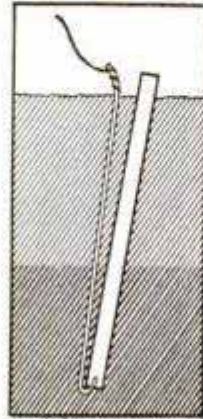
If a belt persists in slipping, hold a piece of tar soap on the inside of the belt while it is running.



Bending Angle Iron to Various Radii

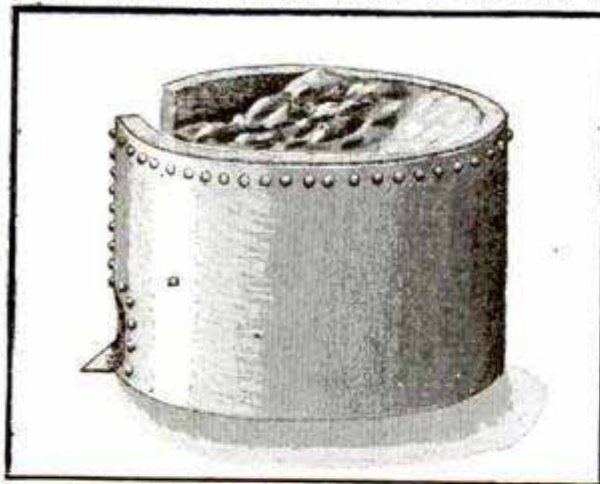
Another Way to Ground a Wire

Having read in Shop Notes the best ways to fasten a ground wire to the ground, I wish to submit my plan. I simply take a piece of small pipe, say $\frac{3}{8}$ -in., and long enough to reach the damp earth. Bend a hook in a piece of heavy wire and hook into the bottom of the pipe and drive both into the ground, as shown in cut. Either lead this wire to the desired place, or solder onto it, which can be done with less danger of a loose connection and a poor ground than by soldering to a piece of pipe.—Contributed by H. C. Gamble, Keifer, I. T.



Old Boiler Used for a Forge

A forge to be used for heating large parts can be made from a section of

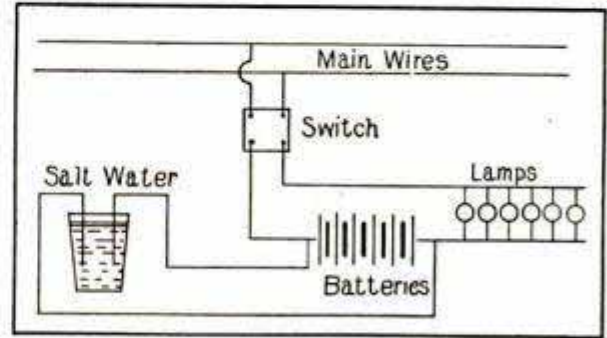


For Heating Large Parts

an old boiler, which can be obtained at a very low cost, says Street Railway Journal. The boiler used in this instance extends about 4 ft. under ground and is left unfilled up to the fireplace. The brick lining is held up by cross bars supported from the rim of the forge. The grate was formed of the perforated plate of a Providence car fender. A motor-driven blower placed overhead supplied air to the forge through a square wood pipe.

How to Find the Positive Wire

To distinguish the positive wire of a direct current from a negative wire, put a tablespoonful of salt in a glass of water and insert the free ends of the wires so they are an inch apart and do not make a short circuit, then

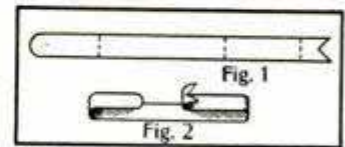


To Find Positive Wire

turn on the current. Fine bubbles will be given off from the negative pole, and therefore the other wire is the positive. It is always necessary to know the positive and negative wire in charging storage batteries. The cut shows the proper connections, which should have six 32-cp. lamps in parallel with the batteries.—Contributed by I. L. Powers, 326 E. Walnut St., Lancaster, Ohio.

A Belt Supporter for Trousers

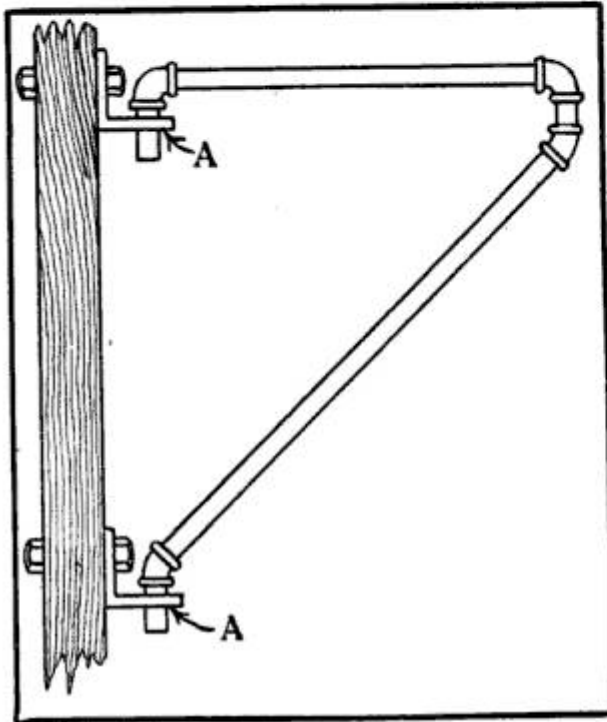
As I had considerable trouble wearing a belt on trousers that had no belt straps attached, I made a substitute out of some strips of sheet iron which were about $2\frac{1}{2}$ in. long and $\frac{1}{4}$ in. wide and cut to a shape as shown in Fig. 1. I bent them at the points marked by the dotted lines and shaped them as shown in Fig. 2. After putting them on the belt I clamped them tight, leaving the prongs to hold in the cloth of the trousers.—Contributed by Ralph E. Briley, Ames, Iowa.



Temper can be drawn from brass by the same process by which it is put into iron—by heating to cherry-red and then plunging into water.

Quickly Made Support or Bracket

To an upright piece and where wanted bolt two pieces of iron bent in an angle which is drilled to take the size of pipe to be used, as shown at A



Bracket Made of Pipe and Fittings

in sketch. Any size pipe may be used, and with three nipples, two elbows, two 45-degree elbows and two pieces of gas pipe cut to fit, will form the bracket as shown when screwed together. The support can be put on upside down by changing the nipples and angles a little, which will make a good hanger.—Contributed by Carson Birkhead, Indianola, Miss.

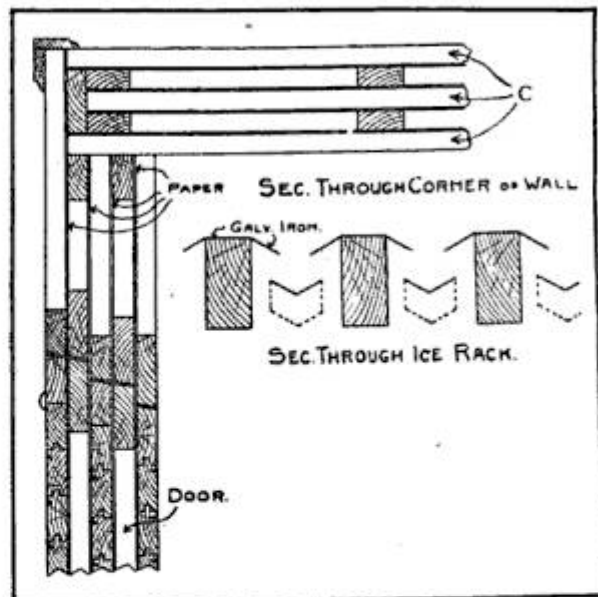
Shearing Value of Rivets

The materials from which boiler rivets are manufactured today are of very uniform grades, and their strength in shear has been definitely determined. The results given below were obtained by the Master Steam Boiler Makers' Association in their tests made about a year ago and are probably the most reliable of any:

	Lb. per. sq. in.
Steel rivets in single shear.....	45,000
Steel rivets in double shear.....	88,000
Iron rivets in single shear.....	42,000
Iron rivets in double shear.....	80,000

How to Build a Refrigerator

In constructing a refrigerator there is no necessity of charcoal, or any filling whatever. Simply construct two or more perfectly air-tight walls, with dead-air chambers between them, which makes the best possible insulation, as air which is absolutely confined is the best insulator. Three air-tight walls with $\frac{3}{8}$ -in. space between will make a good refrigerator, says American Carpenter and Builder. A cheap way to obtain this would be to build the outer wall and cover with good two-ply red rosin-sized building paper. This should then have a coat of linseed oil to make it air tight and durable, then strip this with $\frac{3}{8}$ -in. strips, ceil again, cover with paper as before, as shown in cut at C, being sure that all joints are stripped down and air tight. Next cover the strips with paper as before (this may be oiled and dried before applying) and finish with the inner wall of ceiling, which can be best coated with shellac. To make a job which will economize ice this should be the construction of floor and ceiling as well.



Details of Home-Made Refrigerator

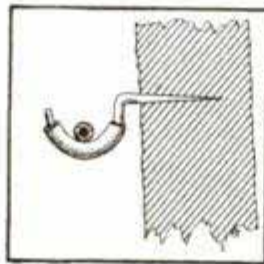
All that is necessary to form an ice shelf is a rack which will support the ice wanted and at the same time give free passage of the air down through and around it and at the same time carrying the water

off perfectly. This may be secured by taking 2 by 4 in. pieces and arranging them side by side on edge, 4 in. apart, and covering them with galvanized iron so it will project $1\frac{1}{2}$ in. on each side and bend down at an angle of about 30° ; then place a series of troughs between the 2 by 4 in. pieces to carry off the water into another trough at the ends of these and connect to a drain pipe, which should be trapped so the air can not pass back through it into the cooling room. The rack should be placed at the top of the room, as cold air descends, keeping up a circulation.

Supporting Electric Wires on Trees

A good device for supporting power, electric light and telephone wires on trees may be made from a piece of metal as shown in the sketch herewith.

A piece of rubber hose is slipped over the hook part, to form an insulator for the line wire. The shank can be about 8



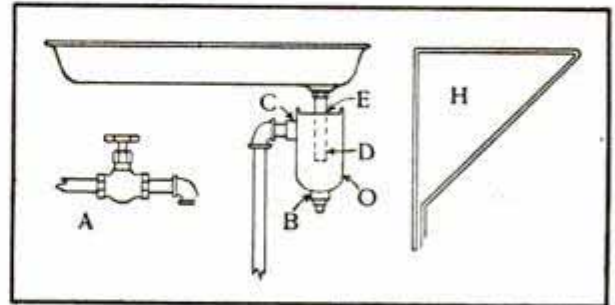
or 10 in. in length, while the hook need not be over 4 in. The line wire can slide in the hook, no matter how much the trees sway, and if fastened to every third or fourth tree it will insure steadiness along the whole line.—Contributed by Charles Vivier, Santa Anita, Cal.

To Use Common Vise as Pipe Vise

A very satisfactory pipe vise can be made from a common steel vise by taking a piece of coarse sandpaper about 3 in. by 6 in. in dimension and after doubling it, place it around the pipe, then place the part with the sandpaper on it between the jaws of the vise and tighten. The pipe may then be either threaded or cut without difficulty.—Contributed by P. O. Ward, Johnson City, Tenn.

A Home-Made Sink Trap

Your magazine has shown many kinks in the past for helping out the engineer and fireman. Perhaps the following may also prove a help to some one: In a certain steam plant



Sink Trap Made of Oil Can

the superintendent agreed to give the engineer a sink if he could find the necessary material to put it in place. For the faucets he used globe valves with a nipple and elbow, as shown at A in sketch. The sink trap was constructed out of an old oil can, O, leaving out the spout. A coupling was soldered in the can where the spout screwed in and a plug turned in the coupling, B. Another coupling was soldered in the can at point C and a pipe connected from this to the sewer. The can takes an inverted position and the pipe, D, leading from the sink runs down into the can as shown, and is soldered at point E. Two brackets were formed by bending $\frac{1}{4}$ by $\frac{3}{4}$ -in. band iron, which made the supports, H, for the sink.—Contributed by J. Ellethorn, Toronto, Ont.

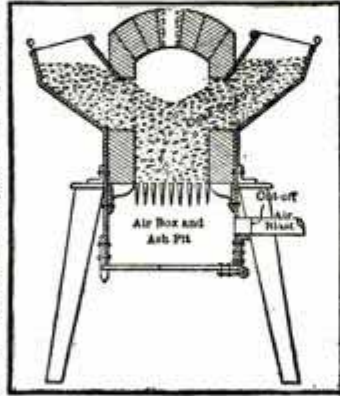
To Remove Fountain Pen When Stuck

When a fountain pen becomes stuck so it can not be unscrewed with the fingers, a good plan is to place a strip of fine emery cloth around the part to be unscrewed, with the emery side in, and clamp the ends in a vise or pliers.—Contributed by Charles Partridge, New Haven, Conn.



A Hardening Furnace

If the tool has been forged and allowed to harden afterward, it is well to heat the whole tool and afterward anneal the shank or neck, so as to secure the greatest possible toughness at that point. In the case of drills and reamers made of unannealed stock this is rarely necessary, if the hardening heat is kept out of the shank. For this purpose the tools may be suspended through the top of the furnace, says American Machinist, when the latter is so designed as to permit of it, with the part to be left annealed projecting outside. The device consists essentially of a cover provided with holes of appropriate size, through which the tools are lowered. The tools are secured by clamp tongs or handles with eyes, and set screws at one end. A coke furnace as shown in the cut could be fitted with a device serving the same purpose, with little trouble.



Hints on Buying a Second-Hand Engine

How to Detect the Weak Points

The fact that a second-hand engine is on the market may be due to many reasons. In any case the buyer should make a complete and thorough examination. If it is possible to trace the history of the engine, so as to determine the exact reason for its rejection by the original owner, the buyer will then know where to look for defects.

Lubricating devices frequently become inoperative, stoppage of the oil ducts or pipes, or damage to the engine itself. The surface of the cylinder barrel and the valve seats and faces can be examined only

by removing the cylinder head, the steam chest cover and the valve; or the valve bonnets and the valves in the case of the Corliss engine. The failure to lubricate these does not show the damage as quickly as the external parts, so the valve, valve seat and cylinder are liable to be badly scored. These parts should always be looked after first. If they are scored, leakage is bound to occur, and leakage at these points cannot easily be detected. Leakage of steam may also occur past the piston, due to the cylinder being worn somewhat oval. These defects may be determined by using calipers and a straight edge.

If cutting or scoring has occurred the marks will plainly show. Where the damage is very great, it will be necessary to have cylinder rebored. The straight-edge should also be applied to the valve seat and face, in the case of the flat slide valve. Rotary valves should be tested by blocking the piston in position and turning steam into the steam chest.

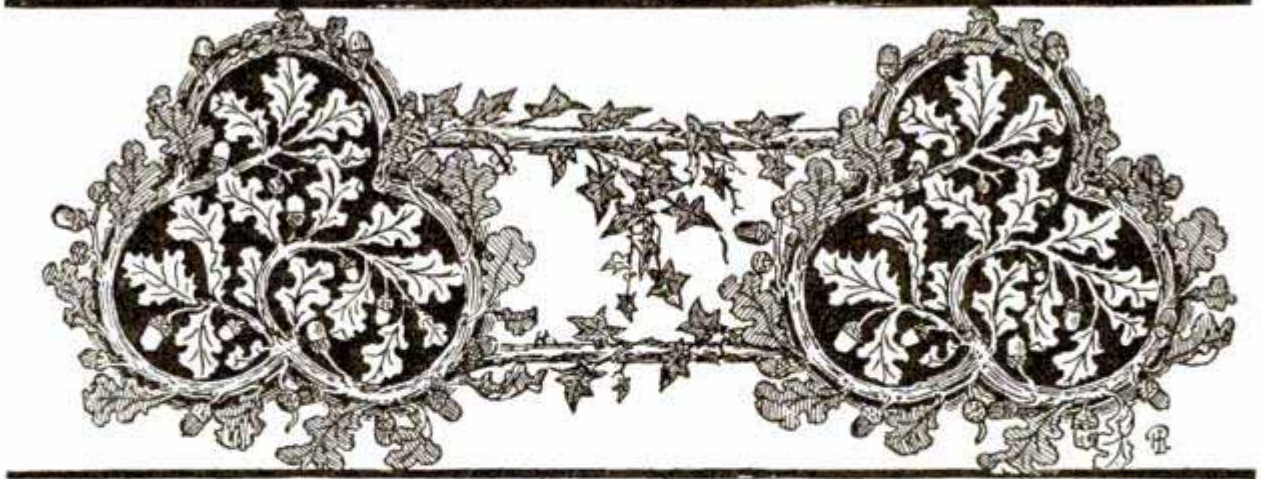
The exterior should be given as much careful scrutiny. Cracked flanges should be looked for and stud bolts in the cylinder should be examined. The precaution of examining the cylinder for cracks should be extended to take in all cast parts, including the main frame or bed.

The various rods and shafts about the engine should be thoroughly inspected for bends, twists and cracks.

The piston rod and valve stems should be examined to see if they have been scored and also note if they have been bent.

All journals, pins and bearings should be inspected for wear. The eccentric and eccentric strap should be gone over carefully to discover if there is any wear.

After the engine has been given a complete inspection, the cost of repairs necessary to put it in proper condition should be estimated and considered in the price asked for it. The foregoing is condensed from an article in the Practical Engineer.



"Oak and Ivy" Design for Frieze--London Decorator

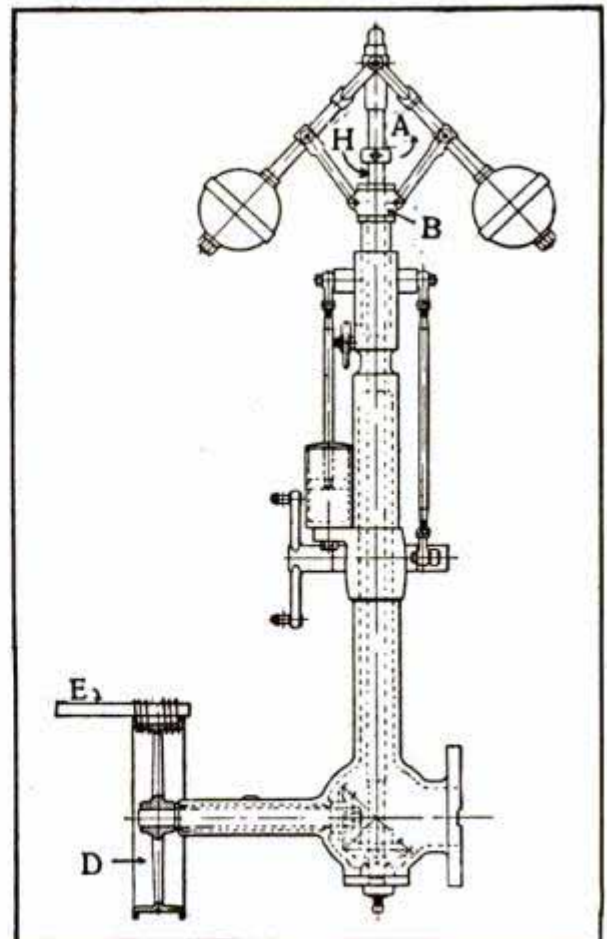
Finding the Speed of an Engine when Shut Down

It becomes a simple matter to determine the revolutions per minute of an engine which is not running when the following method is employed. It is given in the Practical Engineer and assumes that the steam is controlled by a fly-ball type of governor.

Examine the vertical shaft between the stop collar, A, and the sliding sleeve, B. If the engine has been run for a short time a ring will be found marked on the shaft. If the engine is new, lay off about five-eighths of the distance between the stop collar and the sliding sleeve, as indicated by the point H in the cut.

Remove the belt from the governor pulley, D, and secure some sort of a handle to the wheel. A piece of broomstick lashed to the rim with stout twine serves very nicely. Next revolve D until the balls have drawn the sleeve, B, up to the mark H. The pulley, D, is then running at the same speed it would if the engine were working. Therefore to determine the total revolutions per minute of the crankshaft, count the number of turns per minute that D makes to keep the shaft sleeve at H. Multiply this number by the diameter of D and divide by the diameter of the governor belt wheel on the crankshaft. The result is the speed of the latter pulley and of course the engine itself.

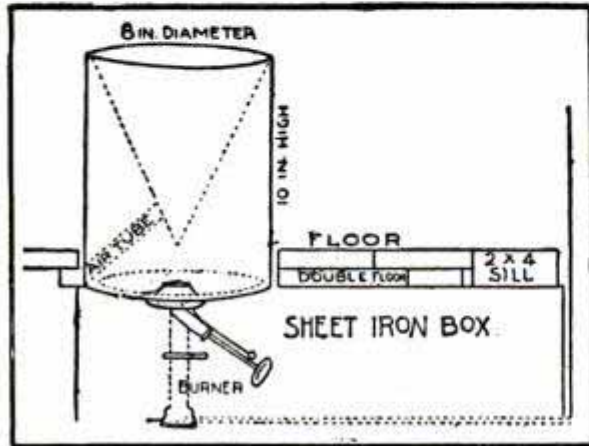
While revolving the pulley, D, the wrist plate should be placed on the center marks to avoid interference with the knock-out knuckles. This method will approximate very closely to the number of revolutions per minute of the engine.



To Determine Speed of Engine when Shut Down

How to Make a Gasoline Brooder

In building a brooder to use gasoline as fuel, make a sheet-iron arrangement around the burner or the lamp box, which should be underneath the poultry house. The heater drum should come through the floor of the house and rest



Gasoline Brooder

on the sheet-iron lamp box with a packing of asbestos paper between the wood and the burner box as well as heater drum.

You can see from the accompanying cut the drum is composed of two cylinders, says *The Rural New-Yorker*, the inner one V-shaped, with the large end the same size as the outer one, to which it is fastened airtight. From near the bottom of the V a small tube runs out through the outer cylinder and takes the fresh air from behind the lamp box underneath. The edges wherever joined should be rolled as well as soldered. The double floor shown in cut is just to bring it level or even with sill.

To Insure a Non-Short Circuit Between Dry Cell Batteries

To prevent short circuits between dry cell batteries where they are in a damp place or in a crowded place where they are liable to come in contact with one another, procure one or two inner tubes of quite large diameter of old bicycle tires. Cut them in lengths about 3 in. longer than the battery cell, pull the piece over the cell, only leaving the

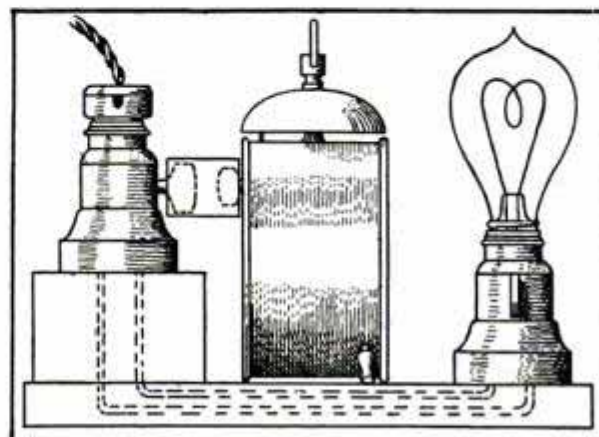
connecting wires through end of tube. With a piece of strong cord wrap and tie tight each end of the tube. Place one of these on each cell and you will have no trouble with wet weather affecting your cells or short circuiting by cells coming in contact.—C. B.

How to Caseharden Soft Steel

Place the steel to be hardened in the furnace and heat to a cherry red. Then apply cyanide of potassium to cover the entire surface, and see that it fuses. Return to the fire and heat again and then plunge in cold water.—Contributed by H. M. Dinsmore, 13 Frederick St., Providence, R. I.

An Early Riser Alarm

The early riser is a simple device which rings a bell and turns on the light. A porcelain base lamp socket is fitted on a block of wood the right height so its key will be in line with the key of the alarm clock, as shown in the sketch. A piece of wood with a notch cut in either end to fit the socket and alarm key fastens together these two keys. This socket is then connected by wires through the wood block and a board used as a base to a socket and lamp placed in front of the clock. A flexible wire connection with a plug at both ends will attach this device to any lamp socket. The alarm is wound up by turning the piece of wood connecting the two keys. When



Rings Bell; Turns on Light

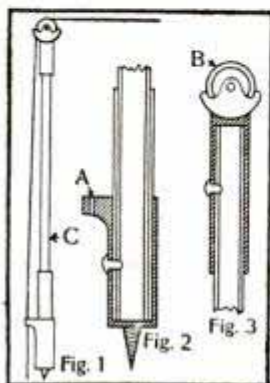
the time set for the alarm comes the bell rings and the light is repeatedly turned on and off.—Contributed by John Cook, Allendale, N. J.

How to Put Brass Cogs in a Wheel

First, cut and dovetail where the cog broke, about $\frac{1}{8}$ or $\frac{1}{4}$ in. deep, according to the thickness of rim of wheel; then bore two holes in the cut and cut threads in them; cut threads on rod and screw in tight. Then cut the rod off about $\frac{1}{4}$ in. shorter than the height of cog. The rod must be so that the brass covers it, says J. F. Koenig in American Blacksmith. Now take two plates the height and width of the cog and shape the same as the other cog. Then set the plates on the edge of the cut to get the right thickness of cog. Now take two more plates, place them on the sides and clamp all together with clamp screws. Now fill the space between the plates and other cogs with clay to keep them in place. Then take a plumbago crucible and put in your old brass and melt it to a very bright heat, so that it flows very freely. Now pour in quickly and, after it cools, take away the plates and dress down edges with a file, and you will be delighted how nice a cog you have. I charge from \$1.50 to \$5 per cog, according to the size.

Line Wire Hoist

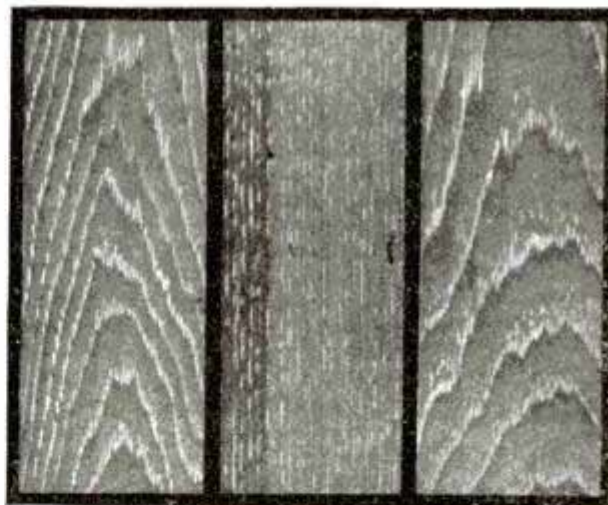
It is sometimes very difficult for men to hoist a wire on account of trees and rubbish being in the way. A device that is simple and easy to carry in a wagon is shown in the accompanying sketch. A cross section view of the handle and upper end is shown in Fig. 2 and Fig. 3. A projection is made on the handle, Fig.



2, in which is drilled a $\frac{1}{4}$ -in. hole, A, for the line wire to pass through. A 3-in. brass wheel is placed in the upper end, B, Fig. 3. The complete device is shown in Fig. 1. The handle is constructed so as to make the main rod C extend or shorten.—Contributed by Clifford B. Brainerd, Chevy Chase, Md.

Photographing Wood Grain

Of course a block of wood can be photographed the same as anything else by direct light, but the grain will be brought out much better by using transmitted light. Obtain a thin veneer of the wood to be photographed, back it with a sheet of ground glass, and allow strong direct light to fall on the glass. The picture will be more perfect if some light is allowed to fall directly on the surface of the wood, but most of it



From a Photograph

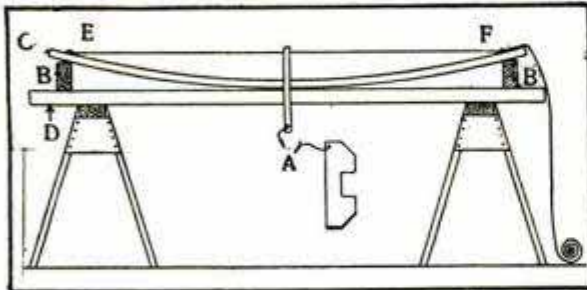
should be transmitted. The results are shown in the accompanying cut by courtesy of "Camera Craft."

While this may be a good way of reproducing the grain in small pieces of wood, it would not be practical for securing grain of wood where it is made up in furniture, etc.

This can be done at the time the wood is prepared for the filler. As soon as the camera is ready, with a large brush dash a good quantity of gasoline on the object to be photographed and quickly make the exposure.

To Stretch Screen Wire on Frames

It requires some time and patience to put screen wire on frames and get good results. A method used by a correspondent of American Carpenter and

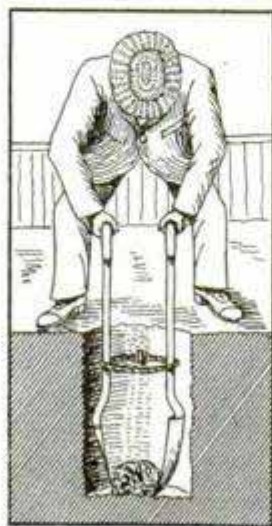


Frame Clamped for Attaching Wire

Builder is illustrated in the accompanying cut. Take two 2 by 6 in. pieces, D, a little longer than the frame and place them on two horses so they will be far enough apart to be the same width as the frame. Place two pieces of wood, B, across the pieces D as shown. Put the frame, C, on the pieces B and apply the clamps, A. Fasten end of screen wire at E, using care to get it to run parallel with the sides of the frame. Draw screen wire reasonably tight and fasten at F. After clamps, A, are removed fasten screen wire to the sides of the frame.

Substitute for a Post-Hole Auger

In constructing a piece of backyard fence I keenly felt the lack of a fence post hole auger or digger. The extent of the work did not warrant the purchase of such an implement. Doubtless many of your readers have been in a similar predicament, and they are welcome to my experience. I found that a most efficient tool to dig these holes was made by putting a small rope or noose around a



shovel and spade, near the middle, so that the ground could be lifted out of the holes by prying the two apart on the top. Any depth hole can be made in this way. For holes of small depth, the hand can be used to hold the shovel and spade together.—Contributed by Charles Voigt, Sheboygan, Wis.

Field Glasses for Line Inspectors

Instead of climbing the pole, line inspectors can relieve themselves of a large amount of physical labor, if they will use a plain hand mirror and a small field glass in connection with their work. When a day is sunshiny, the lineman can take a position on the ground beneath the wires and reflect so strong a light upon the insulators, cross-arms, or pins, that small defects, which might become serious, can be detected through the field glasses almost as well as though the observer were at the top of the pole.

To Grain a Plastered Ceiling

A plaster ceiling is easily grained, and where a room is finished in the natural wood, or grained, it presents an appearance which is superior to almost any other form of decoration. "Too little attention," says the Modern Painter, "is paid to the decoration of the ceiling in the average house of the better class. Great pains are taken to have the furniture, hangings and wall paper harmonize, while the ceiling is often left a blank white, or merely tinted, with no attempt at decoration."

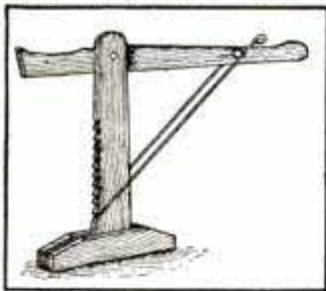
One of the simplest forms of graining for the ceiling is to lay it off to represent sheathing, or a more elaborate plan is to decorate it with panels and mouldings, conforming to the architecture of the room. It is a good idea, if the latter is used, to grain all the flat surfaces first, leaving the mouldings to the last, which avoids the possibility of ragged edges.

Care should be taken to keep the colors light, as a ceiling grows dark

more rapidly than the side walls. Three coats of good paint, smoothly applied, are required to produce a proper foundation. After the graining color is thoroughly dry, it should be given a thin coat of varnish which has about one gill of raw linseed oil to the pint. This makes the varnish less likely to crack. The latter is only necessary to facilitate cleaning, for now the ceiling can be sponged over and washed, whereas if the graining were left unprotected it would be a difficult matter to do this.

A Buggy Jack

A cheap and handy buggy or wagon jack can be made from 1-in. boards as shown in cut. For large vehicles it should be made of heavier material. The main post is tapered to the top and is 4 in. wide at the lower end,



where two cross pieces are fastened for the foot. The lifting piece should be pivoted at a height of one-half the sum of

the radii of the front and back wheel from the base. A wire loop that is used to hold lifting piece is made to fit the notches in the main post and has an eye at the end for the finger to use in changing from notch to notch.

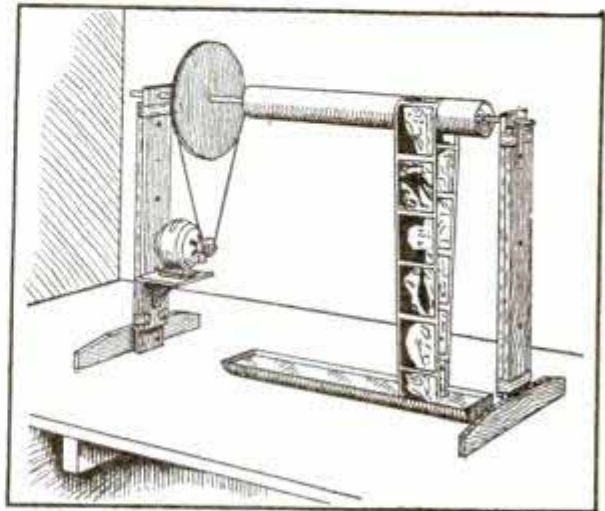
An Adjustable Sandpaper Block

An adjustable sandpaper block that I find very useful for hollow work is made by gluing a piece of rubber packing to a block of wood $1\frac{1}{2}$ by $2\frac{1}{2}$ by $3\frac{1}{2}$ in., says a correspondent in Wood Craft. When dry pass it over the rip saw a number of times, cutting grooves about $\frac{3}{16}$ in. apart in the wood and to within $\frac{1}{8}$ in. of the packing.

For gold ink rub together 2 parts mosaic gold and 1 part gum arabic.

A Multiple Film-Developing Machine

Where I had a large number of films to develop the old method seemed to be too slow for me, so I made an arrangement as shown in the sketch to develop



Develops Several Films at a Time

several at a time. I placed a roller on two adjustable end pieces which is turned by a small electric motor. Underneath the roller I use a long tray for the developing solution, in which is a small roller for the films to turn around. As the ends are adjustable any length roller may be used for either 6 or 12 exposure films.—Contributed by Joseph Bell, 411 Herkimer St., Brooklyn, N. Y.

Home-Made Tongs for Handling Fuses

To replace burned-out fuses of the cartridge type where it is necessary to reach past exposed bars that carry high voltage while current is on, necessitates something to do the work besides the



Made of Wood

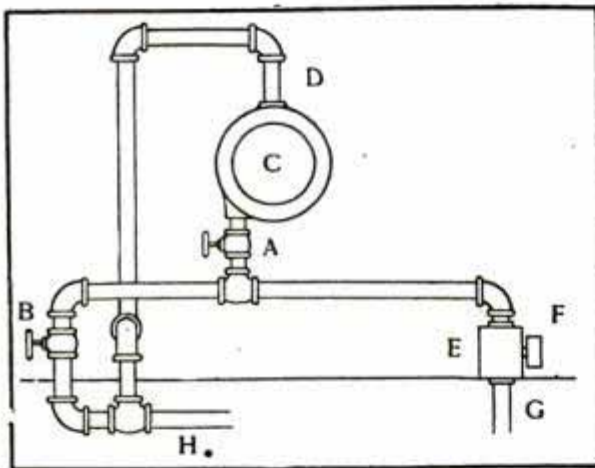
bare hands. To avoid accidental shock, says a correspondent in Power, we have had some wooden pliers or tongs made, to handle the fuses with, as per the accompanying sketch. The tongs

comprise two pieces of oak, 1 in. thick and $1\frac{1}{2}$ in. wide, the handles being rounded with a plane. The jaws are tapered for a distance of 3 in. to about 1 in. at the ends. The pieces were clamped together, and a hole bored laterally through the jaws, near the end, as indicated, so that half of the hole is in each jaw piece. This hole is just the size of the smallest fuse. A piece of strap-iron was riveted on each side to form the hinge, there being two rivets in one leg to keep the parts from "sawing" back and forth.



Piping Gasoline Engine for Kerosene

Under certain conditions kerosene is as explosive as gasoline and can be used in engines of the explosive type



Burns Kerosene Instead of Gasoline

for power if those conditions are applied. We were told that if we could get the cylinder hot by first using gasoline to start we could turn on the kerosene and use it the same as gasoline. We made this change in our engine at the expense of about \$10, including a small tank for kerosene, says a correspondent in the Grain Dealers' Journal.

When starting, valve A is opened to pump the cylinder jacket full of water, the water running back into pump to prime it. Closing the valve also holds the water in the cylinder when it is necessary to stop; keeping the hot water in the cylinder does not require so long a run on gasoline to start.

After starting, the engine is run on gasoline until the water in the jacket gets hot, the water from the pump being run to waste pipe. The flow of water through the jacket of the cylinder is regulated by the globe valve B, after turning on the kerosene. By means of the two globe valves, A and B, the amount of water passing through the engine can be regulated almost to a drop. Valves A and B are the 1-in. size and we use an inch pipe from pump to engine, and $1\frac{1}{2}$ -in. for the overflow.

For piping the kerosene (not shown) we use a quarter-inch pipe attached under the gasoline pump; and on the oil overflow we have a three-way connection, $\frac{3}{8}$ -in.

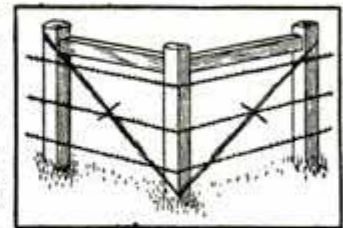
We have run as much as five hours at a time handling grain, leaving the throttle that furnished the gasoline at the same mark in using the kerosene. We find that kerosene does not require so much air as gasoline, and this is regulated by using a cut-off, which we experimented with until we got the required amount.

The engine should be stopped on gasoline as well as started, so as to leave the pump and pipes full of gasoline ready to start on.



Corner Brace for Wire Fence

A good way to make a corner brace for a fence is shown in the accompanying cut. The top cross pieces are made from 4 by 4 in. material about 8 ft. long. The brace wires are constructed by winding together eight wires.—Contributed by G. A. Fullwood, Turnersville, Tex.



To make a mirror brilliant rub with a ball of soft paper slightly dampened with wood alcohol, sprinkle with a little whiting and polish with tissue paper.



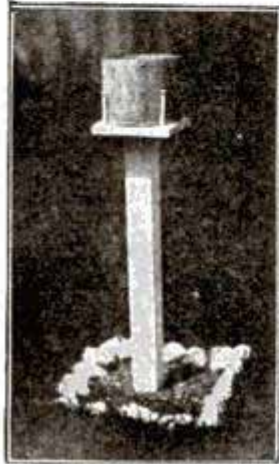
Amateur Mechanics



To Make a Negative Without Plate or Film

The accompanying illustration is a reproduction of a photograph print obtained from a negative made of developing or gas light paper which was used in the plate holder instead of a plate or film. The time given to make this exposure was one minute. The bath used in developing and fixing is the same as used on prints.

When through the solutions, washed and dried, it is then printed in contact the same as a film, only it requires longer time in printing.—Contributed by Charles W. Fankboner, Grand Rapids, Mich.



arately and the hole made to fit the plug. Some of the plugs were made up of different kinds of wood in different ways and glued together before being turned.

The stand contains 19 pieces of wood which were first cut in triangles and glued in the form of a hexagon. Two of these layers were glued and turned



on a face plate to form the bowl, the other layer was turned to form the base, while the column is one piece of walnut. The task required considerable time and patience.—Contributed by C. E. Mallory, University of Washington, Seattle, Wash.

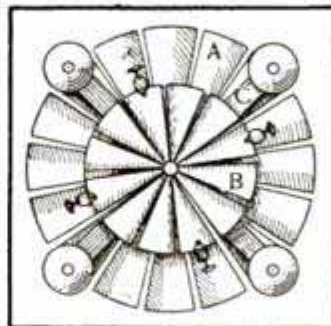
How to Make a Hollow Ball

The illustration shows a hollow ball, 6 in. diameter, the shell being about $1\frac{1}{2}$ in. thick. It contains 263 pieces of hardwood, fitted perfectly with glue. Twenty-five kinds of wood were used. A 6-in. ball of fir was first turned and a chuck made to hold the ball. Holes were then bored to a depth of 3 in. (to the center of the ball) and wooden plugs were inserted just $1\frac{1}{2}$ in. When the entire surface of the ball had been thus bored and plugged, I had a ball 6 in. diameter with a $1\frac{1}{2}$ in. shell and a 3-in. diameter hollow within. Each plug was turned out sep-



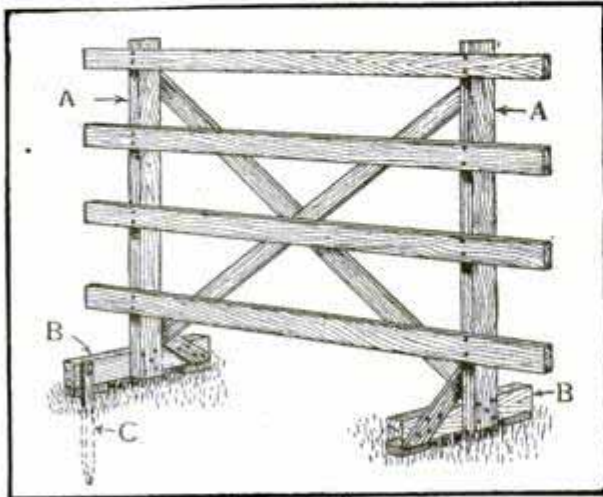
A Musical Windmill

Make two wheels out of tin, which may be of any size, but wheel A must be larger than wheel B. On wheel A fasten two pieces of wood, C, to cross in the center, and place a bell on the four ends, as shown. The smaller wheel, B, must be separated from the other with a round piece of wood or an old spool. Tie four buttons with split rings to the smaller wheel, B. The blades on the wheels should be bent opposite on one wheel from the others so as to make the wheels turn in different directions. When turning the buttons will strike the bells and make them ring constantly.



How to Build a Grape Arbor

A grape arbor made of white pine, put together as shown in the sketch, will last for several years. The 2 by 4-in. posts, A, are 7 ft. long. The feet, B, are



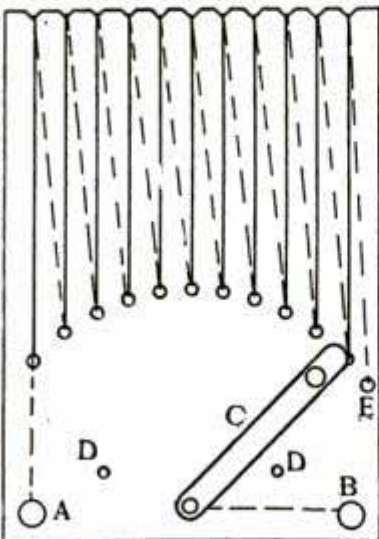
Grape Arbor Trellis

made 2 by 4 in., 4 ft. long, and rest on a brick placed under each end. The crosspieces and braces are 1 by 2 in. A piece of strap iron, C, fastened to the foot by means of a nail through a hole in its top, is driven into the ground, which holds the arbor from blowing over.— G. A. Dale, Virginia, Ill.

A Battery Rheostat

In a board 7 in. long and 5 in. wide bore holes about $\frac{1}{4}$ in. apart in a semi-circle 2 in.

from the bottom and cut notches in top end to correspond with the holes. From a piece of brass a switch, C, is cut with a knob soldered on at the end. Nails for stops are placed at DD.

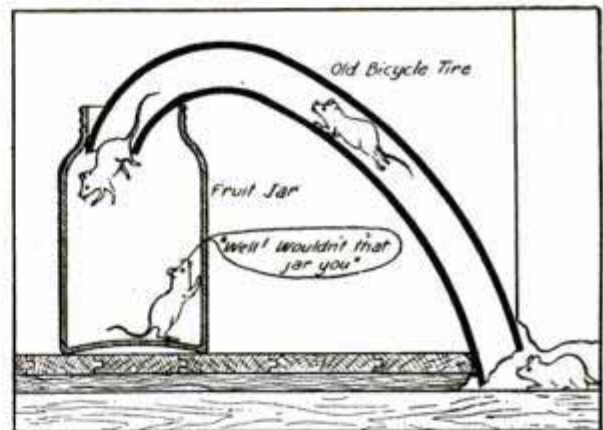


Two binding-posts are placed in board at A and B. With about 9 ft. of fine iron wire attach one end to the bottom

of post A and run through first hole and over in first notch to back of board and then through second hole and over second notch and so on until E is reached, where the other end of wire is fastened. Connect switch to post B.— Contributed by Edmund Kuhn, Jr., East Orange, N. J.

Novel Mouse Trap

A piece of an old bicycle tire and a glass fruit jar are the only materials required for making this trap. Push one end of the tire in the hole, being sure that there is a space left at the end so that the mice can get in. Then bend the other end down into a fruit jar or other glass jar. Bait may be placed in the jar if desired, although this is not



Great Fun: Try It

necessary.— Contributed by Geo. G. McVicker, North Bend, Neb.

One-Wire Telegraph Line

The accompanying wiring diagram shows a telegraph system that requires no switches and can be operated with open-circuit batteries on a one-wire

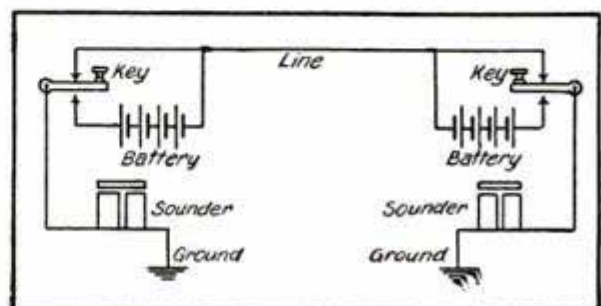


Diagram of One-Wire Line

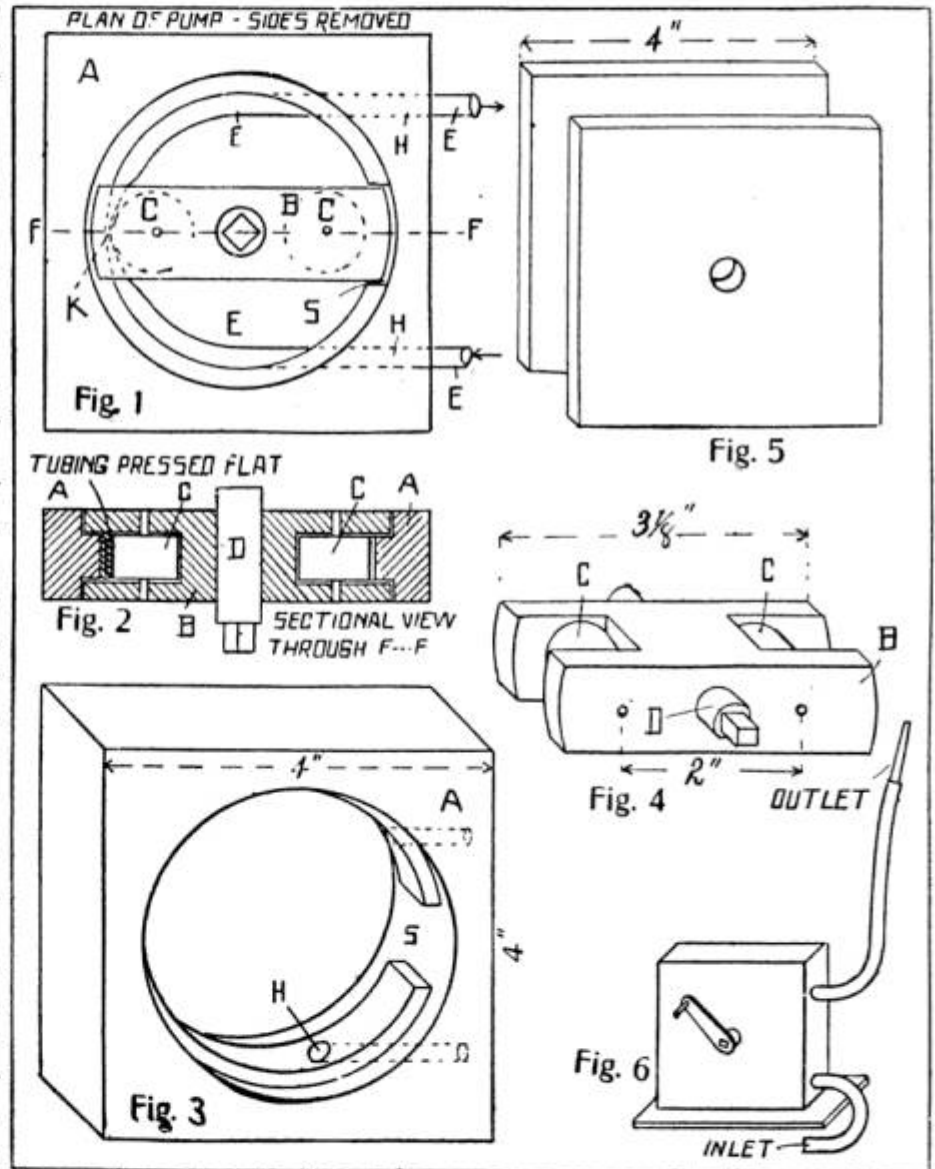
line with ground connections at each end. Any telegraph set in which the key makes double contact can be connected up in this way.—Contributed by R. A. Brown, Fairport, N. Y.

How to Make a Rotary Pump

A simple rotary pump is constructed on the principle of creating a vacuum in a rubber tube and so causing water to rise to fill the vacuum. Figs. 3, 4 and 5 show all the parts needed, excepting the crank and tubing. The dimensions and description given are for a minimum pump, but a larger one could be built in proportion.

Through the center of a block of wood 4 in. square and $\frac{7}{8}$ in. thick (A, Figs. 1, 2 and 3) saw a circular opening $2\frac{7}{8}$ in. in diameter. On each side of this block cut a larger circle $3\frac{1}{4}$ in. in diameter, having the same center as the first circle (Fig. 3). Cut the last circles only $\frac{1}{4}$ in. deep, leaving the first circle in the form of a ridge or track $\frac{3}{8}$ in. wide, against which the rubber tubing, E, is compressed by wheels. Bore two $\frac{1}{4}$ -in. holes (HH, Fig. 1) from the outside of the block to the edge of the inner circle. Put the rubber tube, E, through one of these holes, pass it around the track and out through the other hole. Notice the break (S) in the track; this is necessary in order to place in position the piece holding the wheels.

Figure 4 shows the wheel-holder, B. Make it of hard wood $3\frac{1}{8}$ in. long, 1 in. wide and a little less than $\frac{7}{8}$ in. thick, so that it will run free between the sides (Fig. 5) when they are placed. Cut two grooves, one in each end, 1 in. deep and $\frac{1}{2}$ in. wide. In these grooves place wheels, CC, to turn on pins of stout wire. These wheels should be $\frac{3}{4}$ in. in diameter. When placed in the holder their centers must be exactly 2 in. apart, or so arranged that the distance between the edge of the wheels and the track (K, Fig. 1) is equal to the thickness of the tubing when pressed flat. If the



Details of Rotary Pump

wheels fit too tight, they will bind; if too loose, they will let the air through. Bore a hole through the middle of the wheel-holder and insert the crank-

pin, D, which should be about $\frac{1}{2}$ in. in diameter. The crankpin should fit tight; if necessary drive a brad through to keep it from slipping.

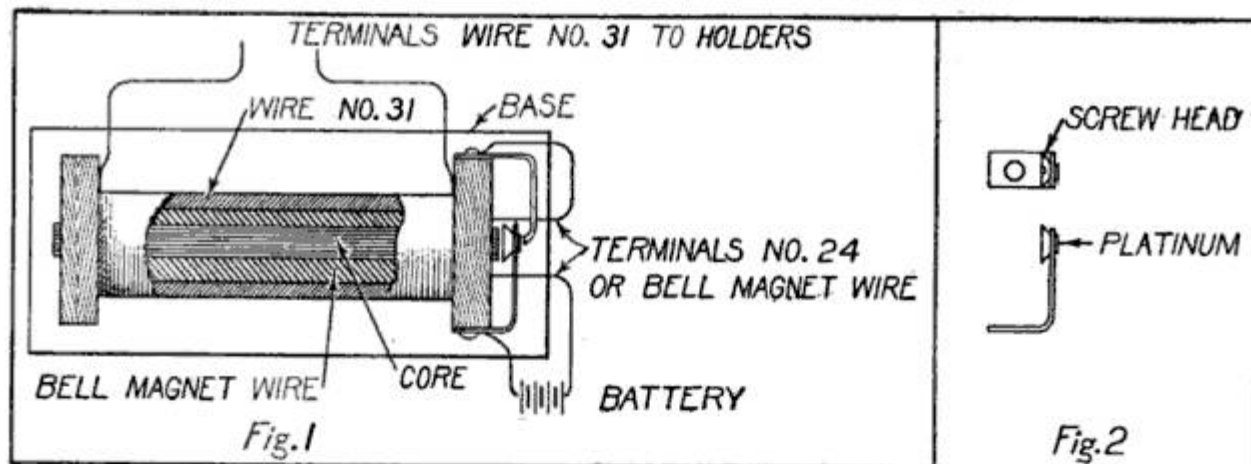
In the sides (Fig. 5) bore a hole in the center of the crankpin to run in loosely. Now put all these parts together, as shown in the illustration. Do not fasten the sides too securely until you have tried the device and are sure it will run smoothly. For the crank a bent piece of stout wire or a nail will serve, though a small iron wheel is better, as it gives steadiness to the motion. In this case a handle must be attached to the rim of the wheel to serve as a crank. The drive wheel from a broken-down egg-beater will do nicely. For ease in handling the pump, a platform should be added.

How to Make a Small Medical Induction Coil

The coil to be described is $3\frac{1}{2}$ in., full length of iron core, and $\frac{3}{4}$ in. in diameter.

Procure a bundle of small iron wire, say $\frac{1}{4}$ in. in diameter, and cut it $3\frac{1}{2}$ in. long; bind neatly with coarse thread and file the ends smooth (Fig. 1). This done, make two wood ends, $1\frac{1}{4}$ by $1\frac{1}{4}$ in. and $\frac{3}{8}$ in. thick, and varnish. Bore holes in the center of each so the core will fit in snugly and leave about $\frac{1}{4}$ in. projecting from each end (Fig. 1).

After finishing the core, shellac two layers of thick paper over it between the ends; let this dry thoroughly. Wind two layers of bell magnet wire over this, allowing several inches of free wire to come through a hole in the end.



Medical Induction Coil

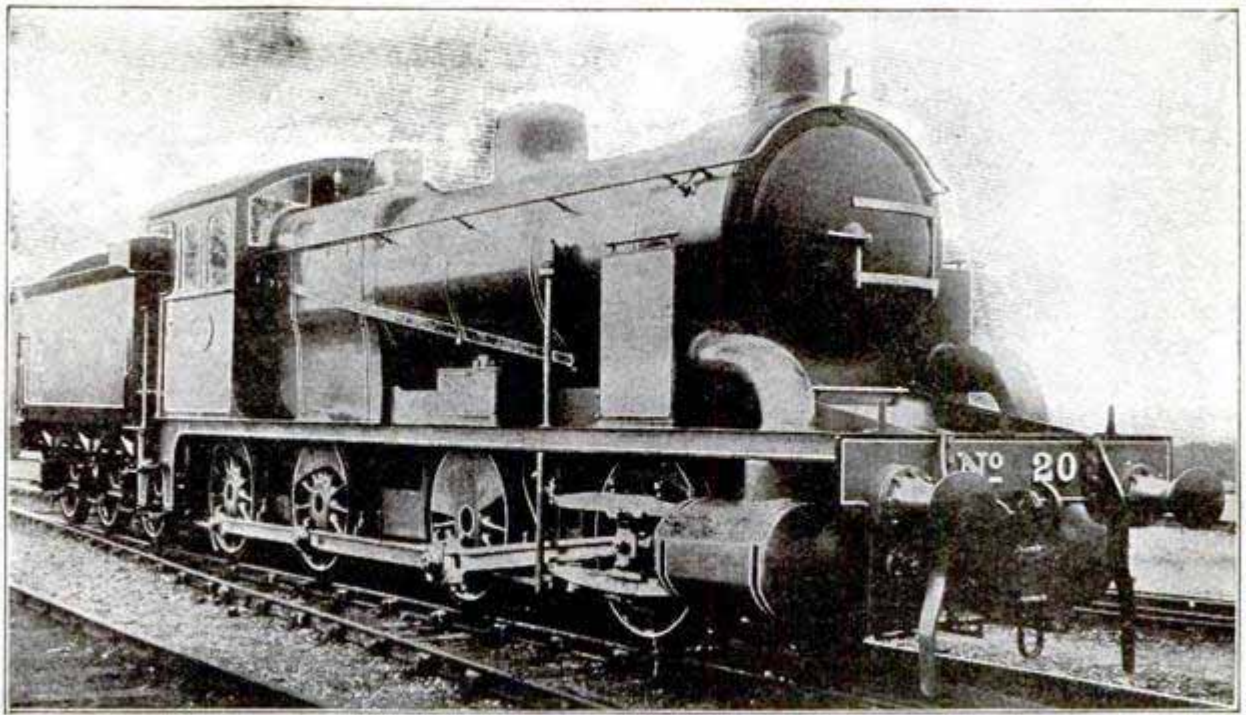
To use the pump, fill the tube with water and place the lower end of the tube in a reservoir of water. Make a nozzle of the end of a clay pipe stem for the other end of the tube. Then turn the crank from left to right. The first wheel presses the air out of the tube, creating a vacuum which is immediately filled with water. Before the first wheel releases the tube at the top, the other wheel has reached the bottom, this time pressing along the water that was brought up by the first wheel. If the motion of the wheels is regular, the pump will give a steady stream. Two feet of $\frac{1}{4}$ -in. tubing, costing 10 cents, is all the expense necessary.—Contributed by Dan H. Hubbard, Idana, Kan.

Cover with paper and shellac as before.

Wind about $\frac{1}{2}$ in. of fine wire, such as used on telephone generators, around the coil, leaving long terminals. Soak the whole in melted paraffine and let cool; bind tightly with black silk.

The vibrator is made of a piece of thin tin to which is soldered the head of an iron screw and on the other side a small piece of platinum, which can be taken from an old electric bell (Fig. 2).

Of course, a regulator must be had for the vibrator; this can be accomplished by bending a stout piece of copper wire as shown. The connections and the base for setting up are shown in the figures.—Contributed by J. T. R., Washington, D. C.



Freight Locomotive, Great Eastern Ry., England

KILLED BY STEPPING ON FURNACE REGISTER

The death of Miss Grace Dillon, of Champaign, Ill., has baffled the electrical experts, who can find no logical reason for it. Miss Dillon had hold of a long drop cord, grasping the electric light bulb, between thumb and first finger. As she walked about her room she stepped upon a galvanized iron radiator which connected by iron pipes to the furnace, and was almost instantly electrocuted.

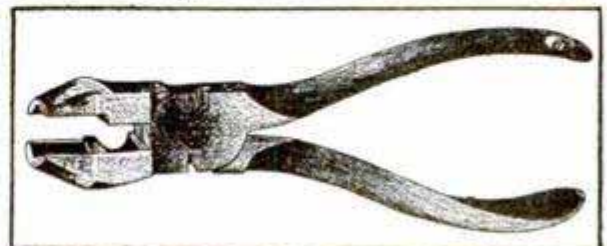
Her fingers were burned to the bone, but where the current left her foot, passing through a tack in her shoe, it made only a slight black mark. The point of the tack had worn through the skin of her great toe, thus lessening, to a large extent, the resistance of her body.

Electrical experts who examined the house wiring, declare that there was absolutely no evidence to indicate the presence of any high potential current other than the ordinary 110-volt circuit and are completely at a loss to understand how the death occurred. This accident is due to the fact that electric bulb sockets do not completely cover the lamp's metallic end, a con-

dition which all electricians complain about. The coroner's jury exonerated the lighting company. Its electrical engineer, G. W. Caldwell, says: "I believe the underwriters should require that all sockets be long enough to cover the bases of all lamps. They now require that the bases of the lamps be short, but even with this I have not seen one that was so thoroughly covered that you could not touch the live parts."

PLIERS FOR REMOVING NUTS

With these new pliers nuts can be screwed on or off in all sorts of awkward places where the use of a wrench is either impossible or difficult. It can

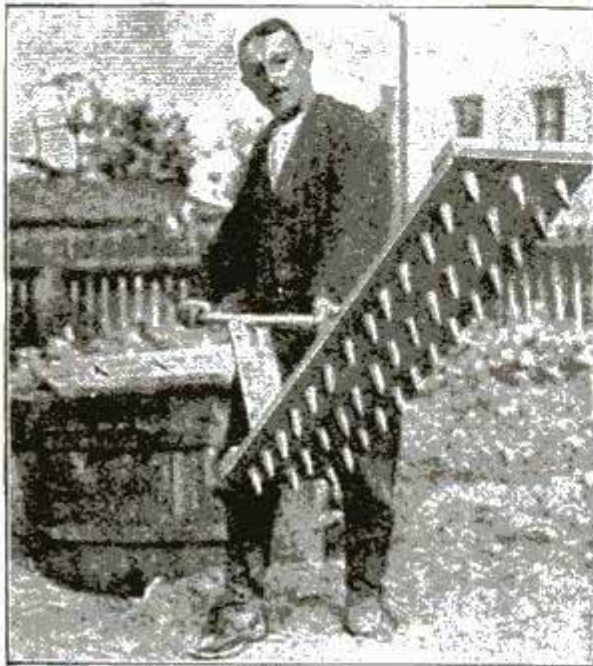


Nut Wrench and Wire Pliers

also be used as a wire cutter; as an ordinary pliers; and in several other ways. For electricians the handles are insulated.

GERMAN RADISH BOARD

In Germany the radish is not highly esteemed as a food vegetable but is used in preparing medicines. In plant-



Marks Places for Planting

ing, the gardeners use a marking board which when pressed upon the soft earth leaves 39 holes, spaced equally. Into these holes the seed is dropped.

SAWDUST AS A WALL FILLING IN RESIDENCES

It is a singular fact that with all our scientific training of the present age people will not use some insulator to keep the heat in a house during the winter and to keep it out during the summer. Fireless cookers and hay ovens are successful because they keep the inherent heat of a substance doing useful work, instead of allowing it to escape.

This same principle can be applied to house construction by filling the walls with sawdust and putting a layer of it over the ceiling. To most people, however, the mention of sawdust filling conjures up the following objections: dampness, spontaneous combustion, decay, odors, and nests for rats and mice. These objections are less serious than supposed. It has been proven that

even if sawdust is damp, it will soon dry out if placed in walls. Sawdust cannot decay where there is no moisture and as it is a slow combustive it is an actual protection against fire. Rats cannot live in walls when they are tightly stuffed and any slight odor from the wood is dispelled in a few weeks. A. K. Campbell says, "I have used it for 37 years in building. Every house that I have been connected with in that time has had its walls filled with sawdust and the ceilings covered. There has not the shadow of an objection developed itself during all that time in any of these instances. It has proved itself to be the greatest fuel saver I have ever known. It costs but a few dollars to fill the walls of the whole house."

GOING INTO FOUNDRY BUSINESS? POINTS TO CONSIDER

The inexperienced man who is going to invest should carefully consider the following vital points before embarking in the foundry business:

The great lack of good skilled labor.

The advantage that sellers of appliances and purchasers of castings take of ignorant beginners.

Difficulties in obtaining practical and good executive managers and foremen.

The underestimation of the obstacles and uncertainties that every beginner must encounter.

He should make a thorough investigation to discover if there is a demand for the class of castings he intends to make, and what competition exists.

One seeking orders, and not competent to quote prices, should not be ashamed to seek his manager's or foreman's advice.

In starting to make castings don't be in a hurry to fill your shop with work. Go slow, feel your way, and your chances for error or failure will be greatly decreased.

Be sure to have sufficient working capital and good chances of obtaining a surplus over and above what is considered necessary.



LOIS L. HOWE, Architect, Boston.

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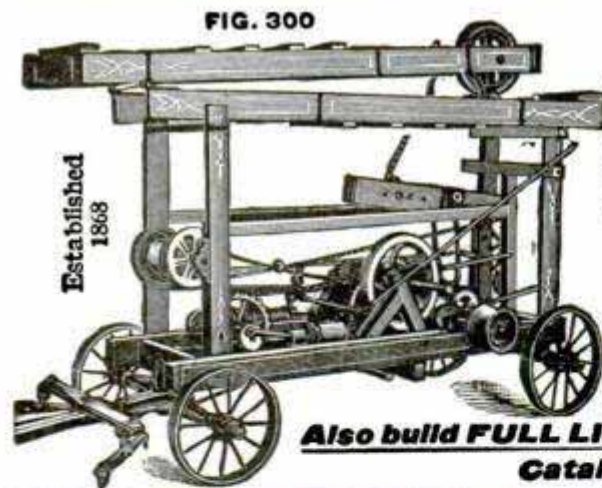
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AN IMMENSE OIL SCHEME.—The Southern Pacific proposes to expend at least \$2,000,000 on an oil pipe line from the Kern county oil fields to a point on San Francisco Bay opposite the city. This pipe line will be 265 miles long, and will consist of an 8-in. pipe for the entire distance. This will be the first railway company in the world to own and operate its own entire oil supply. The pipe is intended to supply its hundreds of locomotives in California at a minimum cost.

The company finds it impossible to buy or build enough tank-cars to distribute oil at 200 or 300 points in the State to daily supply its engines.

On the 265-mile route there will be 23 pumping plants, each with two single or triple compound duplex oil pumps of special design; also two water pumps for injecting water to facilitate the flow of the oil through the pipe line from the wells to San Francisco Bay. At each pumping station there will be a 750-hp. battery of watertube boilers in three units; also two large steel tank reservoirs for storage purposes.

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CUTTING RUBBER WITH A WET KNIFE.—Some years ago the writer was employed in a paper mill in Vermont and one day saw the machine tender cutting some heavy rubber which covers one of the rolls at the "wet" end of the machine. After every stroke of the knife he would wet the blade in his mouth. Being asked the reason he explained that it made it cut easier and then told the following story: A certain firm of rubber manufacturers were experimenting with a new mixture of rubber and were observing the utmost secrecy regarding its composition with a view to protecting same when a satisfactory mixture had been found.

One day a visitor wormed his way into the works on some plausible excuse or other and was looking about with apparent indifference and that lack of close observation which characterizes the merely curious.

He was apparently a minister, being of a benevolent mien, with a long black coat of a clerical cut and a white tie. As he came to where some of the finished rubber lay he asked if he could have a piece to use as an eraser and as he looked anything but the technical expert he was told that he might have a piece.

Taking out his knife he took up a piece of the heavy sheet and wet his knife to cut it off. Instantly the man in charge snatched away the sample sheet and with no gentle hand spun the clerical-looking gentleman around with the words, "You get out, and quick, too, you know altogether too much about rubber for us. Now go!" He went.—Contributed by W. E. Morey, Chicago.

SUBMARINES MADE SAFER.—The danger of sailors being caught in a trap when a submarine sinks will be removed in the future, thanks to Commander Hall and Staff Surgeon Rees, of the British navy. They have devised an apparatus to enable men to escape from a vessel, even if it is filled with water or poisonous gas.

The invention resembles a diving helmet with a jacket attached. It contains an ingenious oxygen generator, the chief feature of which is that the oxygen may be breathed and rebreathed repeatedly several hours because the carbonic acid in the respired air is absorbed by a special substance called oxylithe.

The apparatus also has the qualities of a life buoy, and the wearer, when under water, can, by a simple manipulation, rise to the surface rapidly and float until rescued. The apparatus can be hung handily within the submarine boat and can be donned in thirty seconds.

Even in the most poisonous fumes of chlorine gas which the sea water generates when it comes in contact with the batteries of submarine boats the wearer can live for an hour and twenty minutes.

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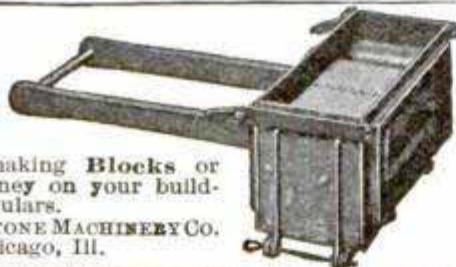
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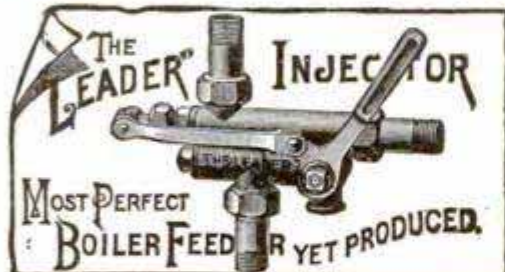
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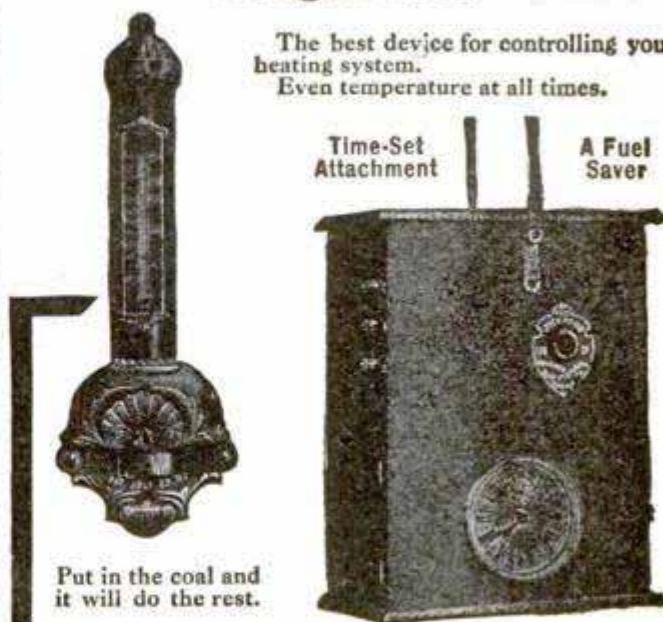
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THE PUMP THAT FOOLED THE YOUNG REPAIRMAN.

[From the American Machinist.]

Jimmy was a young mechanic whose confidence in his own abilities were fully developed. Once, when the shop was short handed the boss had let him go out alone to fix a gas engine. Not long after the force was again all busy when Hans Pumpnickel, who ran the little steam barrel mill down by the creek, wheezed into the shop in a veritable cloud of perspiration.

"Gott im Himmel!" exploded Hans, "mine bumb she von't bumb, und I can get no vasser in mine poller already. I loose a tousan tollars a tay."

Here was Jimmy's chance.

With manly stride and bulging kit he sallied forth. On the way he questioned Hans as to the pump's symptoms. Not that he needed any coaching; he would make his own diagnosis; but he was curious to learn what ideas mechanical oozed (he felt certain they merely oozed) around within the miller's round head.

"She go oud lik dis," elucidated Hans, thrusting his fist from him slowly and steadily, "unt she koom pack like

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dis." Here Hans suddenly shot his arm back with enough violence to dislocate his shoulder.

Jimmy smiled knowingly and, gazing away to the horizon with a wise look, muttered to himself, "valve."

The pump proved to be a little Knowles. It also proved to be situated in a not too commodious passageway, against the side of the boiler, which was anything but cool. As a preliminary, Jimmy turned on steam and watched the pump's action. The miller's graphic explanation fittingly described it.

Jimmy opened his kit and spread his tools out in imposing array. He then poured a pail of cold water over the hot cylinder and took off the steam chest. The valve appeared to be all right. The trouble must be in the outside gear. He took off the cylinder head, too, to make sure; everything all right there. He replaced the chest and head and examined the gear.

The valve was worked by a rocker attached to the trough, the rocker being moved by means of a roller on the piston rod. The movement of the valve was regulated by having the link which connected the rocker with the valve stem in two parts screwed together. The lock nut on the link was loose; the link must have unscrewed and

(Continued on page 1024)

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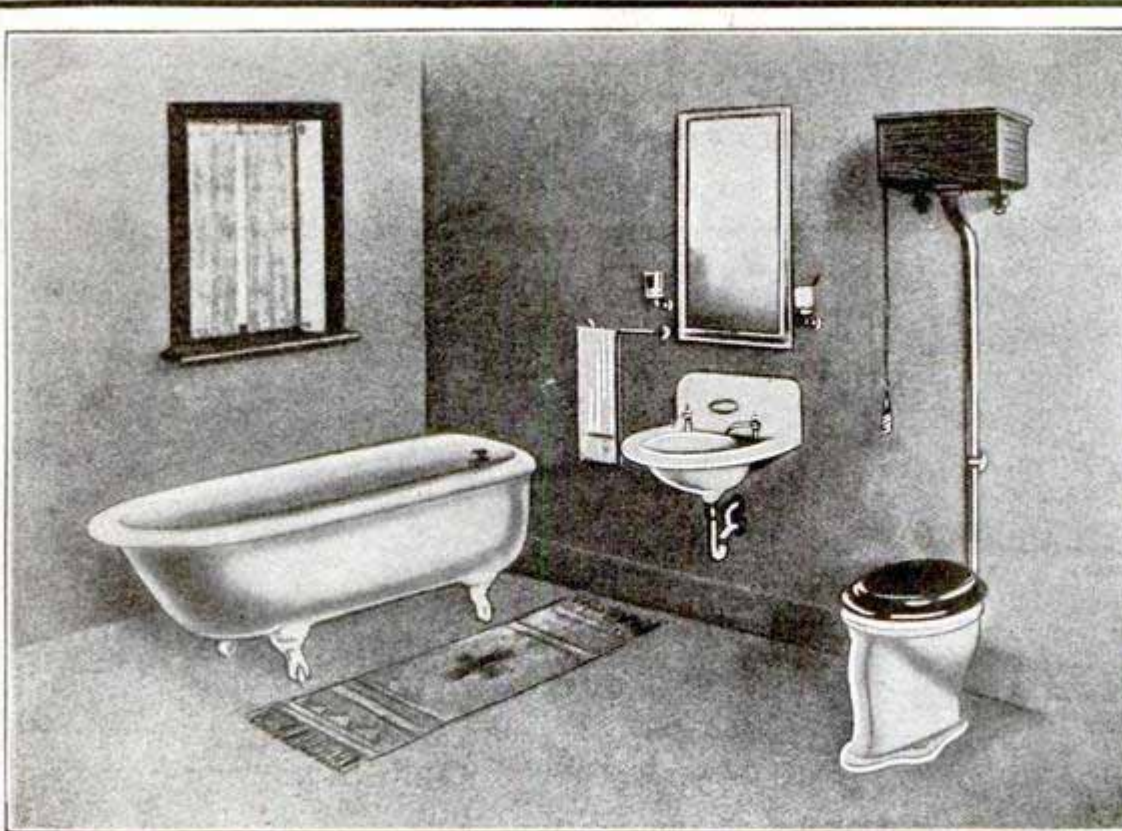
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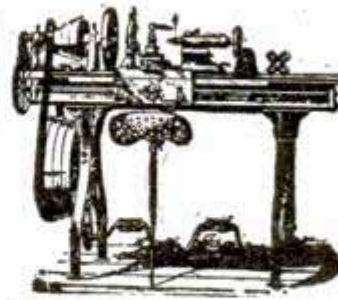
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(Continued from page 1022.)
lengthened. Jimmy started the pump and slowly screwed the link together. The piston merely took half strokes. He screwed some more. The piston was at once apparently stricken with fever and ague, for it began to tremble violently. Jimmy decided to screw the link out instead of in. Slowly he moved it, and after no little adjustment he got the pump to work as it did at first. Still he adjusted; the piston merely went to the other end of the stroke and threw another ague fit. Then back and forth Jimmy adjusted, but always with the same result. Perhaps the trouble was in the chest, after all; so off it came again and was given a close scrutiny. It certainly was a complicated looking affair.

Jimmy was worried. The knowing smile had long since given way to that tense, drawn expression we read about in modern frenzied-finance literature, embellished by a few impressionistic streaks of grease, over which the perspiration trickled in grimy streamlets. Jimmy was not the only one worried. From his perch on the waste can Hans would demand ever and anon:

"Can you fix him, hey?"
To which demands Jimmy answered in the affirmative, in which assurances a close observer might have detected a slight falling off from the true ring.

Jimmy tentatively moved the piston and valve back and forth and tried to fix in his mind some relation between the outside gear and the valves; but the more he tried to think, the more confused his mind became, until his head fairly hurt. In fact, at the end of fifteen minutes' concentrated brain bruising he could not have sworn whether the piston moved the valve or the valve the piston.

"If it was only a steam engine," he wailed to himself, "a feller could see how it went; but this cussed thing not only slides back and forth, but twists around, and I'll be hanged if I know what it don't do."

To facilitate the working of his mental apparatus, Jimmy sat down on what appeared to be a cold-water pipe. The pipe was anything but cool, and Jimmy arose with an alacrity that precipitated him several feet in the air. When he again landed he kept right on going, his one idea being to get as far away from that pump as possible in the quickest time. It was not just plain pump either; for the heated condition of his mental machinery, together with the high temperature recently generated at the other

(Continued on page 1026.)

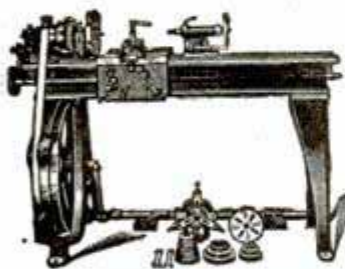


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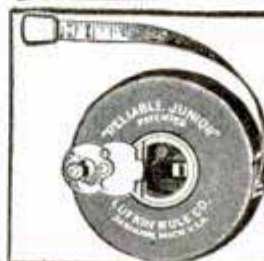


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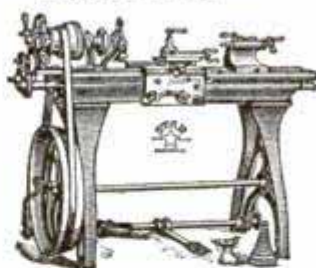
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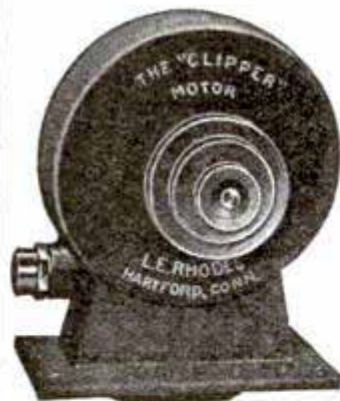
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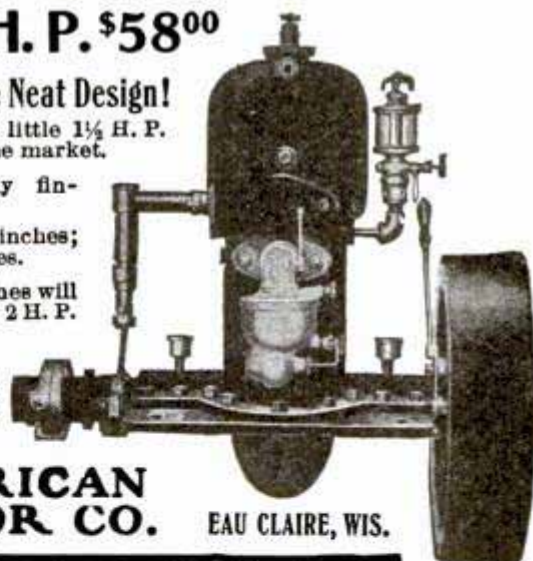
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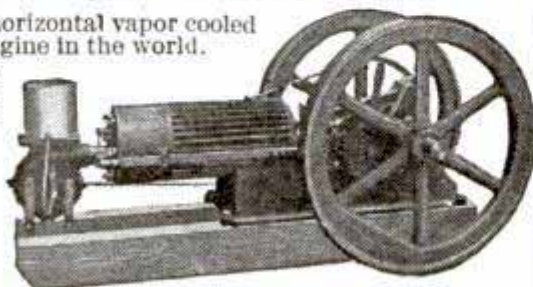
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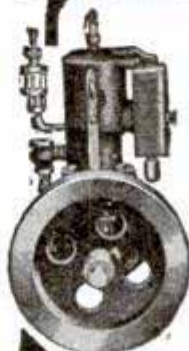
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(Continued from page 1024.)

extremity of his anatomy, produced a potential that escaped in a string of sizzling adjectives, usually represented in print by a series of dashes and exclamation points.

Outside a cool summer breeze fanned his fevered brow, the sun shone brightly and the birds sang sweetly; the world was not such a dark chaos after all. Jimmy reconsidered. He would tackle it once more.

Now just here, according to the formula for producing modern literature, Jimmy should have gone back to that pump with the light of determination in his eye, and, after an heroic struggle, matter would have succumbed to mind. But there wasn't any light of determination in his eye; the pump had him beaten to a standstill. He must tackle it again, however, or be laughed at. As he turned with leaden steps, an angel-like vision came into view.

To ordinary mortals it was only a grimy machinist returning from a job with a sack of tools on his way back. To Jimmy the face was cherubic, the sack was sweeping wings. Jimmy ran forward and headed off the passing angel.

"Oh, Ben," he called, with a world of supplication in his voice, "come over here, will you? I'm stuck."

The latter admission plainly indicated to what depths of self-abnegation he had descended.

"Pears to be all right here," vouchsafed Ben, after examining the valves. "Now you put it back and adjust the gear back somewhere near where it was."

Jimmy, only too glad to take orders, hastily obeyed. When the chest was once more in place and all connected up, Ben turned on steam. The piston moved out steadily and came back like a coiled spring. In the soul of Jimmy there was quite a trace of exultation; for, if Ben should get stuck, there was some justification for his own failure.

But Ben did not appear to be greatly worried; instead, to Jimmy's amazement, he told him to open up the water end. There did not appear to be anything the matter there, except that one of the valve springs had broken and a part of it lodged in the holes in the valve seat. Ben pulled the bit of brass out and told Jimmy "to close her up." When steam was turned on the pump went to work with a smoothness that shattered the gloom of Hans into an expansive smile of satisfaction.

"Son," demanded Ben, gazing down with pedagogical severity at the gaping cub, "what does an engine do when she has no gunner and the load is thru'n off?"

"Why," answered Jimmy, dazedly, "she races."

"Exactly," answered Ben; "an' when a suction valve of a pump is held open, the load is offen her on that side, and she races on that stroke. Next time you doctor a pump, don't fergit that the valve can be set in the water end."

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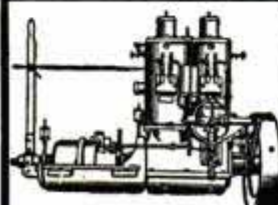
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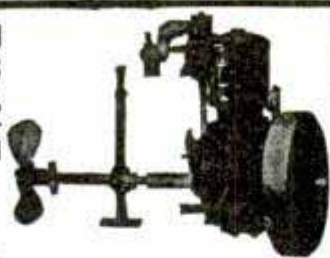


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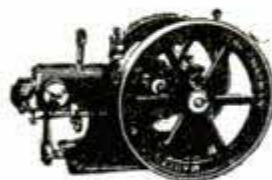


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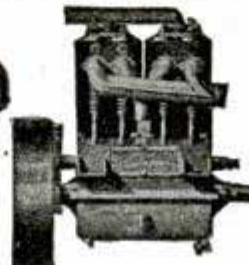
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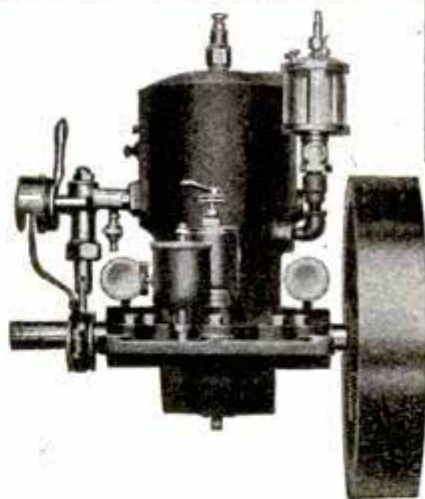
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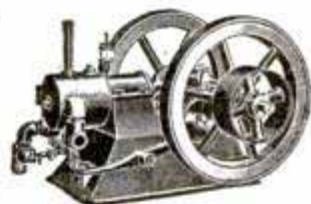
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Simple, Substantial, Efficient.

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ENGINE

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\$49 Little Giant

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GASOLINE MOTORS

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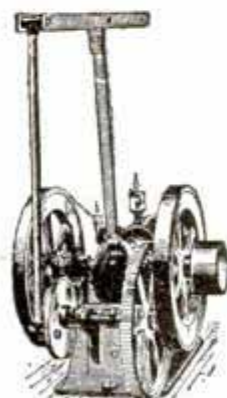
Our Free Catalog C4 is worth your having.

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1½ and 2½ H. P. Equipped with short connection for spray pump or walking beam attachment for pumping from wells. Will work against 150 lb. pressure. Gasoline in base of engine or outside. Write for agency.

AIR-COOLED MOTOR CO., LANSING, MICHIGAN.

If your water pressure is 25 lbs. or over, buy a WATER MOTOR, 5-in., \$2⁵⁰

Larger Sizes Proportionately Low

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

A SAMPLE MOTOR FREE

to the right person in each town. Write for terms, stating water pressure.

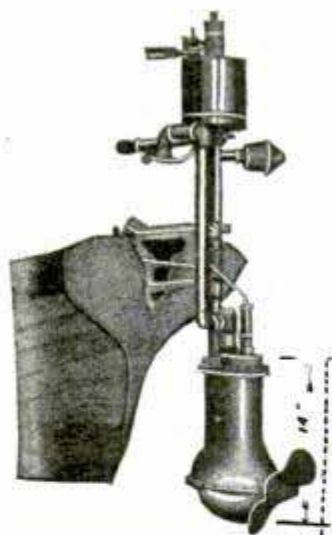
ENGINEER WANTED

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

LIPPINCOTT M. S. CO.,

Newark, :: :: New Jersey





New Portable Gasoline Submerged Propeller

Lightest, most practical, easiest applied (and most powerful for weight), 4 cycle Gasoline Motor Propeller in existence. Can be attached and detached to any boat in a moment, and can be raised or lowered to run in shallow water when necessary. When in operation the engine is entirely submerged, the water in which it operates forming the cooling jacket, which is a most effectual one. It is fully $1\frac{1}{2}$ H. P. and will propel a 16-foot boat at a speed of about 7 miles per hour. Can be operated easily by any boy or girl and run for 1 day with 1 gallon of gasoline, but the tank on engine holds only enough for a little over a half day's run.

Write for Catalogue "L" for full description and price.

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KNOCK DOWN FURNITURE

You Save $\frac{3}{4}$ the Cost

By putting together and finishing it at home. We furnish it—art and mission designs—heavy solid oak—every piece fitted and smoothed—includes stain and fastenings. You save $\frac{1}{2}$ manufacturing cost— $\frac{3}{4}$ the freight and all dealers' profits.

Send trial order for this \$4 chair. Bottom cushion cover of leatherette, \$1.50. Particulars of other pieces sent on request.

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THE "DAKOTA" A TOTAL LOSS.—The steamship "Dakota," which was wrecked on a Japanese reef in the early part of the year, is a total loss, according to Capt. Fred W. Young, who made an examination of the ship. He says:

"The vessel lay balanced across the summit of a rock and was broken completely in two by the high seas. The forward part slid down on the side of the rock and lies in seventeen fathoms of water. The after part broke in two again, so that the vessel lies in three pieces. Nothing remains above the surface but a small length of the foremast.

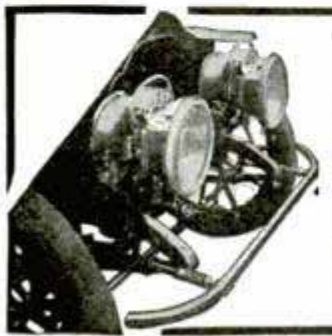
"The 'Dakota' is a complete loss. The divers went all through the wreck and reported that her engines were reduced to a mass of scrap iron. Of the cargo, that portion which was stored in the after part of the vessel is ruined, while there will be a small salvage on that which was in the forward hold. The vessel is one of the largest losses that the London underwriters ever sustained, and it is probable that the wreck of the 'Dakota' will cost them \$3,000,000."

THE FILIPINO MECHANIC.—Americans are accustomed to think of the Filipino as still in the same condition as described at the time Dewey shot his way into Manila Harbor. The London Commercial Intelligencer, however, reports great progress and says:

"The Filipino has never handled any other tool than a bolo, with which he builds houses and constructs irrigation plants of a sort on his paddy fields. Now he begins to understand the use of hammer and nails, of saws, and of the adz. In the recent extension of the Manila-Dagupan Railway, in the erection of the splendid 350-ton ice-making and refrigerating plant in Manila, in the putting up of school houses and barracks all over the island, and in a thousand and one other ways he has helped not only to improve the general appearance of the country, but to learn something of a white man's taste for proper sanitation and good quarantine conditions.

"Upon machinery he yet looks with awe, but he has learned to set type, and one, some time back, turned a patent fire extinguisher onto a blaze which broke out in an old mansion in the Calle Cabildo, Intramuros. So it is easy to see that they are coming on, and if space permitted one could quote many incidents to show how this great mass of people, so suddenly lifted out of obscurity, are shortly to become a factor in the world's industrial life."

The natives in the towns also are adopting clothes and buying sewing machines, phonographs and toothbrushes.



THE TURNER BRASS WORKS

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Manufacturers of Marine Hardware and Motor Boat Specialties. Sole Manufacturers and Licensees of Harroun Auto Bumpers, Martin Alarm and Reserve Valves, Martin Gasoline Separator and Strainer.

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

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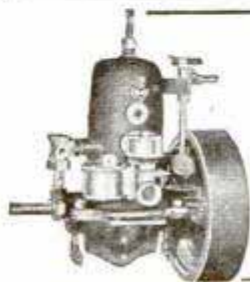
MAKE A MOTOR BOAT OF ANY BOAT IN 5 MINUTES



Here's a little 2 h. p. marine motor (40 lbs. complete) that you can attach to the stern post of your boat in 5 minutes without any tools. Drives an 18-ft. row boat 7 miles per hour (runs 8 hours on one gallon gasoline). Can be detached from boat just as quickly and stored in box in which it is carried. Simplest motor made—does not get out of order.

Write for catalog with full description and price.

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

BUILT BY

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

LIFE IN THE NAVY ILLUSTRATED.—The Bureau of Navigation, of the Navy Department, at Washington, has issued a very attractive booklet entitled "The Making of a Man-o'-Warsman." The purpose of the book is to set the advantages of joining the navy before the young men of the country. There are 32 pages of reading matter, profusely illustrated, many of the cuts being in colors. These reproductions all depict various phases of the seaman's life, his pleasures, and his work.

The pamphlet is very comprehensive and covers the possibilities of a naval career from the time a landsman enters one of the various training schools as an apprentice until at the end of 30 years' service when he retires with three-fourths pay. Any young man who is contemplating joining the navy would do well to send for this book. It will be forwarded free of charge to any address upon application to Desk 69, Bureau of Navigation, Navy Dept., Washington, D. C.

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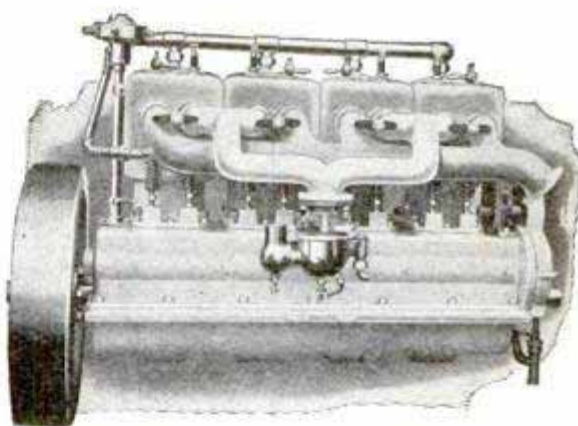
2 cycle
3 port
4 6 8 and 12 H. P.

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that we made last month? We offered for 30 days only to sell just one man in each town our 8-10 H. P. or our 15-20 H. P. marine engine *at agents' cost*, for advertising purposes only. The response having been so large, and wishing to clean up on the season's work, we have decided to extend the offer for ten days.

The exact figures of this Special Price we quote only to interested inquirers.



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is the greatest step forward in marine engine building in recent years. Every part is an improvement. Every proportion bespeaks sturdy strength and toughness. It will outlast your boat. 2 cylinder, 8-10 H. P.; 4 cylinder, 15-20 H. P. Positive, automatic system of lubrication; two roomy hand hole plates in crank case; Parson's Manganese Bronze Connecting rods; Schebler float feed carburetor. With its polished brass trimmings and highly finished castings, it is by far the handsomest engine on the market today; and it is the only really high class engine selling at a moderate price. Write for our catalog and special price to you. Do it today.

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WRITE FOR CATALOG "P"—480-pp, PROFUSELY ILLUSTR'D.

A NEW POSTAL CARD PROPOSED.—A new form of postal card for return purposes has been proposed by Carl R. Klok, which differs from the ordinary United States postal card only that instead of McKinley's photograph being in the right-hand upper corner there will be the facsimile of a 2-cent due stamp. The 2c due is to be paid to the carrier upon delivery when returned to the firm, the same as on any ordinary letter on which there is postage due. The adoption of this proposed postal card by the Government would mean a great benefit to all concerned, as is shown by the following example: A firm sends out 1,000 reply postal cards, costing \$10, which are enclosed with letters or other printed matter, and of this number there are approximately 25 or so returned, thus causing a waste of 975 cards and a loss to the firm of \$9.75. Had the postal card which is proposed been used in the above instance it would have cost the firm but 50 cents for the 25 replies and nothing would have been wasted as this card assumes value only when returned.

Mr. Klok suggests that the Government print these cards, selling them for a little over the actual cost; their use to be restricted to business firms, clubs, and others using them in large quantities. It would not necessitate the establishment of a new department as the postage due department is a permanent feature in every postoffice; it might possibly cause a little additional work, but for this they would be reimbursed by receiving double the amount of postage on the ordinary postal card.

CHINESE CUSTOMS.—His compass points south. In saluting you he puts on his hat. Walking with you, he keeps out of step. He shakes his own hand instead of yours. He says east-south instead of southeast. To be polite he asks your age and income. He throws away the flesh of the melon and eats its seeds. His women often wear trousers, while he often wears a gown. He presents coffins to his friends as you present cigars or books.

NOT FIT FOR PUBLICATION.—A Spokane school girl was required to write an essay of 250 words about an automobile. She submitted the following: "My uncle bought an automobile. He was riding out in the country when it busted going up a long hill. I guess this is about 50 words. The other 200 are what my uncle said while he was walking back to town, but they are not fit for publication."—The Copper News.

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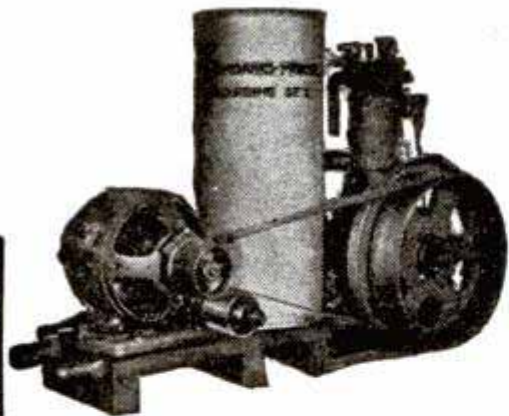
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Gas, Gasoline or Kerosene Engines for all purposes, from 2 h. p. up.

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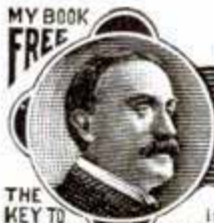


Send 10 cents in silver or stamps for a large sample pouch and booklet; both will be a delight to you.



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Stop Forgetting

THE KEY TO SUCCESS

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"SEA-MYSTERY TURTLE" CAPTURED.—One of the puzzles of the ocean has just come to the surface at San Diego Bay, California, when a gigantic sea turtle was captured by Julius Solissa, a Greek fisherman, in whose net the huge creature became entangled. This giant turtle weighed 1,902 lb.—almost a ton—and its shell measures 5 ft. and 2 in. from tip to tip. The strangest feature of it all was, that on the top of this turtle's shell somewhat plainly carved or burned was the following inscription:

"British Ship 'Sea Bride,' August 12, 1881, 3 South, 86, West. If found, please notify Thomas Fletcher, Brawley Road, Revington, England."

From this brand it would appear that this huge turtle was captured 26 years ago in the South Pacific, and after being lettered, was again committed to the mercies of the sea. If the creature was caught where the marking indicates, then his turtleship must have traveled hundreds of leagues in order to reach San Diego Bay. The shell, with the mysterious inscription, will be shortly added to the Museum of the California State University.

BABY HOTEL IN OPERATION.—The long threatened London baby hotel has been opened—not exactly to the public but to babies between the ages of one month and eight years who can give good references as to their station in life. Many Americans are said to patronize the place, as the accommodations are all that may be desired and the hotel far safer for baby than traveling would be. There are single rooms and suites, the exclusive services of one or more nurses going with each apartment. There is also a seaside cottage in connection with the institution.

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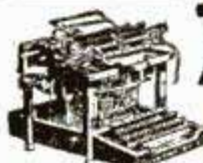
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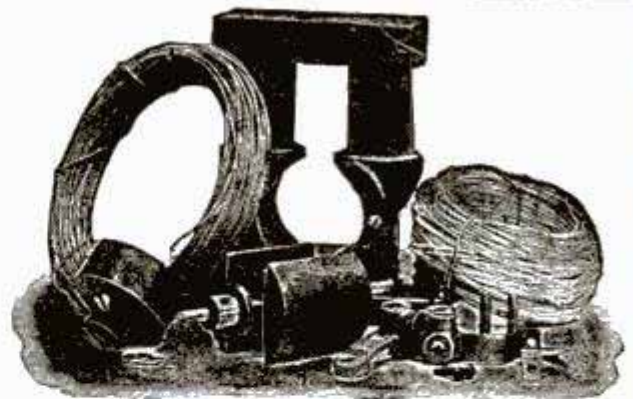
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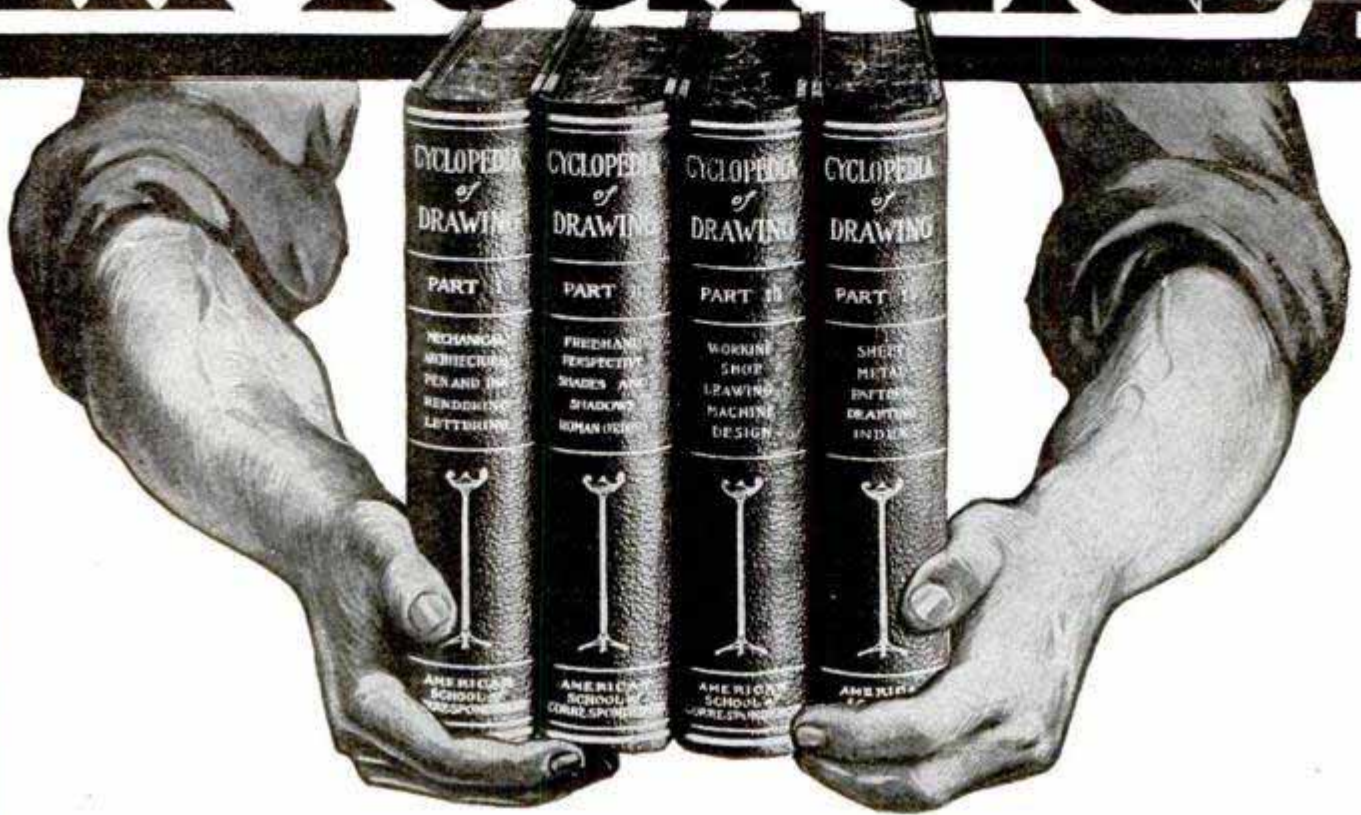
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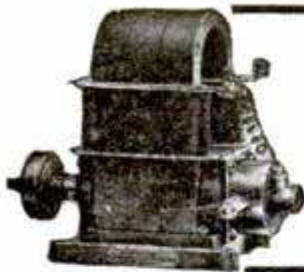
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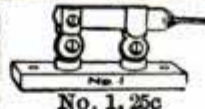
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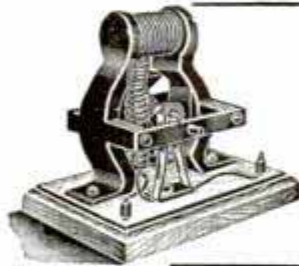
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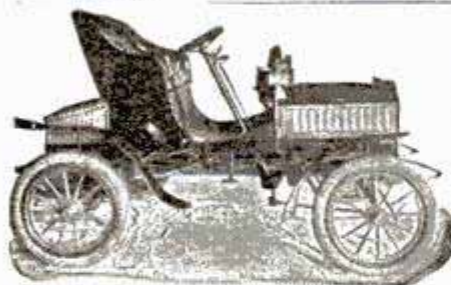
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UNCLE SAM SHOULD BE ASHAMED at the inferiority of American shipping as compared with other nations in the Far East. The Nautical Gazette says: The share of American ships in the immense traffic of the Chinese port of Hongkong is humiliating to those who know the proud place they held in the early days of this colony and earlier in the Canton trade. The present day "liners" from San Francisco and Seattle are the largest ships that come to Hongkong. In these leviathans every American takes pride, and for passenger travel they are in high favor; but while in tonnage capacity the rank of the United States is not small, the huge ships of the Great Northern, Pacific Mail, and other lines bringing up the total, the fact remains that a great body of the imports and exports of our Pacific and Atlantic ports are carried in ships flying a foreign flag.

The total number of ocean ships arriving and clearing at Hongkong in 1906 was 7,984, of which 3,697 were British; and of the 4,287 "foreign" (non-British) the Germans listed 1,682, the Japanese 594, the Norwegians 552, the French 435, the Chinese 405, the Portuguese 148, and the Dutch 125, while there were 119 arrivals and departures credited to the United States. While the immense individual tonnage of the few American ships that come to this port made a total of 613,115, yet the German ships aggregated over four times as much, the Japanese over twice as much, and the French somewhat more than the American.

The enjoyment of American foreign trade by non-American ships may be illustrated thus: The 119 ships of the United States arriving in 1906 brought to Hongkong a total of 41,430 tons from the United States, yet the flour receipts alone for the year, nearly all from America, were 79,635 tons, and of kerosene oil, mainly an American product, a total of 72,869 tons, to make no mention of cotton piece goods and general merchandise. So of exports, American ships took from Hongkong but 56,149 tons, not all of which went to the United States. All the rest of the huge exports went in foreign ships. Of the 3,744,287 tons of imports into Hongkong for 1906, American ships brought 41,430 tons; of the 1,940,274 tons of exports, only 56,149 tons went in American bottoms. Of the 2,878,300 tons "in transit," only 25,329 tons are credited to American ships. These figures have to do with ocean traffic.

As for "river traffic" from Hongkong as a center to Canton and the Delta, while six other nations figure in the statistics, not one item is credited to the United States.

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

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How to make, at an expense of not over \$5, an astronomical telescope which does as good work as instruments costing \$200; will be described and illustrated in Popular Mechanics for October, 1907. The article is written by a young man who made such an instrument, and with it he discovered a comet which had escaped the big observatories.

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THE GEORGIA ACCIDENT.—The premature explosion of a powder charge in one of the turrets during gun drill resulted in 10 fatalities. An effort to break records was the cause. Three shots in one minute has been considered good work, but the gun crew had fired nine shots in less than two minutes and had a few seconds to spare. The attempt to score the tenth shot in 120 seconds did not allow time for the air blast to free the gun from gases or a blazing shred from the previous charge. A flareback was the result. While regretting the accident, it is impossible not to admire the patriotic ambition to excel.

FUTILE QUEST.

Hurry,
Worry,
Thus we go,
Toiling,
Molling,
Blow for blow.

Raging,
Aging,
Speeding fast,
Sinning,
Winning,
At the last.

Rapid,
Vapid,
Pace we set,
Tainted,
Painted,
Gauds we get.

Sighing,
Dying,
Maybe fame,

Dust to
Dust—so
Ends the game.

Birmingham Age-Herald.

A fly and a flea in a flue
Were imprisoned, so what could they do?

Said the fly: "Let us flee."

Said the flea: "Let us fly."

So they flew through a flaw in the flue.

—Life (Melbourne, Australia.)

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FISH ALMOST CAUSE AN ELECTROCUTION.—Fred Higgins, of San Rafael, Cal., had a narrow escape from death June 19, due to his stringing a number of fish upon a piece of copper telephone wire. While awaiting the arrival of his train he exhibited his catch to friends and in doing so the wire slipped down between the station platform planks and was grounded. Mr. Higgins was instantly thrown a distance of nearly 15 ft. directly in front of a train. Friends succeeded in rescuing his unconscious body just in time to prevent it being ground to pieces beneath the locomotive. It is supposed that a circuit was formed by Higgins' body, the current passing from a nearby wire through the platform spikes and his shoe nails into his body and from thence through the fish stringer to the ground.

POOR SHOWING FOR THE AMERICAN FLAG.—The number of ships entering the harbor of Cienfuegos, Cuba, during 1906 was 322, of a total of 739,935 tons. Of this number 109 carried the English flag, 70 Norwegian, 42 Spanish, 34 Cuban, 34 German and 14 American.



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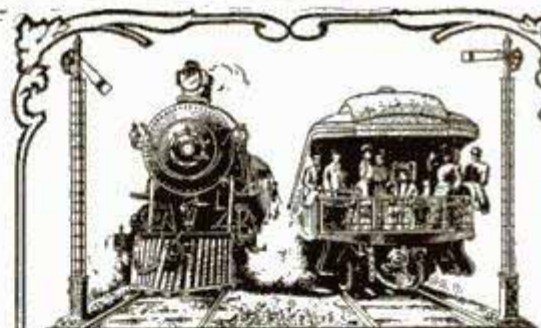
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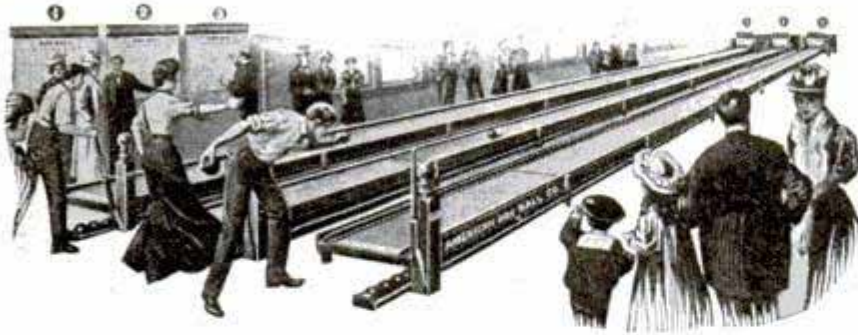


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EXTINGUISHING A BURNING GAS WELL.—Extinguishing a burning gas well which was delivering over a million cubic feet of gas per hour at a pressure of about 600 lb. per square inch was accomplished last winter at Vanderpool Well No. 1, of the New York Oil & Gas Company, near Independence, Kan. The well had been drilled to a depth of about 1,500 ft. and there was in the hole about 360 ft. of 8 1/4-in. casing when the gas was struck. The gas was, in a measure, unexpected, and certain fittings not being on hand it was decided to tube the well with 6-in. pipe and set a packer. When 1,100 ft. of 6-in. pipe were in the well and its closure seemed certain, a severe electrical storm occurred and a flash of lightning ignited the escaping gas. Forty feet of 6-in. pipe had been left extending above the ground and from the top of this there rose with a great roar a jet of burning gas 150 ft. high, which destroyed the derrick over the hole.

The problem included not only extinguishing the flame, but also preserving the well so that the gas could be finally controlled. Nine boilers, such as are used in connection with oil well drilling outfits, were collected and eighteen 2-in. jets of live steam at a pressure of about 120 lb. per square inch were simultaneously turned on the flame in an attempt to smother it. No impression was made and the scheme was abandoned. The two joints of pipe projecting above the ground were removed by throwing a line round the top, bending the pipe to one side about 45° and then unscrewing it close to the ground with the same line. The 1,100 ft. of pipe hanging in the well was supported by "elevators" or clamps fastened around its top and resting on the top of the 8 1/4-in. pipe.

It was determined to cover the well with a conical hood, through the top of which the flames could pass until the bottom should be made tight when the top could be closed and the flame extinguished. This plan was finally carried out successfully, but not until numerous unsuccessful attempts had been made and considerable special apparatus destroyed. The cast-iron hood finally used was conical in form, 3 ft. in diameter at the base and about 6 ft. high. In the top was fixed a 12-in. gate valve upon the stem of which was fastened a reel wound with flexible wire so that two men running out with the end of the wire could quickly close the valve. A crane built of 6-in. steel pipe with a mast about 50 ft. high and a boom about the same length was placed so that when the boom was swung over the well the hood would come directly above the opening. Means were provided for controlling the motion of the hood in all directions. The clamps holding the 6-in. pipe were then pried off and the pipe slipped down, causing the flame to issue solidly from the 8 1/4-in. casing. This made it possible to approach the well with screens and dig a saucer-shaped cavity around it, which was made muddy so that the bottom of the hood might be submerged. The latter was then lowered to place and the flame shot through the gate valve. The bottom of the hood was made tight with successive layers of earth and canvas kept thoroughly wet and wire cables were thrown over the hood and fastened to dead men buried deep in the ground. When all was ready the men who were to shut the valve were given the signal to run. The attempt was successful, after five weeks of effort, and the flame went out. Less than ten seconds later the gas broke through under the hood, but the fire being extinguished, closing the well was then an easy matter.—Engineering Record.



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Admiral Evans complains that his men were abused at Portland, the police maltreating them and skating rinks and other places of amusement barring them.—Press dispatch.

I went into a skatin' rink to take a little roll,
A man he looked me up and down and wouldn't take
my toll;
"The skates in here ain't jest your kind," he hollers with
a leer.
"And cheap skates from the navy can't go skatin' round
in here."

Oh, it's Jacky this, and Jacky that, and Jacky-spoil-the-
fun.
But when a war is comin' I'm "the man behind the gun";
The man behind the gun, my boys, the man behind the
gun—
Then it's "Thank you, Mr. Jacky, our dear man behind
the gun!"

I met a big policeman, and he looked me up and down;
He says, "We want no navy bums in this here moral
town";
He clubbed me and he drubbed me, and he says, "Now
twenty-three"—
And its only old good Fightin' Bob who stands by such
as me.

For it's Jacky this and Jacky that and Jacky cool your
heels
A-waitin' till civilians get the best o' shows and meals;
But it's man behind the gun, my boys, when war's loud
toes in peals,
And it's man behind the gun, my boys, when Sammy
needs his keels!
—Denver Republican.

While making a mad dash to reach the bedside of his
dying wife recently a Virginia engineer ran over and
killed two men within fifteen miles of each other.

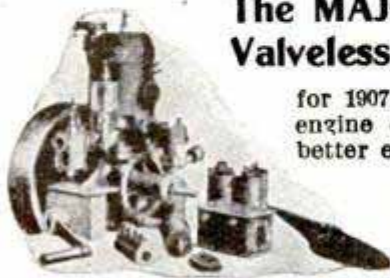
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WANTS A METAL LANTERN BELLOWS.—M. Berger, 1332 11th St., N. W., Washington, D. C., requests some reader to inform him how to make a "lantern bellows entirely of metal. I understand such a bellows has been made, and that the cost is high, but am anxious to make one nevertheless."

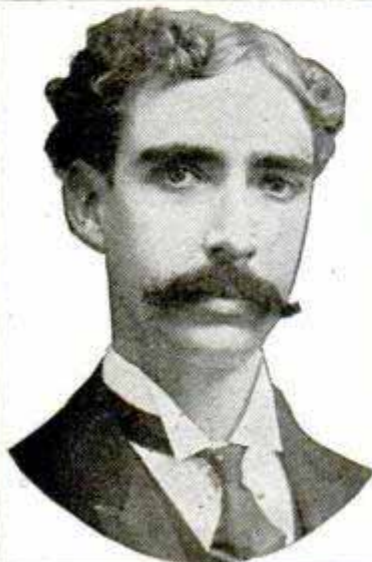
JAPAN'S ACTIVITY.—The Japanese appear to be ready to cut out work for the foreign office of every other government. They have, we will not say an exaggerated, but an exalted, idea of Japanese dignity. It is possibly too much to say that they have chips on their shoulders, but their coat-tails are down to the ground. They have established a censorship over the British stage, and made regulations for the conduct of the public schools of California. Mr. Secretary Root is now engaged in investigating a riot in San Francisco in which a Japanese restaurant was raided.

Civis Romanus sum is the spirit that now actuates the little brown men of the far East. They have an army of 800,000 men, and a navy equal to any other in the world save one, and that the navy of an ally bound to them in solemn covenant, and they have just emerged victor from a great war with one of the most powerful nations of the world. They are a warlike race, and have more nearly made war a science than any other people, ancient or modern.

Whether it be a mistaken idea or not, the impression maintains in both hemispheres that the wealth and power of the future are to be gained in those lands washed by the Pacific. It was for that we built our transcontinental railroads, for that we are digging an interoceanic canal, for that England is at Hong Kong, for that France is at Tonkin, for that Germany has her establishment over there. Russia built the longest railroad in the world to get into Manchuria, which she sought to annex in order to contend for the mastery of the Pacific.

Japan expects to master that ocean. She has the vantage of position, and she has every confidence in her prowess and in her destiny. Whether she has designs on the Philippine Islands nobody knows except her rulers, but if she has such designs a war between Japan and the United States is inevitable before the isthmian canal is finished, unless England should forbid Japan to fight.

There is a complacent set in our country, and they are in the big majority, who look on the attitude of Japan as Pompey looked on the career of Caesar. And let us hope they are right; but battleships cannot be had for the stamp of a foot in our day, any more than armies could be raised that way in Pompey's time.—Washington Post.



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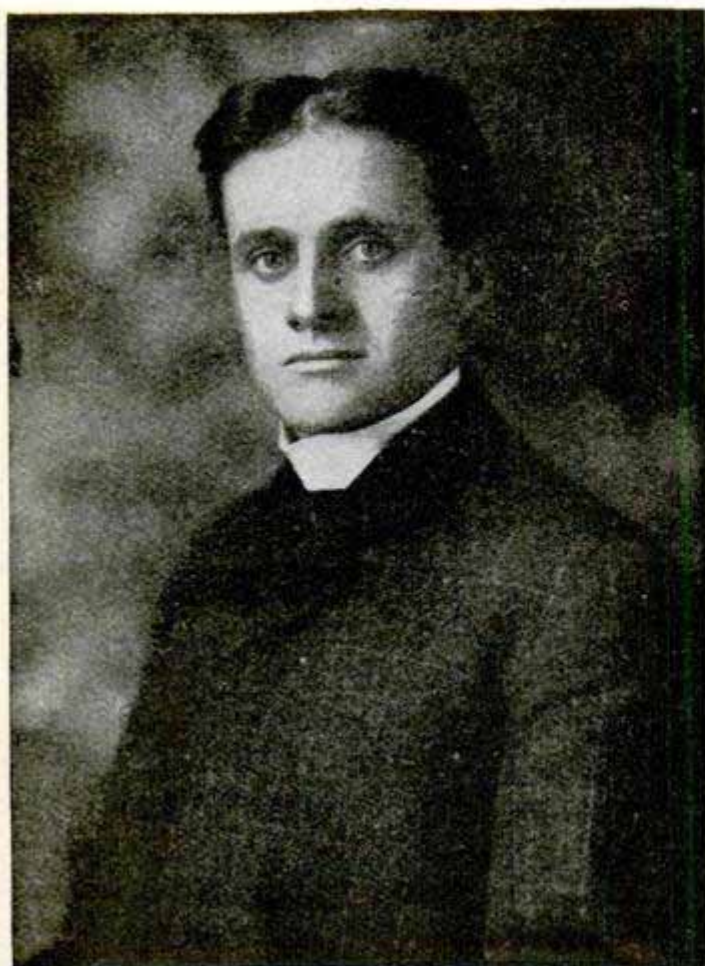
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A leader of men, marching fearless and proud,
And you know of a tale whose mere telling aloud
Would cause his proud head to in anguish be bowed,
It's a pretty good plan to forget it.

If you know of a skeleton hidden away
In a closet, and guarded, and kept from the day
In the dark, and whose showing, whose sudden display,
Would cause grief and sorrow and lifelong dismay,
It's a pretty good plan to forget it.

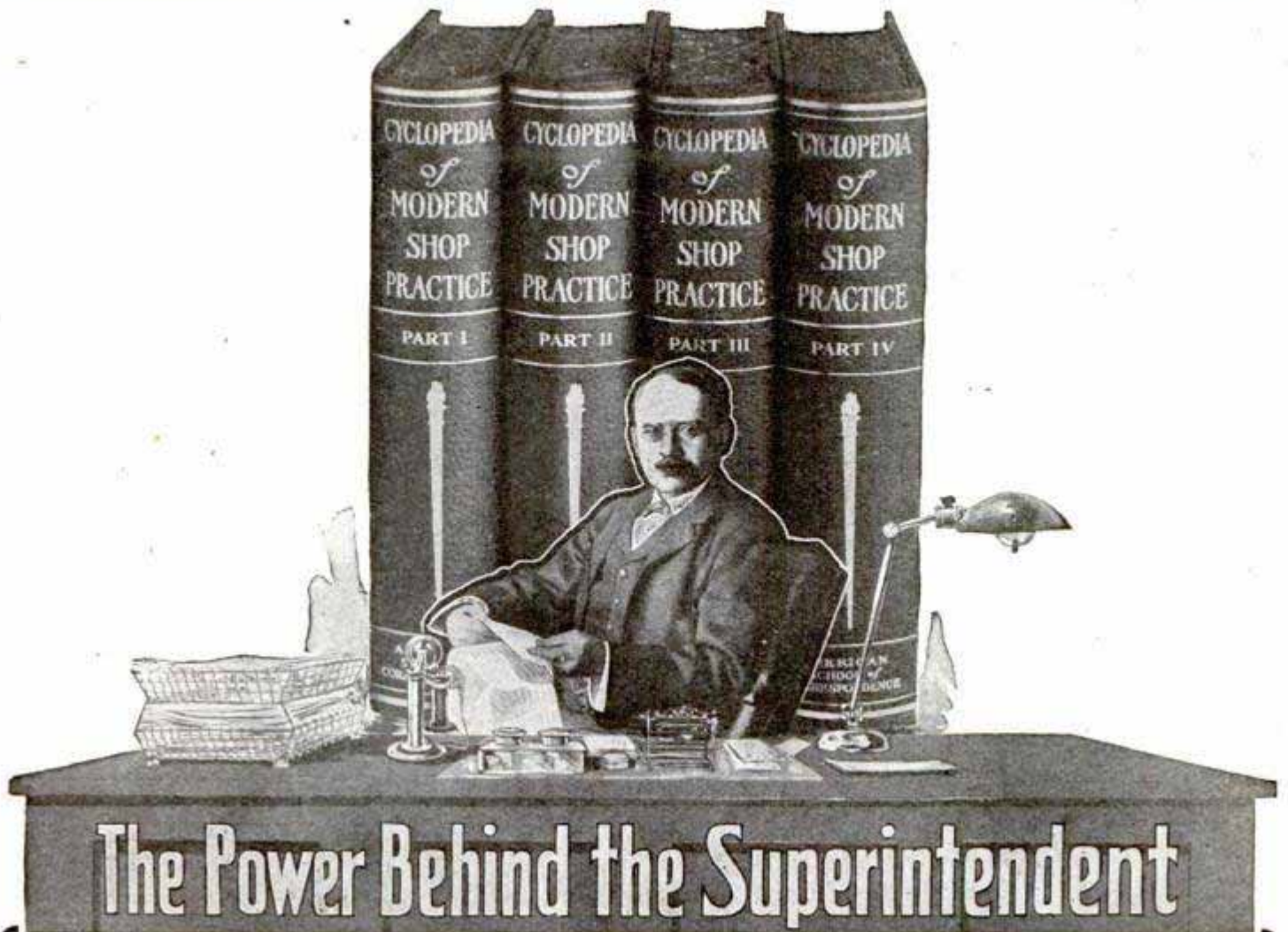
—Common-Sense.

HICCUGH REMEDY.—When the first symptoms of hicough appear draw a deep breath, forcing the capacity to straining, then expel the breath as much as is comfortable or a little more; repeat this several times and the trouble is gone. By thus straining the lungs the muscles which cause hicough tire out and the malady is physically impossible.

What may cure one may not cure another, although I have used this remedy for several years, having discovered it by accident, and have never been troubled one full minute at a time since.—Contributed by A. C. Jones, Somers, Mont.

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Don't look as pleasant as a calf's father when the boss gives you a disagreeable job. Do it cheerfully. If you think he is rubbing it in, you can always quit; and if he really is, you had better.

Don't pick out all the snaps for yourself, when you have help on a job. However good you may be—

Don't forget there are others.

Don't despise the help of the apprentice on the job. He did not come in simply to learn to varnish, so let him do things. If he falls down, pick him up, and—

Don't forget you had your troubles, and when you are a has-been, he may help you.

Don't take time to lay out a job, then not use the layout; properly used, it will save time on the job.

Don't fail to study economy both of material and time; both cost your employer money.

Don't waste time setting bevels for standard cuts that are arranged for on the saw table or trimmer. A little mental calculation and the indicator is better.

Don't think that you know it all; there are other men that know a little.

Don't do by hand that which the machine should do, but you—

Don't have to wait your turn at the hand-saw to cut off a toothpick.

Don't fail to study your machines and how to get the most out of them, but—

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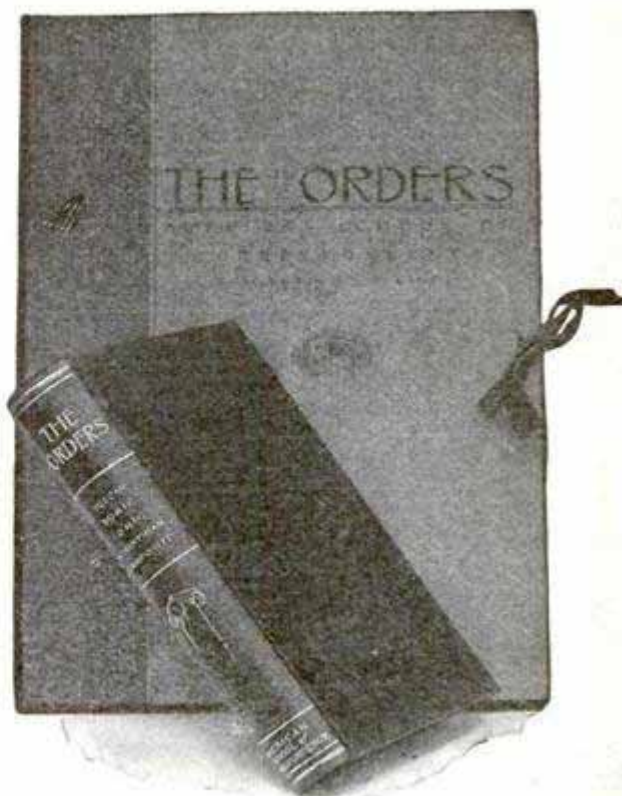
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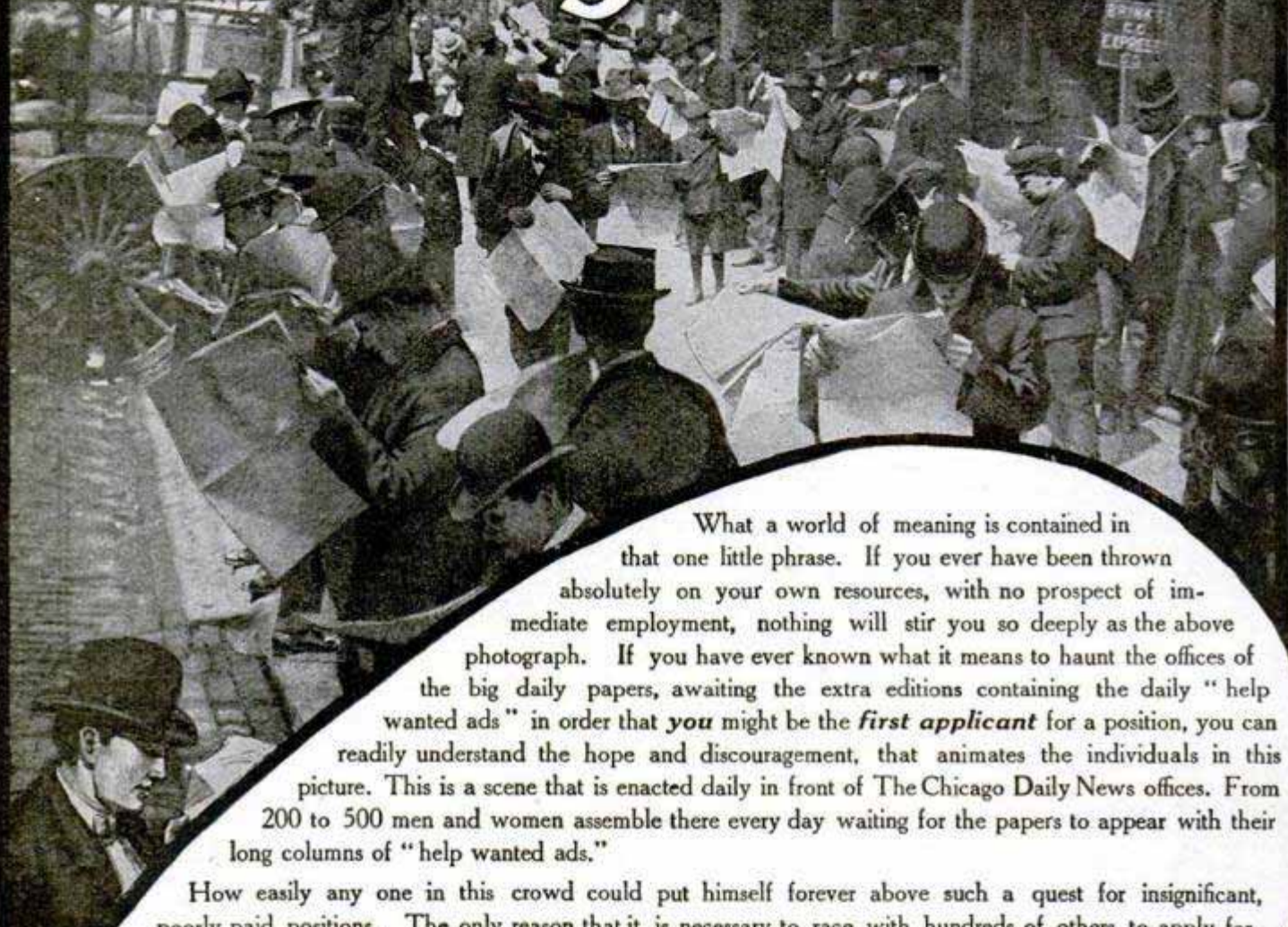
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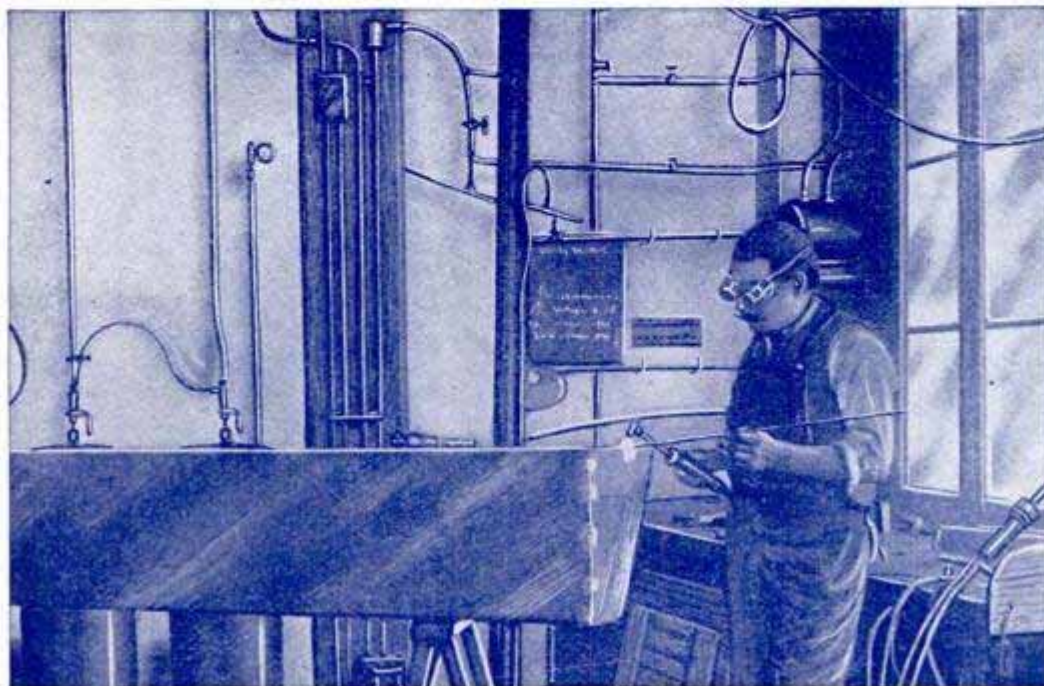
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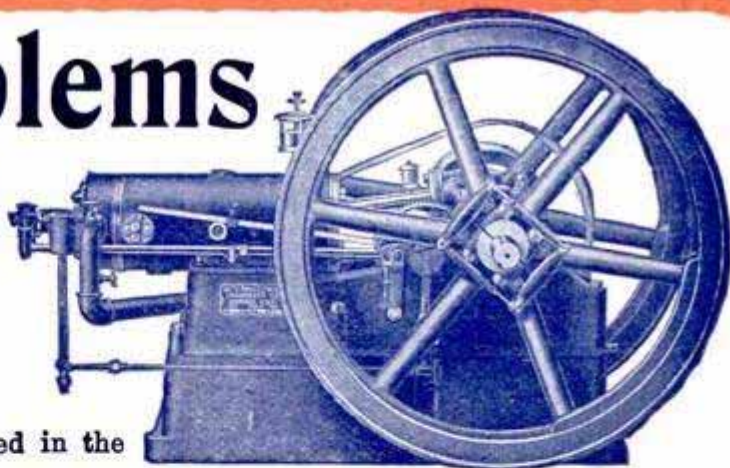
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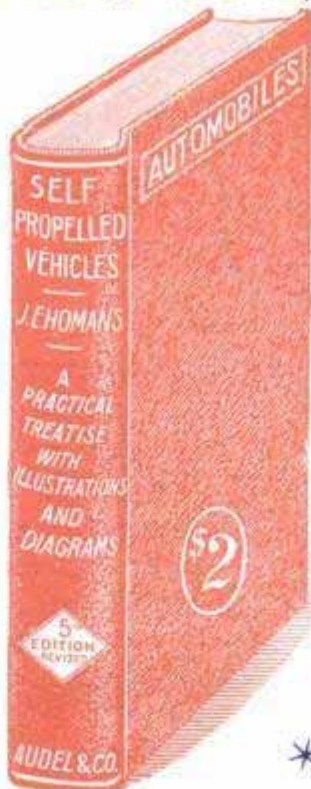
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