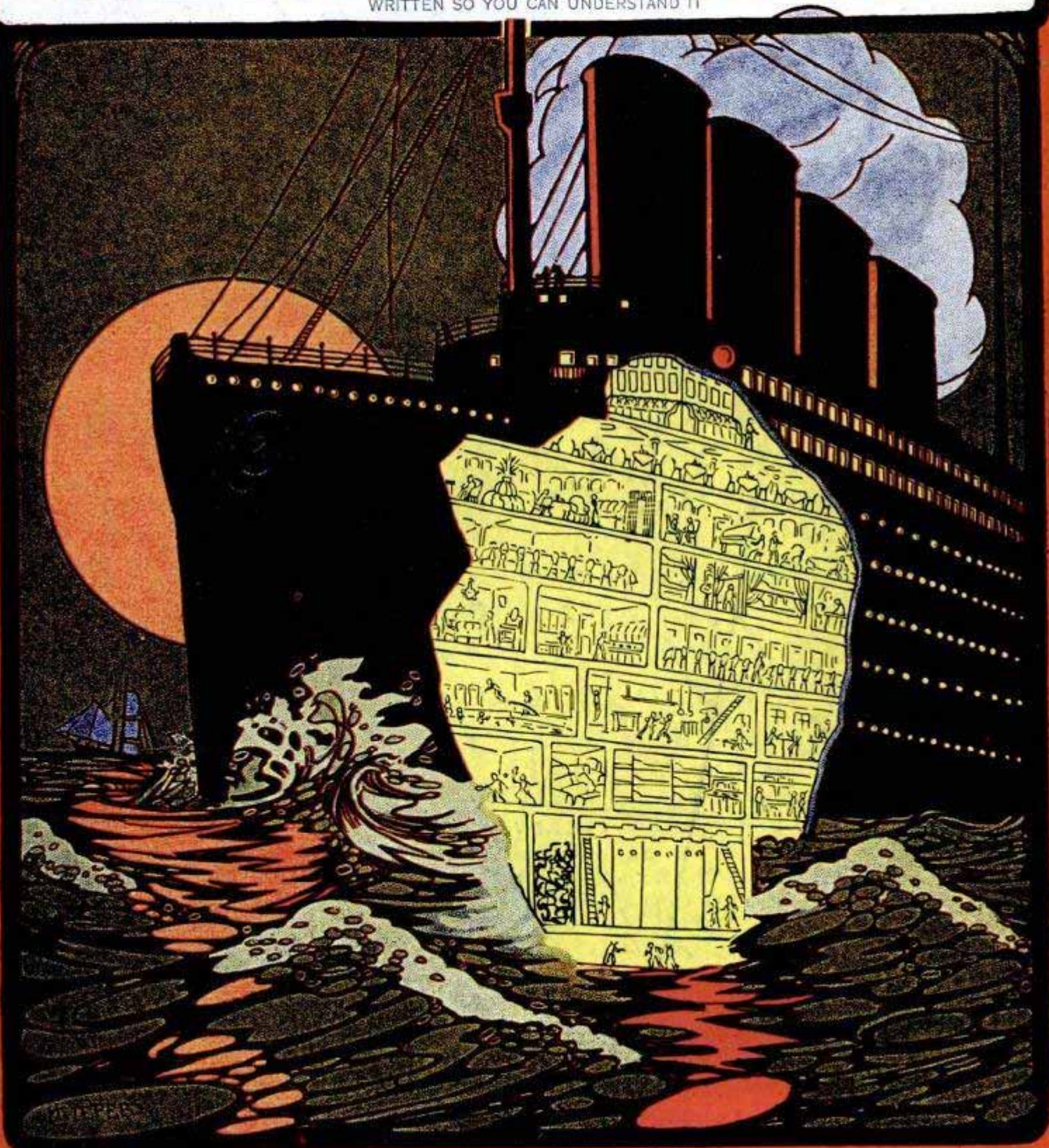


# POPULAR MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT



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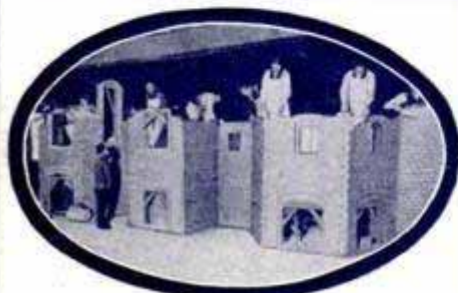
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No matter what your age nor what your work is now, we can make you independent for life by teaching you

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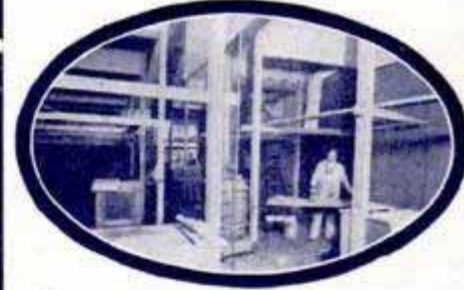


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# Popular Mechanics Magazine

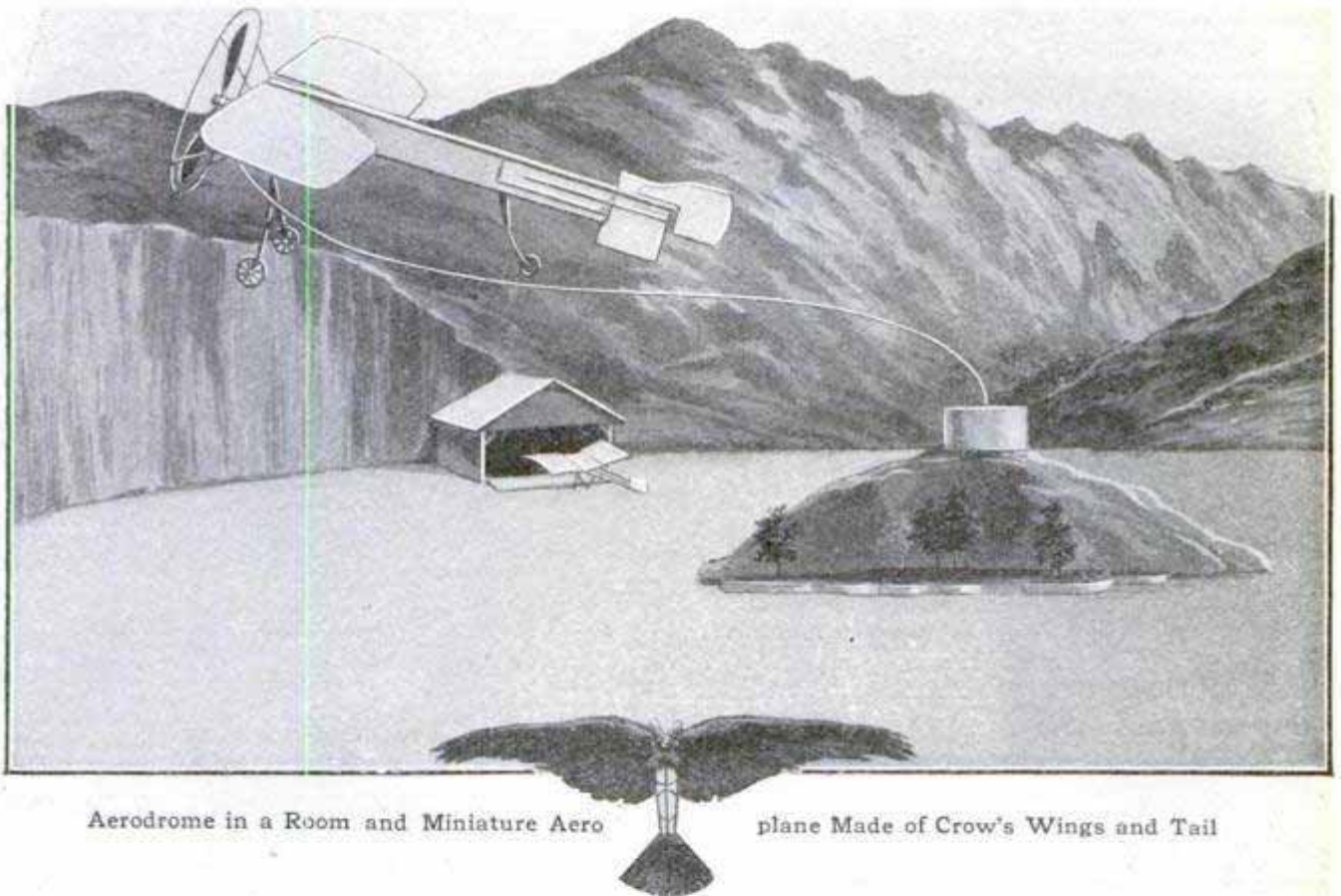
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 15

JANUARY, 1911

No. 1

## MINIATURE AEROPLANES DRIVEN BY FLEXIBLE SHAFT



Aerodrome in a Room and Miniature Aero

plane Made of Crow's Wings and Tail

**T**HE miniature or toy aeroplane is usually considered only as a plaything, but as operated by M. Brienne in his unique Paris aerodrome, the little models lend themselves to instructive experiments.

The aerodrome is a room about 13 ft. square, in the center of which is a miniature hill containing an electric motor. A flexible shaft connects this motor with the propeller of the aeroplane model being tested and causes it to revolve. The models are thus

made to fly and perform evolutions in very much the same way as real aeroplanes.

An interesting experiment was carried out by M. Brienne in order to study the flight of birds. He attached the wings and tail of a crow to a wire frame, spread them in the exact manner of the bird when soaring, and mounted a small propeller at the front. Attached to the flexible shaft, the bird-model was made to soar like a crow.

### BUILDING A CHURCH UNDER AN OLD STEEPLE

The construction of St. Stephen's church, Buffalo, N. Y., now under way, is attracting more than ordinary at-



Constructing New Church Under an Old Steeple

tention because of the fact that it is being built under the steeple of an edifice that was torn down to make room for the place of worship now in process of erection.

When the old church was built more than a quarter of a century ago, it was capped with a tower of oak 170 ft. high, weighing more than five tons. In it were installed three big bells. When the project of building a new church was agitated, the hope was generally expressed that the bells might again be used to summon the faithful to the new edifice. The work of taking down the bells and re-instating them in a new tower would, it was foreseen, entail much additional expense.

The architect of the proposed church evolved the ingenious plan of leaving the old tower, containing the bells,

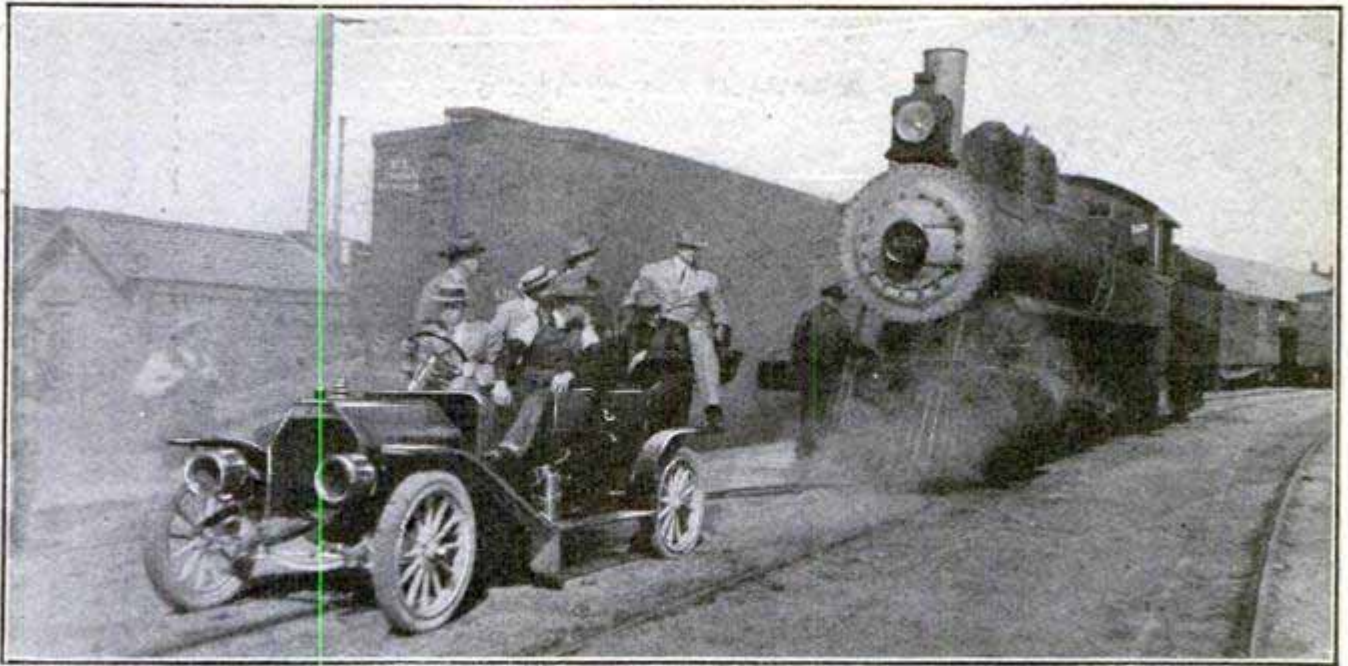
standing and building the new church in under it. All of the church was then torn down with the exception of the front portion which supported the front tower. The part left standing as a support to the tower was securely braced. The outer wall of the front part of the new church is being built around the section of the old church that was left intact. When the new walls are built up as high as the base of the tower, the tower will be placed on said walls and the original support of the tower will be removed.

### BALLAST SPREADER USED TO UNLOAD COAL

A unique method of unloading coal for winter storage has been adopted by the Atchison, Topeka & Santa Fe Railroad at Chillicothe, Ill. A switch engine picks up one of the 40-ton dump coal cars, couples it to an ordinary ballast-spreading car, and pushes them down to the end of the spur track. The center dump doors are then opened and the engine backs out, the coal dropping on the track and being plowed aside by the ballast-spreading car. This operation is repeated until the coal is piled on each side of the track as high as the plow will push it. Then 40 or 50 laborers raise the track by pushing the coal under it, and the dumping recommences.

### MOTOR CAR TOWS A HEAVY RAILROAD ENGINE

The tremendous pulling power of an automobile of the ordinary touring car type was demonstrated at Los Angeles by an enthusiast who hitched his 30-hp. car to a 110-ton passenger locomotive, and pulled it along the tracks a hundred yards or more. The feat was performed on the Santa Fe tracks and was the result of an argument between an automobile dealer and a railroad engineer who had recently acquired an automobile. The dealer asserted that the engineer's automobile had sufficient power to pull the locomotive—and



Automobile with 110-Ton Passenger Locomotive in Tow

proved it. He selected a car from his stock that was similar in every respect to that purchased by the engineer. A heavy rope was wound around the rear axle of the automobile and attached to the coupler on the locomotive cow-catcher. In order to secure the necessary traction for the rear wheels of his car, the motorist put four men in the tonneau and another stood on the rope. The automobile engine was started slowly and the wheels whirred for a moment after the clutch had been thrown in without moving the locomotive. Then the big engine commenced to creep slowly forward and was towed the required distance. After the test the automobile was driven through the streets of the city to prove that the feat had not strained the mechanism.

### MEXICANS SKILLFUL AT DRESSING FLEAS

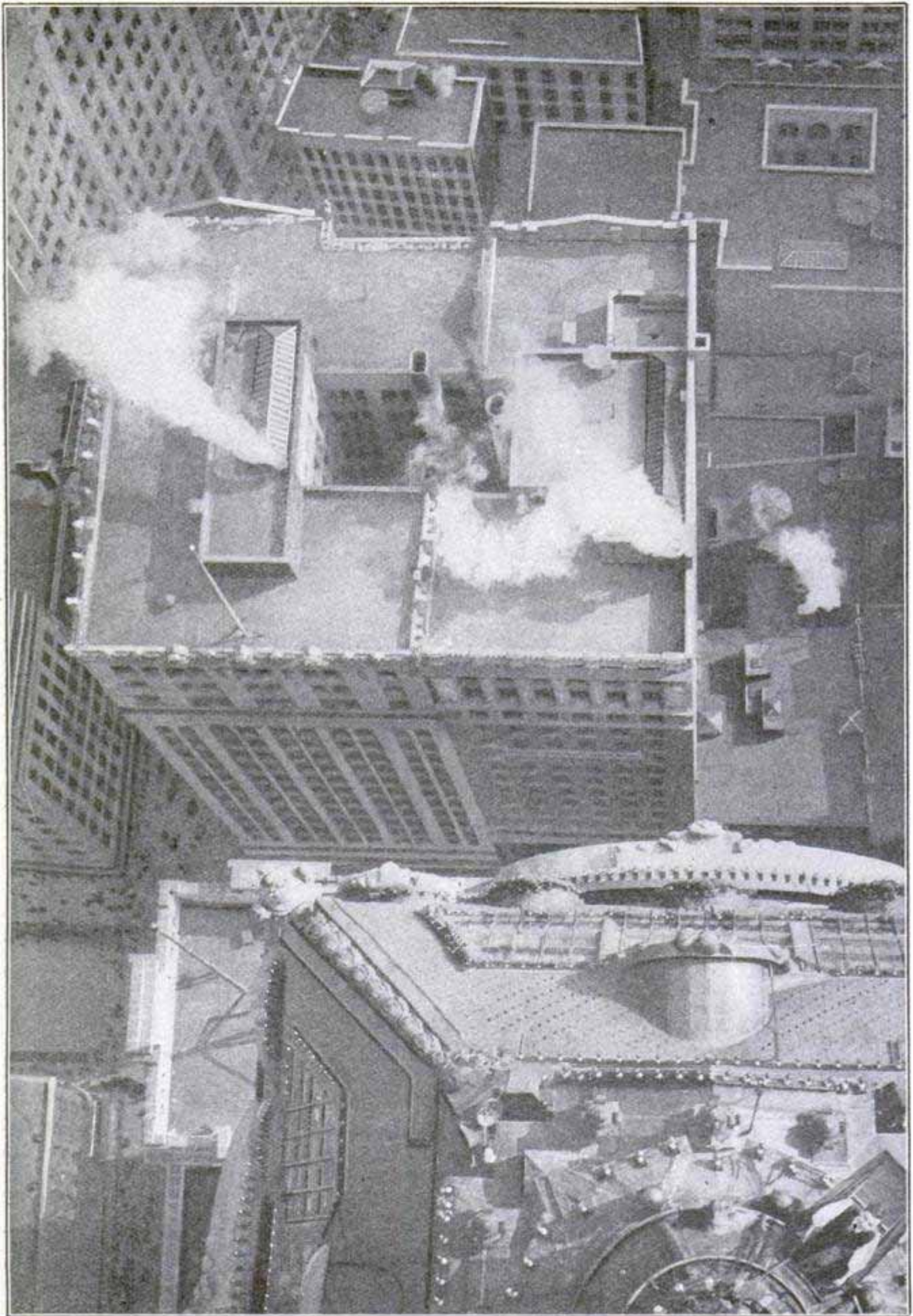
Southwestern America contains some of the biggest works of nature, and it also has some of the most minute. While it is not the only section of the earth where fleas are to be found in abundance, it is probably the only place where the natives use these little pests as ornaments or toys and dress them in fancy costumes. The Mexicans are held responsible for the manufacture of these unique speci-

mens of handicraft. The fleas are coated with a sort of varnish and are dressed according to the fancy of the person doing the work. Minute torcadors, señoritas and señoras are given all the habiliments of their calling and sex. The dress is applied with a very small brush, like paint, and usually is of very gay colors. Frequently a guitar or tambourine is placed in the "hands" of the flea-doll. After being dressed, the fleas are mounted in boxes scarcely a fourth of an inch square and are then ready for



Mexican Dressed Fleas Under the Microscope

the tourist or the curio seeker. It requires a powerful microscope to examine the fleas and their gay attire.



Remarkable Birdseye Photograph of New York Skyscrapers Taken from Perch on Singer Building Flagpole, 700 Ft. above the Ground—Building in Center is Broadway Maiden Lane Building, 18 Stories High

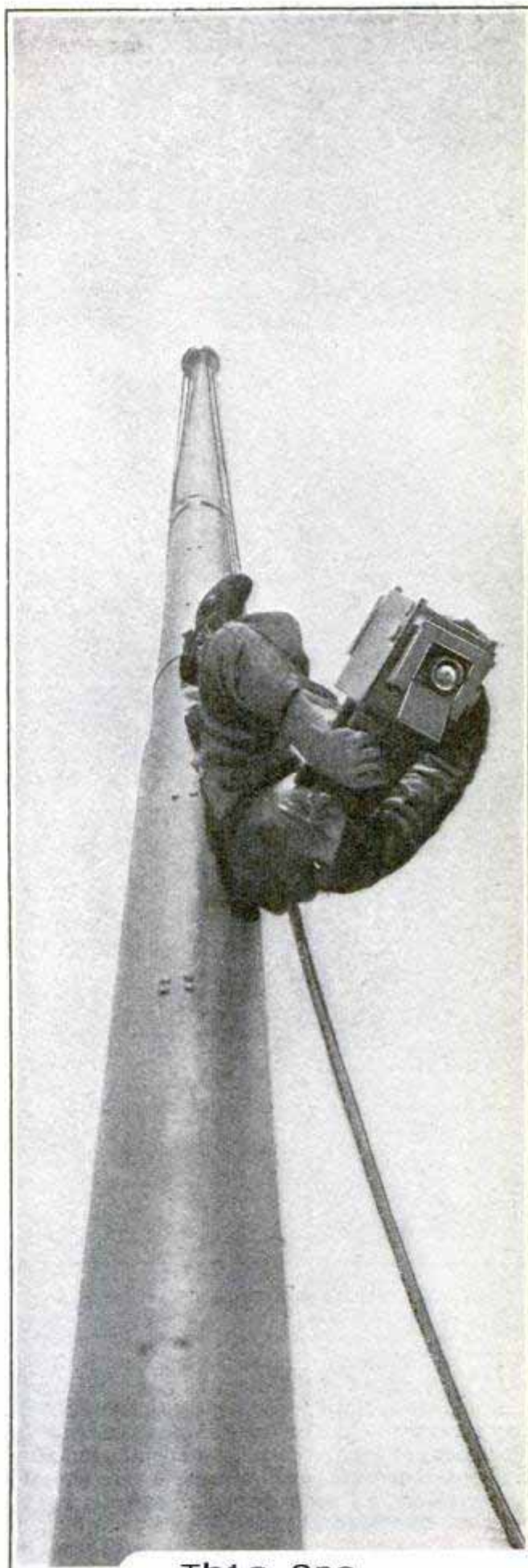
## NEW YORK CITY AS THE BIRDS SEE IT

The most remarkable photograph ever made of lower New York was taken from the top of the flagpole of the Singer building, 700 ft. above ground, by a daring steeplejack who climbed up the pole for the special purpose of making the picture. George Nealy is the man who made the dizzy climb, and in order to secure the photograph it was necessary for him to hang head downward from the boatswain's chair he had rigged to draw himself to the top of the pole. Nealy is known as "The Human Fly" and has made a number of climbs to the tops of steeples and tall buildings for the purpose of making repairs. He selected the Singer building as the best viewpoint for the photograph of New York as the birds see it, because from that height he would not be blanketed by the walls of adjoining buildings.

The feat was performed at about noon. The photographer made his way from the observation-room of the tower to the top with the boatswain's chair, a trapeze-like apparatus, which is built to slide up and down the pole. When he reached the top Nealy secured his ropes and then, in true circus-performer style, swung himself head down to sight the camera and take the picture. It was necessary for him to raise the camera by ropes from the observation-room to the height he had reached. Before righting himself he lowered the camera again to his awaiting assistant, and then, after performing a few acrobatic feats, slowly made his way down the pole to a more secure footing. While Nealy was engaged in photographing New York, another photographer took advantage of the opportunity to make a picture of him.

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ⒸA group of English capitalists is preparing to organize a company for the transportation of mails, passengers and express matter between Liverpool and North Wales, in dirigible balloons and motor cars.



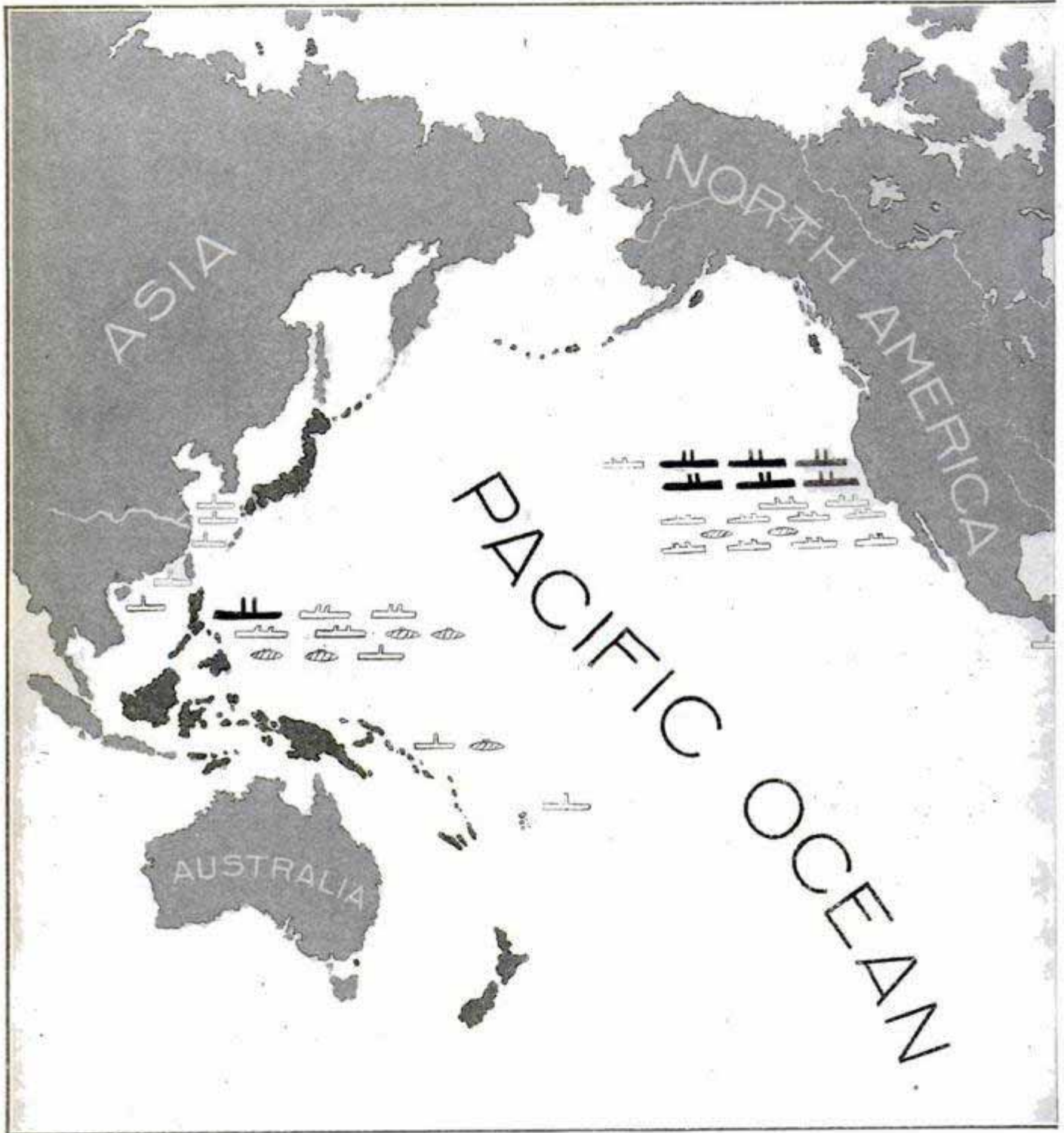
This One

Perilous Pe  
Electricia



WA4E-WS4-C929

# How the Fighting Ships of the American



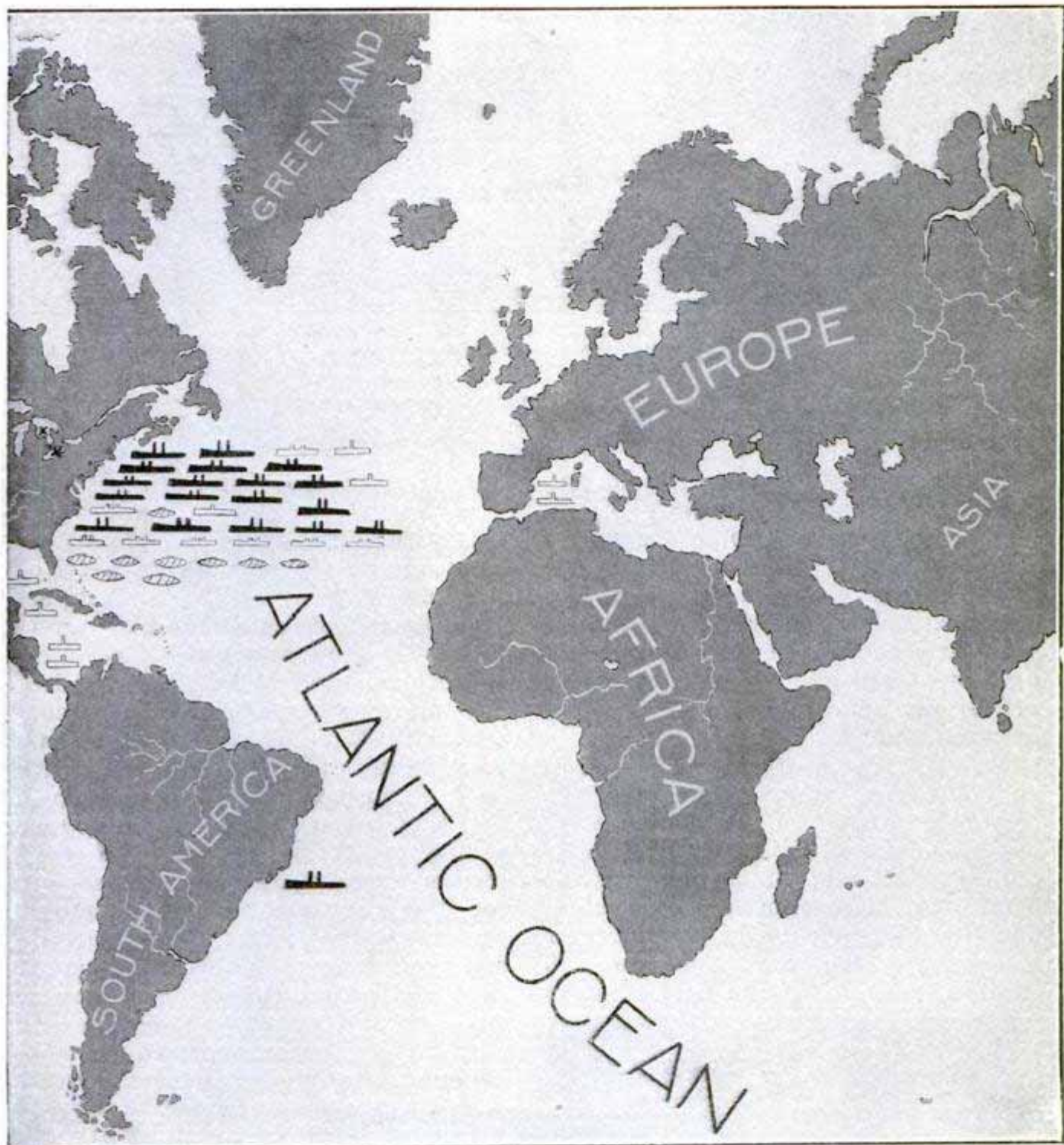
BATTLESHIPS and CRUISERS are shown by black ships

DESTROYERS and TORPEDO BOATS are indicated by outline of two-stack boats

**W**HERE is the United States Navy? This question must address itself occasionally to every citizen of the United States. Generally it is coupled with a second query—What is the United States Navy? To satisfy the general desire to know, the Navy Department was asked one day recently—just before the battleships of the Atlantic fleet sailed for Europe,—to give an exact statement of where the navy was stationed at noon on that day—the ships in commission, in reserve and out of commission. The statement showed among other things that there were 34 battleships and cruisers, 22 destroyers and torpedo boats, 16 submarines, and 20 gunboats actually in commission, a total of 92 ships. There were 7 battleships and cruisers, 32 destroyers and torpedo boats and 2 submarines, making a total of 41 vessels, in reserve, and 19 battleships and cruisers, 1 submarine and 9 gunboats out of commission, a total of 29; giving a grand total of 162 vessels in the navy that are ready, or could be prepared within a short time, for battle. This does not include the station ships or the vessels that are not yet out of the hands of the builders.



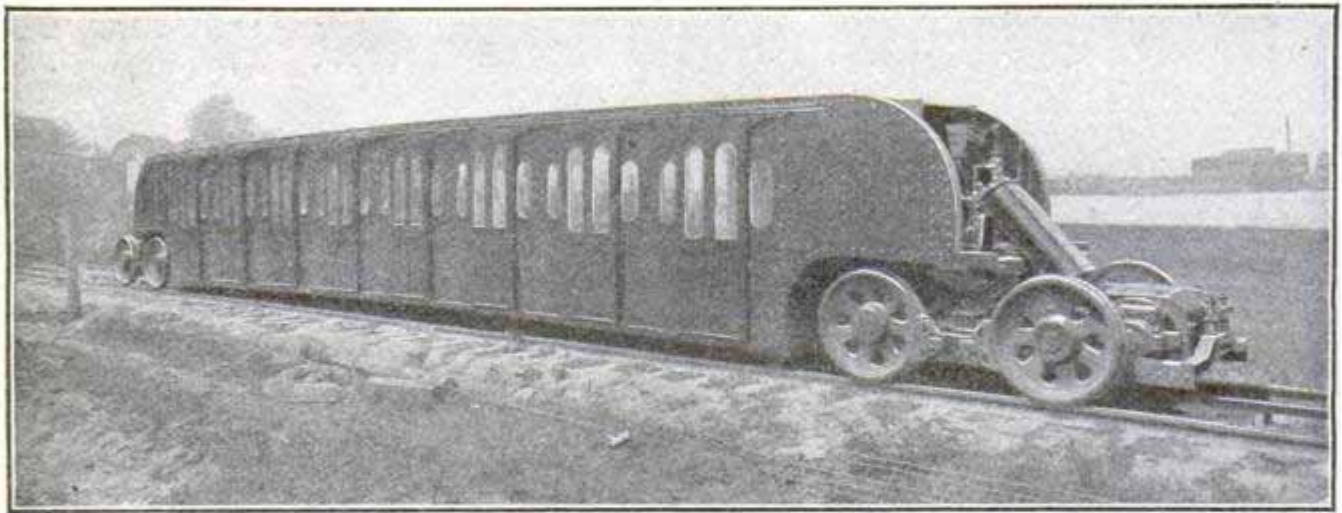
# Navy are Distributed Throughout the World



**GUNBOATS** are shown by outline boats with one stack

**SUBMARINES** are indicated by submarine-shaped outlines

At the particular time this unique naval census was taken, the battleships of the Atlantic fleet had just returned from the battle practice off the Virginia capes and were in the various navy yards along the coast fitting out for the European trip. The armored cruiser "Washington" was en route from the Pacific to the Atlantic coast and had just reported at Rio de Janeiro, Brazil. The armored cruisers "California," "Colorado," and "Pennsylvania" were returning to San Francisco from a long southern cruise, and were at Chimbote, Peru. The cruiser "Des Moines" was at Lisbon, hurried there at the time of the overthrow of King Manuel. The gunboats constitute the corps of military messengers that fly from port to port "showing the flag" and guarding the American interests. These little ships will be found in all parts of the world and they go from place to place at the behest of the American residents or the needs of the diplomatic service. In the preparation of the map, there were so many ships in some ports that it was impossible to reproduce them ship for ship.



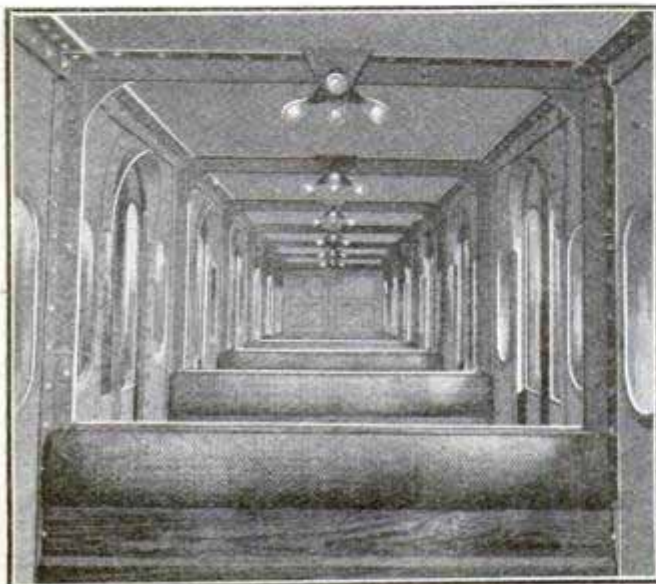
Exterior View of the New Subway Car

## NEW SUBWAY CAR BUILT FOR SMALL TUNNEL

A car built for underground rail-ways that requires a subway of but 7 ft. 6 in. from the top of the rail to the roof and 13 ft. from side to side is the latest achievement of the car builders. They believe it is destined to greatly cheapen the building of underground railways. The new car is of curious appearance and is swung between, and not over, its trucks. In experimental runs it has been used in an improvised subway that gave it a clearance of but 1 in. all around, without the slightest difficulty. The car is built of steel and is 58 ft. long over all; 6 ft. 6 in. high from floor to ceiling and 5 ft. 6 in. wide inside. From center to center of each truck it measures 48 ft. The bottom of the car is but 6

in. above the top of the rail on which it is run.

It being impossible to put the ordinary brake rigging with its levers on the car, a large brake cylinder has been placed between the brake beams, the piston being attached to one beam, and the cylinder to the other. A half-inch movement is given to the brakes and, with 65 lb. air pressure, this has been found to work very well. Side doors furnish an entrance for each of the back-to-back seats which extend all the way across the car. The cross-sectional area of the tube necessary to run this car is estimated at but 40 per cent of that of the New York subway and, because the depth of the car is so limited, the tunnel for it may be made to dip below the sewers and other obstacles encountered in construction, the moving and reconstruction of which has formed no small part of the cost of subway building throughout the country.



Interior of New Subway Car

### RUBBER BEST PRESERVED BY DISTILLED WATER

Distilled water is the best medium for the storage of rubber goods. For many years, scientists have been seeking a means for preventing deterioration of rubber. It has been known that even when not in use rubber will deteriorate to a very marked degree.

Two Russian savants have recently completed a series of experiments that extended over a period of 15 months and developed some interesting facts. They discovered, first of all, that immersion in distilled water kept the rubber in the best condition. This was determined by tests of tensile strength after immersion in various liquids during the entire period covered by the experiments. It was found that the rubber covered with water had a tensile strength of 77 lb., while that stored in lime water registered 62.7 lb. on test. Rubber placed in a one-per cent solution of sodium carbonate was tested up to 61.6 lb. before breaking, and that stored in a 10-per cent solution of glycerin and water, resisted only 57.2 lb. pull, and boric acid in solution of two per cent showed only 39.6 lb. on test.

### STRAW COW GARMENT FOR COLD WEATHER

In excessively cold weather, a blanket thrown over a cow while standing in its pen does not always suffice. And, as blankets are sometimes scarce,



An Overcoat of Straw

one blanket may be made to do by stuffing straw up under it in the manner shown by the illustration.

ⒸThe Birmingham, Eng., school authorities are contemplating establishing a course in gun-making as a part of the city school system by taking over the classes that are now maintained by the Gun Makers' Association.

### PUMPKIN THAT DEVELOPED A LIKING FOR HOG WIRE

The strange behavior of a big yellow pumpkin on a farm near Stuart, Iowa,



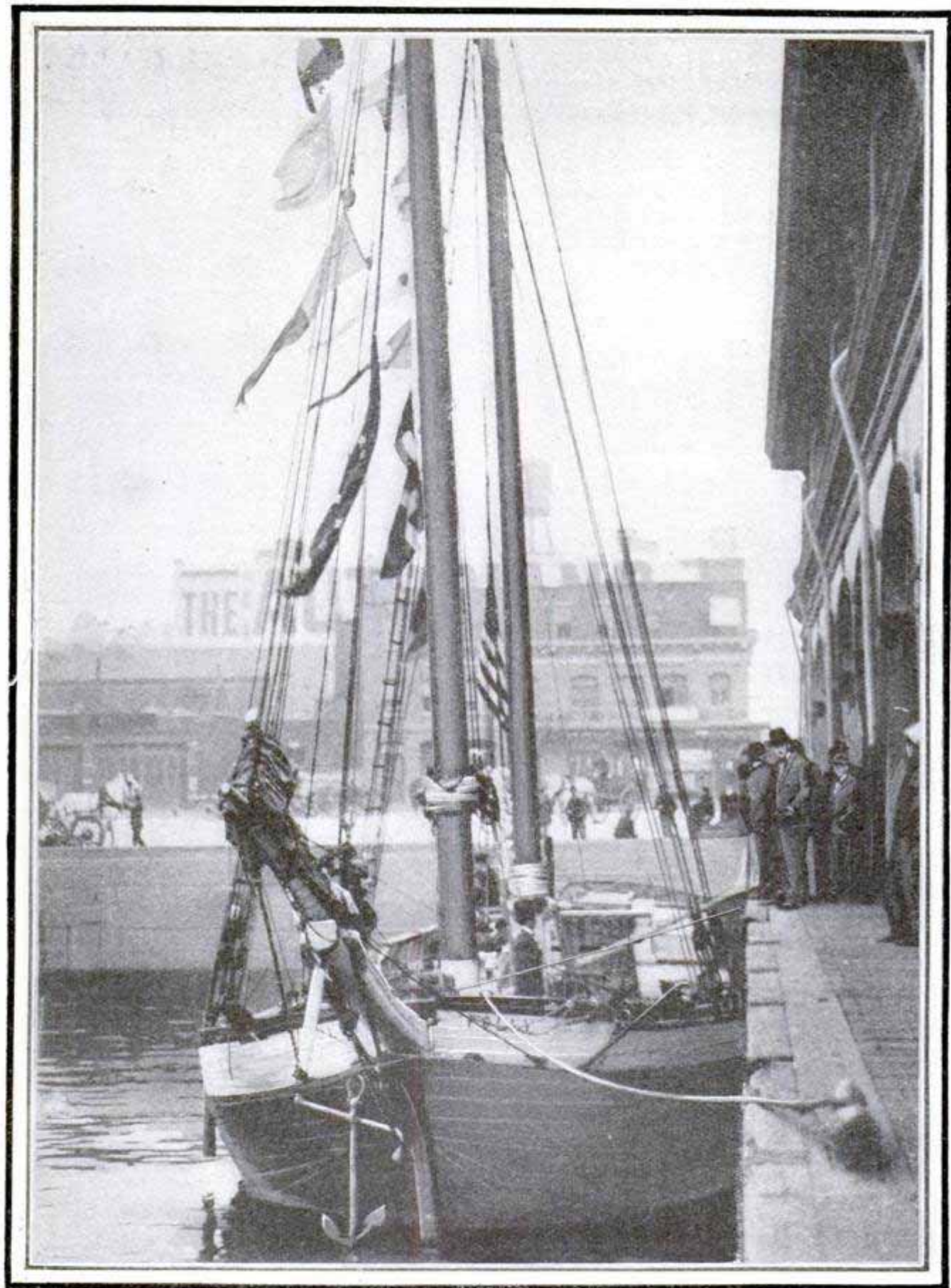
An Iowa Pumpkin That Embraced a Wire Fence

puzzled the farmers of the vicinity. This particular pumpkin had grown around the mesh of a wire fence of the type known as "hog wire" in such a manner that half of it was on one side of the fence and half on the other, while the whole enclosed a complete section of the wire.

### THE "GROG" OF THE BRITISH NAVY

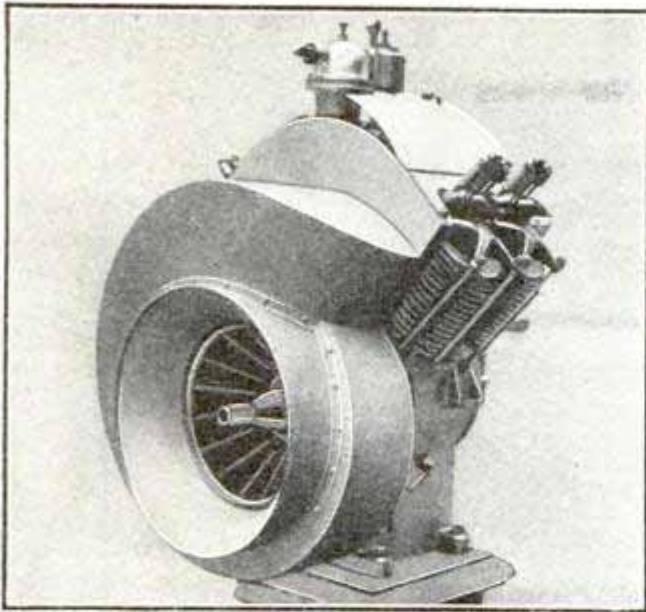
The cruisers "Rainbow" and "Niobe," which form the nucleus of the new Canadian navy, are to be "tee-total warships," the first, it is believed, that have ever put to sea under the British flag.

"Grog," which is one part of rum mixed with three parts of water, is part of the standard ration issued to the men of the British navy. As a regular ration, however, it is comparatively recent, and straight rum only slightly older, first being issued early in the eighteenth century. Each man received a quarter of a pint at midday and another in the evening. From the beginning of the English navy as a national force down to the eighteenth century, a gallon of ale a day for each man and boy was issued, and not until about 1830 was the brewing of ale especially for the fleet stopped.

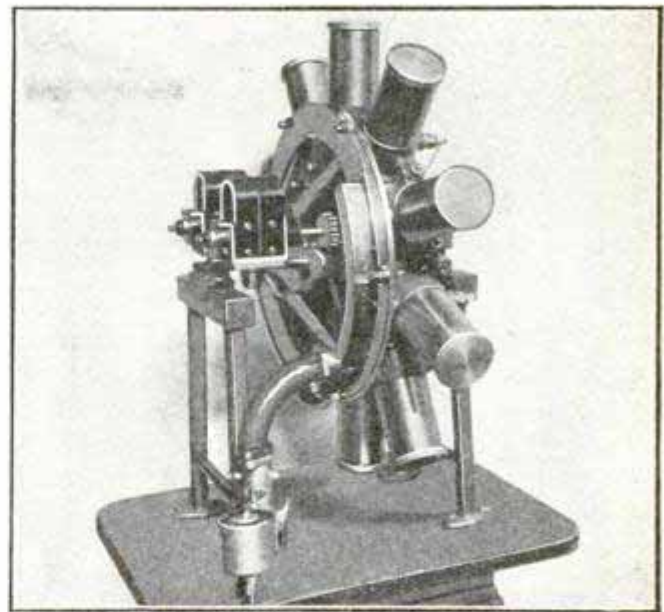


#### PRIVATEER OF 1812 STILL IN COMMISSION

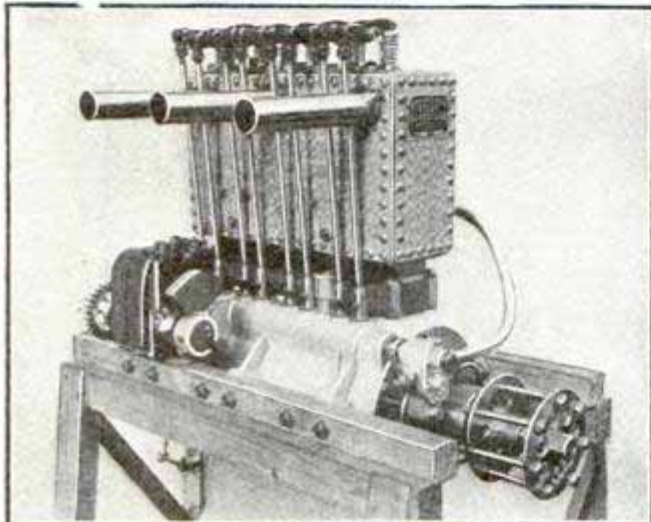
**T**HE National Society of United States Daughters of the War of 1812 recently presented the schooner "Polly," a privateer in the War of 1812 having a record of 11 captures, with an honorary tablet. The "Polly" was built in 1805. Eleven ships were forced to lower their colors to her. As a merchantman, she twice circled the globe, and now, although more than 100 years old, she is used in the coastwise trade, running to various points with Boston as her home port.



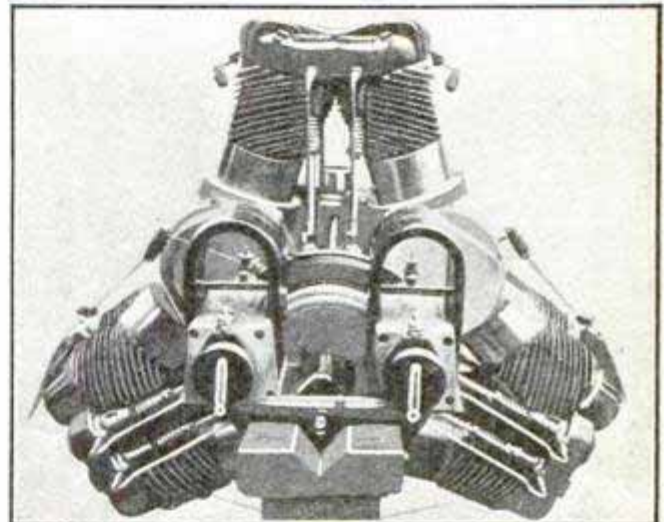
**RENAULT MOTOR**, 4 cylinders, V-shaped, 25 hp. with air-cooling fan and funnel. An innovation in aviation motors, in order to dispense with the weight of water-cooling devices. Weight 220 lb.



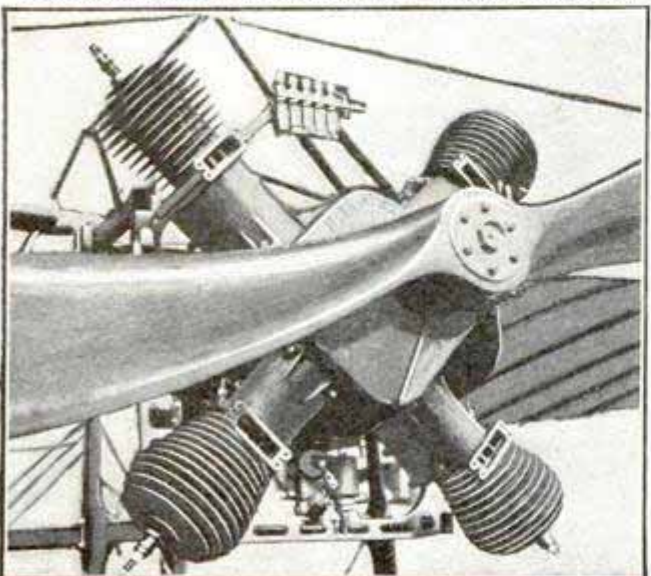
**CANDA ROTARY MOTOR**, 10 cylinders, no valves, 60 hp. The revolving cylinders contain piston rods and heads guided in a grooved cam, which takes the place of the cam shaft. Weight 150 lb.



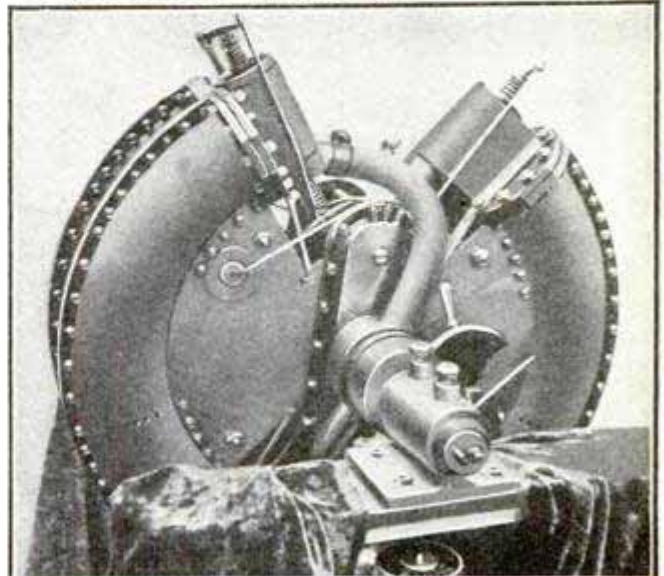
**GREGOIRE MOTOR**, 40 hp.—On the aeroplane the cylinders hang below the propeller shaft, reversing positions shown in photograph. This aids stability.



**BRETON ROTARY MOTOR**, varying from 10 to 60 hp., 12 cylinders, of which either 4, 8, or all 12 can be used at once. Weight 198 lb.

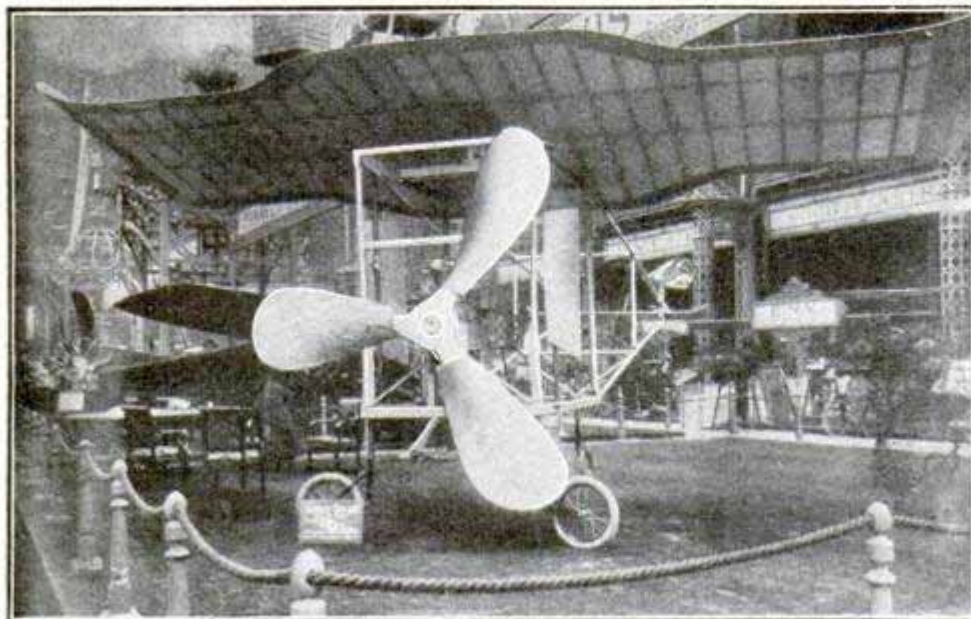


**BERTHAUD ROTARY MOTOR**, 4 cylinders, 50 to 60 hp.—Pistons of opposite cylinders are connected with a rigid rod.



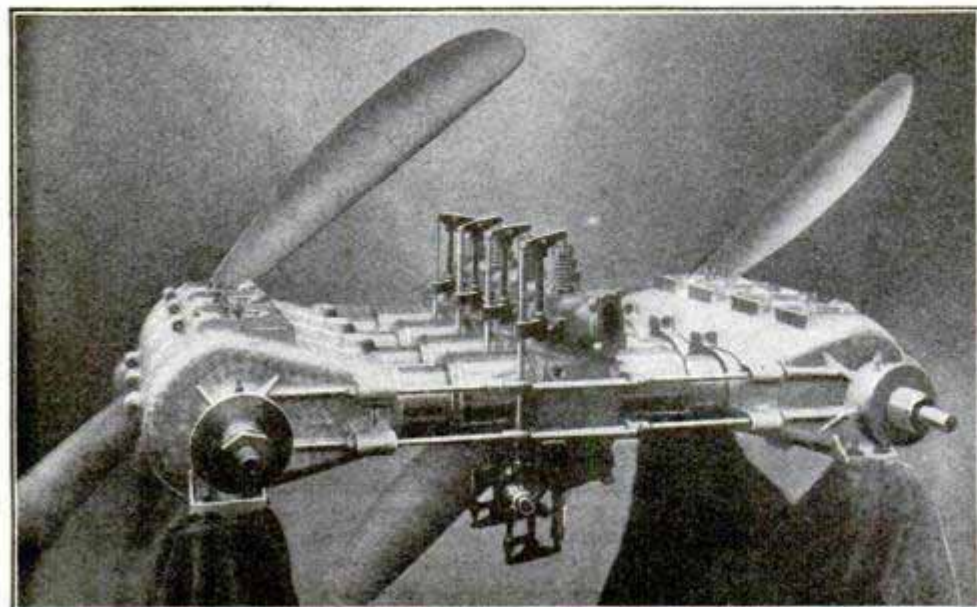
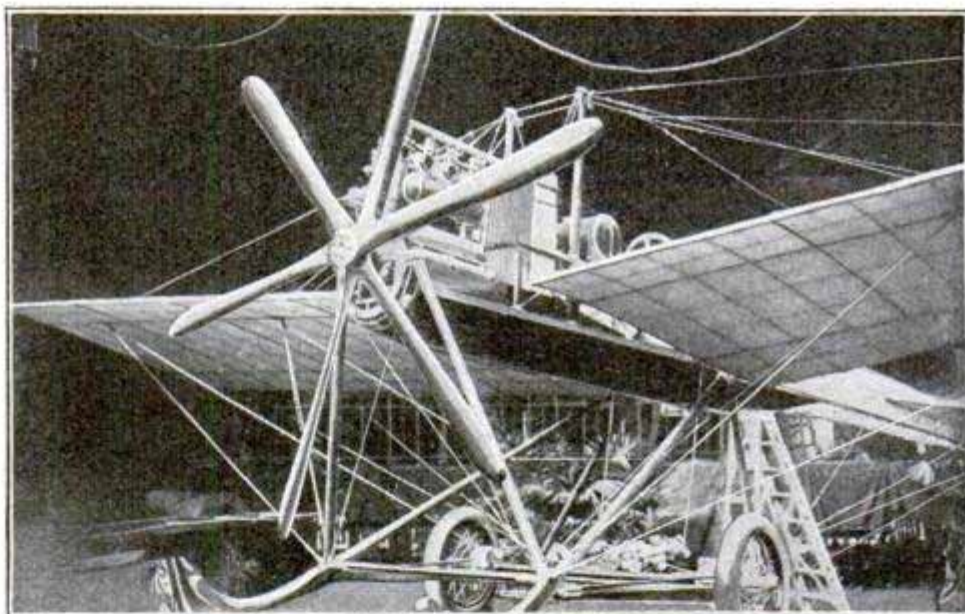
**BECK ROTARY MOTOR**, 8 cylinders, 50 hp. In 2 equal and parallel half-tors 8 curved pistons move with reciprocating motion.

## AEROPLANES AND MOTORS WHICH WERE DIS-



**VUITTON AEROPLANE** one of the "freaks" shown at the exposition. The machine presents many radical departures from the accepted types. The single plane is of unusual shape and the propeller is more like that of a steamship.

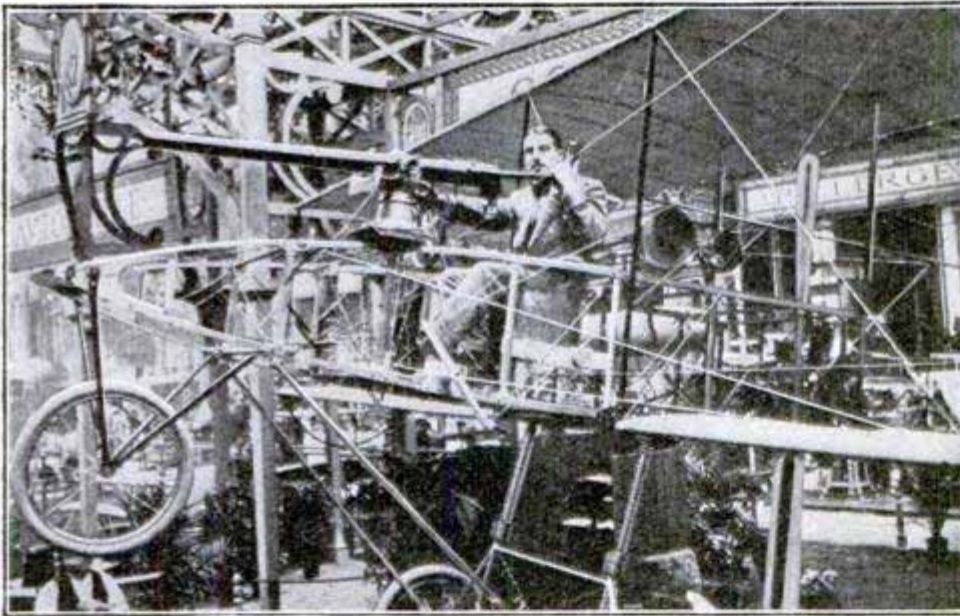
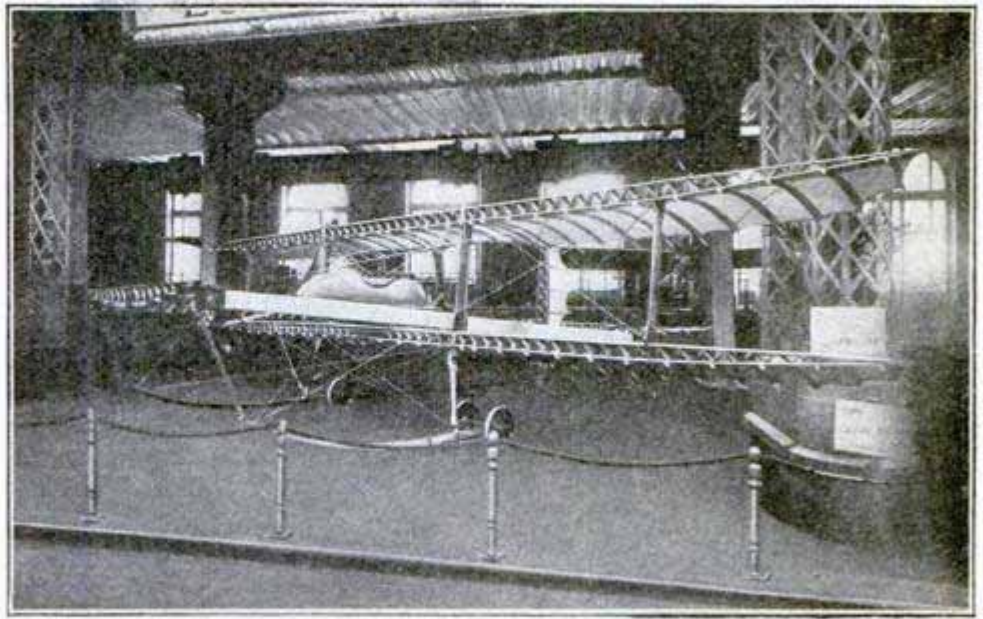
**DUPERDUSSIN'S MONOPLANE**, built along lines of Antoinette. The propeller has 6 narrow blades. The value of this type of propeller has not yet been established.



**EOLE MOTOR** of 100 hp.—8 cylinders. This novel engine is for use on dirigible balloons.

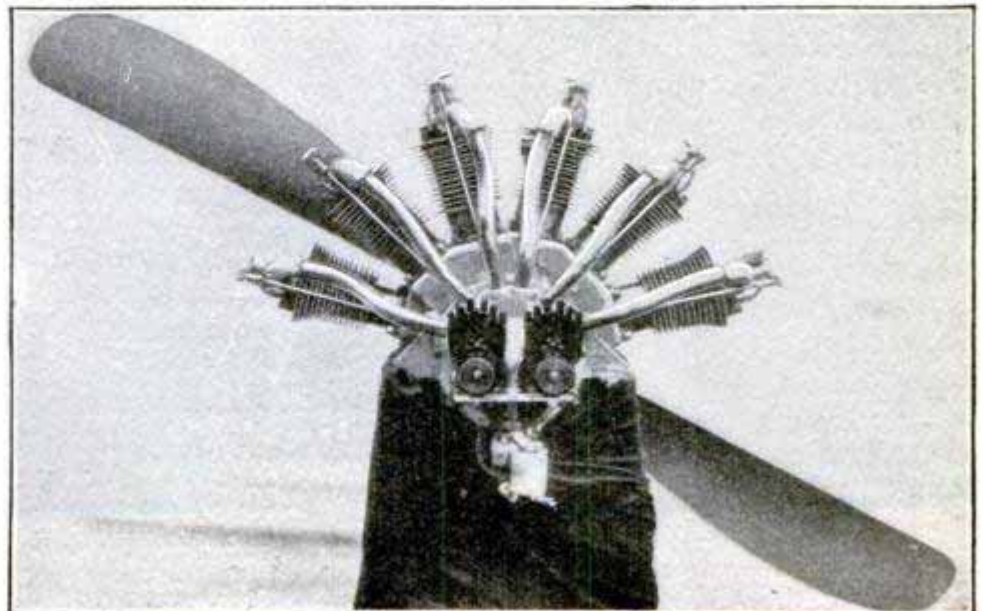
## PLAYED AT RECENT FRENCH AERONAUTIC SHOW

PAULHAN, THE FAMOUS AIRMAN, has become a manufacturer and this machine, with latticed wooden girders, is his design. The girders give the aeroplane strength and the triangular openings serve to divide the rush of air into equal streams against top of the wing.



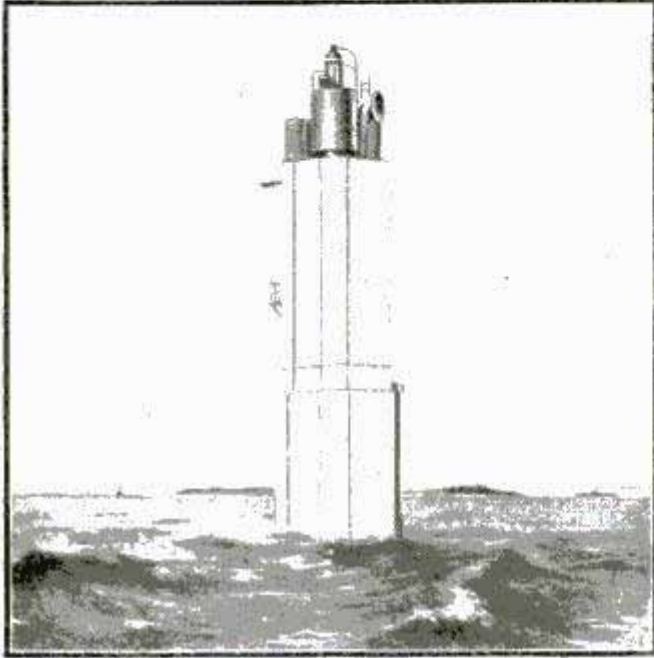
NEW VOISIN BIPLANE of military type mounted with a machine gun. This is the first machine to be so equipped. The fuselage, or frame, has been extended forward to carry the gun.

LEMASSON MOTOR, 6 cylinder, 50 hp., air cooled, with 2-throw shaft and 2 magnetos.



## LIGHTHOUSE OPERATED FROM THE SHORE

The new lighthouse on the coast of Guernsey, one of the group of islands in the English Channel, is a departure



Provided with Fog Siren Operated from Shore

in lighthouse engineering, as it contains a powerful fog siren as well as an acetylene light, although the lighthouse keepers are stationed at the electrical plant on the shore, more than a mile distant.

This dispensing with keepers on the rock is desirable because of the long periods of exposure to a heavy sea. The fog signal is worked entirely by electric cable, the turning on and off of the electric current on the shore automatically starting and stopping the motor and pumps which force air into the reservoirs. This compressed air drives an air motor, which in turn operates the siren.

The acetylene light is automatic, and will work for months without attention, the gas being automatically turned up at dusk and down at day-break.

The lighthouse is a monolith of concrete, rising 80 ft. high from a very small rock, with deep water all around its base. It is exposed to a heavy sea, so heavy, in fact, that it has gone over the top of the tower. The electric

cable is of the heavy rock type with three cores for main power purposes, and two smaller cores for minor purposes.

## EUROPE'S LARGEST STALACTITE CAVE

The stalactite cave recently discovered near Schoenbergalm, in the Dachstein mountains, Upper Austria, is claimed to be the largest in Europe. The principal tunnel has been found to extend over a mile, with numerous side passages of varying lengths. In traversing the main tunnel, the exploration party had to cross, by rope ladders, an ice crevasse 75 ft. deep and more than 100 ft. wide. The cave is divided into two levels. In the upper one was found two immense ice halls containing precipitous subterranean glaciers, about 300 ft. long. In the lower level is a series of halls, the largest more than 600 ft. long by 100 ft. wide.

## A 1909 "FREAK"

An original rendering of the year 1909 in Roman numerals may be seen on the front of a house constructed in that year near Manchester, Eng. The correct lettering of course would be MCMIX instead of XIXCIX. The builder seemed to have more regard for architectural ornamentation than accuracy.



Prince Henry of Prussia is making flights in an aeroplane. If the revolution business continues to prosper, there are others of royal blood to whom a 'plane might come handy.



# PLANNING AN AMERICAN GIBRALTAR

By L. WILLIAM THAVIS

**I**T is the plan of Uncle Sam to build large fortifications at the mouth of the Chesapeake Bay, involving the expenditure of millions of dollars. For several years, the military and naval authorities have argued that the present protection at this strategical point is wholly inadequate and should be strengthened. They hold, as does President Taft, that it is impossible to effectually guard the entrance of the bay with the biggest guns at Fort Monroe. Plans and estimates are being prepared, and this winter President Taft will strongly urge Congress to take action. The plan involves the construction of artificial islands of stone and concrete between Cape Henry and Cape Charles, a distance of about 18 miles from Fort Monroe, upon which is to be placed the powerful batteries.

The board on coast defense has recommended the island fortification, and asks \$2,600,000 for the construction of the islands and breakwaters and \$6,102,871 for the fortifications. These figures also include the cost of an auxiliary fort on the shore of Cape Henry.

President Taft is keenly interested in the proposed work and says he will push the project with his strongest effort. While secretary of war, he recommended it and in an address before the deeper waterways convention at Norfolk, Va., said: "You are here at the end of Chesapeake Bay, which is the greatest strategical point of naval rendezvous in the United States. We have a very heavy and very formidable coast defense at Fort Monroe and all about here, but if we want to protect this coast, we ought to protect, with as much emphasis as possible, the entrance to Chesapeake Bay. Now, that can be done in one way—by erecting an island on the middle ground between Cape Henry

and Cape Charles and placing thereon a fort that should be impregnable. That is what I want."

It may surprise the average intelligent American to learn that any point on our country's coast is practically defenseless. It must be a shock to most of them to realize that its most important locality is utterly lacking in means to repel the invasion of an enemy. In estimating the possibilities of a successful attack by a foreign navy, there are two factors for consideration: First, the vulnerability of the defense; second, the strength of the enemy.

At the outset, it may be premised that no single power could effect a widespread or continuous occupation, but it is sure, according to our naval and military experts, that any of several foreign powers might dominate one of our most important strategical positions—Chesapeake Bay—and inflict immense damage, before the nation could gather sufficient forces to expel him.

President Taft says: "Commercially and strategically, Chesapeake Bay is today, as it always has been, of the very first importance. With the entrance as it is now, unfortified, a hostile fleet, should it gain control of the sea, can establish, without coming under the fire of a single gun at Fort Monroe, a base on its shores, pass in and out at pleasure, have access to large quantities of valuable supplies of all kinds, and paralyze the great trunk railway lines crossing the head of the bay."

This is a positive statement, and it is not exaggerated. If our coast is scrutinized from Maine to Texas, from Lower California to the northernmost limits of the State of Washington, we can find no point which is more vulnerable than Chesapeake Bay, and none which offers to a strong

enemy such opportunities for inflicting great damage. The very factors which make the Chesapeake Bay section such an invaluable naval base for the nation, cause it to be a superlative menace if held by an enemy.

To leave the entrance to the Chesapeake unfortified is not merely a mistake, it is a crime. Cape Henry is the logical Gibraltar of the United States. It can be made impregnable and impassable. It is the key to the most important of our strategical situations. Its protection would insure to the nation the preservation of its finest naval harbor and its most important base of naval operation. It is contended that in the event of war, Cape Henry, unfortified, would require a fleet of battleships for its defense; fortified, it could rely upon itself and leave the navy unhampered.

The ports of New York, Boston and Galveston, representing our geographical as well as commercial poles, lie almost within gunshot of the ocean; and they would require, in addition to their present defenses, a considerable naval reinforcement. The American Navy is none too large when the immensity of the country's coast line is considered; and to invite a serious drain upon its strength is folly.

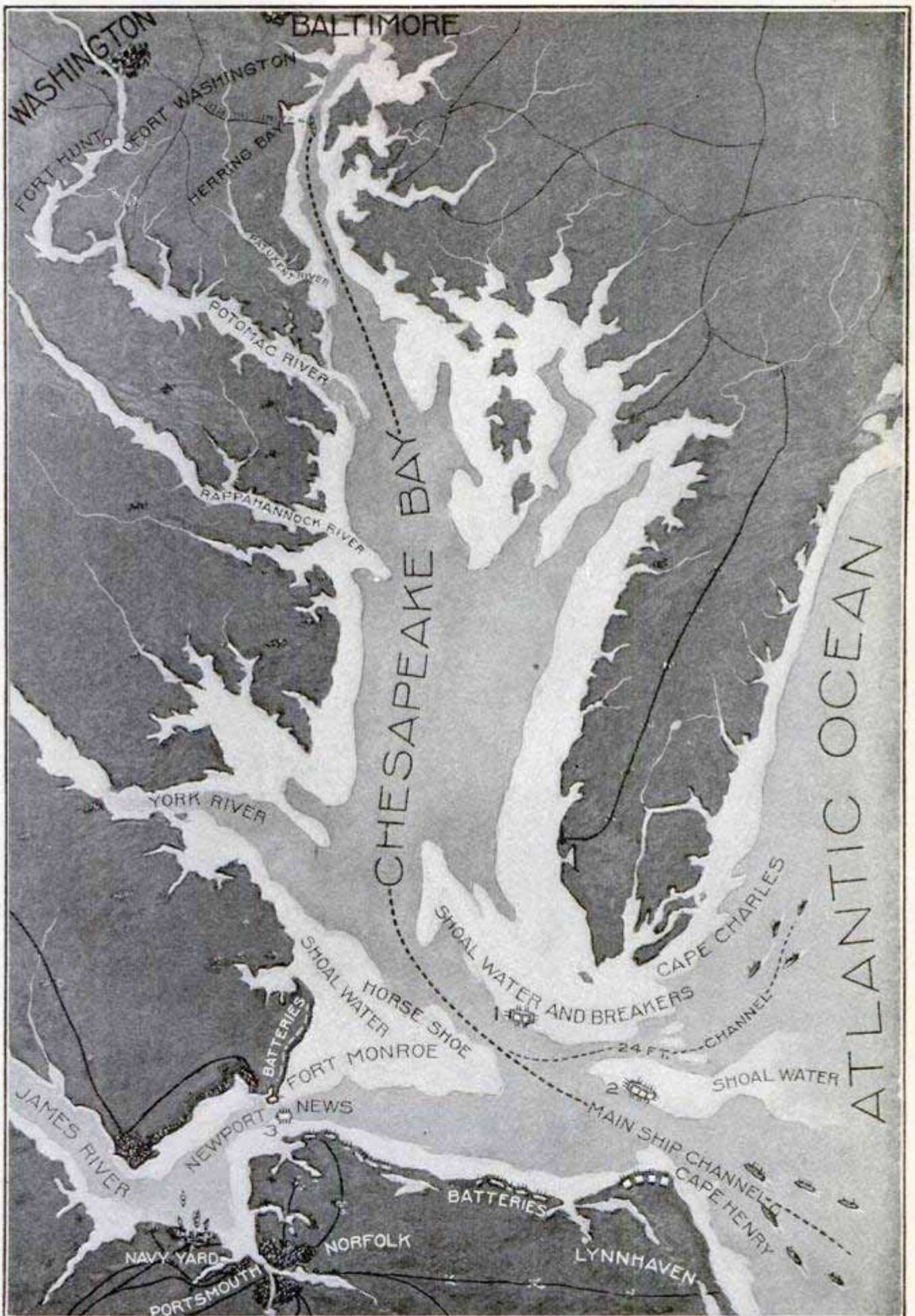
Against a hostile fleet sailing up the Chesapeake Bay, the guns of Fort Monroe would be absolutely powerless. According to military and naval authorities, a squadron could pass these sentinels day or night and be hull down on the horizon. Even if stacks and smoke should betray the location of the craft, the distance would insure immunity for all except the most fragile object, and the lighter craft might obtain protection behind the heavier. It is true, however, that the 14-in. gun can penetrate 7-in. Krupp armor at a distance of 25,000 yd., but even this monster weapon is admitted to be ineffective against 12-in. armor at more than five miles. It is confidently contended that a fleet can pass Fort Monroe on its northward journey up the Chesapeake with-

out approaching nearer than 22,000 yd. or 12 miles.

In the matter of channel way, Baltimore, Norfolk and Newport News are accessible to weapons of the Dreadnought type. Vessels of that class may easily enter the York River 25 miles; the Potomac, 35 miles; and the Patuxent, 18 miles. Annapolis may be approached within a mile, and many harbors on the eastern side of the Chesapeake Bay may be entered. Forming the four main peninsulas on the western side of the Chesapeake are the James, York, Rappahannock, Potomac and Patuxent Rivers, which may be utilized by large warships for distances varying from 40 to 100 or more miles inland. Such possession, of course, would involve only naval offense. But a power that controlled the entrance to Chesapeake Bay and the peninsular territories could, at will, land great forces of troops, debarking or shipping them at pleasure.

An attempt to force the Chesapeake under present conditions, would, it is contended, necessitate the employment of a large quota of our navy as defender. A successful entrance would demand the immediate mobilization of the flower of our army to prevent the seizure of vital points. A naval victory leaves in its wake derelicts, and the nation would be compelled to face this situation—its army placed at a disadvantage before an enemy which could choose the battleground and its navy depleted by the loss of some of its necessary units.

With Cape Henry fortified, there would be real security. The navy would be free to perform its normal functions, without having superadded to these the care of a strategic point which could well be protected from the land. An impassable fortification at the cape is considered a sure solution of the problem. Every physical and strategical condition favorable to defensive tactics is there. North-north-east of Cape Henry, the distance across the channel, from the beach to the farther limit of the five-fathom line, is only three statute miles. To pass this



**THE PLAN FOR ESTABLISHING AN IMPREGNABLE POSITION AT THE MOUTH OF CHESAPEAKE BAY**

The proposed fortifications to command both channels to the bay are shown at 1 and 2, 3, being old Fort Wool, better known as the Rip-Rap. The importance of protecting this position may be seen when it is realized that a hostile fleet could enter the bay, once the batteries at the end of Cape Henry were silenced, proceeding to Herring Bay, there landing troops to attack Washington and Baltimore. The importance of protecting Hampton Roads and the navy yard is apparent.

point, a hostile fleet would not likely risk taking less than seven or eight fathoms of water, as a close approach to the north would render grounding imminent; such a course would bring the warships within  $2\frac{1}{2}$  to  $2\frac{3}{4}$  miles of Cape Henry—a range which would permit its 6-in. guns to penetrate the lighter armor, and the larger cannon to perforate the heaviest battleships.

The total distance between the Virginia capes is approximately nine miles, but a large proportion of this expanse is shoal water. There are two distinct channels, one is near Cape Henry; the other, a break in the shoal water nearer Cape Charles. This north channel may be navigated by ships drawing 24 ft., but the passage is, owing to narrowness, broken soundings and shallow places, dangerous to attempt, particularly under conditions of war which would place the voyagers under the fire from the not more than five miles distant Cape Henry.

Strategically, Washington is removed from the ocean only by its distance from Herring Bay—about 24 miles. Baltimore is nearer than the mouth of the Patapsco, practically accessible. Leisurely and without concern as to their safety, hostile ships,

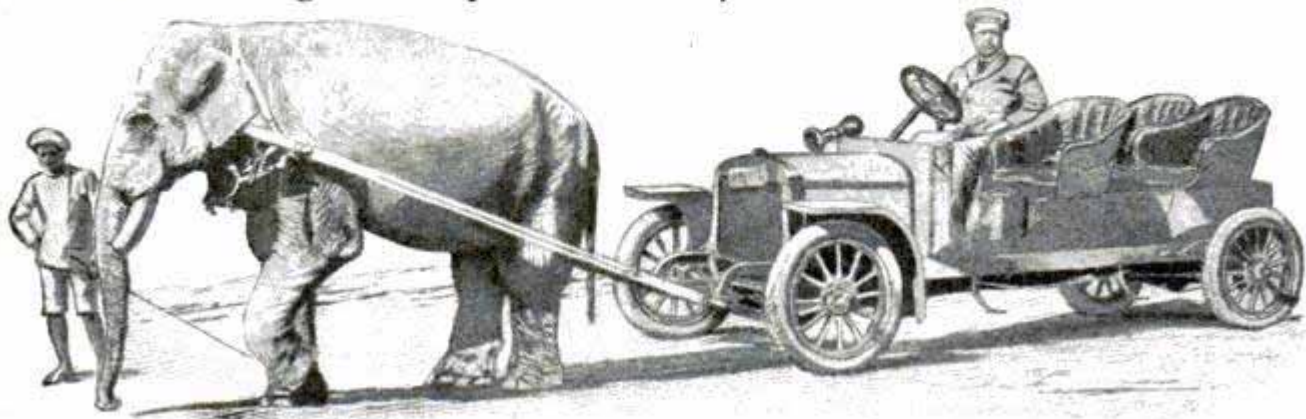
once in control of the entrance to Chesapeake Bay, could without hindrance traverse the 58 miles to the Potomac or the 140 miles to the Patapsco and proceed with the destruction of Washington or Baltimore. Fort Monroe, admittedly, could guard the approaches to Norfolk, Newport News and Richmond, but the fort would undoubtedly be subjected to a concerted sea and shore attack which might result in its loss, a calamity which would leave the points beyond Hampton Roads at the mercy of an enemy. Battleships could not navigate the James for any considerable distance, but gunboats can reach Richmond.

With adequate fortifications, a comparatively small number of artillerymen could hold the Chesapeake Bay safely against attack; without these defenses, the protection of the bay and its circumjacent lands must inevitably demand the services of fleets and forces. To avoid a wholesale sacrifice of our soldiers, to afford commercial security and to insure national prestige is the duty of our government; and by no single act can it better fulfill that duty than by placing an impregnable fortification at the country's chief strategic point.

### “GET AN ELEPHANT”

Conditions of environment are very favorable if, when an automobile breaks down in America, one or more boys are not present to exclaim “get a horse.” But in India, the cry of derision would be “get an elephant.”

Elephants are used in India for much of the work done by truck horses in this country, and the illustration shows one of the big beasts patiently towing a stranded automobile home for repairs.



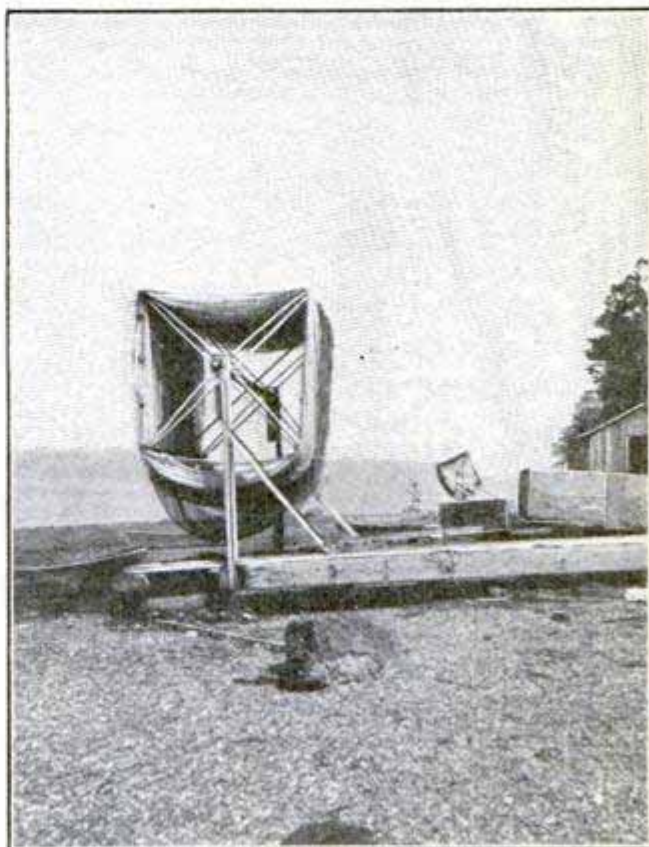
Locomotion Extraordinary in India

## BUILDING LONG TUNNEL IN NEW ZEALAND

The tunnel being constructed connecting Christchurch with Greymouth on the New Zealand Government Railways is to be one of the largest in the world. Compressed-air drills are being used and when finished, the bore will be  $5\frac{1}{2}$  miles long. Work was commenced in 1908, and five years are allowed the contractors to complete their construction. The tunnel will have a height above rails of  $15\frac{1}{2}$  ft. It is of horseshoe form, 14 ft. wide at the rail level. The ordinary section has a 12-in. lining, which is of concrete, faced with concrete blocks. The borings are being made from both ends, and the rate of progress is about 12 ft. per day.

## THE FISHERMAN'S CLOTHES-LINE

The fishing villages of the Puget Sound country, with their net-drying racks along the beaches, resemble to some extent the clumsy windmills of



A Floating Rack, with Net in Process of Drying

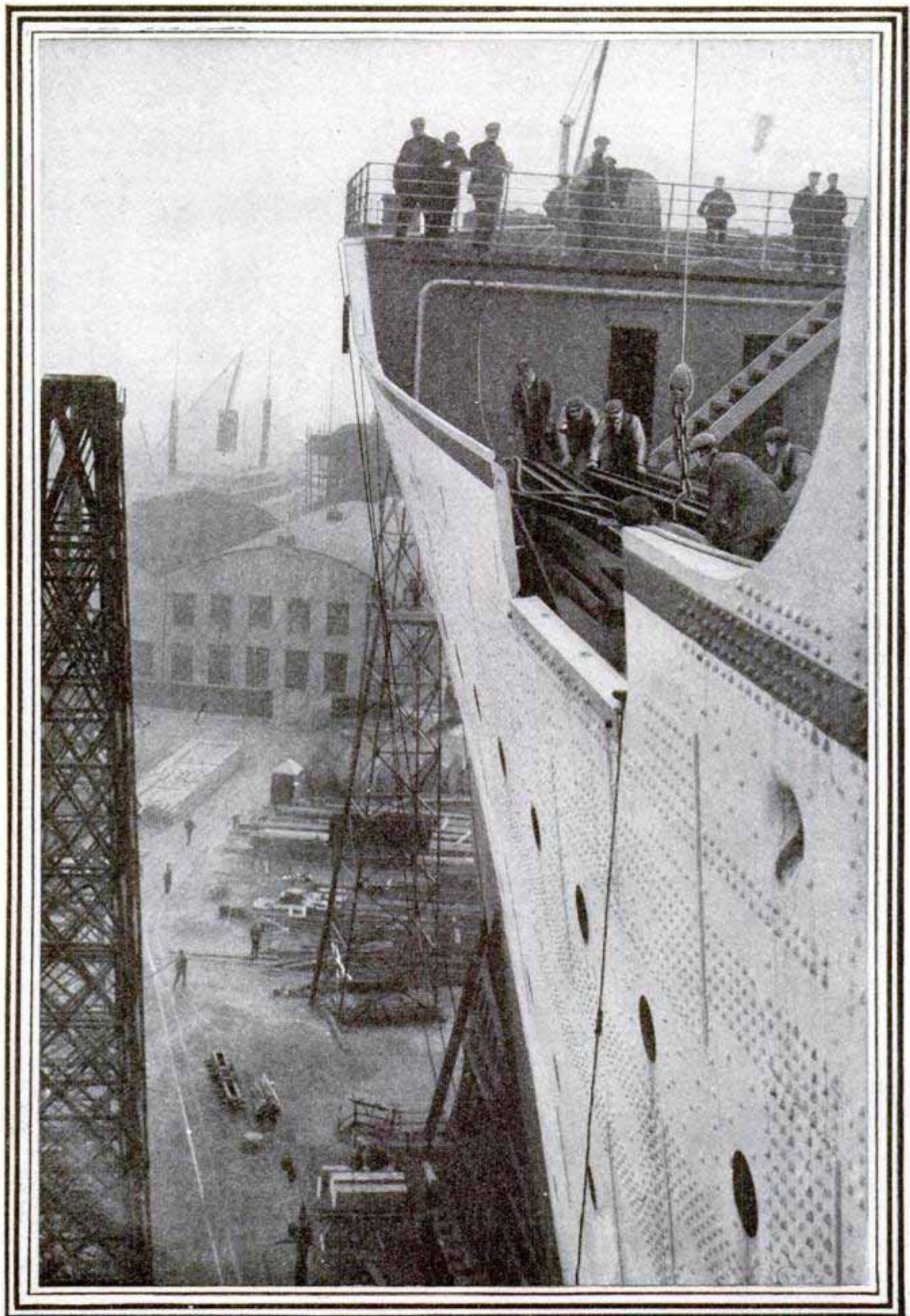
Holland, especially when viewed from a distance. The racks are swung on uprights nailed to heavy skids which can be floated at high tide and towed out to the nets. The racks revolve on an axle, taking up the net as they turn. One illustration shows an empty rack of crude design, with a runway in the background, and the other shows a floating rack, containing a net in the process of drying, with a similar rack some distance in the perspective.

## PAINFUL RESULTS FOLLOW CHEWING TOOTHPICKS

The attention of the medical fraternity of the country has recently been called to the dangers resulting from the chewing of wooden toothpicks through the serious illness of a hotel keeper in Michigan who developed alarming symptoms. The physician in attendance found that his patient was addicted to the habit of chewing toothpicks and it was subsequently learned that, on the day he was stricken with his peculiar symptoms he had swallowed portions of several of the little slivers of wood, one of which was almost an entire toothpick.



Empty Net-Drying Rack of Crude Design—A Runway in the Background



View of Bow of "Olympic" Before Launching, Giving a Good Idea of Its Great Height

## NEW LARGEST SHIP, THE "OLYMPIC"

The "Olympic," one of the two monster ships for the White Star line, the building of which has engrossed the marine world for the past two years, was launched recently at Belfast. Much has been written of these giant ships, and much remains to be written before the world at large will completely grasp the magnitude of this shipbuilding achievement.

The "Olympic" is 882½ ft. in overall length, as compared to the "Lusitania's" 762 ft. Her breadth overall is 92½ ft.; height from bottom of keel to top of captain's house, 105 ft.; height from keel to top of funnels, 175 ft.; gross register, 45,000 tons, and displacement, 66,000 tons.

It is in the comprehension of some of the parts that make up the whole, and the accommodations, however, that a clear idea of the magnitude may be gained. The largest steel plates are 36 ft. long, and weigh 4½ tons each; the largest beam, 96 ft. long; the stern frame weighs 70 tons; the after boss arms, 73½ tons; the forward arms, 45 tons; the rudder, 100 tons; the engine crankshafts, 118 tons each; bed-plate, 195 tons; columns, 21 tons; the heaviest cylinder with liner, 50 tons; the wing propellers, each 38 tons; the casings for the turbine cylinder, 163 tons, and for the solid bronze turbine propeller, 22 tons. The number of rivets in the double bottom alone is estimated as 500,000, weighing about 270 tons, while for the complete ship, the number is given as 3,000,000, weighing 1,200 tons.

Highest speed is not sought after, as in the case of the "Lusitania" and "Mauretania," but the speed will not be less than 21 knots (about 24¼ miles), driven by a combination of reciprocating engines working with high-pressure steam, and turbines driven by low-pressure steam.

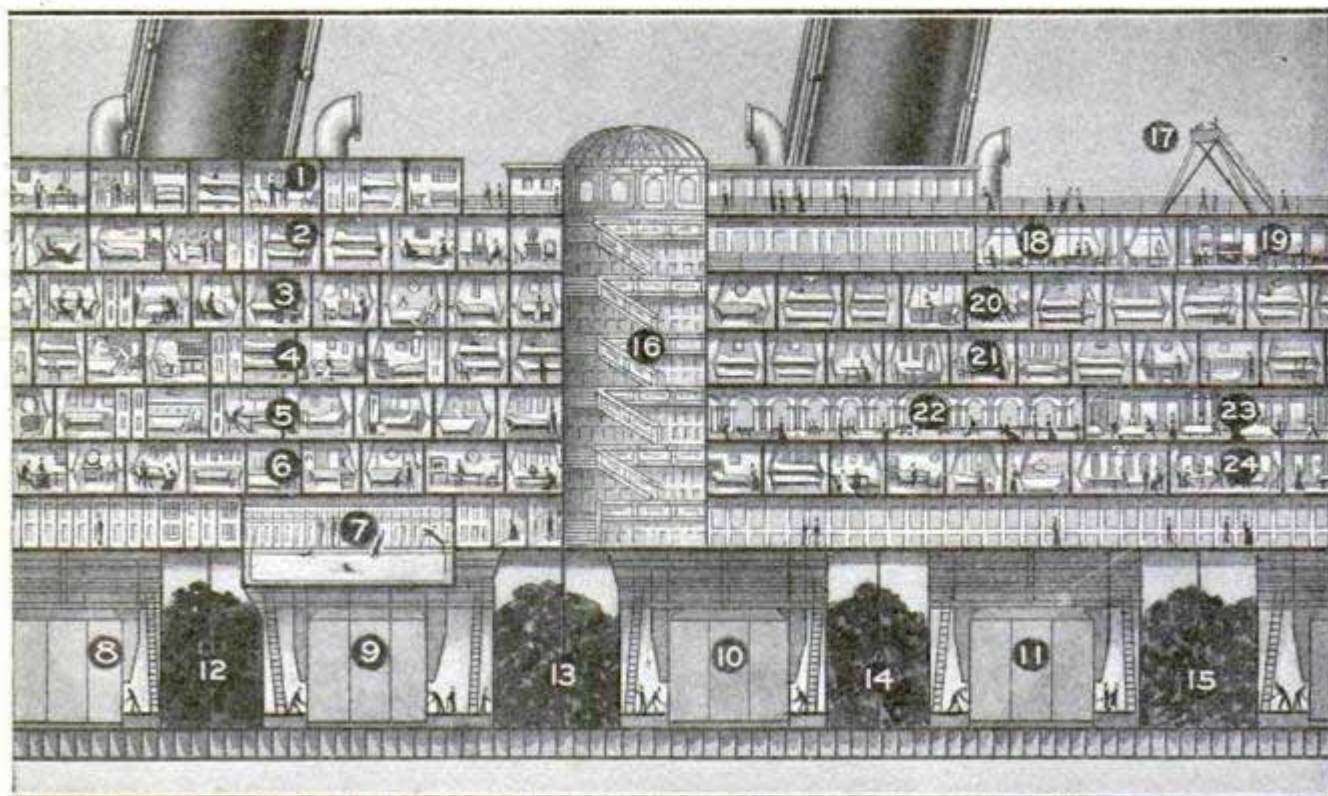
Passengers will be catered to with every device which makes for safety,

comfort and variety on the voyage. There are more than 30 watertight compartments, the massive doors of which are all controlled by the officers on the bridge.

The variety of accommodations for passengers is stupendous. Complete suites of rooms—ocean flats—fitted with every modern appliance even to shower baths, may be engaged. Passenger lifts communicate with the different decks, of which, all told, there are 11. The nursery will be the most complete afloat. There will be a gymnasium, a swimming pool provided with diving boards, a floral cafe with vines and trellis work, a huge space that may be used as a ballroom or skating rink, turkish baths, racquet court, roof garden, old English grill-room, electrical baths, sun parlors, sport decks, palm courts, etc.

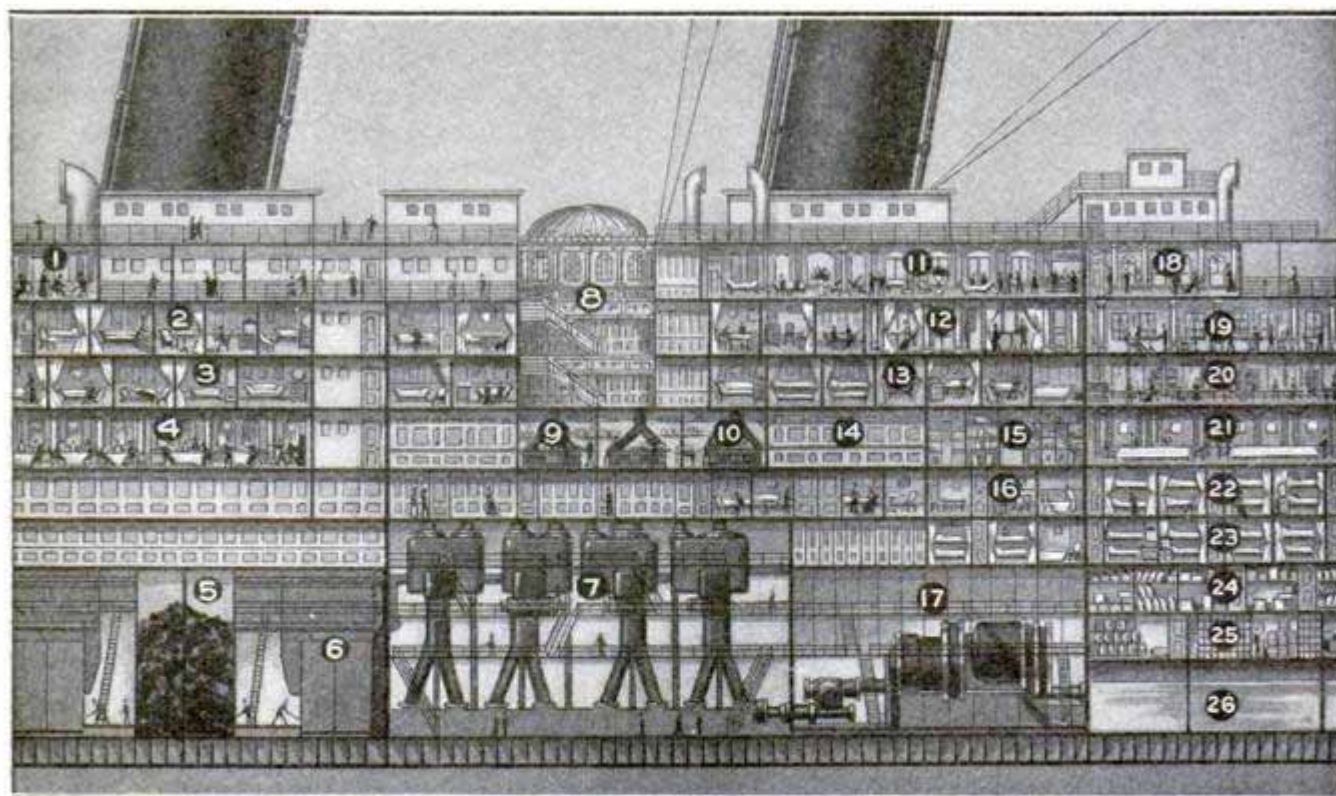
The launching of the great ship, preparation for which had been steadily carried on for months, and, by the way, cost Belfast some \$200,000 in harbor work, was accomplished without the slightest hitch. From the time the triggers were released until the ship was floating quietly in the water, less than two minutes elapsed.

The most interesting feature of the launching arrangements was the means employed for releasing her after the supporting blocks and shores had been removed and the order given. Some distance from the bow, the usual timbers supporting the standing ways, as well as the standing ways themselves, were replaced by two steel castings weighing several tons, fitted with a wrought-iron trigger. This trigger was pivoted within a recess in the casting, and was maintained in position with its upper end engaging in a steel-shod recess in the under surface of the sliding ways by means of a hydraulic cylinder and ram pressing against the lower end. The hydraulic cylinder and ram formed a portion of



A SECTION OF THE FORWARD PART OF THE "OLYMPIC"

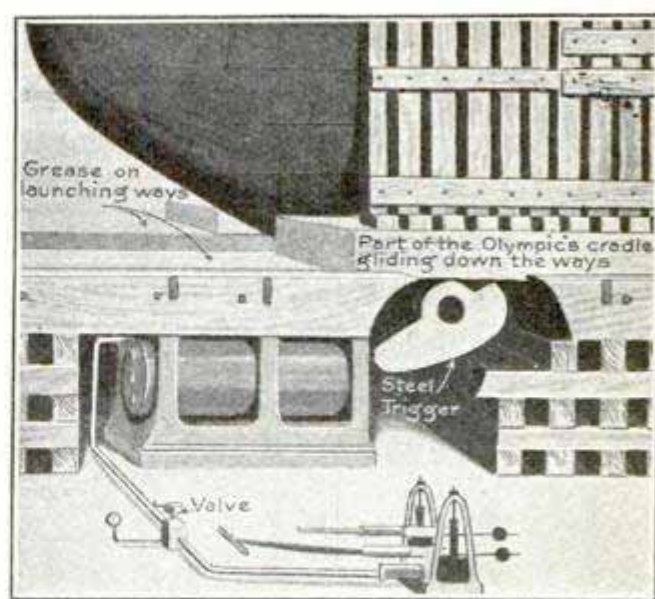
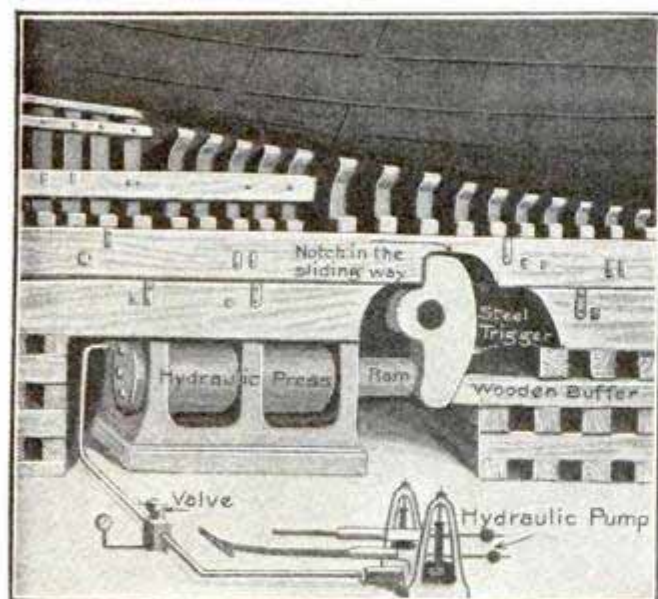
- 1, Officers' Quarters—2, 3, 4, 5 and 6, First-Class Staterooms—7, Plunge Bath—8, 9, 10 and 11, Boilers—12, 13, 14 and 15, Coal Bunkers—16, Grand Staircase—17, Compass—18, Writing Room—19, Lounge—20 and 21, First-Class Staterooms—22, First-Class Reception Room—23, First-Class Dining Saloon—24, Card Room.



A SECTION OF THE AFTER PART OF THE GREAT LINER BUILT IN ENGLAND

- 1, Lounge—2 and 3, First-Class Staterooms—4, First-Class Dining Saloon—5, Coal Bunkers—6, Boiler and Fireroom—7, Reciprocating Engines—8, Grand Staircase—9 and 10, Kitchens—11, First-Class Smoke Room and Bar—12, Restaurant—13, Staterooms—14 and 15, Pantries—16, Staterooms—17, Turbine Engines—18, Veranda—19, Second-Class Smoke Room—20, Library—21, Second-Class Dining Saloon—22 and 23, Second-Class Staterooms—24 and 25, Provision Rooms—26, Fresh-Water Tanks.





#### HOW THE "OLYMPIC" WAS LAUNCHED

Position of Trigger Before Release. The Ram Presses the Trigger Against the Buffer, and so Keeps it in the Notch that Penetrates the Sliding Way

Position of Trigger when Released by the Withdrawal of Hydraulic Pressure Against the Ram. Showing How the Monster, in Her Cradle, Slipped to the Sea

the casting above referred to, and the pumps and appliances for maintaining the pressure were situated alongside the berth. When all was ready for the actual launching, the simple opening of a valve released the pressure in the cylinder and the ram was withdrawn, thus leaving the pivoted trigger to fall away either by gravity or owing to the pressure of the moving sliding ways and the weight of the vessel. To assist in starting the launch, two sets of hydraulic cylinders were placed on the heavy staging under the bow, the rams acting upon

the fore ends of the sliding ways. These cylinders were connected with a hydraulic intensifier, and were collectively capable of exerting an immense force. One of the illustrations shows the trigger (exaggerated in size so that it may be clearly seen) before and just after its release. The launching weight was 27,000 tons, said to be the greatest ever transferred from land to water.

According to present plans, the "Olympic" is expected to make her maiden voyage to New York in July of this year.

## NAVY OWNS LESS THAN HALF GOVERNMENT BOATS

Considerably less than half the boats belonging to the United States government are a part of the navy. The War Department controls a greater number of craft of all kinds than is found on the navy lists, while the Departments of the Treasury, Commerce and Labor, and Agriculture, all have fleets under their jurisdiction. According to the latest government figures, there are but 340 vessels flying the naval pennant. The flags of the various branches of the War Department float over 635 boats, some of them passenger

steamers and freight carriers of no mean size. The quartermaster's department of the army alone controls 155 of this total that are used exclusively on the Pacific coast or in the Philippines. In the engineer's department of the army there are something like 420 boats of all kinds employed. These include dredges for keeping river channels and harbors free of obstructions, as well as boats of other description.

In the Treasury Department there are 41 revenue cutters, 29 steamers be-

longing to the Public Health and Marine Hospital service, in addition to smaller craft. The Bureau of Immigration and Naturalization of the Department of Commerce and Labor has several vessels, but the bulk of this department's "navy" is found in the lighthouse service, which employs 51 steamers for supply work, etc., and 72 lightships. There are 18 vessels in the Coast Survey service and several in the Bureau of Fisheries. The Isthmian Canal

Commission has a fleet of 139 ships, barges, dredges, tugs, etc. In the Department of Agriculture, several vessels are used in the Bureau of Forestry and the food inspection service. All told, the United States employs probably a thousand boats of various size and character that are not in any way connected with the sea-fighting service, but which seem to be quite as necessary for the upkeep of Uncle Sam's household and the people's welfare.

### MOTOR-DRIVEN SHOOTING-CAR

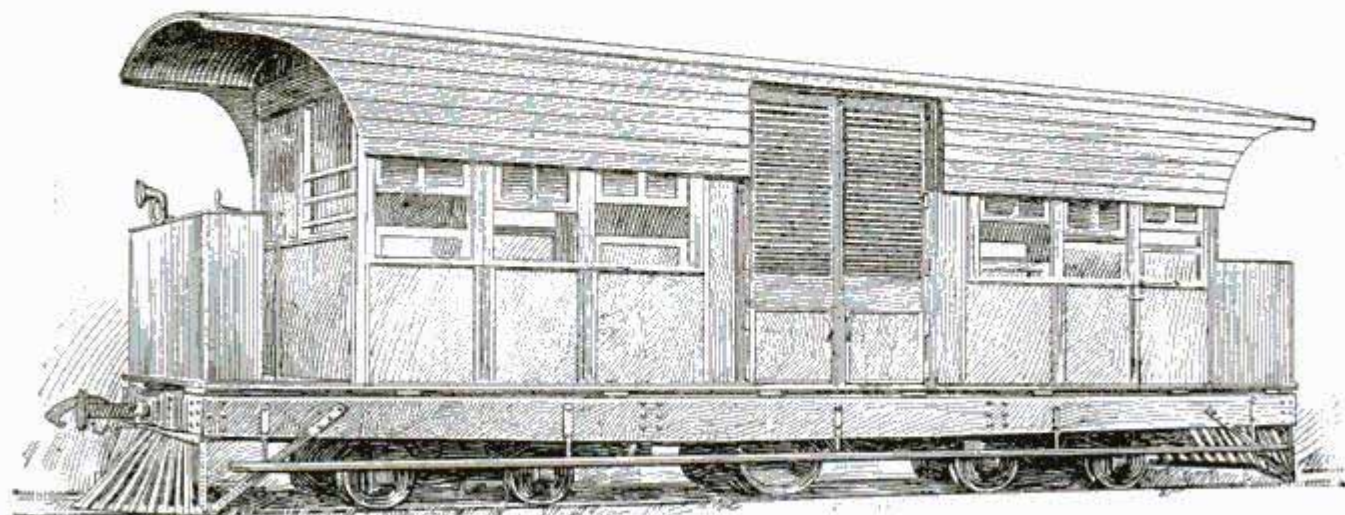
A passenger coach of the type used for general purposes on the railways in India, but provided with a 25-hp. gasoline engine as a self-contained means of motive power, is used by the Rao of Cutch for hunting purposes. Cutch is a state in British India, and "Rao" is the title given a high native official.

The car is used for transporting the hunting party into the territory where game abounds, and the shooting is often done from it. The engine room is the central compartment, directly over the driving wheels. The gearing to the driving-axle is arranged so as to give speeds of 10, 20 and 30 miles per hour either way. On each side of the engine room is a compartment for the hunters.

### AUSTRALIANS FAVOR USE OF METRIC SYSTEM

The government of Australia, through a resolution adopted by its House of Representatives, has declared itself in favor of the adoption of a uniform decimal system of metric weights and measures for the entire British Empire. The resolution provides that should the efforts of the Australian representatives at the next Imperial Conference fail to impress the necessity of the reform on the entire empire, that efforts be made to interest the government of New Zealand with an idea of the two colonies instituting the change.

It is announced that the Russian government has under preparation a scheme for the adoption of the metric system.

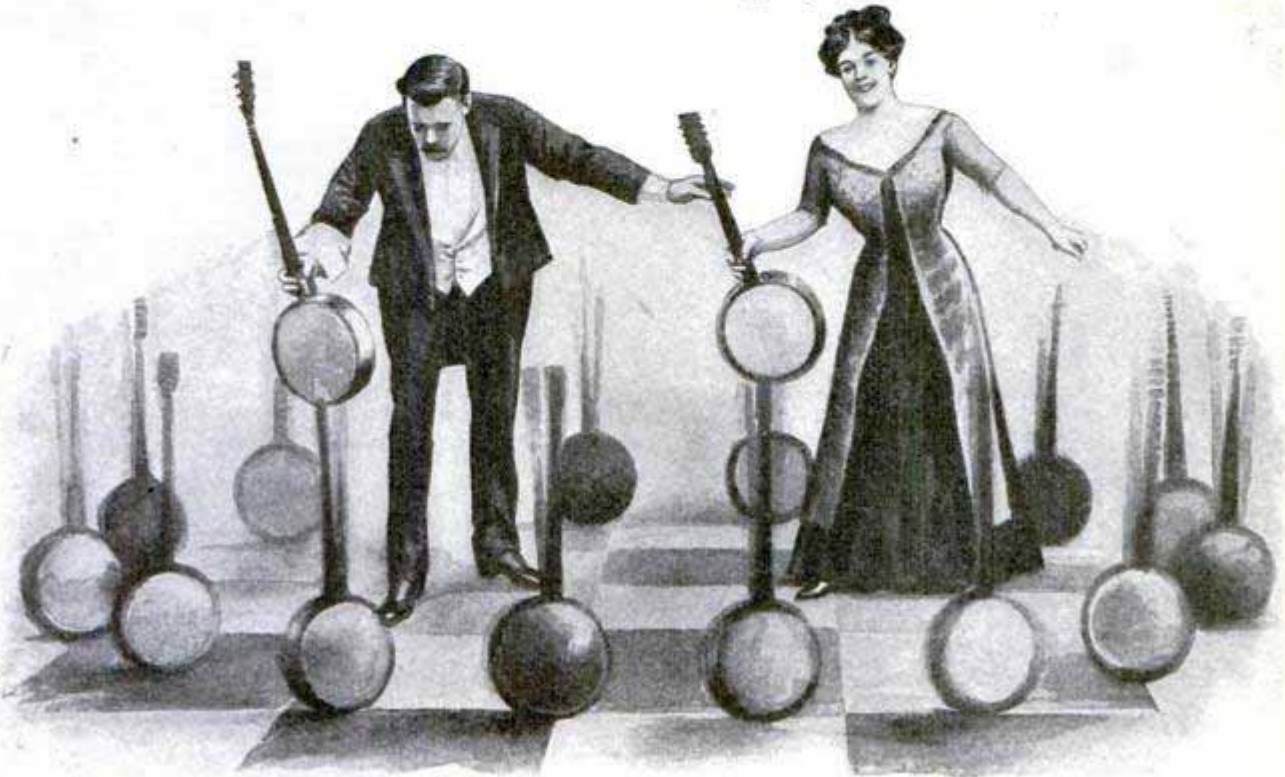


Remarkable Car in Which to Go Hunting in the Wilds of India

## PLAYING A CIRCLE OF SPINNING BANJOS

One of the acrobatic feats of a banjo artist, who has delighted audiences in Berlin, London and Vienna, is here il-

berosum was a product of the *solanum commersonii*; that the latter is, therefore, the "grandfather" of the flaky tuber that divides with bread the honor of being the "staff of life" for a large part of the world.



Spinning the Banjos as He Plays

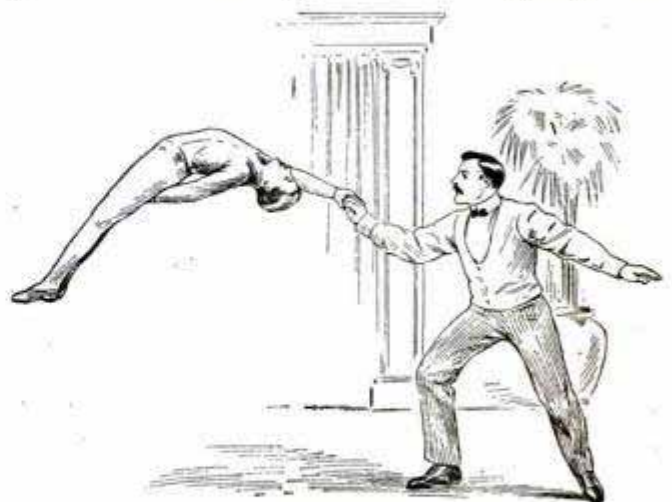
lustrated. Aside from playing the instruments, which he does with considerable musical genius, he keeps them all spinning in a circle at the rate of about 300 revolutions per minute.

## PLANT FROM WHICH WHITE POTATO SPRANG

While the plant that was developed into the present potato seems to have disappeared from the face of the earth, in some parts of America there can yet be found a species of the same botanic family which, though inedible, has many of the characteristics of the garden potato and can, by cultivation, be developed into an edible tuber. The original of the common potato of commerce is known botanically as the "*solanum tuberosum*" and the wild plant now growing is known as "*solanum commersonii*." It is found in Argentine, Mexico and, in our own country, in Arizona. It is believed by some botanists that the *solanum tu-*

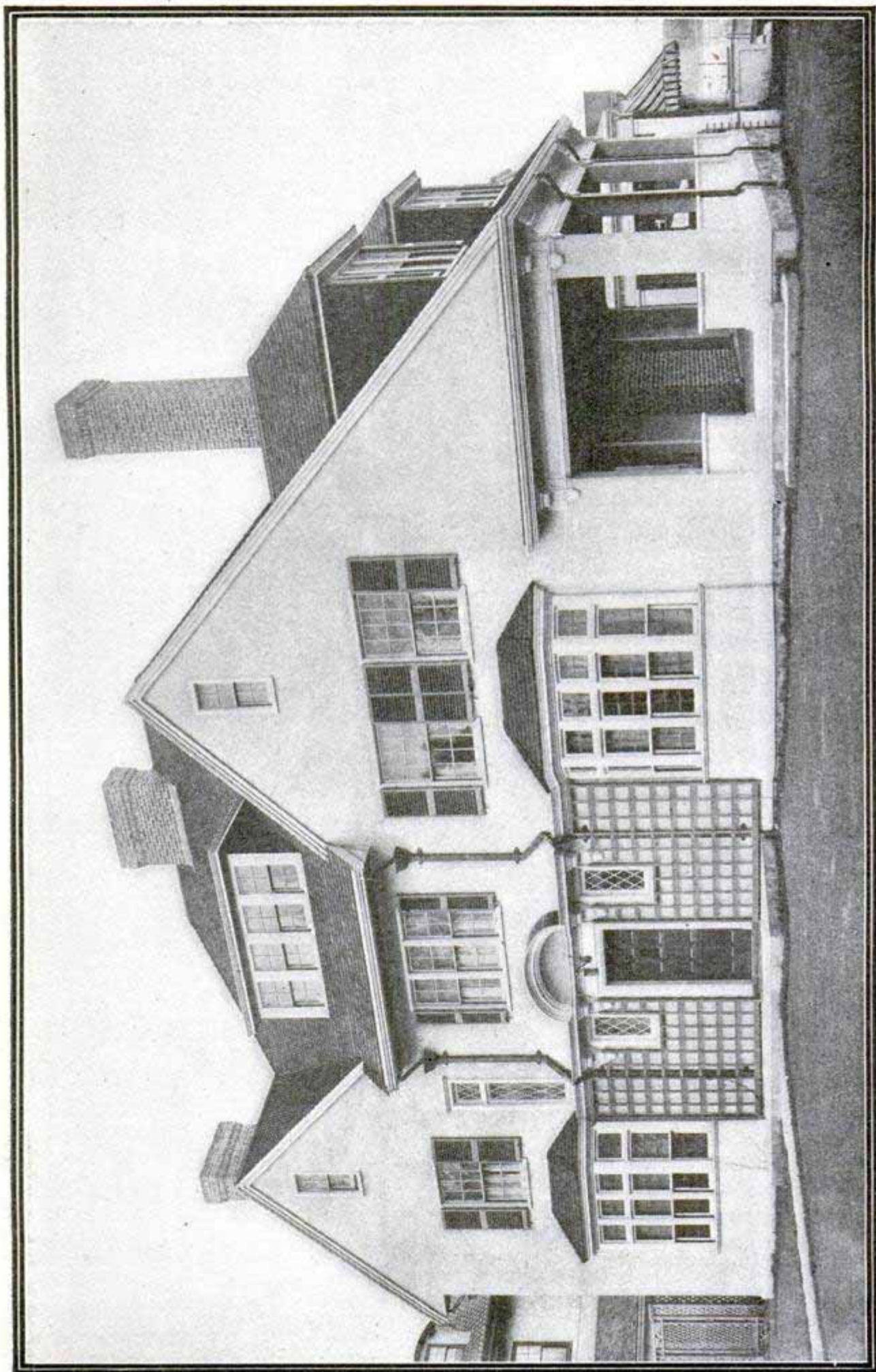
## REMARKABLE ACROBATIC FEAT

An acrobatic feat, remarkable for the rigidity of pose of the performer being swung, rather than the strength of the performer doing the swinging, is



Rigidity and Strength

shown in the accompanying illustration. The curved rigid pose is held steadily through the few moments of the act.



Concrete House Erected by Walter P. Libbey in Boston, Mass.



## MECHANICAL AND SCIENTIFIC PROGRESS IN NINETEEN-TEN.

**I**T IS so true that it is now commonly accepted as axiomatic, that "the more we know the more we find out there is yet to learn." One discovery begets not only another but a multitude of others, and so it goes. But a few years ago the vast multitude of people believed that the limit of invention and progress was well nigh attained, but things have recently been accomplished which, while in themselves formerly beyond even the wildest dreams of anticipation, have opened up fields for research and development which tend to show that as yet we are hardly beyond the portals of the region of human possibilities. Even the very foundations and once-accepted hypotheses of science are undergoing revision and re-establishment.

In writing the story of the progress of the year 1910, it is impossible even to catalog within the limits of a short article all of the notable events, and those that are set down herein are only an index of many others, perhaps equally as important or even more so, considering possible future developments.

By all odds, the most spectacular development of the past year has been the increasing mastery of man over the powers of the air, and it is a peculiar fact that, notwithstanding the undeniable improvements of the heavier-than-air flying-machines, the principal progress has been in the control of the machine by the aviator rather than in the design of the machine itself. Increasing familiarity with the art of flying has led to the establishment of remarkable records, in distance, height and speed, and the desire to excel in this branch of the sport (for such it must be called at present), as well as the chase after the money which has been lavished freely for record-breaking performances, has induced a daring which has not only been reckless, but suicidal and fatal in many instances. For some reason or other, perhaps best known to themselves, the question of stability seems to have been left to the skill of the aviators in managing the hand and foot-operated devices on their machines.

In the world of electricity, steady progress has been the rule. The electric motor is fast displacing other forms of drive in our shops and factories. Central stations are growing bigger, and a noticeable advance has been made toward that much-to-be-desired millennium when all power for running workshops, operating trains, lighting everything, and so forth, will be generated electrically in huge central stations distributed about the country, each operating in its own district, but tied in with all the others so that one can help out another in times of overload and in cases of emergency. The maximum operating and distributing efficiencies will then be attained, and the smokeless age will be no longer a topic, but an accomplished fact.

In chemistry and physics, the most eminent scientists are working overtime to reconcile their long-accepted theories with the disconcerting facts established by irrefutable results of experiments. More than a year ago the transmutation of one element into another was seemingly accomplished, the latest

in this line being the announcement that a Canadian wizard of science has transformed copper into iron. Should he succeed in reversing the process at a commercially low cost, the discovery would tend to produce almost a revolution in certain industries. The astonishing and almost fabulous experimentation which led up to the real or supposed feat of capturing that fraction of an atom called an "ion," and making it do sundry and various tricks to reveal the innermost foundations of the science of matter and electricity, has caused the greatest speculation as to what will be the ultimate outcome of this line of research. Certain discoveries are promised from Germany, in this connection, to outrival even the miracles of our own distinguished Professor Millikan.

In medicine and surgery, splendid work has been accomplished in the prevention of disease, the cure of some afflictions of the flesh hitherto regarded as chronic and incurable, and in the lines of safe anesthesia and bloodless surgery.

The subjects of the automobile, the motorboat, and even army and naval progress are intimately connected with the wonderful development of the internal-combustion engine and the progress of aviation. Reliability and reduction of weight for a given power in the explosion engine have been the burning questions, and much progress in these lines can be recorded. Military men have been concerned with the use of the aeroplane for scouting purposes, and naval men with the question of the offensive power of an aeroplane against a battleship. Successful experiments have been made in dropping "bombs" from aeroplanes on land targets representing battleships. On the other hand, no one has yet consented to be shot at while flying in an aeroplane over an "enemy's" battleship. Two records for motorboats are worthy of mention, a Frenchman's feat in covering a measured mile in a hydroplane at a speed of 46.06 miles an hour, and an American triumph of an ocean journey by a small motorboat to Bermuda and back, 1500 miles, without accident. The British Admiralty is at present building some warships which will be propelled by internal-combustion engines, using producer gas as fuel. In the automobile world, as is also the case with the motorboat, the principal improvements have been in the production of a good car or boat at a remarkably low figure, and this in spite of the fact that it had formerly been stated that the limit had already been attained in the matter of cost reduction. As regards weight per horsepower, it may be mentioned that while the ordinary automobile motor weighs from 10 to 15 lb. per horsepower, a 5-cylinder 50-hp. aeroplane motor has been built weighing 4.4 lb. or less per horsepower, and a 14-cylinder, 100-hp. Gnome motor weighing but 2.2 lb. per horsepower. In gas engines run by producer gas, great strides have been made in economy, design and application.

In civil engineering, the greatest advances have been made in the various immense irrigation projects designed to reclaim the arid wastes of our great West, and in the hydro-electric developments that have generally been complementary to them. The greatest progress has been made in the construction of the Panama canal, and the end is already in sight, the year 1913 having been announced for its completion.

In transportation, New York has set a pace for the rest of the world to follow. The completion of the Pennsylvania tunnels under the Hudson, the magnificent Pennsylvania Railroad terminal station, and the progress on the new Grand Central depot, which promises even to surpass the other great station, are events of the most far-reaching importance.

In shipbuilding, the launching of the giant White Star liner "Olympic" sets the record just a little bit further in the design of huge ocean steamships, and the practical experiments of Parsons and others in England in the building of an all-electric ocean ship, are the forerunners of probably the greatest de-

velopments in the shipbuilding line. In America, great things are expected of the Melville and Macalpine reduction gear, due to the initiative of George Westinghouse, in the application of the high-speed steam turbine to ships of all classes.

For the rest, the experts in several of the most important subjects tell their own stories below:



## Aviation and Aeronautics

By VICTOR LOUGHEED

During the year 1910, aviation has furnished an almost unbroken succession of record-breaking flights, chiefly in heavier-than-air machines, accompanied by a corresponding recklessness which has occasioned the death of several noted leaders in this newest and most marvelous of engineering sciences. Thirty-nine men were killed during the first 11 months of the year in the course of endeavors to advance the art of flying.

Bleriot's cross-channel flight of 1909 has been repeated several times by others, Rolls having made the passage over and back without landing, and Moisant, of Chicago, having made an interrupted flight from Paris to London while carrying a passenger.

Height records have been pushed upward to nearly the two-mile mark. Paulhan commenced early in the year with an altitude of 4,165 ft., and Ralph Johnstone, the American airman, who was killed in November, drove his biplane to a height of 9,714 ft. during the Belmont Park meet in October. J. Armstrong Drexel, another American, made a flight at Philadelphia in November, during which his barograph registered 9,970 ft., but the record was not allowed. Chavez succeeded in surmounting the Alps in a monoplane, only to meet with a fatal accident when returning to earth, his machine falling from a height of 30 ft.

Long-distance flights, too numerous to mention, have been made, most of them across country and one of 60 miles across water. Speeds up to 70 miles an hour in calms and 100 miles an hour with the wind have been accomplished by aeroplanes, and as many as five persons have been carried in a single machine for a short flight.

It has been estimated that up to the first of November, no fewer than 501 persons had made flights worthy of record; 300 flights had been made of over an hour, 30 of two hours, 12 of 3 hours, and one each of 5 and 6 hours—which shows the wonderful progress since the end of 1908, up to which time probably not more than half a dozen men had ever been off the ground in a controllable aeroplane.

The feature of the year in the aeroplane world was the constant rivalry between the two principal types of machine, the biplane and the monoplane. The latter, favored principally in France, has carried off most of the honors, probably due to the greater reliability and all-round excellence of the French-made motors which are almost exclusively used on these machines.

The dirigible balloon, which has been somewhat overshadowed by the aeroplane, has made some progress and written considerable aeronautic history during 1910. The great feat of the year was the attempt of the Wellman-Vaniman dirigible to cross the Atlantic. This machine carried a wireless outfit and a lifeboat, and was lighted by electricity. Although the attempt was unsuccessful, the distance and time records for balloon flights were broken, and sufficient experience was gained to encourage the principals of the expedition to declare that another attempt will shortly be made with consid-

erable likelihood of success. The Zeppelin airship, in Germany, made several notable flights in an attempt to establish a paying passenger transportation business between fixed points.

The improvements in the manufacture of alloys, and the discovery of duraluminum, an extremely light alloy of great strength, portend great future developments in the building of aeronautic craft of all kinds and the motors for propelling them.



## Electricity

By HENRY FARRINGTON, M. Sc., B. Eng.

Owing to its numerous ramifications and the distinct progress which has been made in the several branches of electricity, it has for convenience and ready reference been subdivided as follows:

**Electric Lighting.**—Notable developments and inventions include the quartz lamp, processes for making drawn tungsten filaments, and the light-transforming reflector. In the "wire type" of tungsten lamp, the use of an elastically-mounted continuous filament has produced a lamp of remarkable ruggedness. The electric lighting of Wellman's airship is worth recording.

**Telegraphy.**—The feature invention was a system of cable telegraphy for connecting land lines to submarine cables direct, without intermediate operators. Night-letter telegrams were introduced, and the Reno prizefight broke all records for the number of words (over 800,000) dispatched by telegraph in a single day from one center.

**Telephony.**—New inventions include S. G. Brown's telephone relay and an automatic telephone "enunciator" (for hotels, etc.), the former chiefly useful to medical men and the latter threatening to supersede the ubiquitous call-boy. Automatic and automanual systems made notable headway. Telephone meters are being introduced, several notable inventions having been perfected. The new submarine telephone cable across the English Channel and the laying of underground telephone trunk lines during the year formed the pioneering developments of future probable extensions of the utmost importance.

**Wireless.**—Chief among wireless achievements for 1910 was its successful use on balloons, dirigibles (including Wellman's airship), aeroplanes, fishing vessels (to signal the approach of fish), lightships and railway trains. The location by wireless of a murder suspect on a liner in mid-ocean furnished one of the sensations of the year. Directional wireless has proved invaluable to vessels in fogs, and wireless telegraphing through the earth's crust has been done successfully. The wireless transmission of power is still a dream of the future.

**Television.**—Two systems for transmitting pictures electrically through wires have been perfected and practically demonstrated. Successful demonstrations of wireless systems of telephotography have also been reported.

**Storage Batteries.**—Edison's battery has at last been perfected and its practicability for use on motor cars and street-railway cars successfully proved. An Iowan inventor claims to have produced a storage battery of two and a quarter times the capacity of Edison's cell. The new Salom battery is creating much attention.

**Electric Railways.**—Electrification of main lines has made noteworthy progress. The chief developments have been along the lines of standardization.



**Prime Movers.**—Motors, generators and other apparatus show many improvements and developments. Two generators of 30,000 kilowatts' capacity each, have been ordered by a Chicago electrical company. Gas producers and engines, and turbines of all kinds, are steadily encroaching on the field of the reciprocating engine in central-station practice.



## C hemistry and Physic s

By PROF. E. W. WASHBURN  
*University of Illinois*

The introduction of various evolutionary and revolutionary processes mark the year's progress in chemistry and physics. In experimental physics, one of the most noteworthy advances of the year is the isolation of a single individual atmospheric ion and the accurate measurement of its charge by Prof. R. A. Millikan of Chicago University. A very small droplet of oil or of mercury suspended in the air between the horizontal plates of an electrical condenser is illuminated by the light from an arc lamp and observed with a cathetometer telescope. After a time the drop collides with one of the ions of the air and thereby secures an electrical charge, so that by establishing an electric field between the plates of the condenser, the droplet can be caused to move upward or downward at the will of the observer. By watching continuously the motion of such a droplet, the observer notices a sudden change in its rate of motion whenever it collides with another ion. In this way Prof. Millikan has obtained new and convincing evidence that every electrical charge, instead of being spread uniformly over the charged surface, consists of a large number of particles or elements of electricity all exactly alike and scattered over the surface of the charged body. The value of this elementary charge or atom of electricity was found to be 4.902 c. g. s. units.

Mme. Curie, the discoverer of radium, has at last succeeded in isolating the metal itself, by electrolyzing a solution containing only 0.1 gram of the chloride, using a mercury cathode. The radium amalgam thus obtained, on heating in a quartz tube in a current of pure hydrogen, gave a brilliant white metal, melting at 700° C. The metal dissolves energetically in water and is acted upon by the air, forming a black nitride.

In physical chemistry, the researches of the last few years have given us unquestionable evidence of the actual existence of atoms and molecules.



## M edicine and Surgery

By JOSEPH B. CHAMPION, M. D.,  
*Asso. Editor, Journal Am. Med. Ass'n*

Notable advances have been made during the year in medicine and surgery. In the field of medicine, the most sensational discovery announced was Ehrlich's remedy for contagious blood poison, arseno-benzol, or "606," which kills the causative organism within 24 to 48 hours by the injection of a single dose, and causes marvelously rapid healing of ulcers and other lesions. It is also used in locomotor ataxia, paresis or softening of the brain, both believed to be due to contagious blood poison, and in some other parasitic diseases. Its ultimate permanent value, however, is to be settled by time. Ricketts, at the cost of his life, demonstrated that typhus fever is transmitted by the body-louse, and Flexner and Lewis by experiments on monkeys showed the infectiousness of infantile paralysis and made progress toward producing immunity or securing a serum for its cure. Carrel announced in October that tissues from living

bodies can be cultivated in culture chambers, just as bacteria are now grown. This promises to lead to an understanding of the nature of cancer and other tumors, as well as to other far-reaching results in the nature and cure of disease. Duval has now found a way to cultivate the leprosy bacillus, which is important for the understanding of that dread disease.

Aside from these discoveries, there has been a general advance in the knowledge of pellagra, hookworm, treatment by vaccines or serums, the chemistry of digestion, the surgery of the brain, heart and arteries, and a better understanding of the thyroid gland and other ductless glands. Light has probably been thrown on the causes of asthma, of hay fever, and of hives or other rashes caused by certain foods. New developments have been announced concerning the phenomenon of anaphylaxis, which latter also promises to show how persons may be rendered immune to certain diseases. The progress in the prevention of tuberculosis during the year is also worthy of note. The active interest of the public in health matters, sanitation and preventable diseases, and the introduction in Congress of a bill for a national department of health, were significant incidents. An additional large endowment for the Rockefeller Institute for Medical Research and the establishment of other large funds for the study of cancer and other diseases are also of the utmost importance, and will aid in the solution of these difficult problems. The work of the year in medicine leaves the impression that avenues to further discoveries of the highest significance and importance have been just opened up.



## Astronomy

By PROF. EDWIN FROST  
*Yerkes Observatory*

While astronomy has produced no remarkable observational discoveries during 1910, comets have been in the foreground of popular interest. This interest was stimulated by the naked-eye visibility of two large comets, the one discovered by railroad laborers in South Africa in January, and Halley's comet after its return to perihelion in April. From the scientific point of view, the latter was a highly satisfactory apparition. Precisely what was expected happened at the time of its transit across the sun's disk; its head and nucleus were too diaphanous to be detected, and the sweep of the tail past the earth caused no certainly observable effects on our planet or on its atmosphere.

Probably the most important astronomical work which has appeared within the year is the catalog of the exact position of 6,188 stars by Prof. Lewis Boss of the Dudley Observatory at Albany, N. Y.

Important studies on the streams of stars have been made by Hough and Halm of the Cape of Good Hope, and by Kapteyn of Holland. Valuable papers on spectroscopic binary stars have been independently contributed by Kapteyn, by Campbell and by Schlesinger, of America, and by Ludendorff of Germany. Another volume of measures of the distance of stars has come from the Yale Observatory.

The completion of the great 60-in. reflecting telescope of the Mount Wilson Observatory near Pasadena, Cal., has enabled Ritchey to secure some of the finest photographs of spiral nebulae yet obtained. Stebbins, of the observatory of the University of Illinois, has published his results with a new form of photometer for measuring the brightness of stars, upon which he has been engaged for some years. He utilizes the change in resistance of selenium under the action of light, and a high degree of accuracy is obtained.

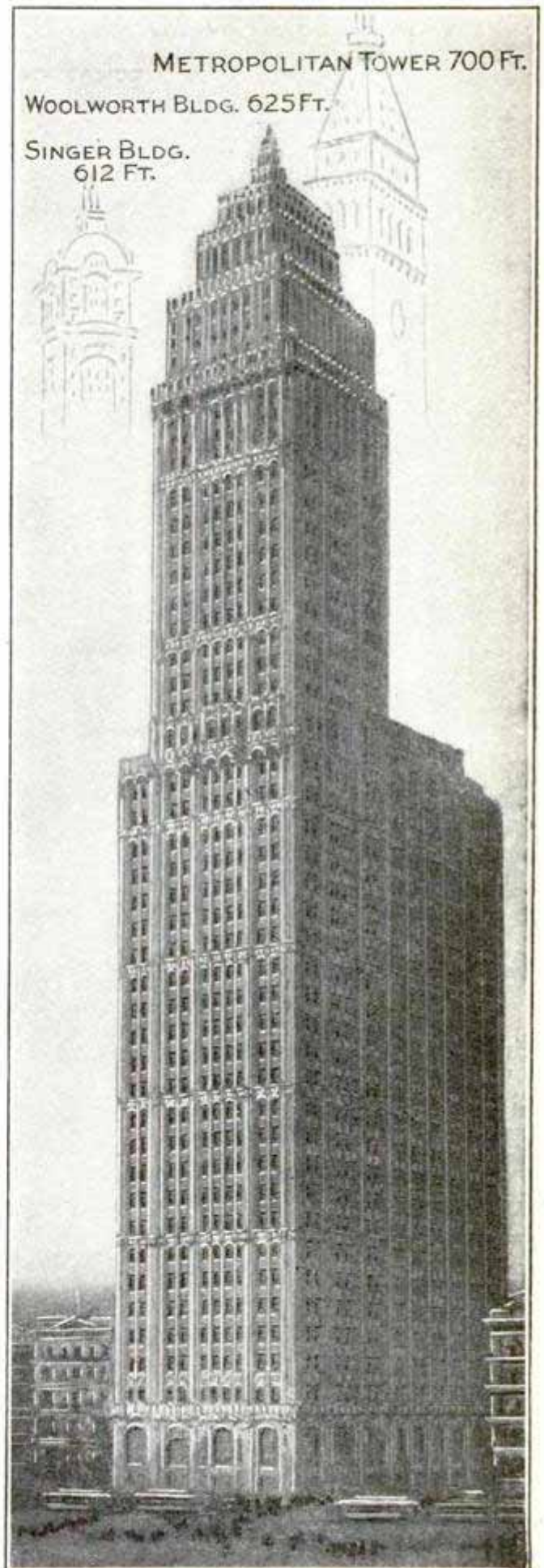
## NEW BROADWAY SKYSCRAPER 625 FEET HIGH

Overlooking the low, squat City Hall of New York, there is soon to be reared another wonder of modern architecture—a 45-story office building, towering 625 ft. above the level of the street. It will be the second tallest office building in the world, the tallest being the Metropolitan Life tower (700 ft.), itself the tallest structure in the world next to the Eiffel tower.

In area, the new tower will be greater than the Metropolitan, for it will be 86 ft. square at the base, whereas the latter measures 74 ft. by 83 ft. The main building upon which the tower will rest will rise to a height of 26 stories. The tower proper will begin from there and continue on for 19 stories. Its top will be just 13 ft. higher than its nearest rival, the Singer building. The location of the new structure, which is to be known as the Woolworth building, is the southwest corner of Broadway and Park Place. The ground upon which it will stand was acquired at a cost of \$2,000,000, and it is estimated that the building itself will cost approximately \$5,000,000.

Like many of the more modern skyscrapers in New York, the Woolworth building will seek to apply old recognized forms of architecture to new conditions. The architect has discarded the familiar Renaissance type and will treat the façade in Gothic. He believes he has worked out a design that will stand as an example of the architectural possibilities in lofty steel construction. In order to support the tremendous weight of 45 stories, it will be necessary to carry the foundations down to bedrock, a depth of probably 100 ft. below the street.

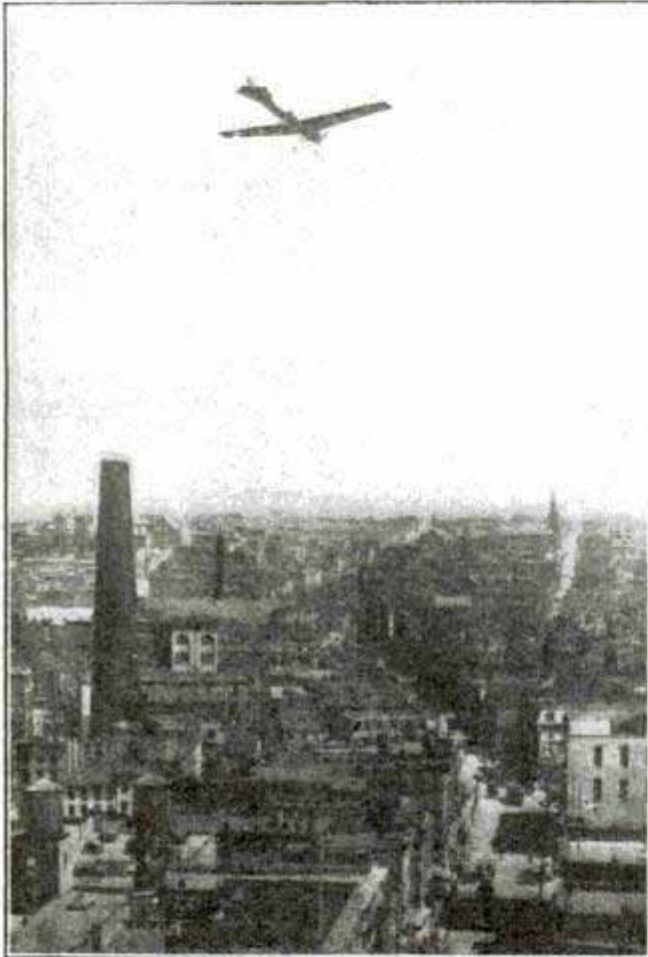
Among other things, the plan calls for a large swimming pool in the basement, and it is likely that there will also be a gymnasium. It is expected that the building will be completed within 13 months.



How New York's New Skyscraper Will Look  
When Completed

## LATHAM SETS NEW MARK FOR OVER-CITY FLIGHT

Hubert Latham established a new record for over-city flight at the Baltimore aviation meet when he made a



Hubert Latham Flying Over the City of Baltimore

circuit of the city, remaining in the air 42 min. and covering a distance of 25 miles. The flight was made for a prize of \$5,000, with an addition of \$500, given under condition that the airman would pass the house of a wealthy invalid who had never seen an aeroplane. Latham used his 50-hp. Antoinette and flew at a height that varied from 500 ft. to 2,000 ft. against a wind that blew from 7 to 15 miles per hour.

## DREXEL'S ALTITUDE RECORD

J. Armstrong Drexel, the millionaire Philadelphian, who has performed so many feats as an airman, startled the world November 24 by ascending to the height of nearly two miles, his barograph registering 9,970 ft. On his return to earth he announced that he

thought he had gone higher, but that the ink in his barograph had been exhausted when a height of 9,970 ft. was reached. While the world was willing to hail Mr. Drexel as the altitude record holder, for a time at least, the Aero Club of America has declined to certify the record because of the fact that the barograph had stopped registering. The instrument was sent to the makers, as it came sealed from the aeroplane, and there the actual reading was found to be 9,450 ft., leaving Johnstone's record of 9,714 ft. the high mark.

## THE DEATH OF RALPH JOHNSTONE, AIRMAN

One of the most tragic aeroplane accidents of the year occurred at Denver on Nov. 17 when Ralph Johnstone fell with his Wright machine more than 800 ft. and was instantly killed. The accident was marked by a most morbid and unseemly action on the part of hundreds of sightseers who crowded about the splintered aeroplane and fought with each other to obtain souvenirs of the gruesome incident. Johnstone was making his second flight of the day. Arch Hoxsey was in the air at the time his partner of the Wright team started on his fatal trip. The Johnstone machine described several maneuvers in the air and the airman was trying to descend in a set of aerial spirals when the right wing of his machine crumpled up and the aeroplane shot straight down. The crowd of 15,000 persons who had assembled to witness the flights saw Johnstone get out of his seat and attempt to right the machine as it passed through the air. His efforts were useless. He was buried in the ruins of his machine. Every bone in his body was broken.

Two million apples, that had won prizes aggregating \$20,000, were hauled in a special freight train of seven cars from Spokane to Chicago for the National Apple Show, in the record time of 60 hr., 5 min.

## COMMENT AND REVIEW

**C**OULD you imagine any music in the shrill shriek of a street car as its wheels grind around a curve, or any melody in the monotonous clanging of its brass gong? Judge Kavanagh of Chicago, sentencing a murderer for life, gives an undreamed-of delight to these very commonplace sounds. He said:

"You have committed a terrible crime. Your punishment is to be more terrible still.

"The instinctive, unreasoning horror of mankind regards death as a severe punishment. This idea is not correct. You are now to receive a sterner punishment. Your victim died but once: You will die a hundred times; you will suffer more the day you put on your prison clothes than she did in her death. After that there will be only the hopeless, painful years from day to day, from month to month, stretching out forever and in agony.

"You will be wiped out of human knowledge; even your name will be taken from you; henceforth you will be known by a number. You will not be permitted to lift a hand or whisper a word; you will have no right except the right to mere existence.

"In four or five years the eternal solitude and silence will begin to crush in upon you like an iron weight. You hear that street car bell ringing in the street as it passes now. You will remember it in after years as the most exquisite music. It will mean hurrying crowds that go where they like and do as they please; it will mean the greatest of all pleasures—freedom.

"You are so elated now at the thought of saving your life that you don't realize all this. I want you, and the others here in the courtroom to understand it. You aren't sorry yet for your crime; you have only a great self pity. There will be few worse men than you in that great prison, but I may say, the law has taken its full and ample revenge upon you."

\* \* \*

**I**N St. Paul they do things different: It may also be stated they do one thing right. In that city joy riding is mentioned in a hushed and solemn tone of voice. That is because joy riding is dead in St. Paul. It no longer is. Time was when the St. Paul joy rider shot through the streets and up St. Anthony hill with the gay abandon of a Laramie cowboy. He now travels in a manner as dignified and moderate as the Father of Waters at the foot of Jackson street. He is subdued, tamed, to all appearances lifeless.

How was the miracle performed? Other joy-ridden cities would fain know. Will the cure that cured in St. Paul cure elsewhere?

It will. We even guarantee a cure.

What then is this wonderful panacea?

Brooms. The Making of Brooms. And then more. Just brooms, the ordinary kitchen variety. The joy rider when taken in his riding is sent to the bridewell. There is no need of any trial. The brooms furnish that, for the price of liberty is the making of a certain number of brooms. There is no alternative penalty, neither is there any fine which only the wealthy can afford. Outraged justice demands brooms, and a certain number of brooms at that. By a strange

irony of fate the first candidate for broommaking was a banker. He offered bonds, and bullion, backsheesh and bargains in loans. Nothing doing. His quota of broom handles looked like a carload of telephone poles, and his allowance of straws like the sands of the sea in number, but there was only one way out.

If other cities really want to be cured, let them attend on the story of the St. Paul broom.

\* \* \*

THE daily press, and even some technical journals, have worked themselves into quite a glow over the flight on November 7, in a Wright machine, from Dayton to Columbus, in which was made the first delivery of merchandise in an aeroplane. The distance is 65 miles and was covered in 67 minutes. The package weighed 100 lb. and contained silk valued at \$800. We must confess that silk sounds better than soap, even though less essential, and presume it is fitting that the first delivery via the air route should be something more esthetic than groceries. However, the feat is more scientific than practical, for we must not expect our ordinary household wants are going to be supplied by airships. It is within bounds that as a carrier of official documents, legal papers, an emergency supply for a surgeon or doctor at some remote place, or even the doctor himself, the aeroplane may be the one barrier between a life and death. But for years to come when the cook, halted in her work, telephones for a yeast cake, "right away," the bread-raiser will continue to travel in, at best, a motor wagon, and more likely, crushed in the pocket of the grocer's small boy. It may be cruel to thus disillusionize the fancy but we feel impelled to tell the truth.

\* \* \*

NOW that construction has actually begun on the Hudson Bay Railroad, a vast territory that was once supposed to be a dismal waste is giving surprises of commercial value. On the Nelson River alone, within a district at no point more than 100 miles from the road, are 1,000,000 horsepower in waterfalls which can be harnessed at comparatively small cost. Mineral riches of iron, gold and limestone are being discovered; vast tracts of supposedly barren lands, upon analysis, are found to possess great fertility. Evidently the country is a wilderness but not a waste. As the road is built, this comparatively unknown land will emerge from the mist of the unknown and come into the range of twentieth century observation and opportunity.

\* \* \*

ONE of the interesting features of the land show in Chicago last month was mechanical power for the farm. This took the form not only of the tractors themselves, but was supplemented by a daily illustrated lecture on the economic advantages of plowing and doing other farm work by means of engines instead of horses. The lecture was not a recital of the joy to be derived from a "seeing of the wheels go 'round," but a consideration of mechanical power strictly as a business proposition. There was a time when the farmer was not classed as a business man: Today he is not only more a producer than the manufacturer, but his range of products is such that the volume of his sales compare favorably with those of many country merchants. In his crop production and delivery for shipment he has come to the point where he can use power-driven machinery to quite an extent, and we may reasonably anticipate in the next ten years a large demand for traction power by farmers, especially those

operating several hundred acres. We will come to this through the use of automobiles, which farmers are now buying by thousands.

Some of the records cited are interesting. For instance on the big Dakota farms where the plowing, seeding, harvesting, threshing and hauling, all are accomplished with engines, the cost is reduced \$2.10 per acre. Plowing which formerly cost \$1.35 with horses falls to 76 cents with power; pulverizing, from 63 cents to 17 cents; and hauling, from \$1.00 to 26 cents per acre. The final results are stated to amount to a net saving of 10 cents per bushel, or about 5 per cent on the cost of a 600-acre farm.

\* \* \*

A LETTER from a young lady wireless experimenter calls attention to the fake wireless which a young man recently flashed at night along the Atlantic coast. The message which purported to come from the tank steamer "Oklahoma" called for help. One of the naval stations, and several vessels picked up the call and for hours search was made, of course in vain. The writer of the letter appeals to the honor of all experimenters not to jeopard their present opportunities by making light of so serious a thing, for it is easily conceivable that only a few such occurrences would place amateur wireless under government control. She says: "It is a shame that there should be even one young man among the experimenters, who should injure the reputation of all other experimenters by stooping to such a ghastly joke."

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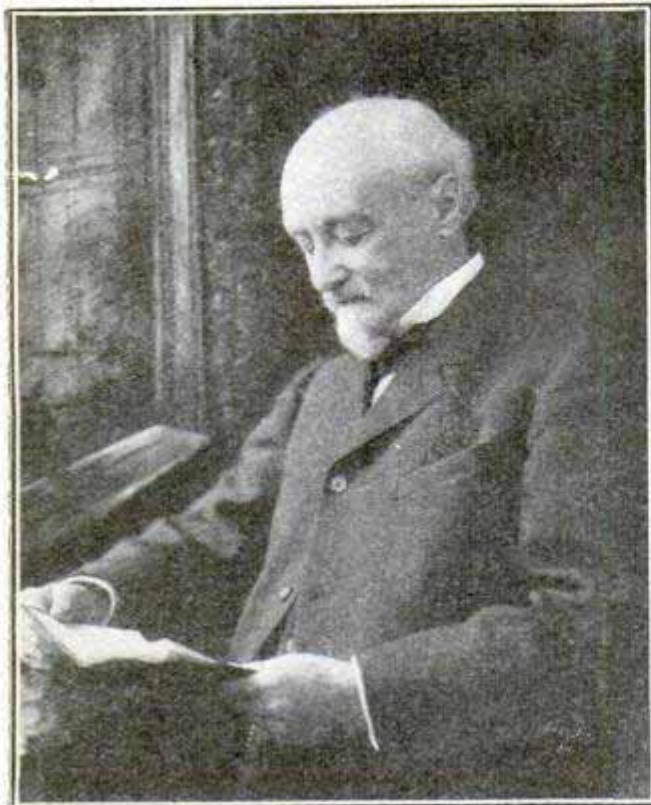
FOR some months we have refrained from mentioning the rats, but during that time the pest has increased, or at least progressed, until they have now officially reached the port of London. Plague-infected rats which had either escaped from Oriental vessels, or home-rats infected from escaped rodents, are being caught in English ports. Already several persons have died from unmistakable rat infection.

The English authorities are fighting the danger with customary thoroughness. In some districts as high as 10,000 rats are being killed daily. Owners of stores, factories, mills, warehouses, railroads, householders, even farmers are united in the war of extermination. To those who are too poor to purchase poison, it is furnished free. So infectious are the rats that the collectors are not allowed to touch them. With a pair of tongs the dead rat is first dipped into a pail of disinfectant, transferred to a steel box cart, and hauled to a crematory. It is no longer safe to eat rabbits and other ground animals. It has become dangerous to handle cats. Food which rats have gnawed imparts disease when eaten. Even ferrets speedily contract the plague and die.

The menace to this country is but slightly realized. With Europe but five to seven days away, we will as surely get the rats as we now get European fashions. It may sound absurd, but we might better set apart a day, or days, to exterminating rats, than as we now do to tree planting, cleaning our cities, or observing some of our holidays. What is needed is concerted national action. Boys of a few years ago will recall the easy money in sparrows when some counties paid a bonus of 1 cent per head. At the same price, a million dollars paid for dead rats would be worth several times the same amount left to some research fund.

H. H. WINDSOR

## THE DEATH OF OCTAVE CHANUTE



OCTAVE CHANUTE  
 "The Father of Aviation"  
 Born, 1832                      Died, 1910

## EXCERPTS FROM THE CHICAGO NEWSPAPERS IN 1896 AND 1910

SEPTEMBER 11, 1896.—"For four days the men through whose efforts humanity may hope some day to ride the whirlwind and mock the railroads have whistled, begged, and even prayed for a north wind. The machine lies waiting either to become a lasting monument or to furnish a failure which means another and a dreadful warning to those who aim at deeds beyond the reach of mortals."

SEPTEMBER 11, 1896.—Flying-machines are being tested in Indiana, it being an axiom among confidence men that a scheme that will go anywhere will go in Indiana.

Octave Chanute, called the father of aviation because of his work in developing the biplane glider, died in Chicago, Nov. 23, as a result of an attack of pneumonia.

When he commenced experiments with a rebuilt Lilienthal apparatus, and a gliding apparatus after a design of his own, June 22, 1896, the world was skeptical, and remained more or less so until after the public successes of Wilbur Wright in France during the month of August, 1908.

During a series of remarkable experiments on the Indiana sand hills, Mr. Chanute made flights of 300 and 400 ft. He was confident that he was on the right track, and fortunately lived to see his ideas develop into a practical aeroplane.

He was born in Paris, Feb. 18, 1832, came to New York in 1838, and began his eventful career as a civil engineer in 1849. He directed the construction of many railroads and bridges.

Same paper, NOVEMBER 24, 1910.—Octave Chanute, the real father of aviation and the heavier-than-air flying-machine. The Wrights and others adopted in a great measure the principles shown by Mr. Chanute in his glider.

Same paper, NOVEMBER 24, 1910.—Octave Chanute was one of the greatest aids and possibly the wisest adviser the Wright brothers had during the period when the Wright machine was in the embryo.

## AEROPLANE FLIES FROM SCOUT CRUISER

Eugene B. Ely recently accomplished the feat of launching an aeroplane from the deck of a warship in Hampton Roads and flying safely to land, a distance of five miles. He demonstrated the possibility of flying from a vessel. It remains now only to ascertain how satisfactorily an aeroplane, once launched from a battleship, can return to the vessel after flying over a fleet or over land. Aviator Ely is absolutely confident that he can accomplish this task.

Opinion differs in Navy circles as to the question of landing an aeroplane on a vessel. Experiments along this line will be made shortly. Some experts believe that a net could be stretched to receive the airship and protect it from contact with turrets and other obstacles, while others believe it will be necessary to equip the flying-machines with pontoons so as to permit them to descend in the water near the war vessel.

The question of alighting on a ves-

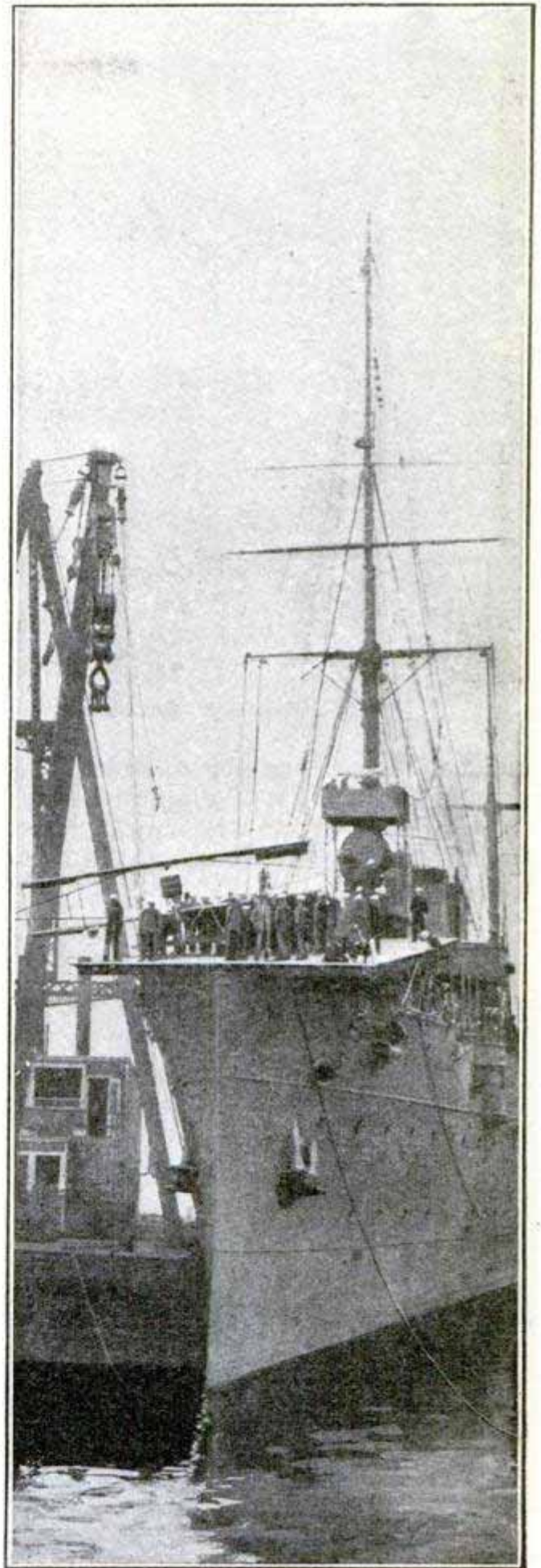


sel, according to Capt. W. I. Chambers, chairman of the Naval Aviation Board, is not nearly so important as that of launching from a ship. After an aeroplane has gotten away and accomplished its mission, the important part upon its return would be to get the aviator and his message on board. That, it is believed, can easily be accomplished from the water. The question of saving the flying-machine is regarded as relatively unimportant. The Navy Department, however, intends to pursue the study of the subject, and the next step will be to test the possibility of having an airship land on a vessel.

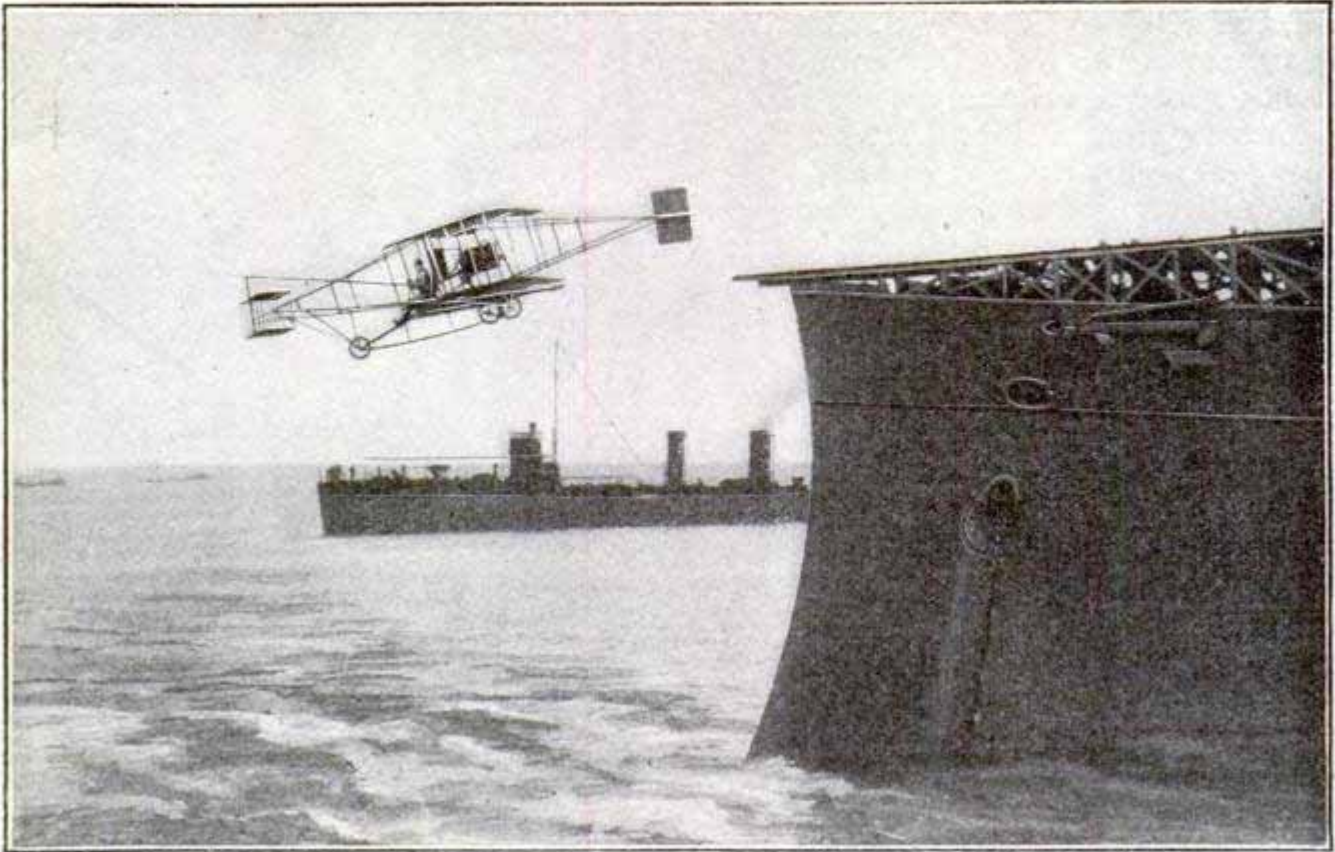
Capt. Chambers was impressed with the fact that Ely was able to launch his machine while the war vessel was at a standstill. That was a disadvantage to the aviator, he said. Navy officers had expected him to leave the ship while it was in motion and they were greatly concerned for fear the warship would run him down in case the flying-machine struck the water and the impact was sufficient to disable it. The fact that Ely was able in one instance to get under way while the ship stood motionless added to the gratification of the officers over the success of the experiments.

Ely's wonderful achievement was made from off the deck of the "Birmingham," one of the fastest cruisers in the United States Navy. At present, naval officers express opinion that if aeroplanes are to come into use as an auxiliary in battle, they should not be placed on board the big battleships, but used rather with the fast scout cruisers which can make a speed of at least 26 knots (29.94 miles) an hour. The average cruiser, it is said, could carry at least eight or ten aeroplanes.

The aeroplane, in view of Ely's recent demonstration, becomes as clearly an essential factor of naval outfitting as the dirigible torpedo, and the launching plane as necessary as the torpedo tube. These two features are strikingly similar in their function and their possibilities, but the aeroplane is obviously capable of far greater range



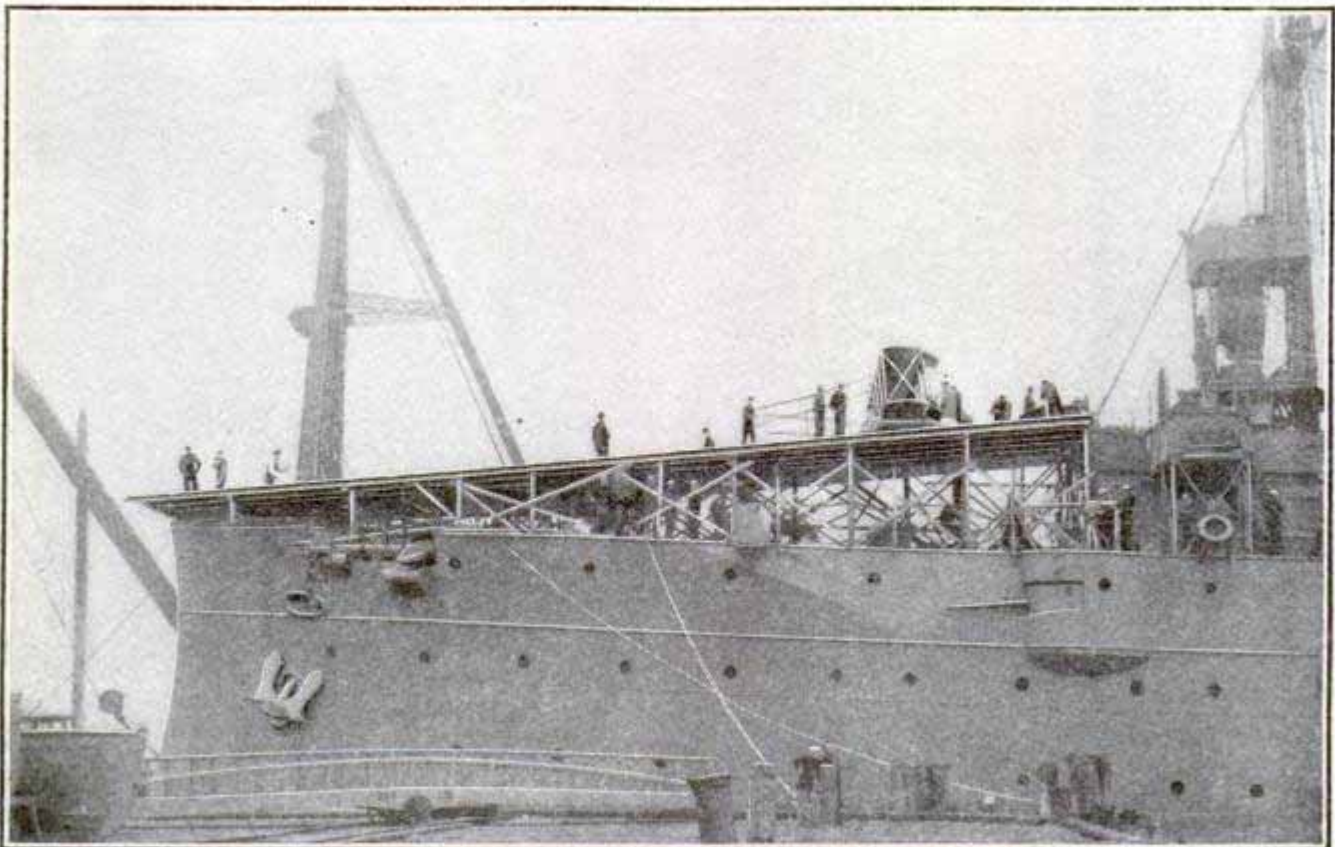
Bow of "Birmingham"—Aeroplane being Hoisted onto Platform



The Biplane as it Shot Off the Platform, and Just before it Struck the Water

and usefulness than the torpedo. Assuming the ability of the aerial scout to return safely to his vessel, even though he does not land on deck, the aeroplane becomes of vastly greater

importance than the torpedo, which is merely a shot launched at a hostile ship with only one possible object and with no return, and developing no information whatever.



This View Shows How the Launching Platform was Constructed on the Bow of the Scout Cruiser

Secretary of War Dickinson is convinced that the machine which flew along with him and a French army officer at the rate of a mile a minute will shortly be developed to the point of carrying a quantity of explosives which, when dropped at targets on the ground, will be practically as accurate and effective as projectiles fired from battleships and land fortifications. He is, therefore, not one of those who believe that the chief value to be hoped for from the aeroplane as an implement of war is for reconnoitering purposes only.

As the result of the failure of the United States to go in for aeronautics, Secretary Dickinson observed in his extensive European travels during the past several months that this country is lagging behind all others in utilizing our system of military initiative and operations.

### MONITOR "PURITAN" USED AS A TARGET

Once more the Navy Department has used one of its older vessels as a subject upon which to test the value of explosives, and again has the quality of steel used in the armor proved its ability to withstand terrific strain. The monitor "Puritan" with armor plate 8 in. thick was used for the purpose and two charges of 200 lb. of the highest explosive used in the navy were detonated. The first charge was placed against the turret and the second against the armor belt. In the first instance, three plates showed some damage and the turret was thrown slightly out of place. Two chickens and a cat that were placed inside the turret were uninjured by the explosion. In the second instance, the plate against which the explosive was placed was buckled and a longitudinal seam below the water line was opened, filling one compartment with water and causing the vessel to settle 12 in. by the stern. The naval experts who conducted the test point out that the wider plates of a modern battleship would have shown more

resistance to the explosive. Summing up the results of the experiments, the chief of the naval bureau of ordnance states that as far as it is apparent at this time, the turret of the "Puritan" was not in any sense badly damaged and that the thickness of the armor belt on a modern battleship, from 12 in. to 14 in., and the greater area of these plates, would have shown less effect from a similar explosion. It is also stated that it would not be possible in time of war to explode such a tremendous charge against the side or the turret of a battleship, nor could an enemy in an aeroplane drop such a charge on the deck of a ship.

### VALUABLE TIMBER TO SELL AT HALF PRICE

Millions of feet of valuable timber on the fire-swept forest reserves in northern Idaho and western Montana are to be sold by the U. S. Forest Service at the rate of from \$1 to \$3 per 1000 ft. The price quoted is about half that usually asked for green timber and the cost of logging will be materially lessened by the absence of underbrush, the flames having swept the ground clean. If the timber is permitted to stand, it will rot and become absolutely useless, as the fire has killed it. All kinds of logging operations are possible under these conditions, and it is expected that there will be a rush by small consumers of lumber, as well as the big firms, to take advantage of the unusual offer. All of the standing timber cannot be cut, owing to its being inaccessible, but there is enough left to make millions of feet of board.

¶The first commercial use of the aeroplane was made by P. O. Parmelee on Nov. 7 when he transported two bundles of silk, weighing 100 lb., from Dayton, O., to Columbus, O., a distance of 65 miles, in 66 minutes. The silk was lashed to the seat built in the machine for a passenger.

## PRICE OF MEAT SHOWS NO REAL DECLINE

One of the peculiar economic conditions that occurs now and then throughout the world brought about a general impression that a decided decrease in the cost of meat products had come during the week following the recent general elections. Newspapers throughout the United States heralded the news that the cost of living was about to go to a lower level. Analysis of the situation shows that the indications noted in the newspapers, and calculated by them to bring about an end so much to be desired, could not be relied on, and that the price of meats was not due for a general decline. It was largely an instance of interpreting figures to mean what they were wanted to mean rather than their actual significance.

The beginning of cold weather invariably brings with it a slight decrease of the price of meat products. This is a perfectly natural event which would occur in time of low prices as well as when the figures are high. At that time of the year, the farmers who have been fattening a few hogs drive them to the butcher for slaughtering or slaughter them themselves. It brings about a decrease in the amount of pork purchased, and slightly increases the amount of meat in the market. It is only natural, therefore, that the prices quoted by the packers as well as the retail merchants should show the effect of this operation. And it is also natural that there should be a slight decline in the prices of other meats.

On June 14 retailers sold pork chops at from 15 to 22 cents. November 28 the price was 15 to 18 cents. Pork loins in June sold for 14 to 20 cents. In November the same meats sold for 14 to 18 cents. On November 30 the wholesale price of breakfast bacon was 30 cents and it retailed from 35 cents up, according to the distance of the retailer from the market, and also, in many instances, according to the amount of money the dealer believed his customers would permit them-

selves to be charged. The prices of beef in June and November showed an increase, boiling beef that sold in June for 8 cents bringing 10 and 12 cents in November. It is true that there was some slight comfort to be gained in contemplating the prices of beef products, porterhouse steak selling in November for 20 to 25 cents that in June had been quoted at 22 to 28 cents. The price of sirloin steak was the same for the two periods and round steak was quoted at 15 cents in November and 15 to 18 cents in June. Lamb remained fairly stationary, although a slight drop was noted in some cuts. Lamb shoulder was quoted at 10 to 14 cents in November and 12½ cents in June.

The wholesale price of meats which showed a slight decrease during the latter part of October and the first of November made an upward movement during the latter month. Beef was quoted at \$7.17 per cwt. in the latter part of November which sold for \$7.05 the first of the month. Similarly, bacon advanced from \$16.25 to \$16.46, in large quantities, practically taking up a slight decrease noted during the month or two preceding. Nor have the packers been paying less than heretofore for their supplies, except as for the reasons noted. A drop of ½ cent in the price of beef was registered after fluctuations above and below that figure. Beef cattle ranged in price from \$5.50 per cwt. to \$7.25, according to quality, with an average of \$6.25 being paid by most of the packers. Hogs brought an average of \$6.40, the price going as high as \$7.15 during the latter part of the month.

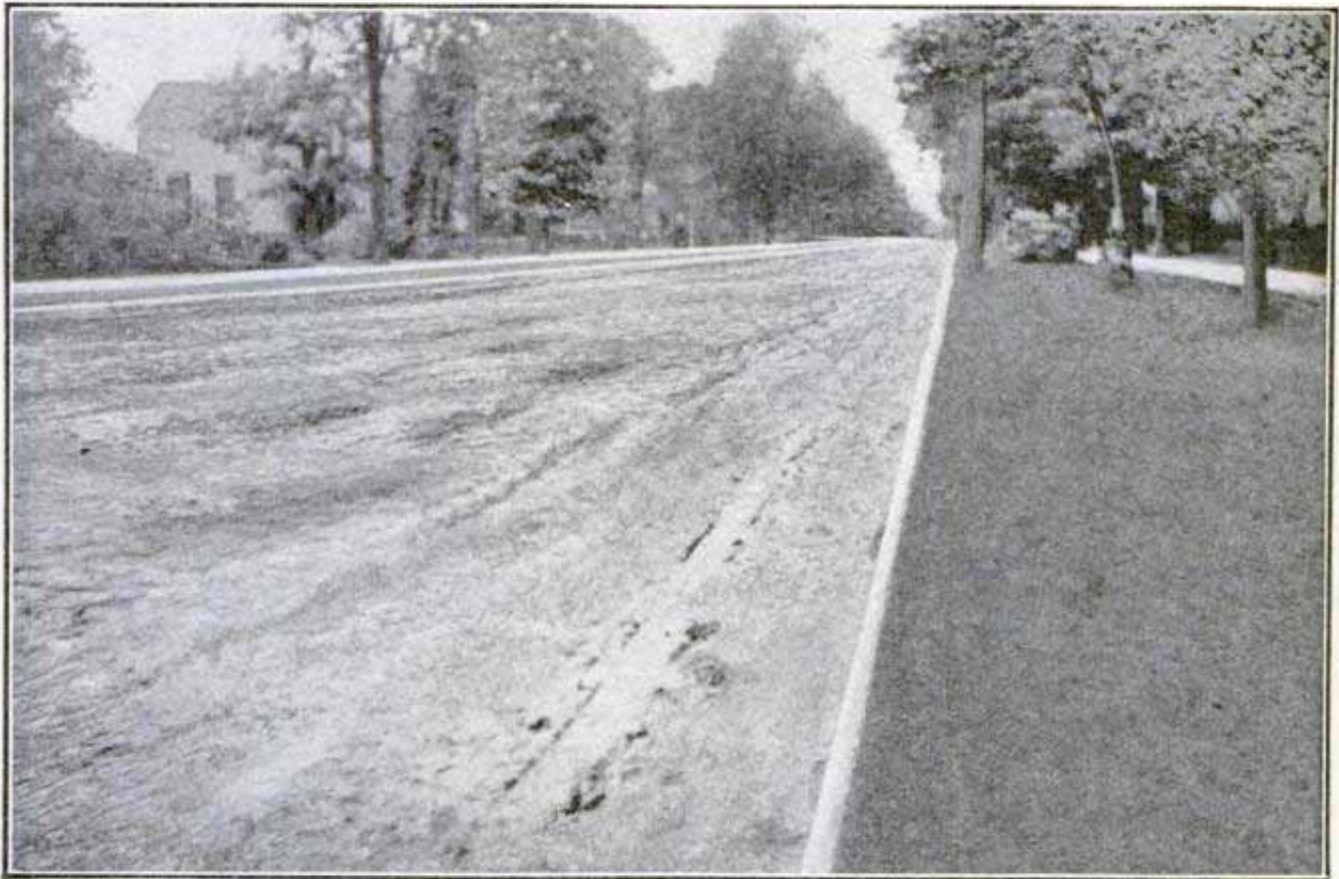
It is regarded by experts as extremely probable that there will be a temporary decline in the price of pork products even more marked than that of the November figures, but that it will be only temporary and the prices of this and all other meats will remain about the same during the winter as they have been during the past six months.

# Rejuvenating Macadam Roads with Oil

By FRANCIS BUZZELL

**A** NOISELESS, asphalt-like road surface, dustless—which asphalt is not—and mudless; new every year, and at a cost no greater than for the sprinkling of ordinary roads or pavements, is made possible by the use of what is left of petroleum after kerosene, gasoline, and paraffin have been removed. That is, if the road upon which it is used is macadam.

embankments from blowing away. However true this may be, the knowledge of the good qualities of oil for this purpose came at a time when the upkeep of macadam roads seemed absolutely hopeless. The stream of automobiles that flows out from the cities over beautiful suburban and country roads had cut the macadam road surfaces to pieces. Small holes or ruts



Rough Condition of Macadam Roads before Oiling

The ingredient which makes this road oil so beneficial to macadam roads is petroleum asphalt, present in quantities varying from 30 to 60 per cent, according to the grade. It first came into general use in the rejuvenation of macadam roads in the west, and its success in this field was such that it is now used in every part of the country.

It is said that the holding-down properties of the oil were first discovered by a railroad system, which used it as a retainer in keeping sandy

first appeared, and these, filled with water after every rain or sprinkling, grew in diameter and depth with every tire that sank into them. The result was a surface very much like a muffin tin in appearance.

Attempts were made to repair this automobile damage, but the concensus of opinion arrived at a short time after each attempt was—"what's the use?" The holes would not stay filled.

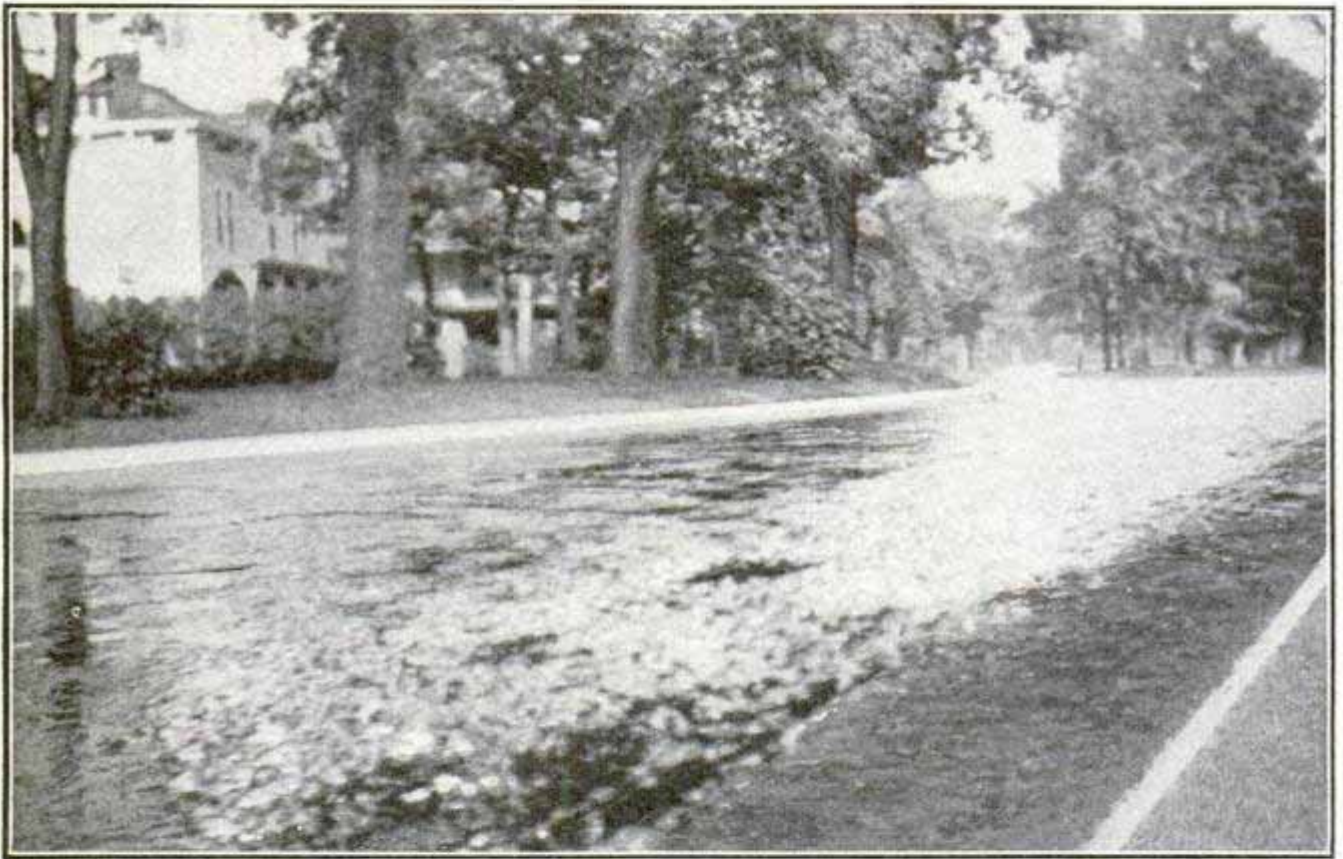
Then came oil as the solution of the problem. No better example of what

can be accomplished by the oiling of roads can be cited than is provided by Evanston, Ill. This community of homes, with its close to 30,000 population, and without a manufacturing concern, is the wealthiest suburb of Chicago, lying just north of that city's limit on the shore of Lake Michigan. North of it are a dozen additional suburbs and Fort Sheridan, providing a 40-mile stretch of beautiful country for motoring.

In Evanston are 45 miles of macadam roads, a considerable portion of which was, two years ago, in the condition

street repair. With this money, the city provides from 20 to 80 per cent of the cost of repairing and oiling; 20 per cent for roads that practically are used only for the benefit of the people living in them, 40 per cent for comparatively well populated streets that may be considered as well traveled roads, and as high as 80 per cent for stretches of such streets when sparsely populated. As a whole, the city pays about 40 per cent of the cost and the land-owners 60 per cent.

The cost of the work is from  $2\frac{1}{2}$  to 5 cents per square yard, but only a



Torn Macadam Road Immediately after the Oiling

described above. Today, through oiling, these roads, traveled by an almost continuous stream of automobiles, are nearly as smooth as new asphalt, and will be kept so by annual oiling at a cost not in excess of the cost of the sprinkling which is no longer necessary. Just what it costs the city of Evanston and the owners of land fronting on the macadamized streets is of great interest.

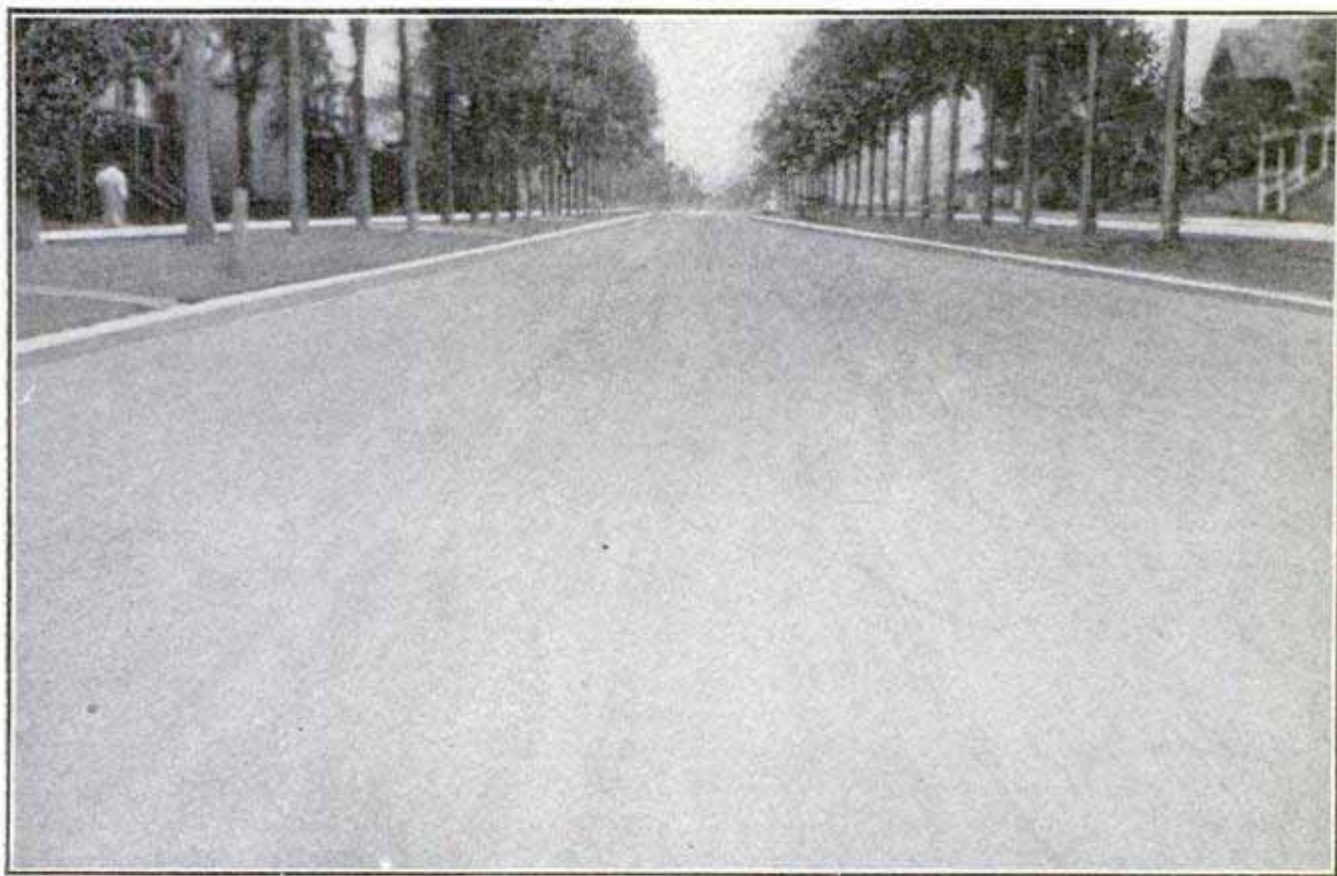
Evanston, through its share of the wheel tax, exceeding-the-speed-limit fines, etc., has about \$10,000 a year for

comparatively small amount is at the high figure, and then only for the first application. That is, when the road is badly rutted and requires patching with broken stone and bituminous cement. In some instances such ruts are only filled with broken stone, especially when they are few and far between. Ruts of a less severe nature only require the oil, followed by a sprinkling of the sweepings brushed aside before the oiling is done, and a little sand. The average cost of the work is 3 cents per square yard, which

is but 5 cents per front foot on each side.

At this figure, if the actual road surface is but 30 ft. wide, all the land-owners pay their share, and the city meet 40 per cent of the whole, the work would cost each land-owner only 3 cents for each front foot, or \$3 per 100-ft. frontage. Every land-owner who does not enter the agreement, however, adds to the burden on the shoulders of those who do. The owners of land must also meet 60 per cent of the cost of the work at street and alley crossings.

The streets should be perfectly dry before the oiling commences, as water prevents the oil from taking hold of the road surface. Frequent rains sometimes mean considerable delay. The warmer the weather, the quicker will the oil take hold. A sweeper is first run over the street, brushing all loose particles to the curbing, where it forms a bar against the escape of the oil. Then exceptionally deep ruts are filled with broken stone, and the road is ready for oiling. Two oil sprinklers of the type shown in one of the illustrations, one sprinkling while the other

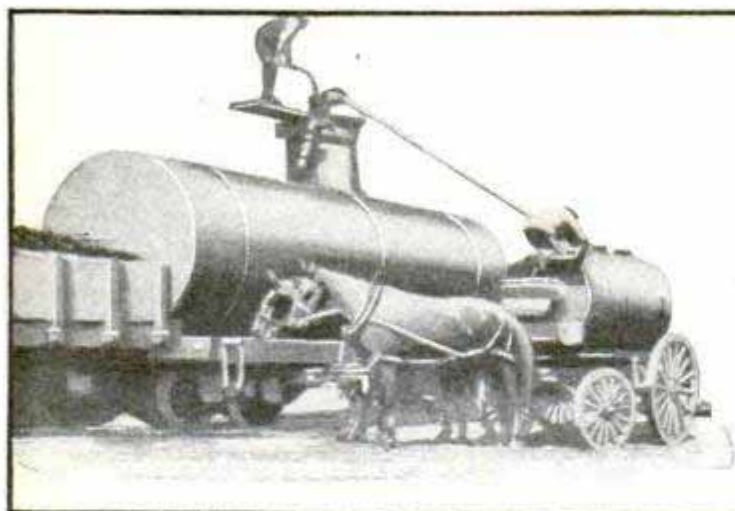


Asphalt-Like Appearance of Macadam Six Weeks after Oiling

The city buys the road oil at 3 cents per gallon. It is delivered in tank cars of the standard type, which cars are run onto a siding and held until the oil is used up on the streets. The average application is  $\frac{1}{4}$ -gal. to a square yard. The force required for the work does not exceed eight men. One of this number is a foreman, paid a wage of \$3 per day, and the other seven, which include drivers, sweepers, and a man stationed at the tank car to aid in pumping the oil out when this is necessary, receive \$2 per day.

is loading, are used. The sprinkling heads consist of three perforated pipes, running side by side across the back of the vehicle. Any one of these pipes may be shut off, and it is in this way that the attendant regulates the distribution. Operated by two men, one to drive, and the other to manipulate the discharge, the sprinkler passes up and down a street in the same manner as an ordinary water sprinkler.

Following close behind the sprinkler, comes a home-made, horse-drawn distributing brush. This brush is formed



The Oil Comes in Tanks and is Pumped into Sprinkler Wagons



Type of Sprinkler Used

of three or four of the stiff-bristle brushes used by street-cleaning departments, nailed end to end on a light piece of scantling, provided with a handle arrangement. Two men are required to operate it, one driving the horse, and the other directing the brush. The brush aids in working the oil into the macadam, and fills the small holes or ruts with the surplus. The holes thus filled are like water puddles after a heavy rain. The road is closed off from traffic when the oiling operation commences, and is kept closed for four or five days, according to the time required for the road to absorb the greater part of the oil.

One more chapter in the actual oiling remains to be told. A few hours after the oiling, the loose surface covering brushed so carefully to the curbing before the oiling was commenced, is brushed back onto the road again. And if this is not sufficient for the result desired, the wagon crews placing sand over the oil at the street crossings so that pedestrians may cross without becoming besmirched, drive their wagons over the road and sprinkle sand in somewhat the same manner as powdered fertilizer is scattered over a lawn or field. This combination of sand and dirt, the latter being mostly composed of gritty particles if the road has been previously oiled, is brushed into the oil and used to fill those ruts which are not of sufficient depth to require a broken stone filler. It mixes with the oil in the ruts

and forces the surplus out, immediately becoming an integral part of the road surface.

With this operation, the city's work is completed, but the smooth, asphalt-like surface that will result is yet to be realized, and, curious as it may seem at first thought, this is left for passing vehicles to accomplish. For a week or ten days the surface, in spots at least, remains very oily, and dogs and cats, running across, are liable to track it into the homes. The danger of tracking is the only disagreeable feature, and is many times overbalanced by the fact that oiled streets are dustless from the beginning of summer to the end. The oil not only keeps the road surface from flying, but acts as a dust trap as well. Dust, flying from alleys and other sources, ceases to be dust after settling on an oiled road.

For the above-mentioned period of a week or 10 days, parts of the surface are also more or less soft, especially near the curbings, where the wheels of passing vehicles leave ridges of matter that looks very much like crumbly black loam. But the stream of automobiles, so instrumental in undoing the work of repair on unoiled macadam roads, helps rather than destroys. The tires, instead of picking the filler out of the holes, work the surface into a state of smooth compactness, very much as a rolling-pin works dough into shape for pie crust. At first this surface gives slightly, in somewhat the same way as asphalt on



a hot day, but it gradually grows harder and harder under the weight of passing vehicles until, at the end of a few weeks, it is easily mistaken for asphalt. At no time during the summer, however, does it become brittle, and the next year's oiling provides a new surface again.

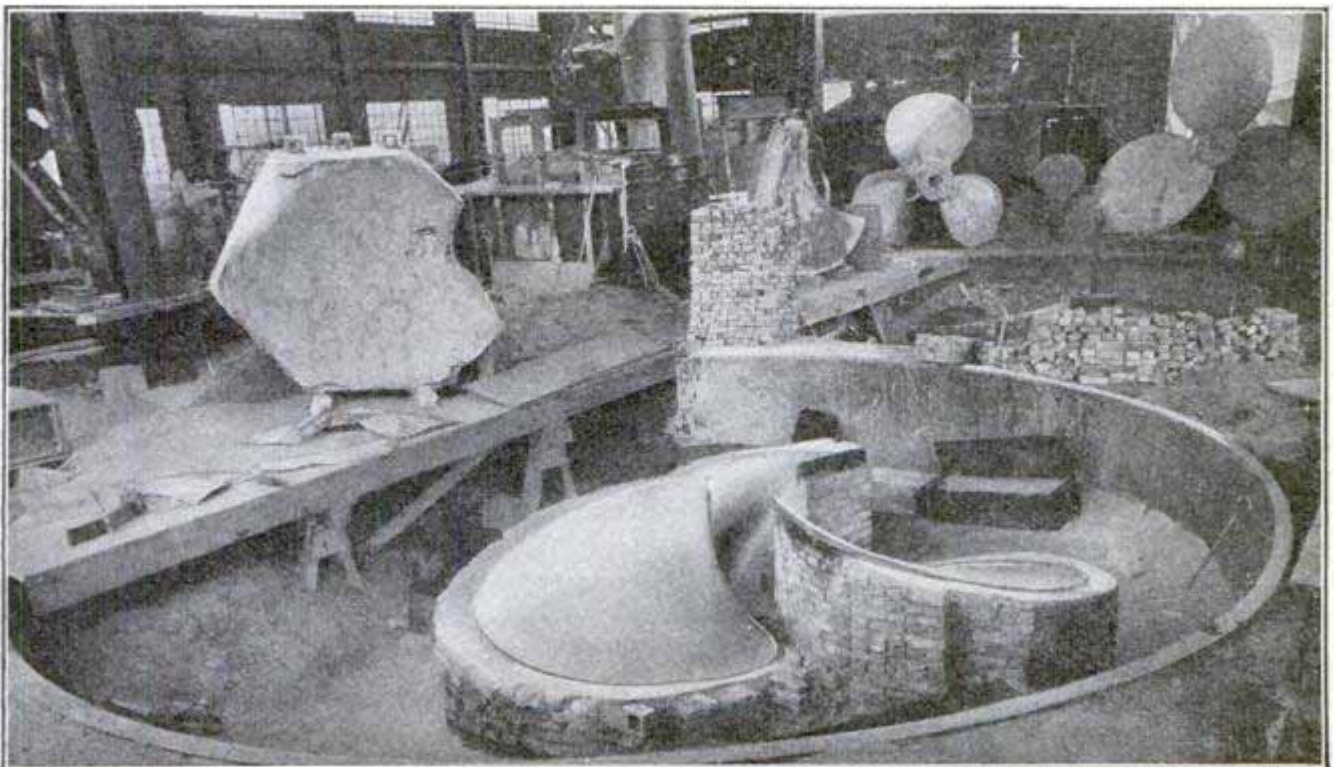
The elimination of dust is, of course, of greatest importance, as is also the elimination of mud. Even after the heaviest rain, the oiled roads are mudless, while unoiled roads, dusty before sprinkling, are muddy afterwards. Water sprinkling aids in wearing out road surfaces, while oil rebuilds.

## MAKING GIANT STEAMSHIP PROPELLERS

The casting of large propellers for steamships is an interesting operation. The pits used for the purpose are 25 ft. in diameter and about 5 ft. deep. At one of the largest plants in the country, where some of these propellers are made, the pit is in the form of a submerged steel tank built of rolled plate. The material used for the mold is ordinary loam and is built up from the bottom of the pit. The loam includes gravel and sand of the grade adopted by most steel foundries. Compressed air furnishes the power with which the ramming is done. There are four gates in the copes of the flash, and these copes are bolted down as soon as the mold has dried and the pattern has been withdrawn.

The molten metal is poured quickly from a 30,000-lb. ladle into which the furnaces are tapped. The pouring is done rapidly for the purpose of eliminating from the metal the dross that would otherwise collect. Propeller metal pours similar to molten brass. Four days are usually required to properly "set" the casting and then the mold is broken and the casting removed for finishing. Recently a wheel measuring  $15\frac{1}{2}$  ft. in diameter and weighing 16,000 lb. was cast in this manner.

Plans have been perfected for the laying of a submarine telephone cable between Nova Scotia and Prince Edward Island.



Mold for Casting Large Steamship Propellers

### A NOSE BEAUTIFIER

Pain and prolonged discomfort are part of the price many women pay in their endeavor to remedy what they regard as defects of nature, but suffering is cheerfully undergone by such persons if the result adds to their beauty. Thumb screws, once used as implements of torture, are now a means of tapering blunt fingers, and in Paris the business of selling beautifiers of the pain-giving sort is flourishing.



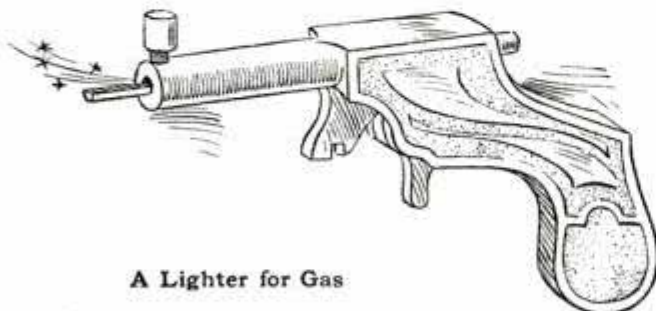
One of the latest devices is the thumbscrew idea applied to the nose as a means of molding this important facial feature into a better shape than nature has given it. It is in the form of a clamp, worn as shown in the illustration.

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### LIGHTING GAS WITH SPARK-PISTOL

A unique lighter for ordinary gas jets, gas stoves and auto lights is being manufactured in the form of a toy pistol. Pressure on the trigger causes a series of sparks to issue from the muzzle. These sparks are like those of Fourth-of-July sparklers, and do not burn, although they ignite the gas.



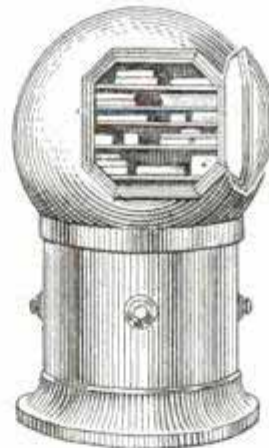
A Lighter for Gas

Pressing the plunger in front of the trigger re-engages the latter for use again. Each charge lasts for a considerable time.

### UNIQUE CYLINDRICAL SAFE

A safe, in the form of a perfect sphere, seated on a metallic standard which contains the mechanism for its operation, has been designed by a Vancouver, B. C., inventor. The sphere is heavily armor-clad, the armor being much heavier around the door than at other parts. It revolves upon its base, so that, by a quarter revolution, the door can be turned downward and the sphere lowered into the pedestal, making it perfectly tight around its entire periphery.

In the turned and lowered position, the sphere presents a solid surface. The under surface, in this position, is heavily weighted, making it practically impossible to revolve the sphere from the outside. In the interior of the sphere is a box for valuables, hung



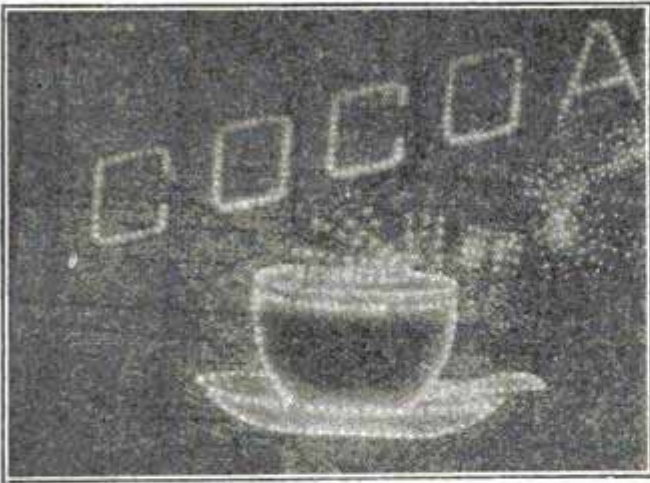
Turned Partially Over with Door Open



Safe Closed, with Door at Base of Cylinder

centrally on trunnions and weighted on its under side, so that it will not revolve with the sphere but will remain in a normal position.

In the standard is a secret door, giving access to the interior mechanism. This consists of hydraulic cylinders for raising the sphere so that it can be revolved to bring its door in the position shown in one of the illustrations. The means for admitting water to the hydraulic cylinders are located apart from the safe and separately locked, the lock being provided with a burglar alarm. The key or wrench for operating the gearing to turn the safe is also kept in a separate place.



Steaming Cup of Cocoa



Wind and Rain Effect

## The Mechanism of Electric Signs

By FRANK MAYNARD

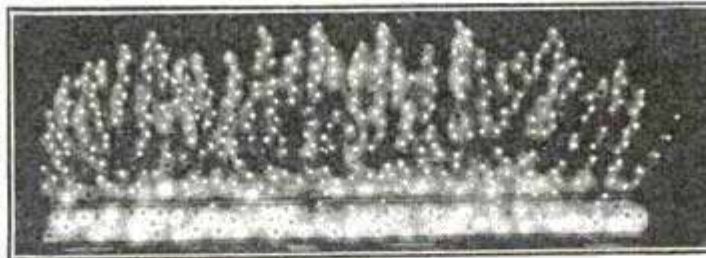
**T**O stand in the street and watch great electric signs producing the effects of lightning, streams of liquid, foam, smoke, fire, waving flags, sky-rockets, etc., gives an impression of great complication of mechanism. Yet the machines that make and break the electric circuits feeding the hundreds, sometimes thousands, of lamps, all of which must come on and go out at an exactly determined moment, are comparatively simple wheeled affairs driven by a 1/20-hp. motor. The wiring, however, connecting the different rows, groups or clusters of lamps to their respective switches, the contacts of which are made by the turning wheels, twists in and out like the lines of a difficult jig-saw puzzle.

The simplest electric signs provided with any action at all, be they large or small, are the kind that are illuminated one moment and dark the next. They are operated by double-pole carbon or series-

carbon machines. The latter type is for signs so large as to require an exceptionally heavy load, and break the line in series, that is, in three or more places at once, making it necessary for the current to jump that many air gaps in order to hold an arc. The double-pole carbon flasher is used for signs of the double-face type, which have one side illuminated while the other side is dark.

The sign following next in order of progression is the type flashed by single letters, such as that in which the words are spelled out. The machine used for such signs is known as the "single-pole type." It flashes one letter at a time until all are on, holds them all illuminated for two or three seconds, and then all go out together. Such a machine is shown in one of the illustrations.

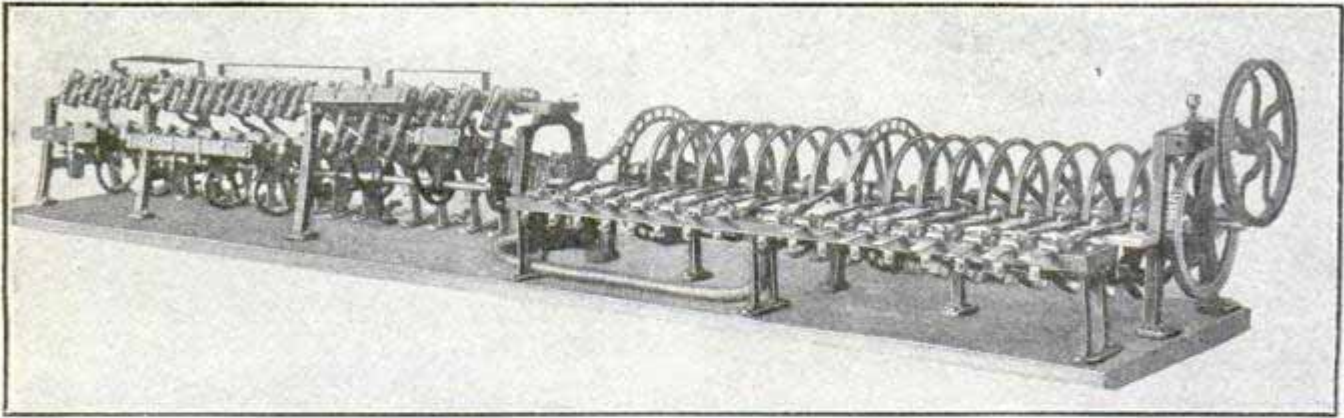
It is the spectacular animated advertising displays, however, which create most interest. They demand great ingenuity in crea-



Flames Rising from Grate



Aeroplane Sign with Flapping Wings



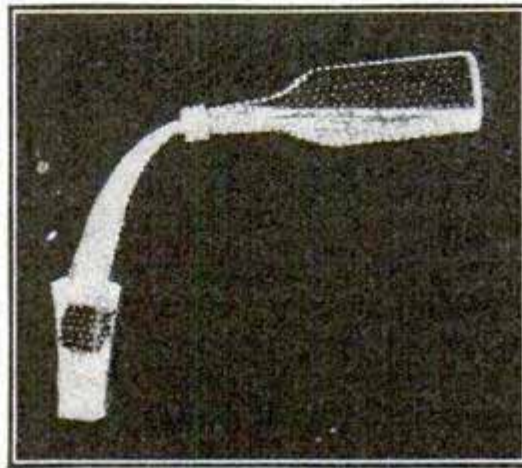
Combined High-Speed and Series Carbon Machine

tion and assembling, although, as already stated, the mechanism operating them is not nearly as complicated as might be expected. Some are operated by a single type of machine, and others by a combination of several types. The sky-rocket provides an excellent subject for description.

In operating a sky-rocket display, several different types of machines are required, known as "lightning," "single-pole," "high-speed," and "series-carbon" types. By watching a skyrocket display, you will see the streak start upward, curve over at the top, and appear to light the cluster, which then rains a shower of fire. Lastly, the wording appears as a whole, or in one or more lines at a time.

The streak generally consists of about 20 groups of lamps, each group in direct line but on separated wires and numbered in rotation. Each wire goes to an individual switch on the wheeled machine, which is so constructed as to throw the several groups on in succession. It lights up the lowest group first, then the next above, and so on, until they are all illuminated, when they begin to go out one cluster at a time in an upward direction. This effect is produced by a lightning-type machine,

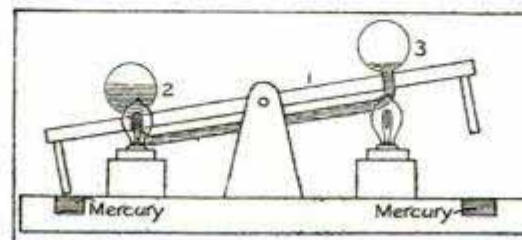
which works with such rapidity that the streak appears to travel upward like an actual skyrocket.



Pouring Liquid from Bottle

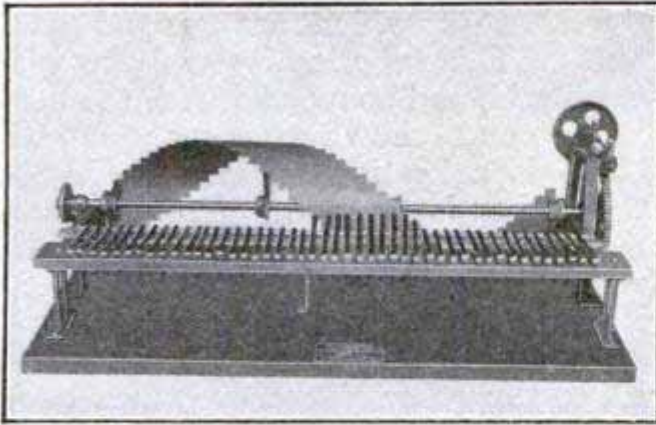
For operating the cluster at the top, the single-pole machine is used. This is generally a machine containing about six switches, and the colored lights of the cluster are divided into that many groups, each group controlled by an individual switch. These groups are not thrown on together, but are brought on unevenly by the different sized wheels of the lightning machine without any regard to uniformity. If uniformity were desired, a single large switch could be used, but this would not give the bursting effect desired.

The showers are worked with two types of machines, the high-speed and the single-pole. In this instance the single-pole machine is known as the "controller," and consists of six switches. The entire number of lamps used in the shower is divided into six sections cross-ways, and each section is connected to an individual switch. The top section is thrown on first, fol-

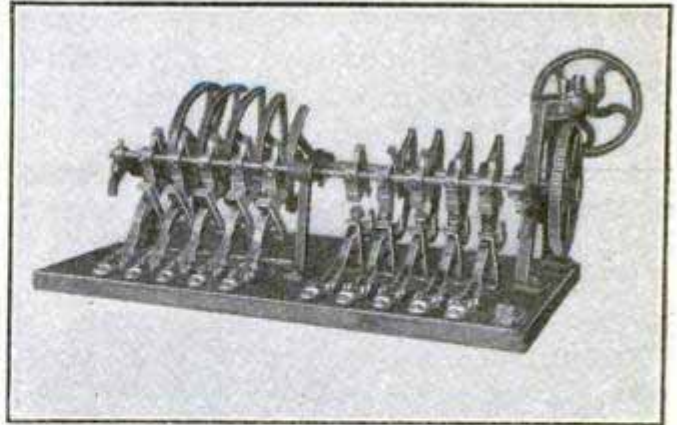


Unique Automatic Flasher Which Requires No Motor

lowed by the other sections in rotation. At the same time the single-pole machine is throwing the lamps on in this downward rotation, the high-speed machine is keeping them in continuous



Lightning-Type Machine



Single-Pole Machine

downward motion as fast as they come on, in an exact reproduction of the falling sparks from a bursting skyrocket.

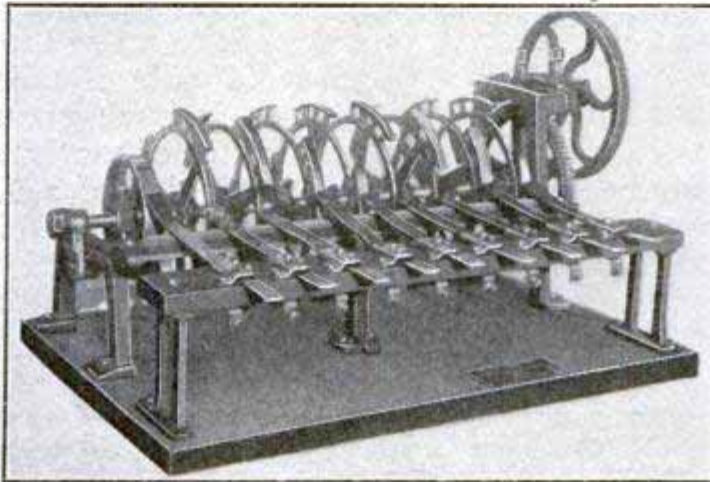
This is accomplished by arranging all the lamps in lines across, the rows being numbered 1, 2, 3 and 4, and repeating downward the full length of the shower. All the lamps on the No. 1 rows, of which there are several, go to the switch designated as No. 1, and all the other rows are arranged the same way. Were only the single-pole machine used, the effect would be only one drop of fire falling in each line of the shower, but through the agency of the high-speed machine, the effect is that of a continuous down-pour.

Large signs of this nature usually have large words flashed, necessitating the use of a series-carbon machine. This is a machine which breaks the flow of current simultaneously at several places on the same wire.

All the above men-

tioned machines are usually mounted on one base, about 8 ft. long and 12 in. wide, and all are driven by one 1/20-hp. motor.

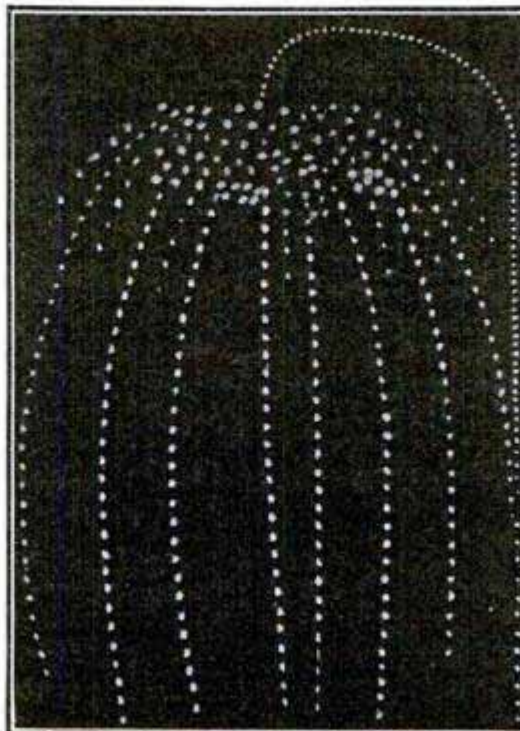
The several machines are connected by means of gears, each machine running at its proper speed to produce the required effect. A display of this kind, containing 2,000 lamps, is said to consume, on an average, less current than 800



High-Speed Machine

lamps of the same type and power burning steadily.

lamps of the same type and power burning steadily.



Skyrocket Effect Produced by Combined Use of Above Machines

The grate fire, shown in one of the illustrations, is a fine effect obtained by a single machine. The flames, which are made up of red, white, and amber lamps, appear to be continuously rising up from the pile of coal. All the lamps are arranged in series, and are operated by the high-speed type of machine.

The cocoa sign, the upper part of which is not shown in the illustration, is 60 ft. high and 45 ft. wide, and has 1,000 lamps. The steam rises continu-

ously. The man-in-the-rain sign is operated by a combination machine. There is a continuous downpour during the time this part of the sign is illuminated, and the scarf and coat-tails of the figure appear to be blown about by the wind.

The pouring effect from the bottle to the glass in another illustration is accomplished by means of high-speed and single-pole machines. As the liquid commences to run, the level in the glass appears to rise, while the liquid in the bottle diminishes.

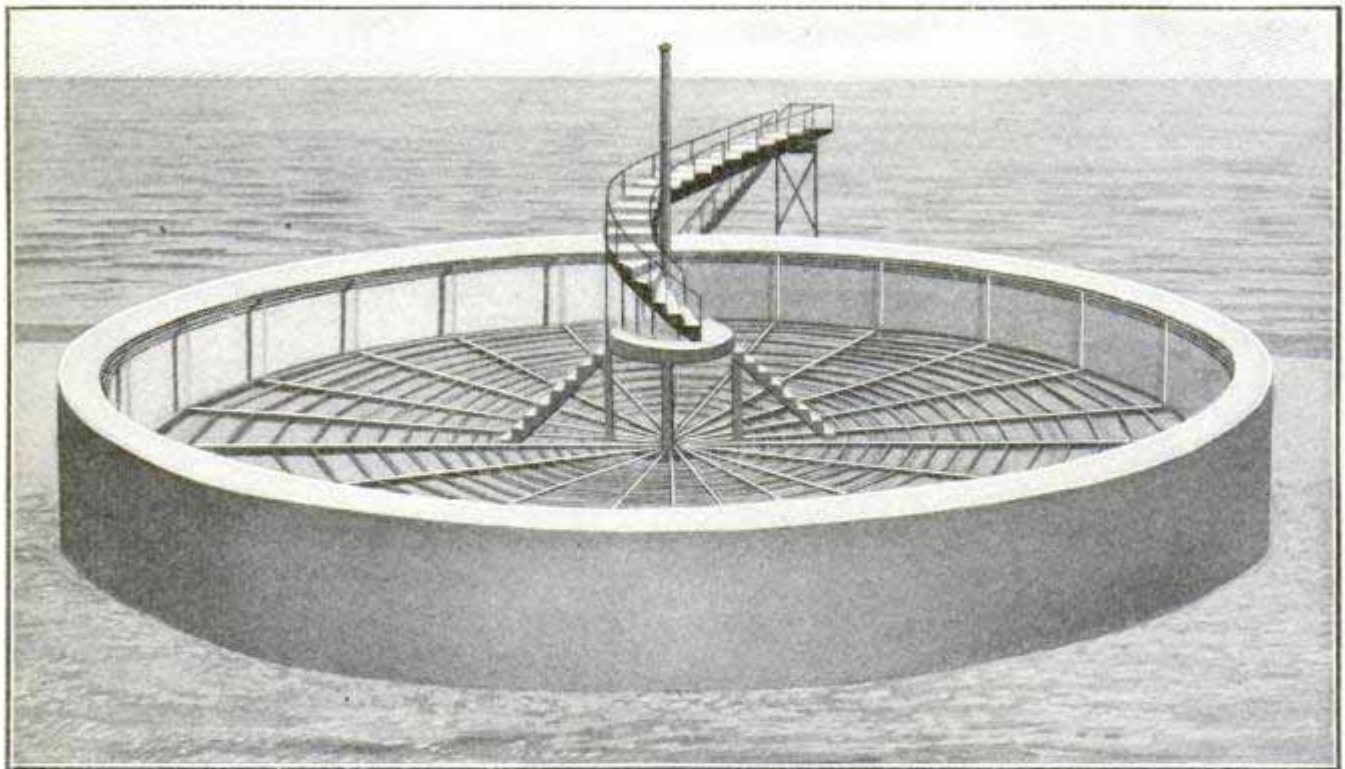
The effect of flying, in the aeroplane sign, is gained by two sets of wings, but only one set is lighted at a time. By alternating them rapidly, the wings appear to be flapping.

One of the illustrations shows a unique and ingenious sign flasher that does not require a motor for operation. Heat is the motive power, the rocker device being provided with a bent tube,

the ends of which are capped with bulbs. This tube is filled with a volatile liquid, and connected with the base at each end (shown as lamps near each bulb) is a heating resistance. When the rocker is tilted down to one side, the bulb on that side becomes heated, and the liquid partly evaporates, and is forced by the vapor pressure into the other bulb. This causes the rocker to tilt to the other side, when the second bulb becomes heated, and the performance is repeated. The rocker operates a mercury switch at each end, alternately making the connection and flashing the lamps of a sign off and on.

A new idea in animated electric signs is to move the lamps themselves, instead of illuminating stationary lamps in such manner as to produce the effect of motion. This is carrying out the idea of a toy figure, such as a jumping-jack, the arms and legs of which are animated by pulling a string.

## ARTIFICIAL WHIRLPOOL FOR BATHERS



Rotary Plunge Tank

An artificial whirlpool bathing tank is to be one of the attractions at Brighton Beach, Coney Island, next summer. It consists of a reinforced concrete tank, 64 ft. in diameter and 7 ft. 9 in.

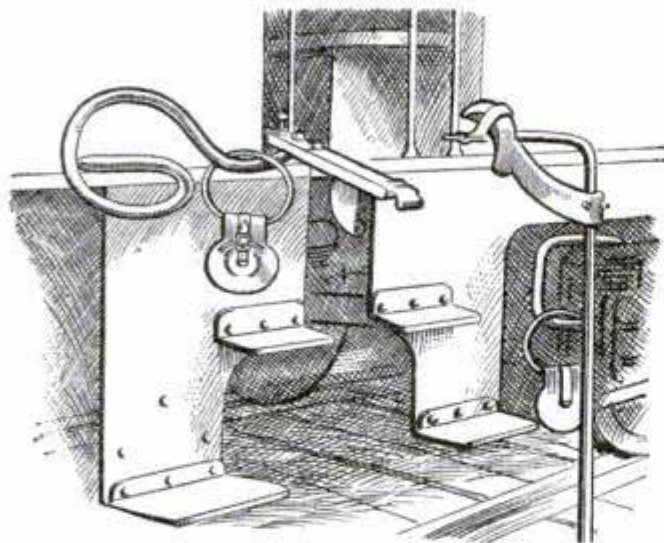
deep, with a revolving platform as a bottom. This platform, driven from underneath by a 40-hp. motor, whirls the 175,000 gal. of water the tank contains into an imitation whirlpool.

## ORDER-EXCHANGING DEVICE FOR RAILROADS

A new and improved tablet-exchanging device, operating in very much the same manner as the mail exchange devices recently described in this magazine, has been adopted by the government railways of New South Wales.

To digress from the subject of the new device for a moment, the system of train operation known as the tablet method, used on British railways, is one by which the engineer receives an order, called a "tablet," at every station. Several types of devices to enable the engine crew to pick up the orders while a train is running at full speed have been in use, but this new tablet exchanger is claimed to be a great improvement.

The principal feature of the device is the helical or corkscrew arm on the engine for picking up the tablet. As the engine passes the ground exchanger, the point of the arm enters the bail of the tablet and pulls the latter out of the holder. The bail then swings around the corkscrew arm and is gradually braked or stopped by the resistance of the atmosphere and comes to a rest on the arm without clatter or



Tablet-Exchanging Device

impact. At the same time the arm on the engine is taking the tablet from the ground device, the latter, provided with a simple catching hook, receives the tablet caught by the engine at the preceding station.

## NEW ADJUSTABLE WIND SHIELD

An automobile wind shield that can be adjusted so as to protect the face without completely blocking the draft



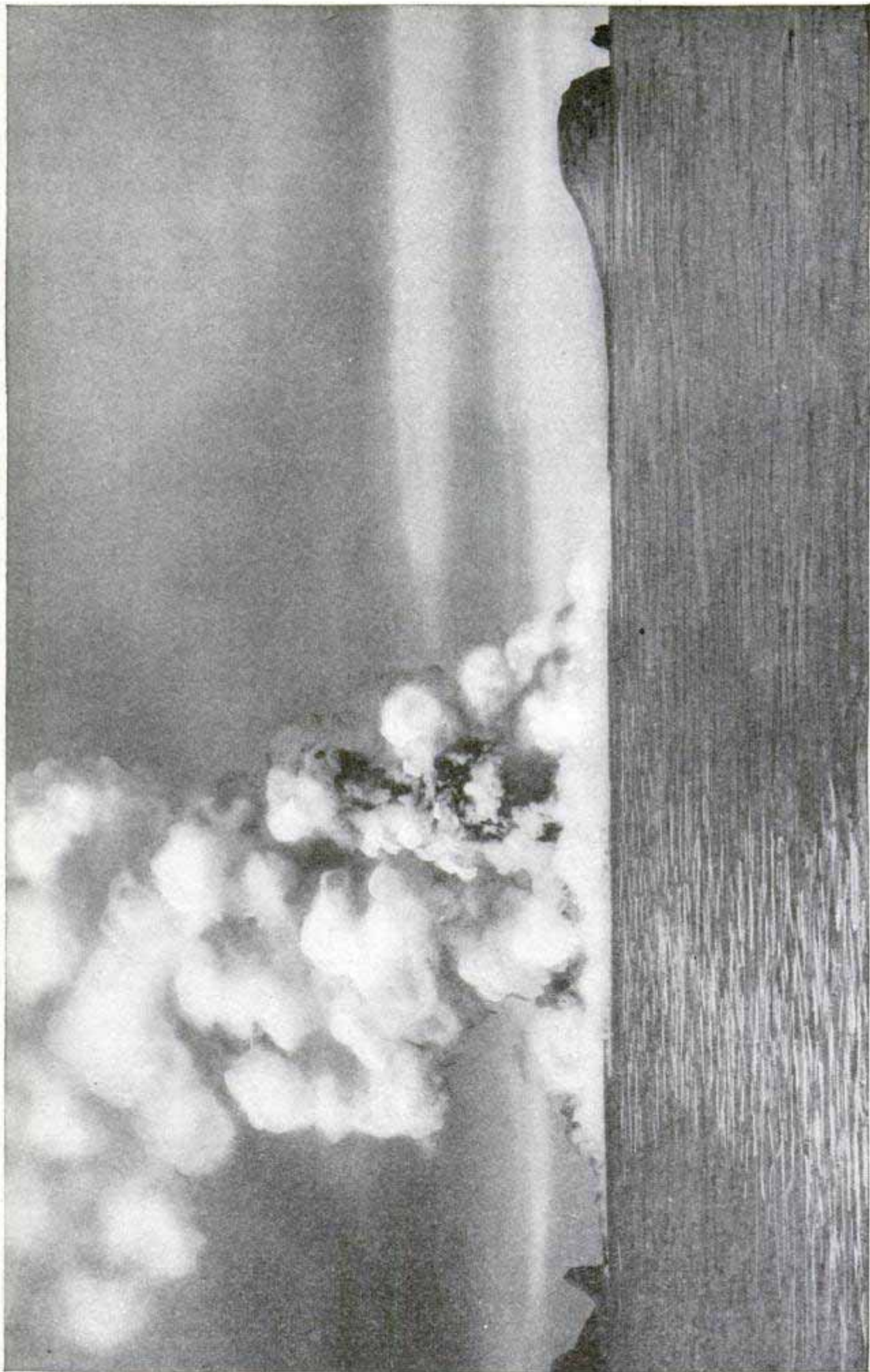
Improved Wind-Shield

which is so pleasant in warm weather, has been designed by a Philadelphia inventor. It consists of two portions, the upper being adjustable to any angle, while the lower is rigid. When adjusted as shown in the illustration, it effectively shields the faces of the occupants from the wind and flying particles, yet a cooling breeze is permitted to pass between the two sections.

## AUTO DEVELOPS NEED FOR NEW FOOLKILLER

The automobile industry has developed the need of a new type of foolkiller for the man who investigates, with a lighted match, the pool of liquid he might see under an automobile. One of the most disastrous accidents of this sort occurred in Pittsburgh where the damage done the garage was \$4,000, and to the features of the truck driver who held the match, so extensive as to make him unrecognizable by even his most intimate friends. His first information as to the character of the liquid he saw under the automobile came to him some hours after he ignited the match—when he recovered consciousness in the hospital.

☞ Electrolytic hypochlorite, a new by-product of an electric lighting plant, is hailed abroad as one of the cheapest and most efficient of disinfectants.



Spectacular Eruption in Bering Sea



## SMALL BERING-SEA VOLCANO BECOMES ACTIVE

Officers of the revenue cutter "Tahoma" watched a small island about 60 miles south of Unalaska in the Bering Sea develop a spectacular volcanic eruption, and took the photograph reproduced in the accompanying illustration while but a mile distant.

The island, which has only been known for four or five years, is called Bogoslof, and was about a mile long and a half mile wide. Two years ago there were two small lakes about 100 ft. across on this island, one of them hot, and the other cold. During the summer of 1909, when the revenue cutter "Perry" was cruising in the vicinity, a number of eggs were boiled in the hot lake and sent to Washington. In June of last year the officers of the "Tahoma" found that the lakes had disappeared, and in the place of one of them was a 60-ft. embankment from which a small geyser, mostly steam, was issuing. Then, on the evening of Sept. 19, while the "Tahoma" was about a mile distant, a great volume of smoke, sulphur fumes, lava, ashes, and steam arose, with frequent flames. Ten days later, when the "Tahoma" passed the island again, the column of smoke and flames was still visible.

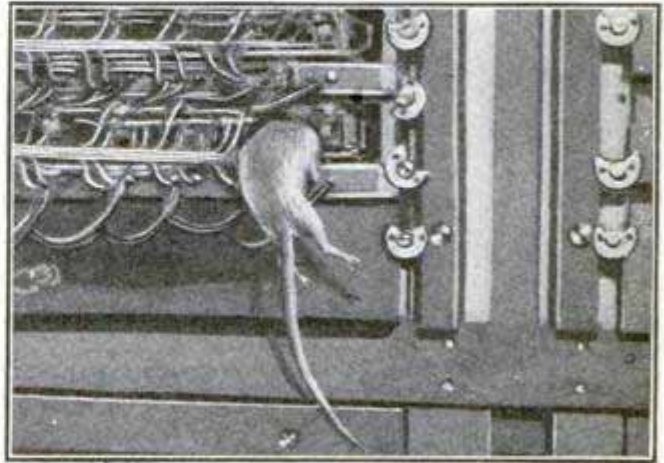
## CURIOUS FOOT-WARMER FOR AUTOISTS

A curious hot-water foot-warmer, designed for use in automobiles, has been placed on the market in England. Its unique feature is the openings in which the feet are placed. Between these openings is a receptacle for hot water, which is depended upon to give sufficient warmth. The bail for carrying the warmer can be engaged in one of the slots of a hinge plate provided for this purpose when it is desired to incline the warmer.



## MOUSE SHORT-CIRCUITS TELEPHONE EXCHANGE

An investigation following the short-circuiting of the telephone exchange at



Trapped in Switchboard Wiring

Somerset, Ohio, divulged the fact that a mouse had caught its head between two wires of the bank of jacks on the common battery board.

## GO IN LONG CARAVAN TO SEEK HEALTH

A novel plan for treating tuberculosis is to be given a trial by an Indiana man who has organized a caravan that will include two automobiles and 12 vans to tour the states of Kentucky, Tennessee, Virginia, North Carolina, South Carolina, Georgia, Alabama and Mississippi during the winter. There will be 50 persons in the party which was organized by the father of a child afflicted with the disease. The patients will have the advantages of out-of-door life and a winter in the South without the vexing routine of a sanatorium. Nurses, cooks and physicians will accompany the party. The trip will be made a pleasure tour as well as an expedition in search of health.

A novel device for counting passengers that pass through the gates at a railroad station is about to be installed in Pittsburg. The principal feature consists of a blast of compressed air which the body of the person going through the gates obstructs, and thereby causes it to register.

## SAN FRANCISCO'S CHINESE TELEPHONE EXCHANGE



Interior View of Chinatown Exchange, Showing Manager and Operators at Switchboard



Exterior of San Francisco's Chinatown Exchange

The telephone exchange in Chinatown, San Francisco, is unique, being strikingly Oriental in both its exterior and interior details, and operated wholly by Chinese. The building has three pagodas, giving it the appearance of the home of a Chinaman of rank, and aside from the sign above the door and the telephone apparatus within, is entirely Chinese.

The manager of the exchange is an American-born Chinaman, and the switchboard operators are Chinese boys and girls. The exchange now takes care of 800 subscribers' lines. The Chinese part of the San Francisco telephone directory is arranged by names of streets instead of by numbers, and a caller gives the name of the firm or individual he wishes to reach. The operators know the names of all the subscribers and are able to

switch the calls about without resorting to the directory.

### PARIS SCIENTIST FINDS GOUT MICROBE

Chickens with the gout form a novel exhibit of the Pasteur Institute in Paris when visitors are taken through the place these days. But the chickens so afflicted are believed to mark a distinct forward step in the study of the germ theory, because Prof. Metchnikoff, the distinguished scientist, believes he has succeeded in isolating a microbe responsible for this most painful ailment, and it is due to experiments made by him that the chickens suffer. The chickens were fed a diet of horseflesh and this food caused the increased growth of certain microbes in the intestines and produced swelling of the joints just as occurs in gout in the human being. Prof. Metchnikoff is also convinced that the absorption of poisons by these same microbes of the intestines is the cause of degeneration of the organs of the body usually ascribed to old age. One of the chief degenerative changes found in old age is in the condition of the arteries. The walls became hardened and brittle. Professor Metchnikoff was convinced that the degeneration, the cause of which was never before determined, was the result of the activity of the intestinal microbes. Experiments on young animals with cultures from a diseased intestine brought about a hardening of the arterial walls that was exactly similar to that which results in the human from what has previously been called "old age."

### GRAVITY CHUTE FOR FRUIT PICKING

A fruit-picking chute which will reach to the top of a 25-ft. ladder and convey the fruit to baskets on the ground, has been invented by a fruit grower of Orange County, N. Y. The chute is made of canvas, and is provided with pockets so spaced as to al-

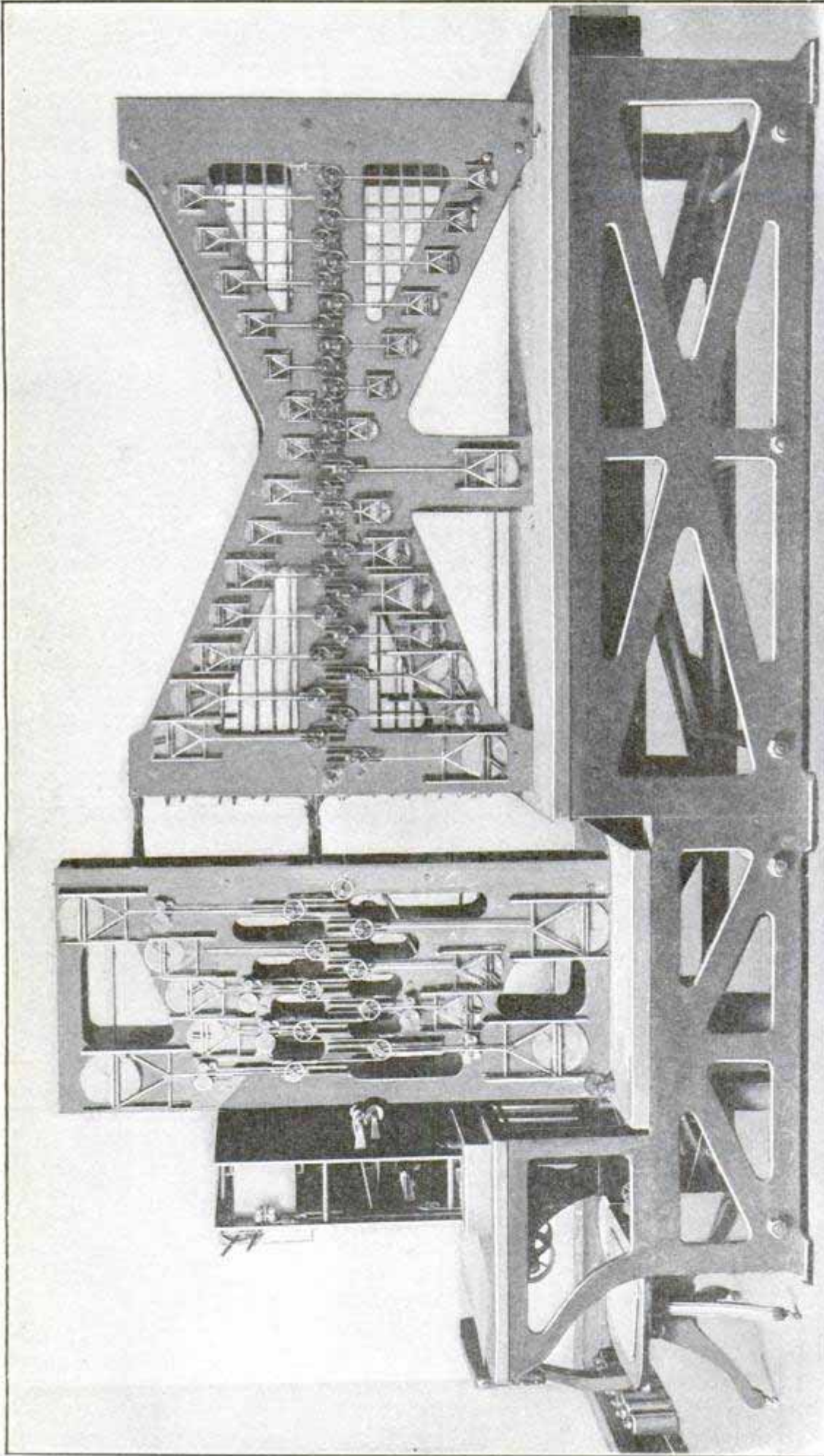


Fruit-Picking Chute in Operation

low the dropping of fruit into it from any rung of the ladder.

It may be attached to any ladder by means of straps, and, as it does not add more than 10 lb. to the weight, the ladder may be carried around and placed against the trees in the usual way. Two baskets are placed on the ground to receive the fruit as it drops from the trough provided to make the fall light. When one is filled, the picker tips the end of the trough into the other by means of a simple arrangement always within reach.

☞ Fresh peaches are to be exported from the Delaware and Georgia orchards to England as the result of successful experiments made with the product of the Canadian orchards.



Side View of Remarkable Tide-Predicting Machine, Which Took 14 Years to Construct

## REMARKABLE MACHINE FOR PREDICTING TIDES

RESULT OF FOURTEEN YEARS STUDY BY GOVERNMENT EXPERTS—  
SAVES WORK OF SCORES OF COMPUTERS

By T. W. LEWIS

ONE of the most important functions of the United States Coast and Geodetic Survey is to give accurate information to the navigator, to the engineer engaged in harbor and river improvement, to the hydrographic surveyor, and to many others, of the rise and fall of the sea along the coast, due to tidal forces. This information is furnished in the form of a book published annually showing the exact time of the high and low waters and their heights, for every port in the United States and the principal ports in other countries.

Today the United States government leads all countries in the world in tidal forecasts with a recently invented machine. Formerly this work required the employment of 65 computers for two or three days to figure out a year's forecast of tides for a given place. Now, one man sits down to a machine, all hung with wheels and pulleys, turns a crank and grinds out a tide table for any point for which the machine has been adjusted. The machine was made by two officials of the survey. Its perfection was not reached until after 14 years of hard work and study, and it cost the government, in time and material, the sum of \$15,000.

The furnishing of the printer with copy for a tidal calendar, put out for distribution from one to two years ahead of time, involves an amount of computation so vast that the use of mechanical devices has long been recognized as necessary. About 1875, Sir William Thompson (Lord Kelvin) invented a machine for predicting tides. It produced a curve on a long strip of paper from which the times and heights of high and low water could be scaled off. This machine, it seems, has never been used in the regular prediction of

tides, and is now on exhibition in the South Kensington Museum. Some time later, E. Roberts, of the British Nautical Almanac office, had another machine constructed upon nearly the same plan, but larger and with some improvements.



Dials and Curve-Tracing Apparatus at End of Tide-Predicting Machine

In 1881, there was constructed for the United States Coast and Geodetic Survey a tide-predicting machine after general plans furnished by Prof. Wm. Ferrel, at that time attached to the survey. It indicates, by a system of dials and pointers, after being set for the time elements of the selected station, the day, hour and minute of each high and low water. These are recorded by

the operator. The machine is then reset for obtaining the heights in feet and tenths corresponding to the previously recorded time. The annual tide tables published by the survey since 1883 were made up from the predictions made upon this machine.

Various short-comings of this machine, as well as the desirability of utilizing more accurate and increased information regarding the constituents of tidal fluctuations, led Dr. R. A. Harris, a member of the Coast and Geodetic Survey, to recommend the design and construction of a new machine. He furnished the theoretical data for solving mechanically a formula which will yield at one setting the heights and times or, in other words, show accurately the height of the tide above any base line at any instant. The general and detail designs of a machine embodying these data were made by E. G. Fischer, chief mechanic of the survey.

A chain, fixed at one end, is lengthened and shortened successively at its free end by pulleys, each representing one of the constituents. These pulleys are moved up and down by means of cranks fastened upon shafts to which motion of the required speed is imparted by means of bevel gear wheels.

The effect, or amount of the influence, of the various tidal forces, each of which is thus represented by a separate mechanism periodically lengthening and shortening the free end of the chain, is obtained for each particular station by setting the crank pins to the required amount of eccentricity upon a scale provided for the purpose.

It will be seen that when all the component mechanisms are put in motion by the hand-crank, shafts and gear wheels suitably arranged for the purpose, each one moving at its own rate of speed and its own amplitude, some lengthening, some shortening the chain laid alternately over and under the pulleys, the free end of the chain, suitably weighted, will move in such way as to represent at any instant the sum of all the components.

In front of the large brass plates

carrying the component shafts, their gears, pulleys, chains, etc., is placed, suitably mounted on two brass plates, a system of dials with their shafts and gears, and a curve-tracing apparatus. The free ends of the two chains, one of which may be named the height and the other the time chain, are connected with these dials in such manner that the motion of the former is shown by a pointer oscillating around a circular scale representing feet and tenths, indicating the height above or below a selected base line. The time chain is carried between the plates of the dial, and is seen through an opening in the front to move back and forth when the machine is set in motion by a hand-crank at the left of the operator, who sits facing the dials.

The turning of the hand-crank also sets in motion the pointers of three dials; one showing the day of the month; one, the hour, and a third, the minute.

The extreme length of this wonderful machine, including the operator's desk, is 11 ft.; its extreme height, 6 ft., and its width, 2 ft.

The time of setting the machine for predicting a tide, including checking, is from 2 to 4 hours; that of predicting and recording the high and low waters for a station for one year, from 10 to 14 hours. The machine can be adjusted, and a whole year's prediction as to what the tides will be at a given point can be recorded and tabulated in half a day by one man. There are but four such tide-predicting machines in the world.

The tidal forecasts for the years 1911 and 1912 have already been computed, and the work of preparing the 1913 forecasts has begun.

It has been suggested that Prof. Willis Moore's job of chief weather forecaster might be made a perpetual round of joy, free from the dread of unforecasted flarebacks, if some inventive genius could catalogue the meteorical influences, as the tidal observers have done with their mysterious elements, and then reproduce the effect on a weather-predicting machine.



Government Mine-Rescue Car

## FEDERAL LIFE-SAVING CORPS FOR MINES

A life-saving service for the rescue of miners in time of disaster is to be inaugurated by the United States Bureau of Mines in the near future. Six specially constructed cars, fully manned by a corps of miners trained in rescue work and equipped with the latest rescue apparatus and first aid to the injured appliances, are now being located in the midst of the great coal districts in different parts of the country. These cars will be ready at a moment's notice to proceed to the scene of a disaster, where the rescue corps, in co-operation with the state mining officials, will do everything possible to save entombed miners.

This is the first important step taken by the new Bureau of Mines in its efforts to reduce the appalling loss of life in American coal mines. During the year 1909, there were 2,412 miners killed in the coal mines and 7,979 injured. In the coal and the metal mines, it is estimated that 3,000 men were killed and 10,000 were injured in 1909. For every 1,000 men employed, from three to five men are killed each year in the mines of the United States. In foreign countries, from one to two are killed in each 1,000 employed. In those European countries where the deaths are least per 1,000 men employed, rescue apparatus has been in



Winning Team of Miners at a Mine-Rescue Competition Held Recently Near Wilkesbarre, Pa.

use for some time, and it is with the hope that European conditions can be approached that the rescue apparatus is being introduced here.

The saving of human life will be the emergency feature of a general campaign of educational work among the miners who will not only be taught the use of the rescue apparatus, but also the proper way to take care of an injured miner. There will also be lectures on many phases of the mining problem looking toward greater safety. There will be little excuse for the miner not benefiting himself, for the mine-rescue cars will go to the miner in his own town or camp. Each car has been given a specified territory, and it is expected that every mining community of any importance will be visited. A mining engineer and a surgeon of the American Red Cross accompanies each car and delivers illustrated lectures on the use of explosives, electrical equipment, fire prevention, sanitation and first-aid surgical treatment.

The cars each contain eight so-called oxygen helmets, a supply of oxygen in tanks, one dozen safety lamps, one field telephone with 2,000 ft. of wire, resuscitating outfits and a small outfit for use in demonstration and actual prac-

tice of equipment relating to first-aid-to-the-injured in connection with mine accidents. One end of a car is fitted up as an air-tight room, used in training the men in the use of the so-called oxygen helmets. This room is filled with noxious fumes, and the miners, wearing the helmets, remain inside for two hours in an atmosphere that would kill without the helmets. These are the helmets that permit one to enter a mine immediately following an explosion, while it is still filled with poisonous gases, and breathe artificially.

The absence of the helmets at great catastrophes in the United States has, it is believed, resulted in a greater loss of life than necessary. Frequently miners who have not suffered physical injury by an explosion have been entombed in the mine to die slowly from the inhalation of the poisonous gases. Had it been possible to reach these men within a few hours, their lives might have been saved. The helmets proved their worth at the ill-fated Cherry mine when the rescuers succeeded in getting 20 men out alive after they had been entombed seven days. In a number of other instances, miners have been saved from terrible deaths by the prompt arrival of the helmeted rescuers.

## CAR SEAL THAT CANNOT BE TAMPERED WITH

A new car seal that cannot be used a second time or tampered with without detection has been invented and is being tested for the purpose of deter-

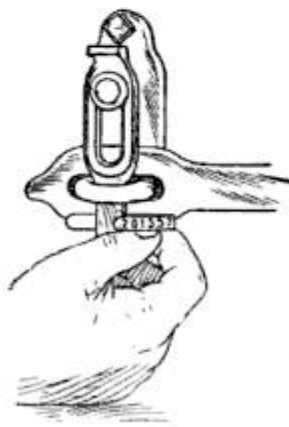


FIG. 1

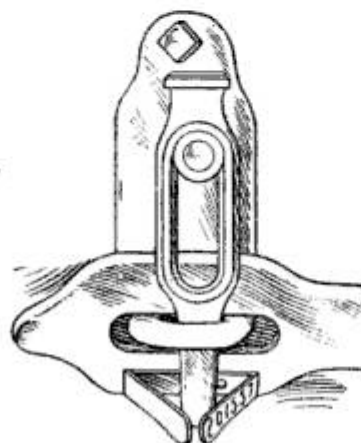
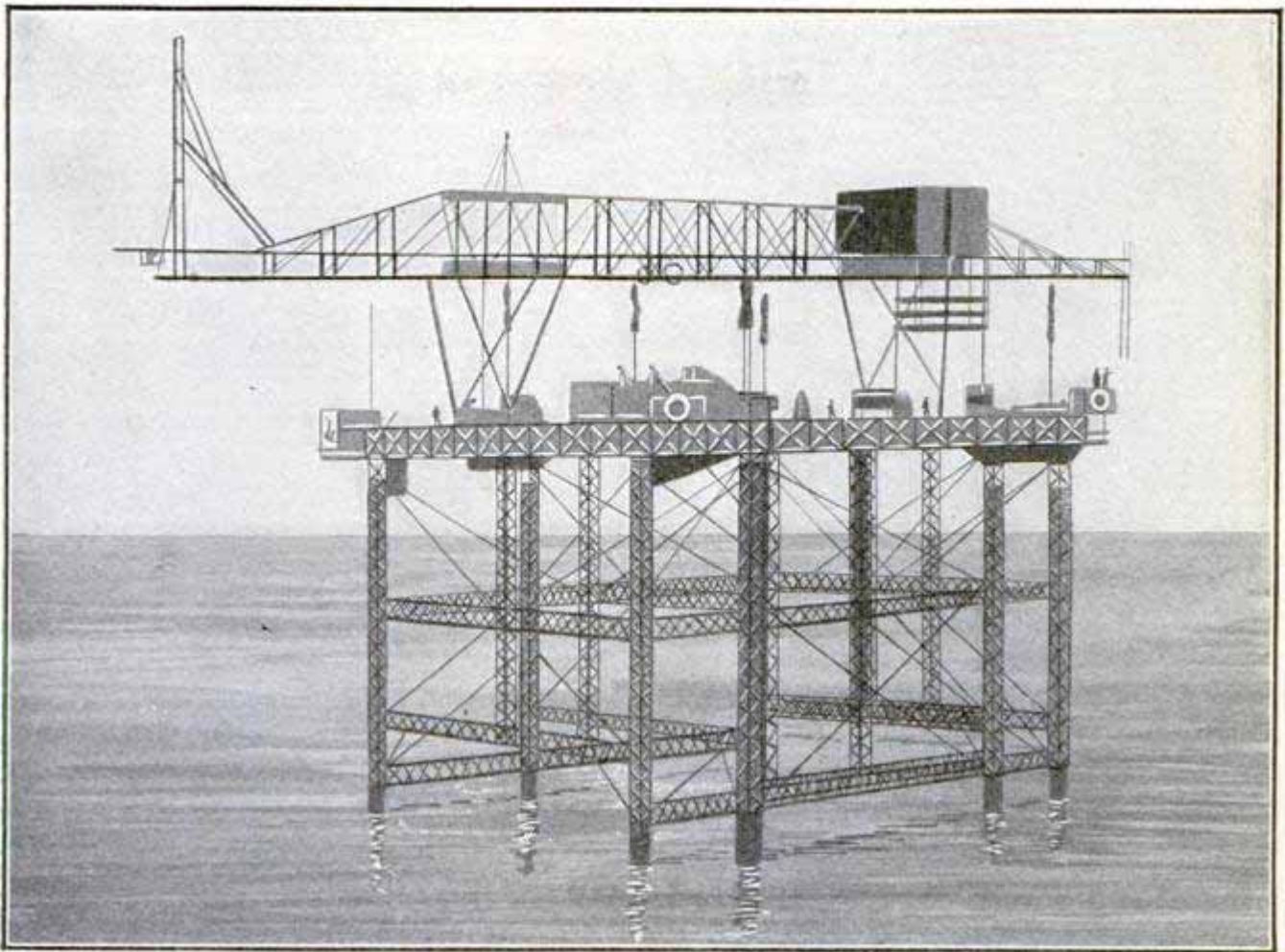


FIG. 2

mining its value. The seal is a strip of metal containing the initials of the railroad and identification number. Two triangular notches are cut in the strip, extending three-fourths of the way across the width of the seal. The seal can only be used in connection with a car pin having a rectangular hole. It is inserted in the hole and the ends bent up at the ends. This forms a triangle of metal. The strip is coated with tin and, in bending, the metal is always broken. Thus the seals cannot be straightened out for a second use while cold and the coating of tin prevents their being heated without detection, as the heating would show by discoloration of the metal.





Walking Marine Stage

## A STAGING THAT WALKS INTO THE SEA

Taking slow, awkward steps, this structural-steel staging walks into the water to the position where its services are required, and moves around as the work progresses, regardless of the roughness of the water. The first "walking" stage was used at Peterhead, a fishing port north of Aberdeen, Scotland, for the blasting of 10,000 cu. yd. of granite, the North Sea along this coast rarely being sufficiently calm for boring from barges.

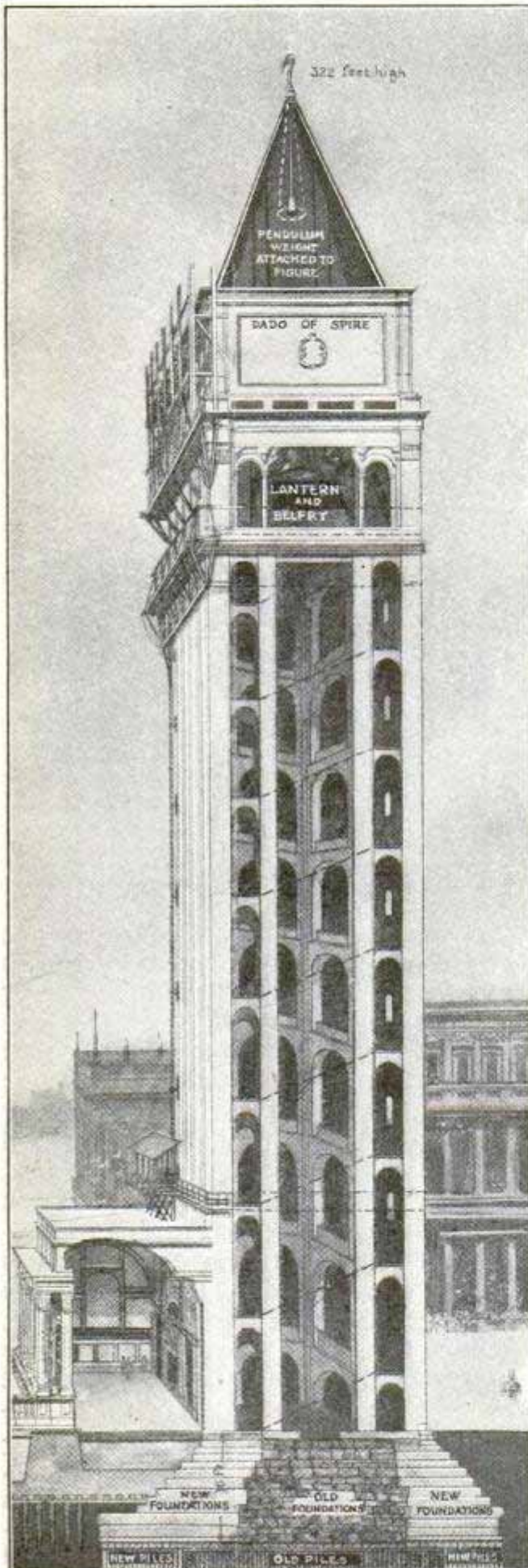
As shown in the accompanying illustration, the staging was used instead of temporary falsework for building a pier extension in Whitby harbor. It consists essentially of two independent structural steel frames, one within the other. They are so arranged as to move independently, and to act as a support, one for the other, in moving. Each frame has four legs or spuds that rise independently of each other.

The "walking" operation is simple.

The legs of the inner frame are raised, in which condition, carried on rollers resting on the outer frame, the inner frame is hauled forward by tackles also attached to the outer frame. The spuds of the inner frame are then lowered again and those of the outer frame raised, which, in turn, is carried on rollers resting on the inner frame, this operation being repeated until the staging reaches the desired location.

The structure can move sideways as well as forward or backward, but the sidewise steps are limited to only 5 ft., while, forward or backward, the step is 10 ft. The spuds are each operated by an independent motor, this independence of action being made necessary by the varying depths of bottom. The overhanging gantry is carried on the outer frame, while the plant necessary for construction work is mounted mainly on the inner frame.

These stages are said to have trav-



Courtesy of The Sphere, London

Sectional View of Restored Campanile

eled distances of 3,000 ft. over sand bottom. A 10-ft. step can be completed in 15 minutes, if the crew is experienced.

### RESTORING THE ANCIENT CAMPANILE

On St. Mark's Day, April 25, 1911, the work of restoring the Campanile or bell tower of St. Mark's church at Venice, which for over a thousand years reared its lofty height above the Venetian skyline before it suddenly collapsed on July 14, 1902, will again, in faithful copy, form part and parcel of the wonders in the ancient city of the Doges.

In the restoration of the big tower, which is 350 ft. high and 40 ft. square at the base, the architects and engineers have followed exactly the lines of the old structure, and wherever possible, the old material has been used. The foundations have been constructed with such extreme care, solidity and strength, that there scarcely is a chance for a repetition of the catastrophe which fell upon the world when the old pile collapsed eight years ago. The new tower has been built of bricks especially made for the purpose and contains an inner and an outer shaft. The walls of the outer shaft are 6 ft. thick and the inclined plane between the two shafts, which gives access to the top, is lighted by 36 windows. The shafts are bound together with iron rods, and the pilasters at the angles of the inner shaft are similarly bound, so that if the tower ever falls again, it will go down as one mass instead of a heap of disintegrated fragments. The restoration cost 2,000,000 francs (\$386,666).

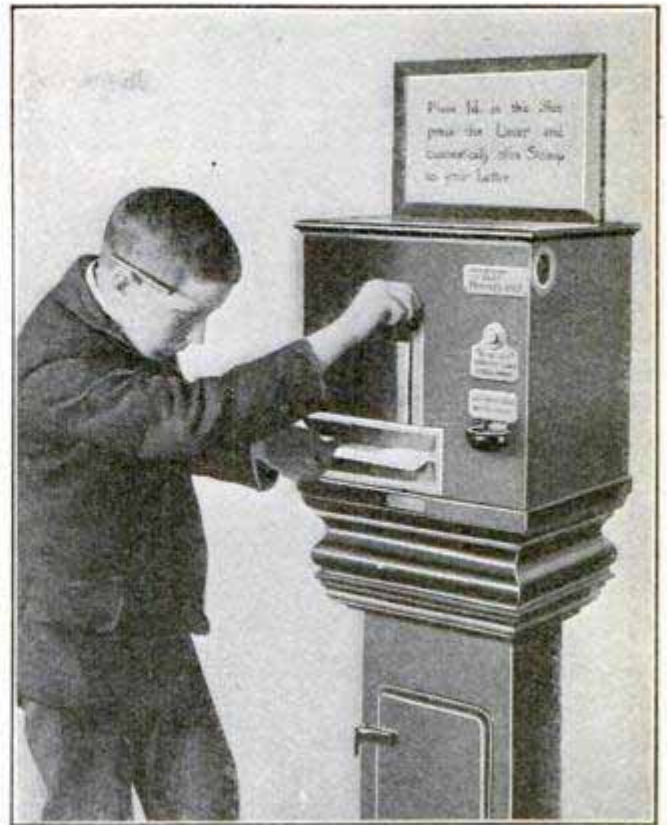
When the old Campanile fell, all but one of the five great bells it contained were destroyed. Pope Pius X has presented the city of Venice with four new bells to take the place of those that were broken. These bells were cast on St. Mark's Day and will first be rung next spring when the tower is declared completed. The magnifi-

cent marbles and bronzes at the entrance in the Loggetta del Sansovino, that were part of the old tower, have been used where possible. In restoring one section of this ancient work of art, as many as 32 fragments were pieced together, and in another instance, 13 pieces were assembled. When it was not possible to use old material, new marbles, duplicates of the old, were secured. The golden figure of an angel on top of the tower is provided with a heavy pendulum, so that when the wind blows against the figure, the strain on the tower will be reduced to a minimum.

The building of the old Campanile was begun in 888 by Pietro Tribuno, but it did not assume the form with which tourists are familiar until 1590. The loggetta, built by Jacopo Sansovino, was adorned with marble reliefs and bronze statues of Minerva, Apollo, Mercury and Peace. The bronze doors have long been regarded as masterpieces.

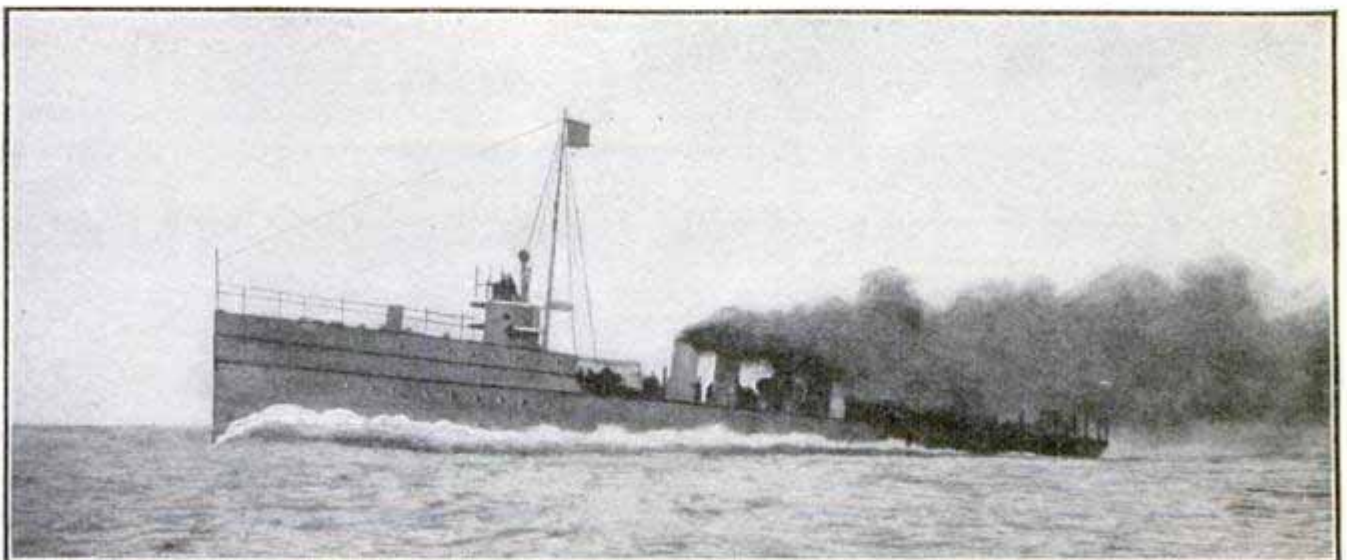
### MACHINE STAMPS ENVELOPES FOR PUBLIC

A machine, operated on the penny-in-the-slot principle, that moistens stamps and affixes them to envelopes, is being given a trial by the British postal authorities. The machine is somewhat larger than the ordinary let-



Affixing a Stamp with the New Slot Machine

ter box. It has a slot wide enough to admit the corner or upper side of an envelope. Above this is a lever which the purchaser presses down after he has dropped his penny into the proper slot and inserted the envelope. To guard against counterfeit and damaged coins, the weights in the machine are so delicately arranged that any coin not of the proper weight is returned. The machine is capable of stamping 4,000 envelopes an hour.



The Oil-Burning Destroyer "Paulding," Fastest Vessel in the United States Navy, Making 33 Knots per Hour During Her Trials

# ORGANIZING A SMALL ORCHESTRA

By GEORGE E. THOMAS

**T**HAT there is more in music than simply its charms to "soothe the savage beast," that its study promotes education, refinement and sociability has occurred to more than one party of young folks planning their winter's amusement program. Music is rated as a social safety valve, good at all times to cure the "blues," and create an atmosphere of good fellowship, and as a relief for all sorts of boring entertainments.

Recently, through the spread of literature on the subject and the cheapness of operatic scores and prints of famous vocal and instrumental compositions, the desire to be a musician has been kindled in hundreds of young men and women. One of the plans that has been adopted toward this end is the encouragement of musical organizations, whether in the form of choral societies or orchestras, and recently the experts have been spending much time in devising schemes for small orchestras.

While the usual idea of an orchestra includes a large assortment of musical instruments, each played by a master, many of the finest compositions—symphonies even—can be played by an orchestra of no more than ten pieces, and the range offered organizations of four pieces is almost unlimited. To master a great symphony may be a little beyond the expectations of the average amateur conductor, but with ten pieces, very good results can be obtained.

The smaller orchestra is the one that attracts the most attention, however, for while there are lovers of music in practically every village and hamlet in the country, there are comparatively few who are courageous enough to attempt to learn to play for the amusement and enjoyment of their fellows,

or for their own amusement and profit. Some of the greatest compositions the world has ever known have been written for four pieces. This class of work is known as "chamber music," and the instruments used to interpret it consist, as a rule, of two violins, a piano and a 'cello. Some chamber-music players vary this arrangement by substituting a harp for the piano and others discard one of the violins for a flute. There are several well known companies of musicians who make a specialty of chamber music, tickets to their concerts usually commanding a high price and their tours being limited to a very few of the largest and most important musical centers of the country.

With the piano, two violins and a 'cello; a violin, a cornet, a flute and a 'cello; or a violin, a flute, a mandolin and a guitar, the organizer of the small orchestra can obtain excellent results and open a way not only for intellectual and uplifting entertainment, but for profitable work as well. Good music is always in demand and usually brings a price proportionate to its quality.

The original investment for a four-piece orchestra of the type suggested need not be large. One of the most important requisites is a good library of music, and the successful organization is the one that includes in its repertoire a wide range of compositions. It must have not only a number of the classics, but also the popular things that do not rank quite so high with musicians but are demanded from the people who support the orchestra. The person who is charged with the care of the library should also be careful to keep abreast of the times and to be constantly adding the new things as they are published.

People like to believe that their home talent is always in touch with the big musical centers and is able to produce the new songs and instrumental compositions as soon as they are given a metropolitan hearing.

As to the expense of equipping the orchestra, there is a wide range of possibilities. While it is very fine to have a genuine Stradivarius violin or a real Testori 'cello built on "Strad" lines, a recent catalogue quoting the former at \$8,500 and the price of the latter being, perhaps, as little as \$1,000, the beginner can do nicely with much less expensive instruments. Violins of fair tone can be obtained for as little as \$3.00, and a better instrument can be bought for from \$6 to \$10. There is really no limit to the price that may be paid for this most flexible of all instruments. A 'cello costs more, the cheapest being quoted at \$15. An instrument of good tone can be bought for from \$20 to \$25. Mandolins are sold at \$5 and more, the cheaper price representing a fair instrument of standard make. The guitar costs about the same for a similar quality. The bottom prices for flutes are somewhat higher, a music house catalogue quoting its cheapest instruments of this class at \$8.50 and from that figure the price jumps to \$17.50 and goes as high as \$175. A good harp costs about as

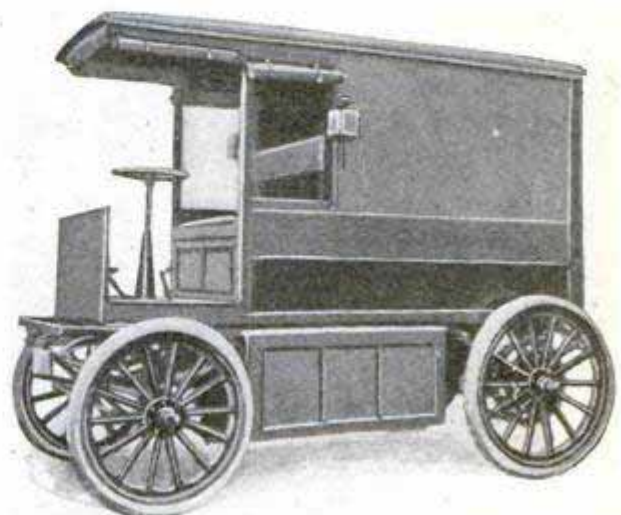
much as a piano and can be played by any piano player after a brief period of instruction and practice, according to the experts. Cornets can be had for from \$8 to as much as the fattest purse can stand.

For the four-piece orchestra of amateurs in a small town, all of whom are beginners in the musical art, a fund of \$37 would buy two violins, a 'cello and a flute; \$39 would buy a violin, a flute, a 'cello and a cornet; \$30.50 would buy a violin, a mandolin, a guitar and a flute or \$28 could be invested in what is known as a mandolin quartette, which would include two mandolins, a violin and a guitar. There must also be a set of music racks and a good supply of music with instruction books, the cost of which must be measured entirely by the ambition of the musicians taken in conjunction with their financial capacity. With any of the instruments in the combinations named—and there are possibly a dozen or more combinations that might suggest themselves—most excellent results can be obtained, and not only will the education of the players be improved by their communion with the masters of music, but their friends will reap untold benefit from the concerts, and the treasury of the orchestra will soon be in condition to provide the members with better instruments and music.

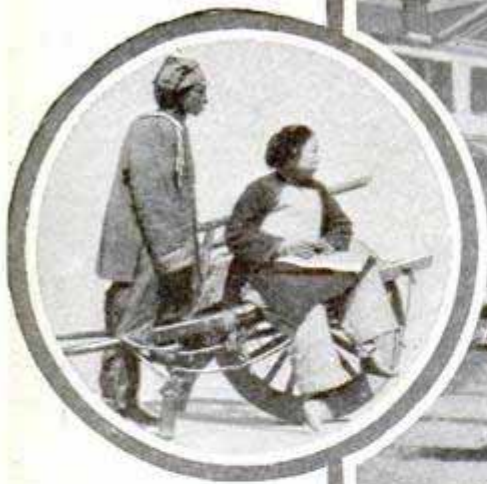
### ELECTRIC AUTOMOBILE FOR CARRYING GUNPOWDER

The transportation of powder from the outlying magazines to the manufacturing establishment of a Bridgeport, Conn., cartridge manufacturing company, is now accomplished by means of electric automobiles, especially adapted for the purpose. The powder compartments of the vehicles are practically hermetically sealed and are so constructed that there is no metal exposed in a way that might cause friction and consequent ignition. The controller and other portions of the mechanism where sparking might take place are immersed in oil, and all

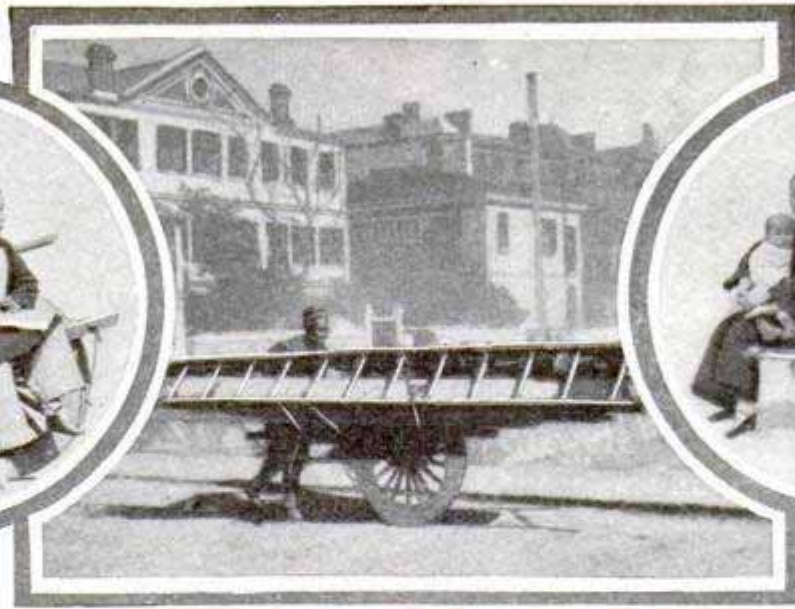
the wiring has been placed in metal conduits.



Automobile Built to Transport Powder Safely



Carrying One Passenger;  
Ballast on Other Side



Transporting Builder's Equipment



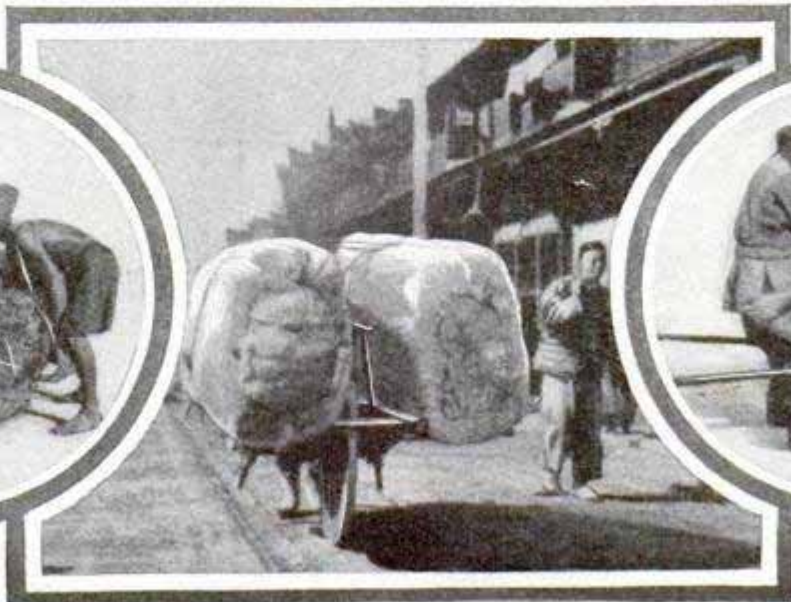
Carrying Four  
Passengers



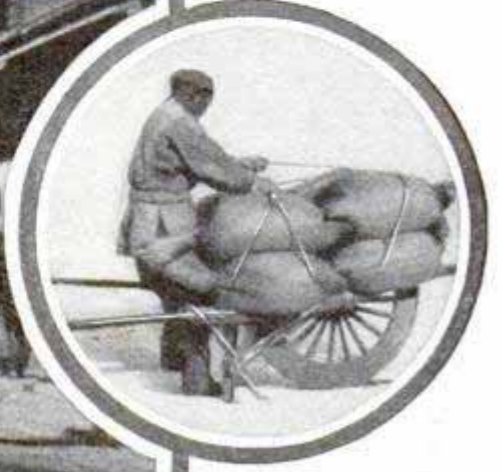
Used by Women of the Middle Class for Shopping or Calling on Friends



Righting a Rig After  
an Upset



Transporting Huge Bales of Goods

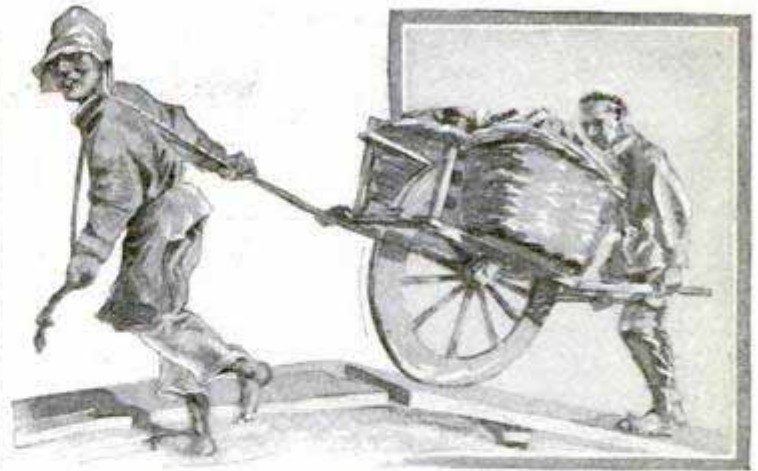


Manner of Lashing  
Heavy Loads

## The Versatile Wheelbarrow in China

By J. E. BECHDOLT

*Photos by Will E. Hudson*



Pulling and Pushing Up a Steep Grade

**T**HE wheelbarrow is the Chinese solution of the cheap transportation problem, and, as such, illustrates the sociological conditions in the Flowery Kingdom. Labor is cheap, and the slow, but versatile wheelbarrow will do business economically.

Accustomed, as we are, to associate the wheelbarrow with bricks and mortar, and gardening only, it should be interesting to learn in how many ways it can be used.

In China, it serves equally well the purpose of carrying a ton and a half of freight between dock and warehouse or store, as that of jauntily conveying a family of the poorer class on a business or pleasure trip. Children, dressed their finest, make New Year's calls by this one-wheeled street car. Wedding guests ride in it, and often it conveys the dead to their last resting place.

Most large Chinese cities have an ordinance prohibiting the carrying of loads over 1,200 lb. by wheelbarrow, not, however, out of any consideration for the coolie, who furnishes the motive power, but to prevent blockades, should the barrow upset. Despite these laws, loads as heavy as 2,400 lb. are often seen trundled along without being stopped and, apparently, with little effort. The construction of the Chinese barrow, which is entirely different from the American, makes it better suited for heavy work. The wheel is rather large and has a wide rim so that it travels comparatively smoothly over the rough cobblestone streets and miserable country roads of the empire. It is placed in the middle of the barrow, where it supports the principal weight of the load. Around it is built a running board which is



Meeting and Passing on a Narrow Chinese Road—A Delicate Bit of Maneuvering

fenced off from the wheel and supported only at the hub of the wheel. The load is arranged on both sides of the wheel and as close to the center of gravity as possible, so that the balancing is easy for the coolie pushing.

The coolie belongs to a union, or guild, of his own and has developed great skill in the handling of his machine. He, of course, prefers to have his load evenly distributed on either side of the wheel, but if he has to carry a single passenger seated on one side, he quickly balances his vehicle by slightly tipping it and thus adjusting the weight. When the load is too big for one man, a woman, boy or sometimes a second coolie helps out by pulling in front. In the case of the coolie with a 50-ft. ladder on his barrow, shown in the accompanying photograph, a small boy ran along behind

to guide the machine and, at the street corners, emitted a cry as blood-curdling and effective as the song of a Claxton siren to warn traffic that something was coming.

While the life of the wheelbarrow coolie is no bed of roses and might well be compared with that of the average truck horse, he can earn from 8 to 18 cents gold a day, which is fair wage in China. He is never out of a job and throughout his existence a wheelbarrow plays a leading part. As a child, he is taken for an airing upon it. As a boy, he earns his mite by guiding the loads and helping to pull. During his mature years, it is his source of income, and eventually his cheap coffin is slung upon it, and in time to the wailing of a few white-clad mourners, borne to the obscure field where he is to join the silent majority.

## HOW TO MAKE AN ARM CHAIR

The arm chair, the picture and drawing of which is given herewith is a companion piece to the rocker pre-

viously described in Popular Mechanics:

With the exception of the back legs, the stock bill which follows gives the thicknesses and widths exact. To the length, however, enough has been added to allow squaring up the ends.

Plain sawed white or red oak will be suitable for a design such as this.

Front posts, 2 pieces,  $1\frac{1}{2}$  by  $2\frac{1}{4}$  by 26 in., S-4-S.

Back posts, 1 piece,  $1\frac{1}{2}$  by 8 by 45 in., S-2-S.

Front horizontals, 2 pieces,  $\frac{3}{4}$  by  $3\frac{1}{2}$  by  $21\frac{1}{2}$  in., S-4-S.

Rear horizontals, 4 pieces,  $\frac{3}{4}$  by  $3\frac{1}{2}$  by  $19\frac{1}{4}$  in., S-4-S.

Side horizontals, 4 pieces,  $\frac{3}{4}$  by  $3\frac{1}{2}$  by  $19\frac{1}{2}$  in., S-4-S.

Back slats, 2 pieces,  $\frac{5}{16}$  by  $3\frac{1}{2}$  by  $19\frac{1}{2}$  in., S-4-S.

Arms, 2 pieces,  $1\frac{1}{8}$  by 4 by 24 in., S-4-S.

Seat slats, 5 pieces,  $\frac{1}{2}$  by  $2\frac{1}{4}$  by 20 in., S-4-S.

Begin work by squaring up the ends of the front posts and shaping the rear ones. Chamfer the ends of the tops and bottoms slightly so that they shall not splinter through usage. Next lay out the mortises and tenons.

The curved horizontals for the back should now be prepared and steamed. A method of steaming wood will be found in the Jan., 1910, number of Popular Mechanics. The curved form to which the steamed piece is to be clamped to give shape to it should be



Handsome Chair Easy to Make

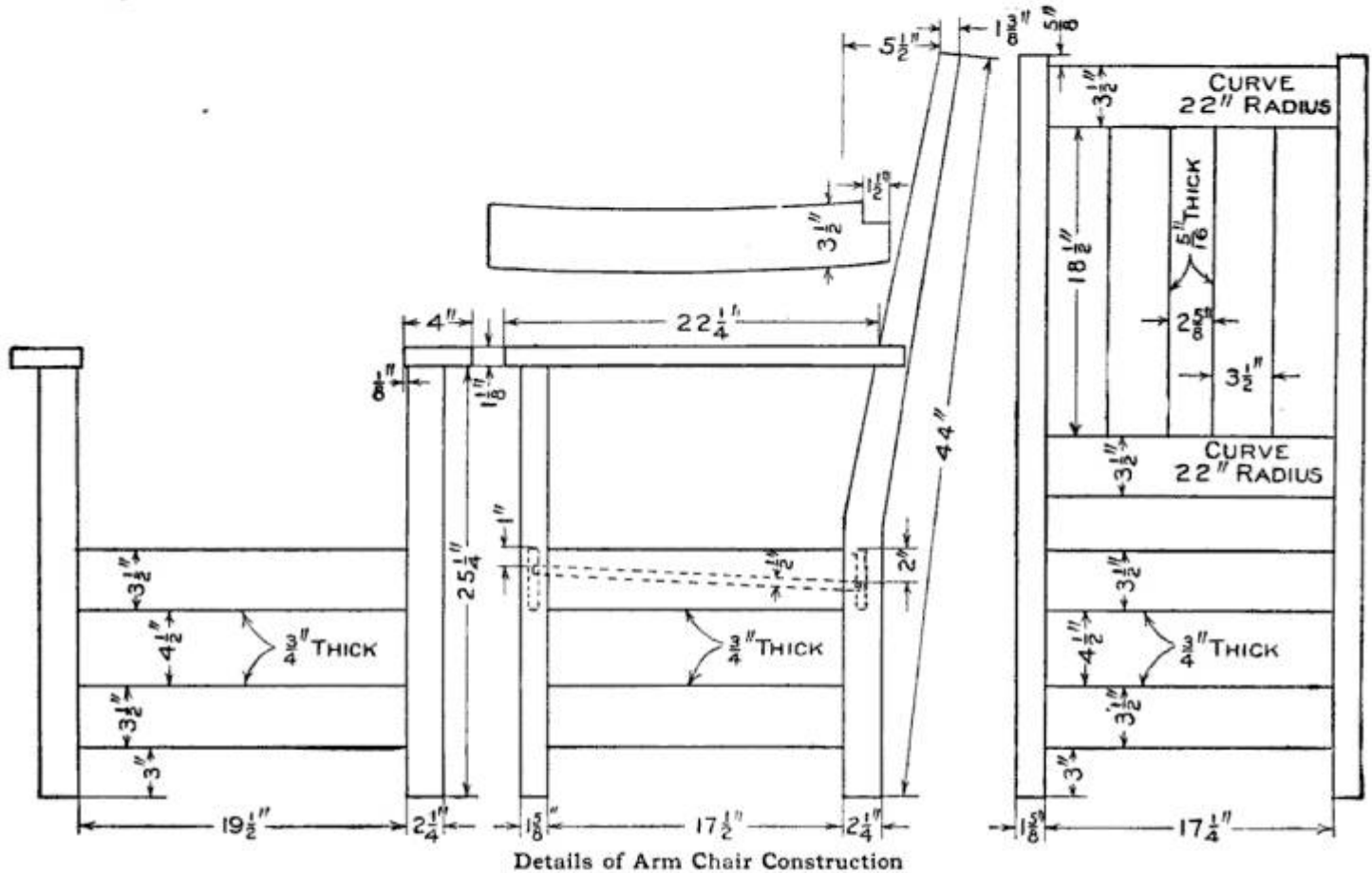


curved slightly more than is wanted in the piece, as the piece when released will tend to straighten a little.

The arms of the chair may be shaped while these pieces are drying on the forms. The rails of the front and back may be tenoned, too. It should be

have been put in place. The latter method is more workmanlike, but more difficult.

A cushion such as is shown can be purchased ready made up, or it may be made by the amateur by lacing together two pieces of Spanish leather



Details of Arm Chair Construction

noted that the front of the chair is wider than the back. This will necessitate care in mortising and tenoning the side rails so as to get good fits for the shoulders. The bevel square will be needed in laying out the shoulders of the tenons.

Assemble the back, then the front. When the glue has hardened on these parts so that the clamps may be removed, put in the side rails or horizontals and again adjust the clamps. The arms are to be fastened to the posts with dowels and glue.

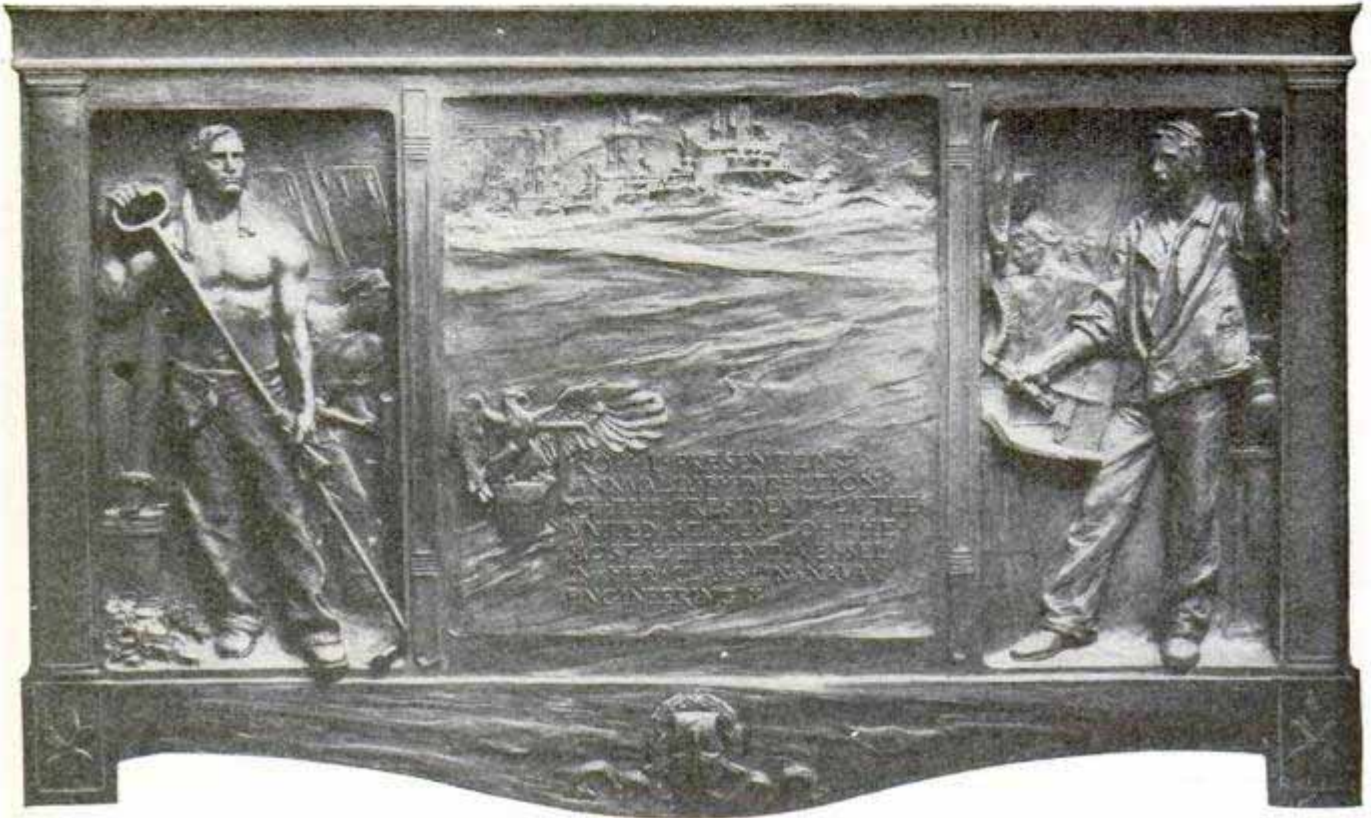
The seat, it will be seen from the drawing, is to be a loose leather cushion to rest upon slats. These seat slats may be fastened to cleats which have been previously fastened to the inside of the front and back seat rails or they may be "let in" to these rails by grooving their inner surfaces before the rails

cut to size and punched along the edges so as to allow a lacing of leather thong. It may be filled with hair or elastic felt such as upholsterers use.

Probably the simplest finish that can be used is weathered oak. Put on a coat of weathered oak oil stain, sandpaper lightly when dry and then put on a very thin coat of shellac. Sand this lightly and follow with two or more coats of floor wax put on in very thin coatings and polished well.

ⒸThe Tongshan Engineering and Mining College of China has negotiations under way with American railway supply companies to apprentice a number of Chinese in the various shops for the purpose of teaching the Orientals the business of manufacturing railway supplies.

## EFFICIENCY TROPHY FOR BATTLESHIPS



Handsome Bronze Trophy, Won by Battleship "Nebraska"

The battleship "Nebraska" will be the first ship to carry the engineer efficiency trophy which its crew won last year by showing the greatest economy in the consumption of coal, oil, water and engineering supplies. The trophy which has not yet been finished, is a bronze plate 3 ft. long and 2 ft. wide, with a symbolic design in three sections by Reuterdahl. The central section shows a fleet of ships in the upper portion and in the lower is the inscription—"Trophy Presented Annually by Direction of The President of The United States to The Most Efficient Vessel In Her Class in Naval Engineering." On one side of the center is the figure of a stoker and on the other side an engineer officer.

New rules that have been promulgated for the award of the trophy next year provide for all-around efficiency, and the vessel that wins must show itself to be effective in gunnery as well as engineering. Admiral Robley D. Evans is generally credited as the

originator of the plan to give a trophy for economy and efficiency in engineering. On the outward passage of the battleship fleet from Norfolk on the start of the globe-circling cruise, Admiral Evans offered a prize to the ship that would show the lowest coal consumption with the maximum of power at the end of the cruise. Such surprisingly good results were achieved that the department took the matter up and ordered an annual competition.

#### HATCHING FISH EGGS OUT OF WATER

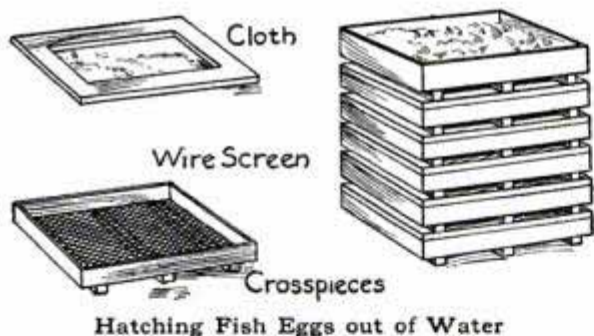
Hatching fish eggs out of water may sound absurd, but it is nevertheless true that the most important stage of the hatching may be passed out of water and that this makes possible a considerable simplification of the hatching apparatus. The method has been tried in Germany with trout and salmon eggs and has given excellent results.

The eggs, thoroughly washed, are

spread to an even thickness on trays about 6 in. square and but  $\frac{1}{4}$  in. thick. The bottoms of the trays are formed of cloth, made fast to the under side of a frame very much like that of a window screen. These egg trays hold about 1,000 eggs each, and each one rests on a second type of tray, called an "air tray." This tray is also 6 in. square, and  $1\frac{1}{4}$  in. deep, the bottom being formed of fine mesh wire.

One of the illustrations shows a pile of these trays arranged alternately, beginning with an air tray, and having at the top a third kind of tray. This is called the "upper air tray," and is 4 in. deep, filled with bog or wood moss.

Placed in a cellar or other cool place, all that is required is to pour a small quantity of pure water into the top tray each day in order to maintain the humidity of the lower trays, and to inspect the egg trays once each day for the removal of dead eggs. When the embryo becomes plainly visible inside



the egg, they are transferred to the ordinary underwater apparatus and will hatch in a few days.

## GROWING UMBRELLA HANDLES

At Maule, a small village near Paris, is carried on a singular industry which is little known. It is a nursery for the cultivation of trees suitable for use as umbrella handles, walking sticks and alpenstocks. Nearly 500 acres of ground are given over to ash, oak, chesnut and maple saplings. One year after planting, these are cut off near the root so as to make them grow several branches, which are then kept free from secondary stems.

## REEL FOR PORTABLE TELEPHONES

A reel for taking up the slack of the flexible wire of a portable telephone is



Taking Care of the Wire Connection

popular in France. It is a little different, however, from the reel for portable electric-light fixtures, recently illustrated in this magazine, in that this reel is made fast to the wall where the wiring enters the room, instead of being part of the standard of the telephone instrument.

CA traveling school for the purpose of teaching young girls the science of house-keeping is about to be inaugurated in Germany.

The most curious part of the industry comes the following year. Incisions are made in the bark, thus engraving upon it various designs. When the bark is stripped, these designs are found traced on the wood. At the end of the third year, the branches are cut, stripped of their bark, bent into various shapes and sent to the manufacturers. Certain forms of handles are shaped while the branches are still growing on the trees.

## HOOP-SKIRT PARACHUTE FOR AIRMEN

This parachute, designed by a Berlin inventor as a safeguard for airmen should their machines meet disaster, is



Good When Something Goes Wrong Aloft

called the "hoop-skirt" because of its resemblance to the style of skirt worn 60 or more years ago. When not in use as a parachute, it forms an outer garment for the airman, and looks something like an ulster.

## JEWELRY OF ROSE PETALS

The most striking novelty in jewelry that has appeared for many a day is the perfumed ornament made of rose petals. In general appearance the rose beads may be compared to jet, though they are not so brightly polished.

Many women in California, where roses are very plentiful, make these beads, using the following process: The rose petals are gathered every day and while fresh are crushed into pulp, (running them through a meat grinder is the domestic way) and the pulp is kept in an iron vessel tightly covered. This process is repeated nine days and fresh petals are added. Then the pulp is molded into beads

about twice the desired size and placed in the sun to dry. To give them a slight gloss, vaseline is used when they are being molded. The beads are then strung in chains, or mounted as pendants. They retain a faint odor of the rose, and are quite a fad at present among women who have rose gardens.

## SAN FRANCISCO TO HAVE AN AERIAL GARAGE

The first airship garage to be constructed in this country is planned for San Francisco. The enterprising owner of a plot of ground conceived the idea of building a structure for the housing of aeroplanes and has already commenced grading the property. Plans have been prepared by an architect for a one-story building of brick which is to have a corrugated iron roof, supported by steel framework. It will provide accommodations for 24 aeroplanes. The interior of the building, which will be reached through a wide doorway, will be divided into rooms to accommodate the various branches of work connected with aeroplanes. The larger portion of the building will be left open, and in this the aeroplanes will be housed.

A feature of the equipment of the building will be an automobile truck especially constructed to transport aeroplanes to various parts of the city, to and from the places of starting flights. The truck is to have a platform about 16 ft. wide and of sufficient strength and length to support an aeroplane.

CA novel route for passengers between Australia and England has recently been adopted by an English steamship company, involving travel by steamer from Sydney to Valparaiso, Chili, by rail from Valparaiso to Montevideo, and by steamer from Montevideo to London, the time for the trip being set at 27 days in contrast to 31 days now required to make the journey along previously used lines of traffic.

# The New Engineer

**U**NDER the old earth's outer crust—  
Mid bed-rock fragments and lava dust;  
Watching the axis turning slow,  
The Old Year stood at his dynamo  
In the power plant which Time maintains,  
And numbered losses and figured gains.

"I've done quite well," said the aged seer—  
"My record's good as an engineer.  
I've kept things humming, above—below,  
Folks can't complain that I've been slow,  
And now I'm off when midnight calls—"  
Then he started doffing his overalls.

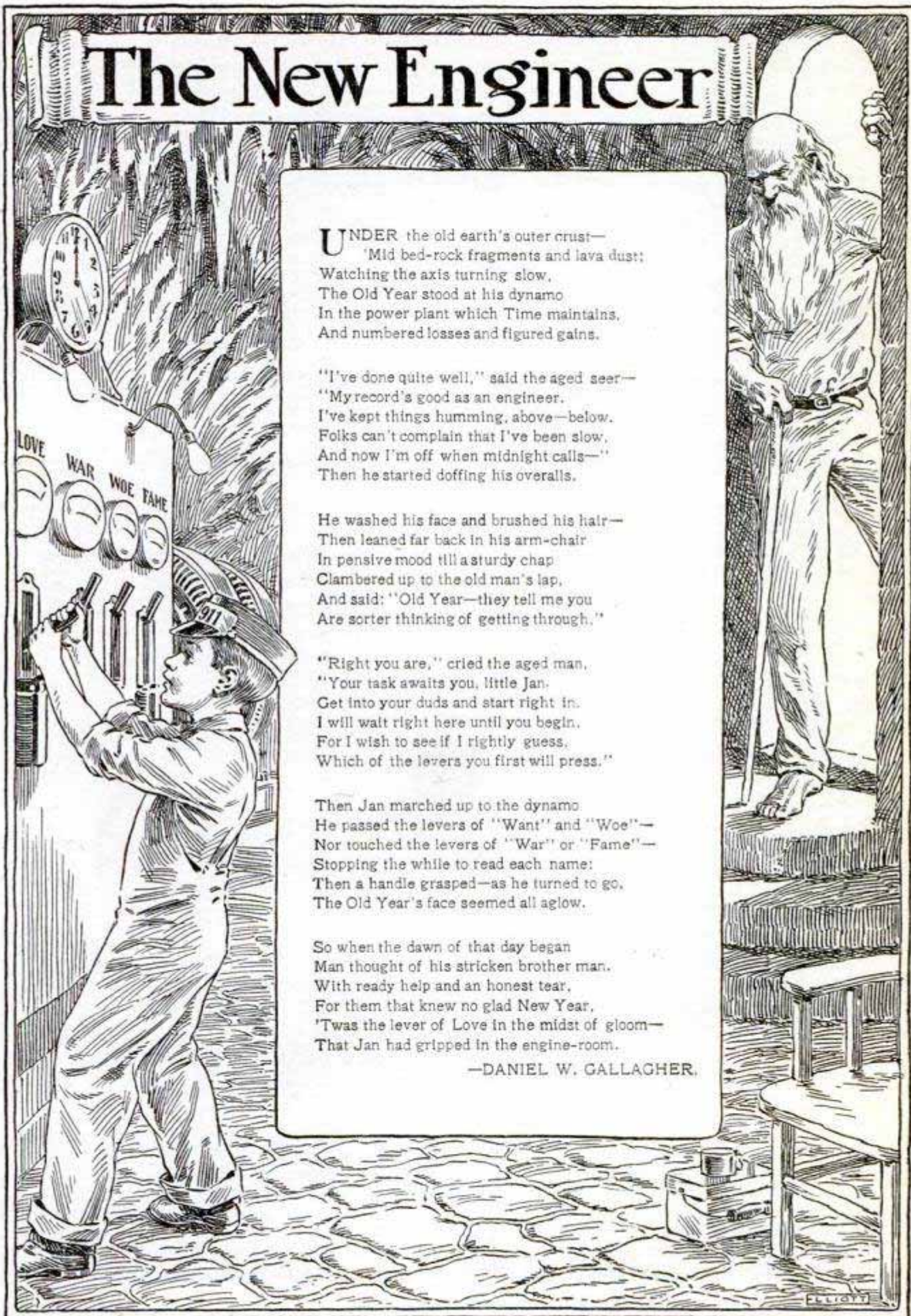
He washed his face and brushed his hair—  
Then leaned far back in his arm-chair  
In pensive mood till a sturdy chap  
Clambered up to the old man's lap,  
And said: "Old Year—they tell me you  
Are sorter thinking of getting through."

"Right you are," cried the aged man,  
"Your task awaits you, little Jan.  
Get into your duds and start right in,  
I will wait right here until you begin,  
For I wish to see if I rightly guess,  
Which of the levers you first will press."

Then Jan marched up to the dynamo  
He passed the levers of "Want" and "Woe"—  
Nor touched the levers of "War" or "Fame"—  
Stopping the while to read each name:  
Then a handle grasped—as he turned to go,  
The Old Year's face seemed all aglow.

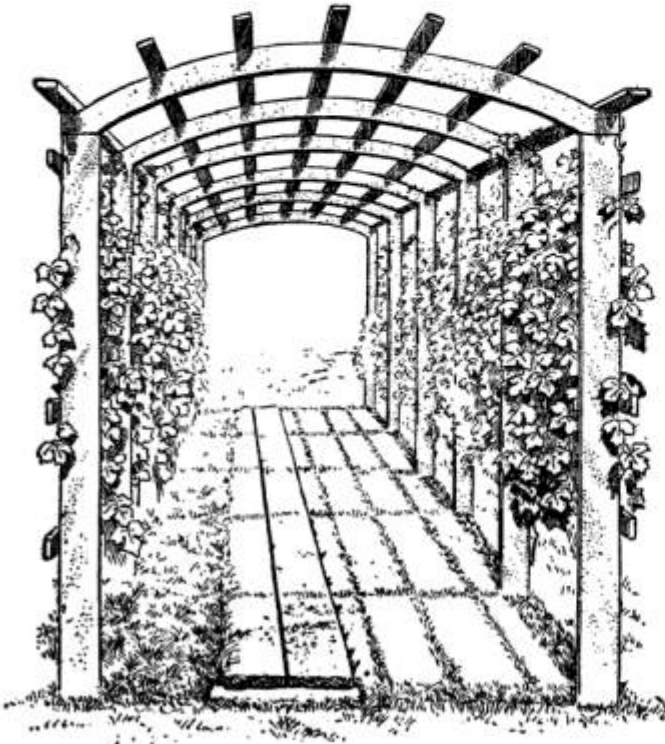
So when the dawn of that day began  
Man thought of his stricken brother man,  
With ready help and an honest tear,  
For them that knew no glad New Year,  
'Twas the lever of Love in the midst of gloom—  
That Jan had gripped in the engine-room.

—DANIEL W. GALLAGHER.



### CONCRETE GRAPE ARBOR

A few details of the construction of this concrete grape arbor, located at Alton, Ill., may prove helpful to those



Attractive Concrete Grape Arbor

who contemplate work of the same nature. The posts, all 10 ft. long, 6 in. square at the base, and tapering to 6 by 3 in. at the top, are set in position in holes 3 ft. deep. They are reinforced with  $\frac{3}{8}$ -in. plain round iron, and weigh 200 lb. each. The lath are fastened by means of  $\frac{1}{4}$ -in. bolts, inserted at the proper distances along the posts immediately after the latter are finished.

The arch pieces, made in a wooden mold measuring 4 by 4 in. inside, are also reinforced with  $\frac{3}{8}$ -in. iron rods bent to the shape of the mold. The arches are fastened to the posts by bolts in the same manner as the lath.

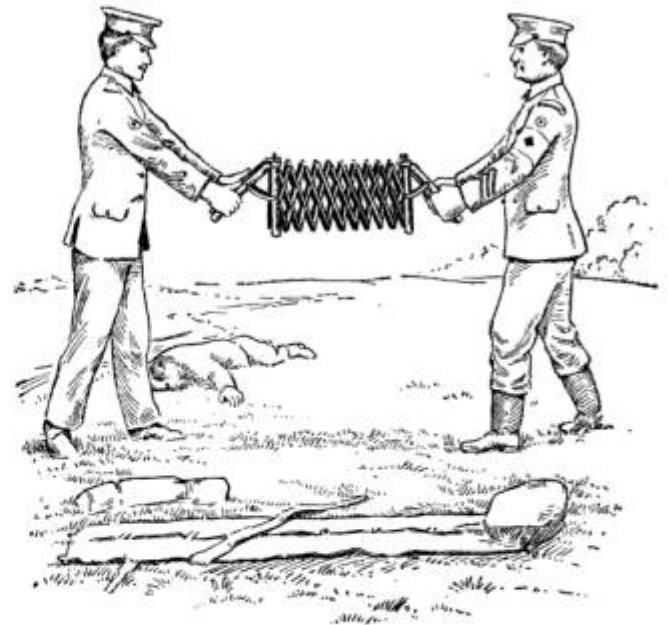
### CROSSES ATLANTIC THRICE IN THREE WEEKS

Captain Dow of the Cunard steamer "Carmania" has the unique distinction of crossing the Atlantic three times, traveling 8,500 miles, within the space of 22 days, a feat never before performed. It occurred entirely through accident. In October the commander

of the "Mauretania," being incapacitated by illness, was unable to resume command of his vessel, and Captain Dow, who was due inward at Fishguard the morning after the "Mauretania" sailed, was ordered to take command of the big ship at Queenstown. On the westward passage he lowered the record of the "Mauretania" ten minutes and would have reduced it on the eastward trip but for rough weather off the Irish coast. As it was, he reached Fishguard an hour earlier than had ever been done previously. This completed the third trip across the Atlantic, all made within 22 days, six of which were spent in New York.

### TELESCOPIC ARMY STRETCHER

One of the improved hospital appliances of the British army is shown in the accompanying illustrations in a partially folded and an extended position. It is a telescopic stretcher, which folds up into a very compact bundle, yet is very substantial when extended.



Stretcher Partially Extended



The Stretcher in Use

### COALING SHIPS IN JAMAICA

A very economical method of coaling ships is practiced at Kingston, Jamaica. Labor is cheap and abundant, and when a vessel is to be coaled, a hundred or more negroes gather. These men are furnished with baskets holding about  $1\frac{1}{2}$  bushels which they fill and carry from the coal yard to the ship's bunkers. As each carrier passes up the gang plank with a load, he receives a penny from the paymaster. This prospect of receiving money at every round keeps the men fairly crowding up the plank.

### LANTERN FOOT-WARMER

An enterprising Canadian concern has placed a unique combined heating and illuminating device on the market in the guise of a lantern foot-warmer. It is designed, of course, for use in rural communities, where considerable driving is necessary during winter as well as summer. Placed underneath the lap-robe, which, it is claimed, interferes in no way with proper combustion, the lantern effectively warms the feet and limbs, which means comfort all over. A copper ribbon passes over the burner, and this conserves the heat without affecting the radiation of light.

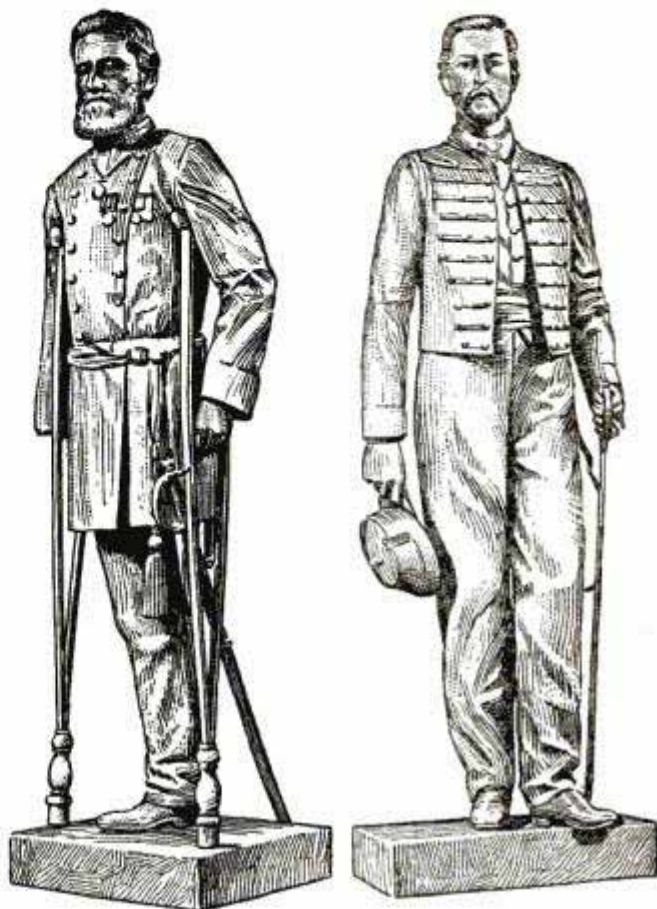
Should light at any time be required, the device is immediately available for such a purpose.



Combined Lantern and Foot Warmer

### STATUES OF SHEET METAL

The statues of the Mexican officers, General Pacheco and General Ojinaga, unveiled at Chihuahua during the cele-



Metal Statues of Mexican Warriors

bration of the Mexican Centennial, were made of stamped sheet copper by an Ohio concern, and are good examples of this new method of statue work.

The statues are portrait figures modeled from photographs, the models being reproduced in every line and detail in plates or sections stamped in heavy metal dies. The sections were then joined together by riveting. All the sections were countersunk, which makes the joining practically invisible. The height of each statue is 9 ft.

¶The men engaged in salvaging the British battleship "Montagu," which was wrecked on Lundy Island four years ago, have, it is reported, discovered a Spanish wreck which went down about 1860, from which a quantity of anchors and heavy chains have been recovered, while much valuable material yet remains to be removed.

## UNIQUE CLOCKS FOR WINDOW ADVERTISING

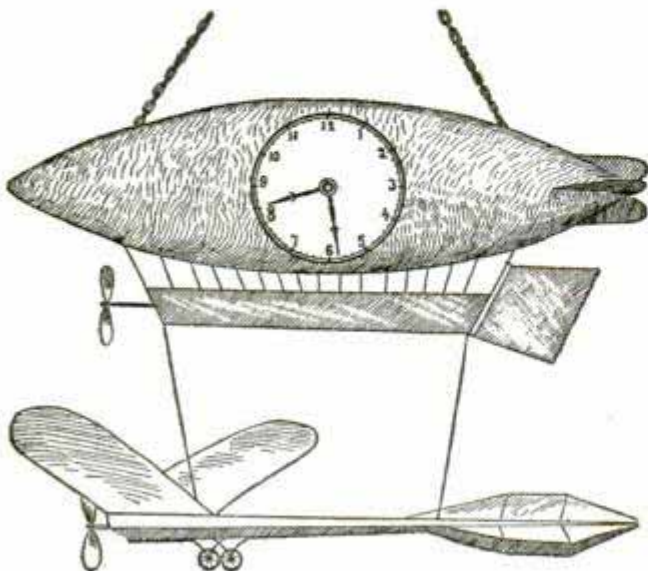
Action in window displays always draws attention, and this is especially so when the action also has to do with



Fisherman's Clock

the time of day. The unique clock settings illustrated herewith, are designed primarily for display in jewelers' windows, but almost all of them would be worth while in the show windows of other retail stores.

Probably the most unique are the "fisherman's" clock and the "convivial" clock. In the former, the time is marked by the float moving along the edge of the water, which is represented by a mirror. Along the bank in the foreground will be seen a number of little twigs, which, on closer inspection, will be found to represent the hours and half hours. The mechanism



Aerial Clock

responsible for the working of this clock consists of an alarm clock movement concealed in the rock to the right of the illustration. This operates a hidden magnet, which moves from left to right, attracting in its wake over the smooth surface of the glass the little iron float. The float, under the influence of the magnet, moves along regularly, indicating the time.

The convivial clock also depends upon a magnet for its effectiveness.



Aeroplane Clock

The main setting is a crystal goblet filled with water, the rim being divided into 12 equal parts and the hours marked around the border in black. One of the intoxicated twain is carved from wood and floats in the water with one of his hands, which is made of iron, extending over the brim as if reaching for the bottle held in the hand of the other. On the figure holding the bottle is a magnet which attracts the iron hand and keeps the



floating figure steady while the goblet revolves. The head of the bottle indicates the time on the revolving goblet.



A Clock of Intoxication

In the "aeroplane" clock, the biplane ascends from the globe every minute, the movement being caused by clockwork and a bent lever concealed in the clouds. When the biplane comes in contact with the sun, a pin acts on a ratchet wheel concealed behind the portion of the biplane bearing the figures. This wheel has 60 teeth, and on its face are figures from 0 to 59, representing the minutes. Every time the biplane strikes the sun, the wheel advances a notch, which displays the next minute figure in rotation. When the sixtieth notch on the wheel is reached, a second pin causes the hour wheel, which is graduated from 1 to 12, to advance one notch.

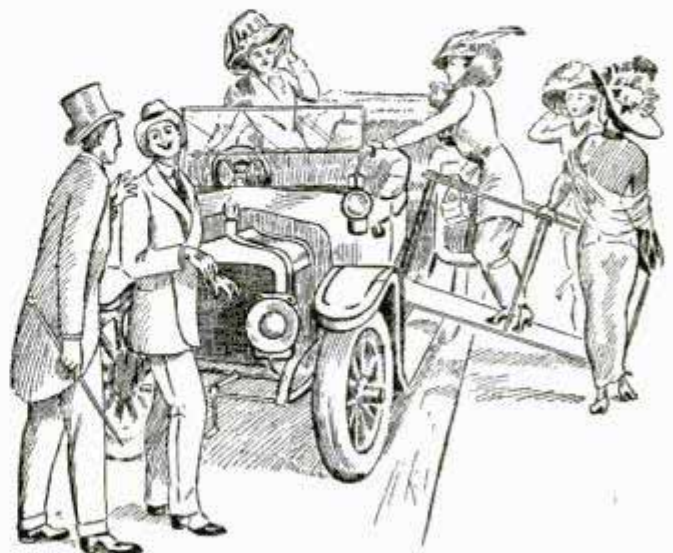
The aerial clock setting in which a dirigible balloon and monoplane are combined differs from the other settings in that the time is told by an ordinary dial. The clockwork back of the dial, however, imparts motion to the propellers.

## OIL MAY BE USED TO FIRE POTTERY KILNS

Manufacturers of pottery throughout the country are watching with interest experiments being carried on with crude oil instead of coal in firing kilns. One plant in Illinois has already built kilns for use of oil and an Ohio concern is now experimenting with the process. The question of the use of oil instead of coal in potteries came up some years ago when a kiln fitted with oil burners was tested by a big petroleum concern. The inability to maintain a uniform heat led to the discarding of the system. The presence of carbon was also considered a fault. A new burner has now been invented which, it is declared, will overcome the objectionable features hitherto found in the use of oil. As a kiln of pottery is a valuable piece of property, most of the firms engaged in the business hesitate to change their systems.

## THE LARGEST FRENCH SHIP

The new turbine transatlantic liner "France," recently launched at St. Nazaire for service between New York and Havre, is the largest vessel ever built in France, as well as the largest flying the French ensign. She is 715 ft. long, with a beam of 75 ft., has eight decks, and will carry 2,000 passengers. The height from keel to deck-houses is 78 ft. 9 in.



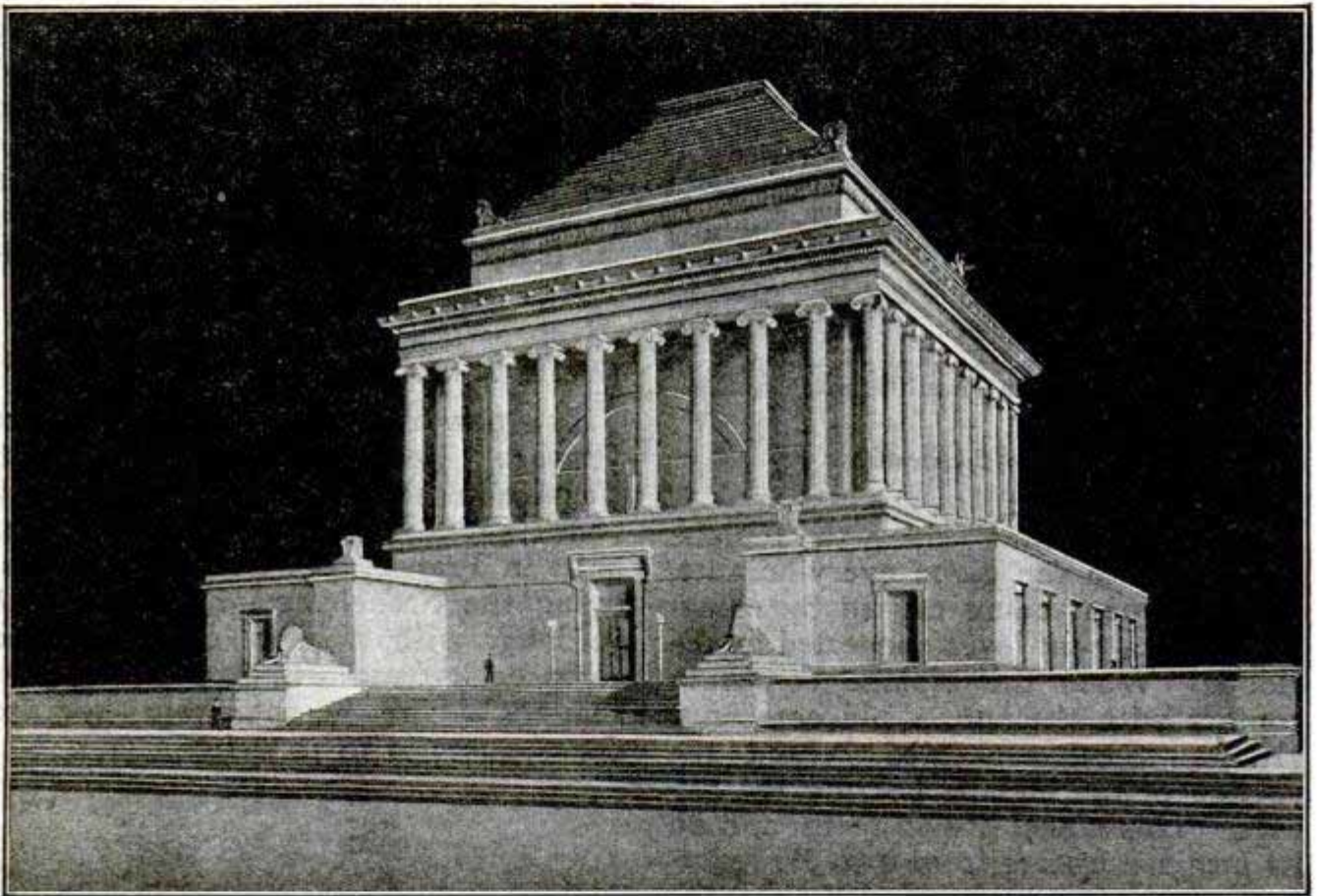
The London Motor's Idea of What May Develop, if the Hobble Skirt Continues in Popularity

## MASONS' MILLION-DOLLAR TEMPLE

The southern jurisdiction of the Order of the Scottish Rite of Free Masonry has commenced the erection of a million-dollar temple in Washington, which is expected to be the handsomest of its kind in the world. The men selected to pass upon every detail in construction and ornamentation are men whose reputations in the world of art are international. It is expected that the temple will be completed in about 18 months. The international conference of Supreme

gilded dome rising 150 ft. from the street level. The temple will consist of three stories, a basement, and a sub-basement. Leading from the sidewalk to the temple will be a symbolic plaza of granite the full width of the building. Ornate massive portals form an entrance symbolic of the Masonic degrees.

The entrance will be flanked on each side with two giant sphinxes and on the terrace will be symbolical and allegorical statuary. Over the arched



Temple to be Built by Masons in Washington

Councils of the world, 26 in all, meets with the southern council in October, 1912, and arrangements are being made to hold the conference in the new temple.

If the purposes of the Supreme Council are to be carried out, the temple will reflect artistically and symbolically the council's Masonic glory in being the parent of the world's councils. The approved plans provide for an imposing structure, classic in design, of white marble, and with a

entrance to the temple will be a golden sunburst, the rays of which will flash from the symbolic double eagle and triangle of the 32d degree.

Above will rise 33 columns, each 33 ft. high, which will surround the building on three sides. Entrance to the structure will be through a spacious vestibule leading to an atrium, 70 ft. by 60 ft., at the far end of which will be located the grand staircase, leading to the temple or cathedral floor.

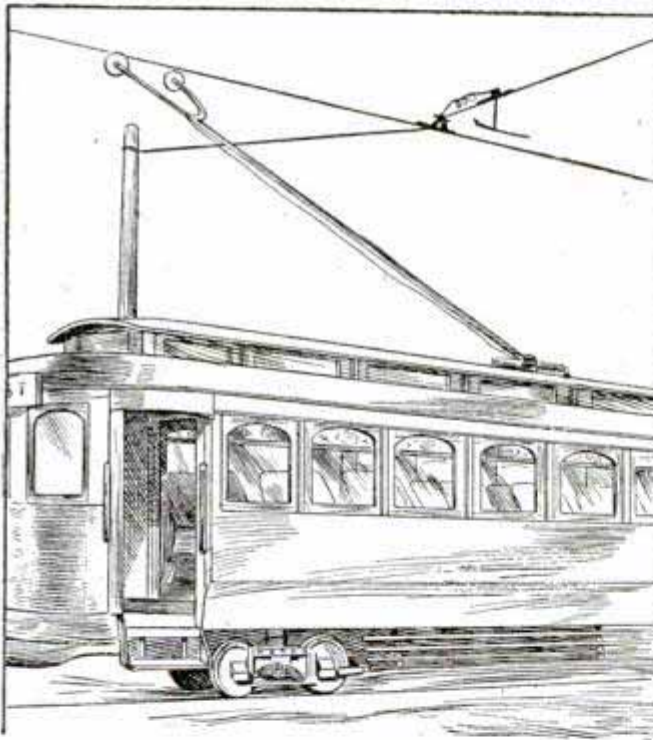
The apartments on the main floor

will be 33 in number. Each state in the southern council will have an apartment. There are 33 degrees in Masonry and each room will have separate symbols and emblems, representing each degree. Each one of the 33 states represented in the Supreme Council will be represented by a coat of arms. Each room will so communicate with the adjoining rooms that it will be possible when occasion requires to throw them all into one, which will lead to the council chamber of the 33rd degree.

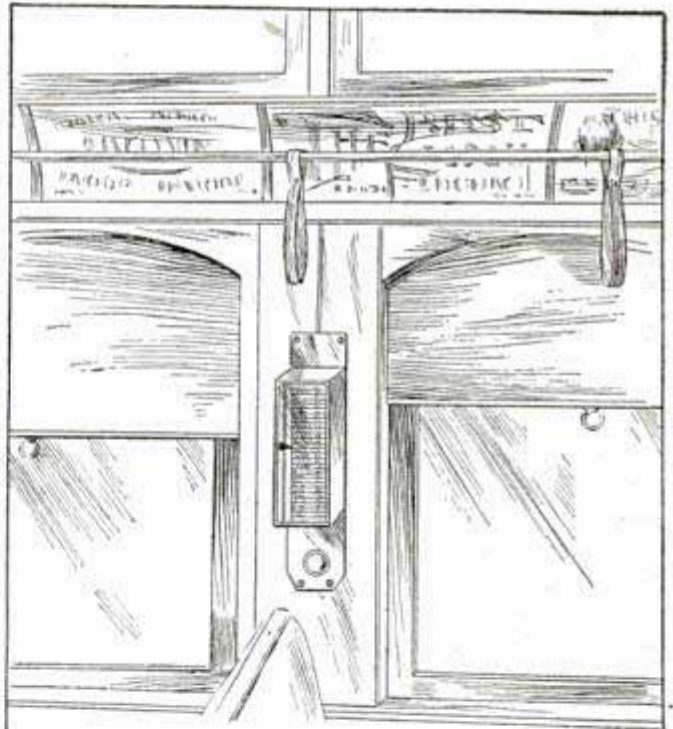
The crowning glory of the interior will be the cathedral, or temple, which

will occupy the entire upper floor of the building. It will represent a symbolic hollow cube 75 ft. square, rising to a height of 75 ft., surmounted by the curved interior of the golden dome. It will be lighted by a great circular skylight, 25 ft. in diameter.

In what is known in Masonic circles as the "grand east," where the great dais of state of the sovereign commander is placed, and rising above the columns, will be another great golden sunburst flashing from the symbolic double eagle and triangle of the 33rd degree at the entrance to the temple.



The Sub-Trolley Arrangement



Appearance of Indicators

## STREET INDICATORS FOR STREET CARS

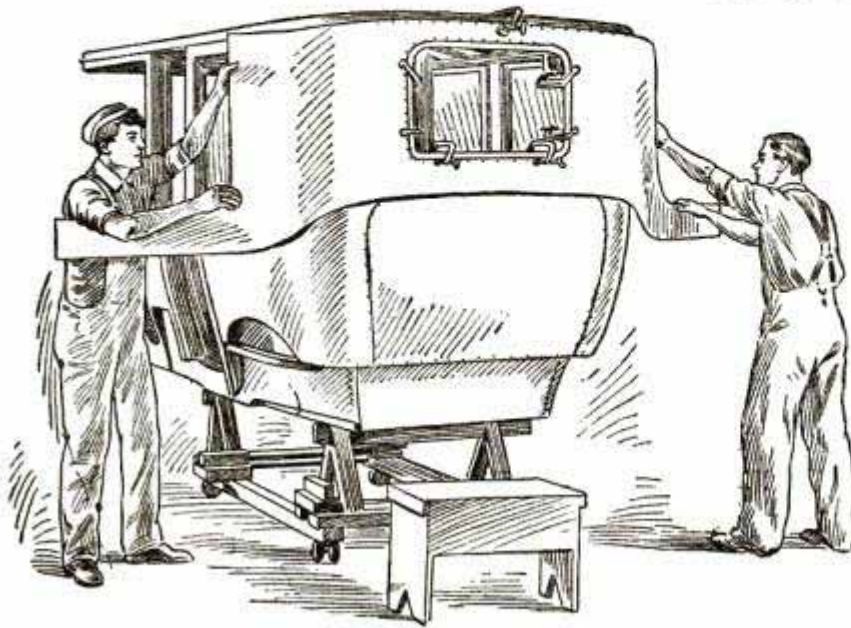
Several mechanical street-indicating devices for street cars have made their appearance from time to time, but the system here illustrated is different from the others in that the indicators are placed in the front and rear vestibules and, inside of the car, between the windows. The sliding pointers, operated by electricity, move automatically to the name of the street being ap-

proached. All that is required of the conductor is to change the cardboard faceplate at the end of each run.

The automatic action of the pointers is made possible by means of a small sub-trolley, attached to the main trolley pole. This sub-trolley engages a short section of sub-trolley wire when an intersecting street is crossed, thus closing a circuit

## SHIPPING LIVE FISH IN SEALED JARS

Following the plan adopted by the large transatlantic liners of keeping fish intended for the table alive in



Making Aluminum Auto Bodies

tanks until needed, an American firm is testing the possibility of shipping live fish from one country to another. A trial shipment was recently made on a German liner from New York. The method of shipping is this: The jars are filled with water, sealed and placed in large tanks. Here the jars are uncovered and compressed oxygen forced into them. The fish are then placed in the jars, which are again sealed. It is believed enough oxygen can be forced into the bottles or jars to keep the fish alive during an ocean voyage of ordinary length.

## AUTOMOBILE BODY CONSTRUCTION

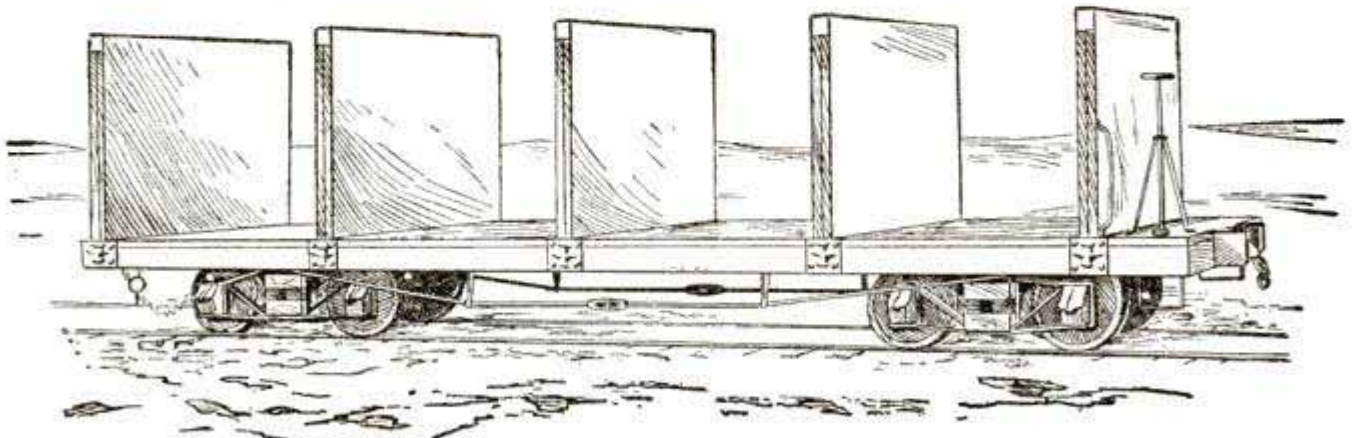
The method of automobile body construction as applied in a Detroit plant, one of the largest in the world, is clearly shown in the accompanying illustration. The body material is aluminum, which is bent onto the frame as shown.

## MAY COOK FOODS WITH HOT AIR

During a recent convention of bakers in London an apparatus was demonstrated which utilizes superheated air for cooking purposes. The steam of an ordinary kitchen boiler is conveyed in pipes to the superheater, where in a series

of coils above a coke fire, its temperature is raised to 1,000 deg. F. without increasing the pressure. Passed through the hollow rods of a griller, the air quickly raises the metal to the same temperature as itself, and then anything can be cooked from a steak to biscuits.

The inventor believes that the kitchen of the future will have no blazing fire, and that everything will be cooked by the turn of a valve admitting the heated air. The air, after passing through the hollow grillers, can be further utilized for heating rooms.



SPECIAL CARS FOR SUGAR CANE

Fifty specially constructed cars have been shipped to Peru by an American car concern for the transportation of sugar cane. Bulkheads, 5 in. thick, are spaced 5½ ft. apart to facilitate the unloading, and are plated with ½-in. steel on each side.

## COMBINED SHUNTING LOCOMOTIVE AND CRANE

A locomotive designed for shunting work and provided with an eight-ton lifting and sling crane is being built by a British firm. The crane is carried on a table erected over the boiler, immediately in front of the firebox, and is arranged to swing clear of all mountings. A winding barrel, supported between the sides of the crane jib, is driven by means of a single-purchase gearing from a vertical shaft, passing up through the center of the crane table. Power for this shaft is provided by a two-cylinder hoisting engine, carried astride the boiler immediately in front of the crane. The two-cylinder vertical sling engine is placed between the cab front and the crane table.

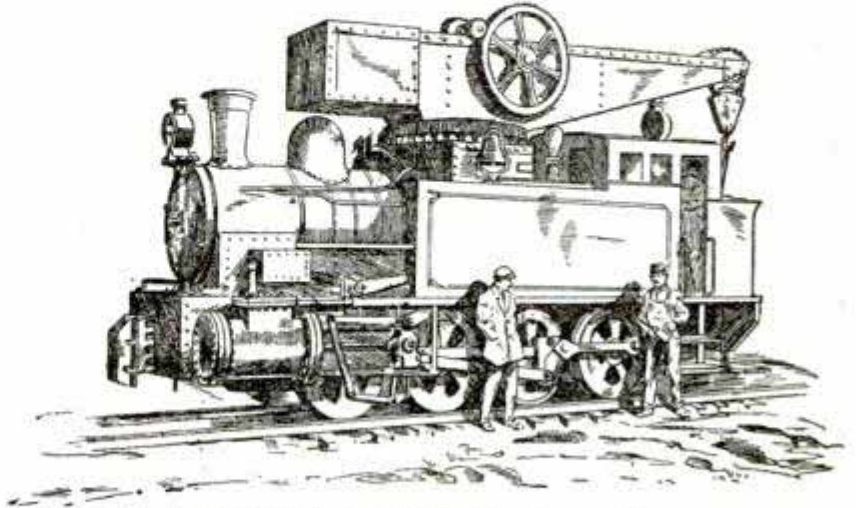
The feature of the outfit is the successful provision of sufficient stability to raise a weight of eight tons at a radius of only 16 ft., while preserving the essential characteristics, such as the closely coupled wheels, of a shunting engine.

## U. S. PRINTER'S TYPE WOULD ENCIRCLE WORLD

More than 3,000 tons of type metal were used in composition at the Government Printing Office during the past year. If this type were laid end to end it would reach 31,000 miles. Composed in the regulation document page of 10-point type, it would be more than 980,000 pages. One hundred and two 30-ton cars would be required to remove the year's supply of metal. An average of 11,500 galleys of type await return to the various government departments. While about 4,000 are undergoing the usual routine of assembling, correction, and composition, 38,000 document pages are in hand partially completed.

## SPOUTING WELL STARTLES FLORIDA TOWN

An intermittent, spouting, geyser-like stream of water that suddenly commenced to issue from a well on the



Eight-Ton Crane or Shunting Locomotive

edge of a lake, ascending sometimes to a height of 30 ft., startled the citizens of Orlando, Florida, recently. State Geologist E. H. Sellards, after careful examination, believes the geyser-like actions of the well were caused by compression of air which entered the mouth of the well with the water from the lake. He pointed out that the top of the well, which is 260 ft. deep and 12 ft. in diameter, was a few inches below the level of the water in the lake and received water at only about one-half its capacity. This meant that a large amount of air was taken into the well with the water, which evidently escaped into a chamber along the side or at the bottom. The air is forced into this chamber under pressure, until the pressure ultimately becomes so great that the air rushes out with considerable force carrying a column of water with it. The spouting occurs at intervals of about five minutes.

⌘Taxicabs have been introduced in Singapore, a rate of 40 cents, Straits currency, per hour being charged. This is about 24 cents, U. S. currency. Singapore money values fluctuate with the price of silver, the Straits dollar being worth about \$0.60, U. S. currency.

## AUTOMATIC AIR AND STEAM COUPLER

An automatic coupler, which is attached underneath the car coupler, and connects the air-brake hose, steam line,



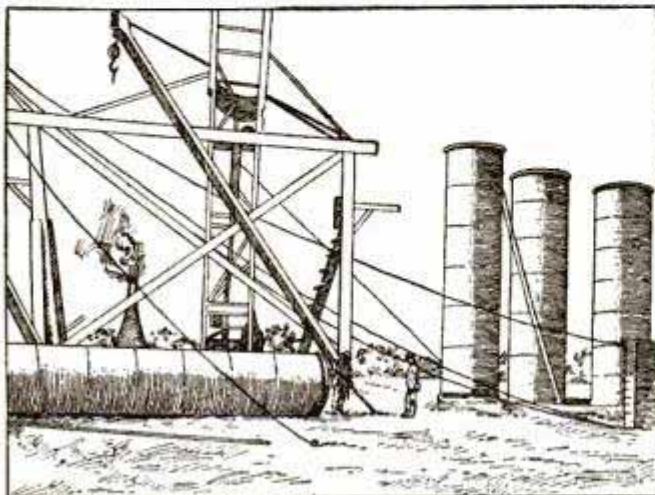
Coupler Devised to Prevent Accidents

and signal has just been invented by a Portland, Ore., engineer. The uncoupling is accomplished by the pulling of the cars apart. All parts such as valves, spring, pipes, etc., are of standard size and such as are now being used by the railroads. It can be used with the standard car coupling.

A number of automatic coupling devices have been invented, but, according to the Interstate Commerce Commission, none of them has proved sufficiently practical for general utilization. The list of railroad employes killed and injured every year through the necessity of getting between cars to make connections is large.

## SEVENTEEN-TON CONCRETE PIPE SECTIONS

What are said to be the largest sections of concrete pipe ever made are being used in the construction of a sewage-disposal plant for Toronto,



Largest Concrete Pipe Sections Ever Made

Ont. These sections are 24 ft. long and 5½ ft. in diameter and weigh 17 tons each. They have steel flanges at the ends and are bolted together.

Toronto's sewage-disposal plant, which will be completed in 1911 at a

cost of \$2,400,000, will take care of the sewage now poured into the bay at the rate of 30,000,000 gal. per day. The work, which was started last year, includes 14 miles of sewer and a disposal plant consisting of 24 settling basins having a capacity of from 40,000,000 to 60,000,000 gal. per day.

## JAPAN FACES PROBLEM IN FORMING AN ALPHABET

The matter of adopting a new form of written language is agitating the scholars and business men of Japan, and a number of proposals have been made that would simplify the present system of symbol writing that has been handed down to the present-day Japanese from their forefathers of thousands of years ago. The most favorable proposition yet received is for the formation of an alphabet of 47 letters which will include all the Roman characters, a number of Russian and a few original ones. At present, the ideographic system of writing, made up of symbols inherited from the Chinese and Koreans from whom the Japanese obtained their early civilization, still prevails. In the eighth or ninth centuries there was added to these forms another system of writing known as "Kana," which represents the sounds of which a word is composed rather than a whole word or phrase as is the case with the Chinese. Almost all Japanese books are printed in a mixture of Chinese and Kana. According to this system each individual word

has its separate sign. Most characters are obtained by means of combination, the chief element being termed a "radical," because it gives a clew to the signification of the whole. It is much as if, having in English special hieroglyphic signs for such easy, everyday words as "tree," "house" and "box," we were to represent boxwood by a combination of the sign for "tree" and the sign for "box," and a box at the opera by a combination of "house" and "box."

The adoption of new symbols does not carry with it any reconstruction of the language itself.

### MONORAIL CAR WRECKS AN AUTOMOBILE

A collision between a monorail car and an automobile, which took place in New York recently, wrecked the auto without damaging the car. A curious feature of the occurrence was that the operation of the car line had been discontinued because of accidents in the past, and at this time a series of tests was in progress to demonstrate that sufficient precautions had been taken to avoid accidents in the future. The automobile, which had two occupants, was running across the track

### SELF-ILLUMINATING PENCIL

An electrically lighted pencil for persons who sometimes have to write in the dark is one of the latest novelties in writing implements. The holder of the lead is provided with a source of electric supply and a tiny bulb, which throws a circle of light on the paper around the point.

The pencil is adapted for the use of physicians, newspaper men, policemen, and for workers in other branches of industry who find it at times necessary to make notes while on the street at night or in darkened rooms.



### HYDRAULIC BRAKES FOR AUTOMOBILES

An English method of applying brakes to all four automobile wheels by means of hydraulic pressure is shown in the accompanying sketch. When the device is operated, pressure is conveyed through the tubes leading from the fluid reservoir to the ram cylinders, and by acting on the toggle

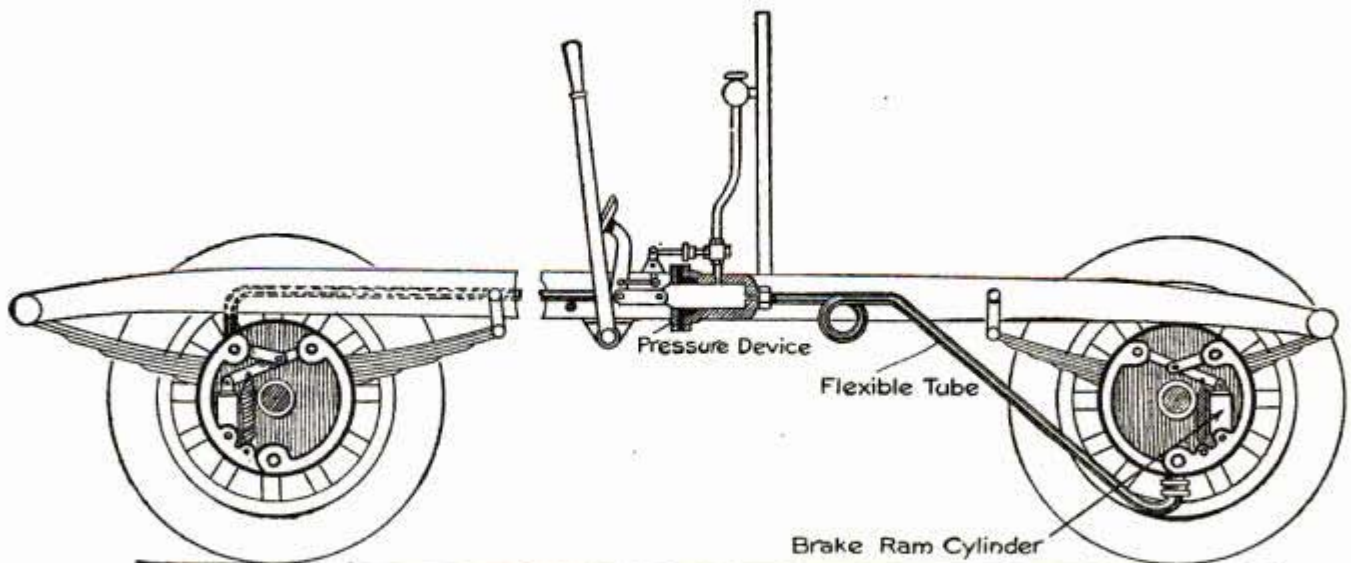


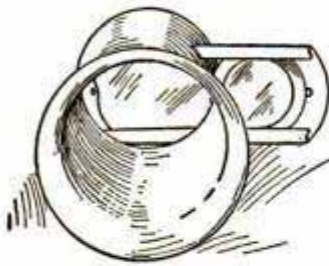
Diagram of Hydraulic Auto Brakes

when the car crashed into it. The sharp steel point of the car pierced the tonneau.

connections between the ram cylinders and the ends of the brake shoes, expands the latter.

### IMPROVED WATCHMAKER'S EYEGLASS

A mere shake of the head changes this improved eyeglass for watchmakers from a single to a double lens. When only one lens is needed, the secondary lens is held in a slide extending out from the loop, and a shake of the head, as before mentioned, is sufficient to cause it to slide into the loop, when its service is required.



### PHILIPPINE WOODS FOR THE CHINESE EMPEROR'S TOMB

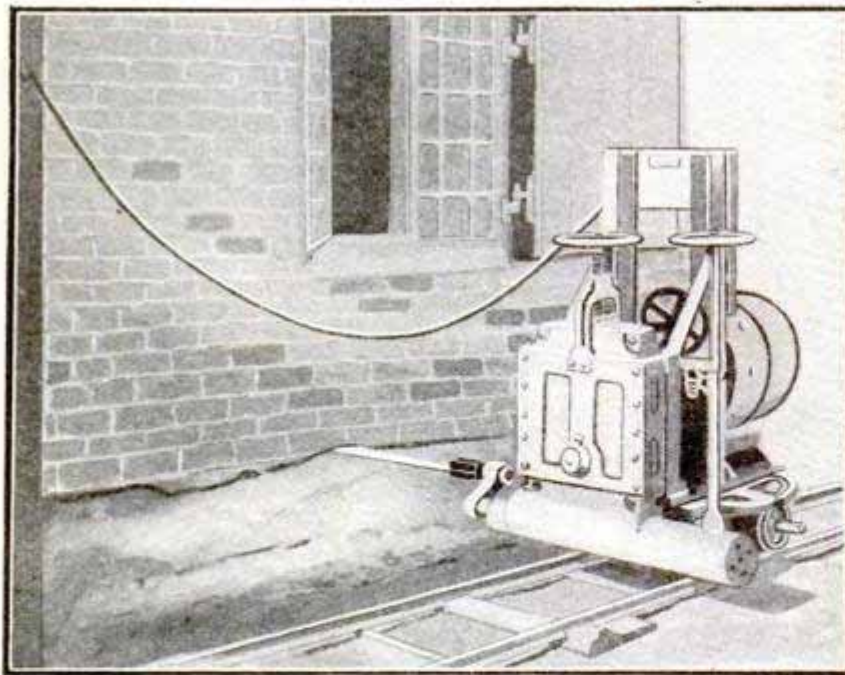
The tomb of the late Emperor of China will be built largely of hard woods from the Philippine Islands. Orders have recently been placed with a Manila lumber firm for 50,000 ft. of Philippine walnut, narra and lumbayo. The framing timbers of the mausoleum will be made of the walnut, giant trees on the island of Mindanao having been

are to be used for the interior finishing. Narra is said to be the most beautiful hard wood in the world. It is of the same quality and texture as South American mahogany, but is a reddish brown in color and takes a brilliant polish.

### BLIND COUPLE AS TELEPHONE OPERATORS

A telephone exchange at Bloomingville, Ohio, is conducted by two operators who are totally blind. The blind operators have been in charge of the switchboard almost a year and during that time there have been practically no complaints of the service given by them. The switchboard they use is of the ordinary type, with the addition of a bar that is attached below each row of drops, on which are raised figures which the blind operators touch to determine the numbers and make connections.

### WALLS MADE DAMP-PROOF BY NEW PROCESS



Making a Wall Damp-Proof by Inserting Sheets of Felt-Covered Lead

An English inventor has designed a machine and originated a process for making old walls damp-proof which has become popular among British house owners. The walls can be treated without disturbing the occupants of the houses and very little debris results from the system. The machine cuts a half-inch seam through the wall near the foundation and into this opening sheets of lead covered with asphalt felt are inserted. The walls are then wedged and the seams filled with cement. The machine has been used in churches, houses, barracks

and government offices, and has been found to work well in almost every case. The insulation used against dampness has given most satisfactory results.

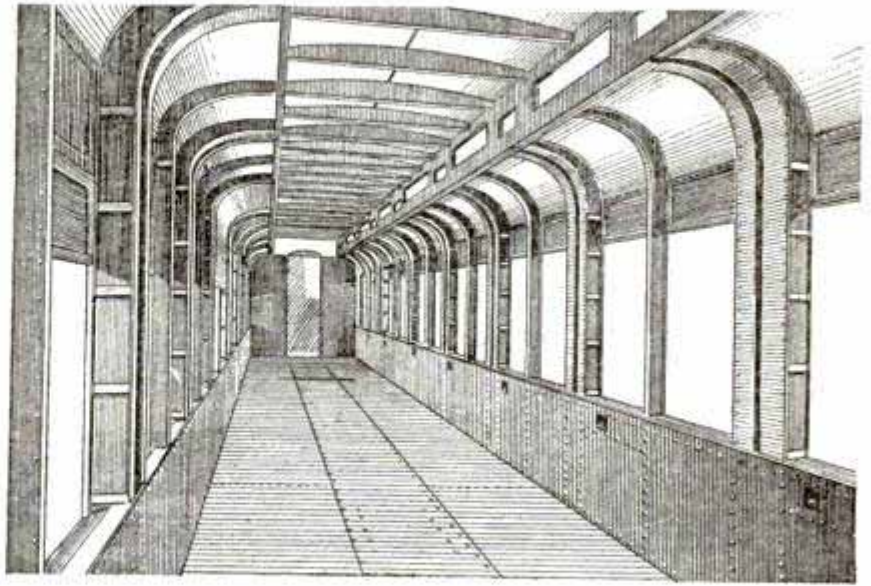
selected for the purpose. Some of the timbers will be 60 ft. long by 45 in. in diameter and will weigh 17 tons each. The narra, which is also known as "Philippine mahogany," and lumbayo



## LIGHTWEIGHT ALL-STEEL PULLMAN CARS

The first steel passenger cars were so heavy as to cause doubt in the minds of railroad motive-power and operating officials as to their general practicability, but the weight has been gradually reduced without sacrifice in structural strength.

The bodies of the new all-steel Pullman cars for the Pennsylvania system average 100,000 lb. in weight, and the two trucks 43,500 lb. As a result, the total service weight is only from 12 to 15 per cent greater than that of the standard wooden sleeping-cars.



Framing of an All-Steel Sleeping-Car

## WIRING OLD HOUSES

Wiring old houses for electric lights does not demand the marring of woodwork and tearing up of floors, walls and ceilings. Instead, the electrician may enter the average house and wire



The "Snake" at Work

it completely without causing near the trouble and dirt that painters, paper

hangers, and carpenters are responsible for.

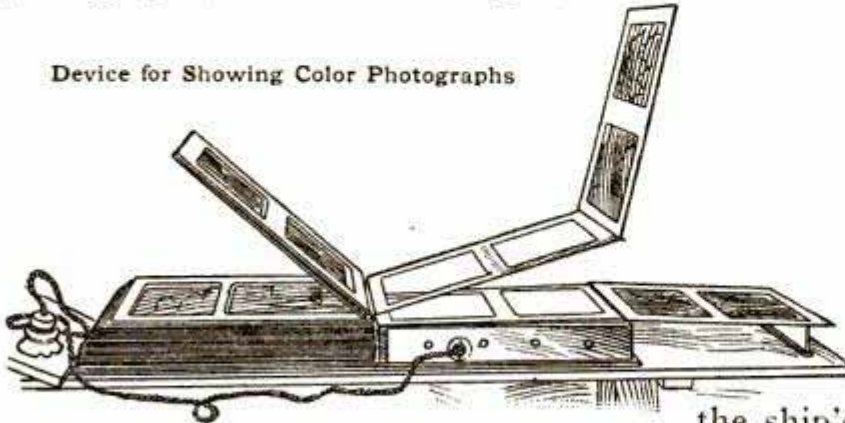
It is done by a clever system of "fishing" wires up and down through the walls by means of a thin steel tape called a "snake." The wires usually enter a house through the basement. One electrician will probably take up a single board from the attic floor near the wall. Then he will insert the "snake" and wiggle it up and down until it finds a clear drop to the basement, where it will be caught by a second electrician, who will tie the wires to it and signal for them to be pulled up. In exactly the same manner, other wires are fished up and down the walls and under the floors to the little holes in the plaster where the fixtures are to be located. Sometimes it becomes necessary to remove a section of baseboard to fish the wires under hardwood floors to the fixture holes in the ceilings, or to take up a section of floor in a closet, but the "snake" always accomplishes its task.

⌈The crossing policemen in Grand Rapids, Mich., have been supplied with copies of the city telephone directory, which are placed in especially made boxes, furnished by the telephone company and attached to its poles at each street corner.

### ILLUMINATED ALBUM FOR COLOR PHOTOGRAPHS

Photographs in color, made possible by the new color-photography, cannot be printed on paper as can ordinary photographs, but are transparencies

Device for Showing Color Photographs



which must be held up before the light before the subjects can be seen. By an ingenious arrangement of double leaves, a French inventor has devised an illuminated album by which such photographs may be examined with as much ease as ordinary photographs in an ordinary album. Two electric lamps are placed in a glass-covered box, and the double leaves containing the photographs are placed in turn over this glass.

### THIEVES DECEIVE POLICE WITH DUMMY SAFE

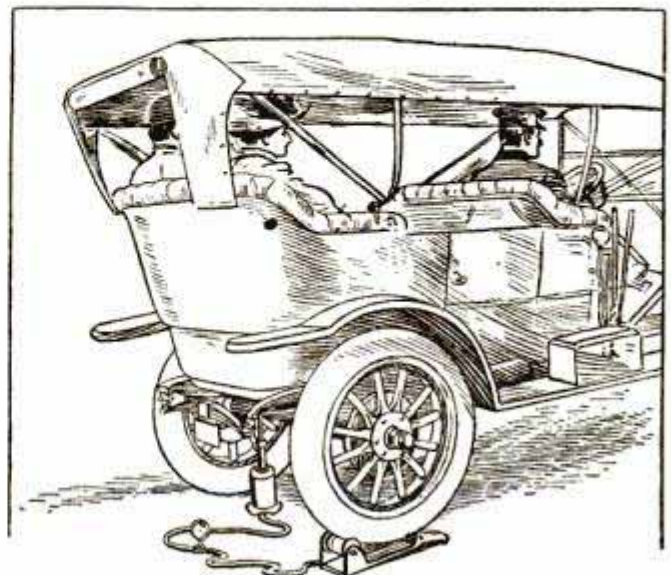
Ingenious English thieves recently removed a safe from a branch post office, leaving a dummy in its place so that the absence of the real article would attract no particular attention from the police who were watching the building. The real safe was removed Saturday evening from the well lighted room in which it was kept and the robbery was not discovered until Monday morning when the manager of the office, who was also proprietor of the business establishment in which the post office branch was located, opened his store. The dummy was made of wood and canvas and was an exact reproduction of the real safe. The latter was found in the basement of the building where it was rifled by the thieves by blowing out the back.

### CUT HULL TO RESCUE MAN FROM DEATH

Imprisoned for two hours in the stoke hole of a capsized steam dredge in Dover harbor, England, a stoker was rescued by cutting through the steel hull of the vessel, after the water had risen to the height of his neck. The man was unable to escape when the dredger turned turtle in a heavy storm but made his presence known by rapping on the steel hull with a hammer. He was jammed between the boiler and the ship's side and both his legs were broken. As soon as he could be located the blacksmiths attached to the dredge cut a hole through the heavy steel plates that formed the hull and the imprisoned man was taken out.

### WHEEL-DRIVEN AUTO JACK

Among the numerous automobile accessories adapted to relieve the autoist of much of his hard labor is an air-pump which derives its power from one of the rear wheels by means of rollers. The wheel is backed upon the rollers, and these rollers operate the piston of the pump when the wheel revolves. The illustration shows this pump being used to raise the opposite wheel with a pneumatic jack.

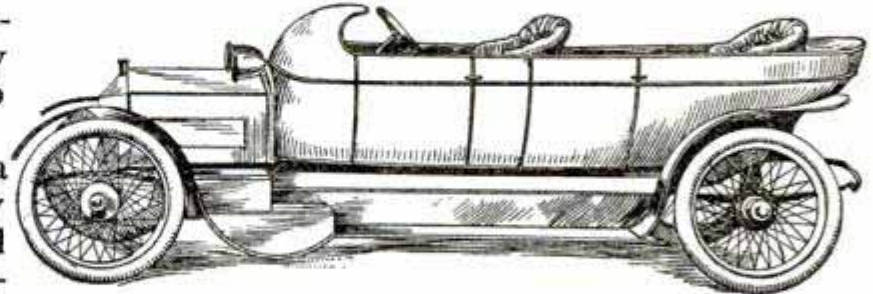


Making a Car Raise Itself

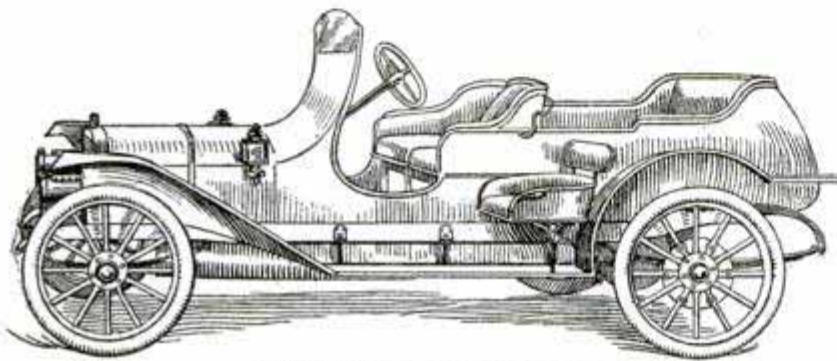
## TWO 1911 AUTOMOBILE DESIGNS

Two interesting designs in automobile-body construction for 1911 are shown in the accompanying illustrations. In one the wind shield is incorporated on the body as part of the permanent construction. The back of the body is of the familiar torpedo type.

The other design shows a tendency to break away from the conventional straight sides, and the necessarily straight line of the



Body with Ocean Liner Stern



Wind Shield as Part of Body

frame has been made use of with the required depth of floor framing to obtain a pleasing curve of the body line. The hood extends well over the body to the level of the steering wheel. Unlike the usual type, this body is wider in front than in back, and the latter, instead of being of the torpedo type, has an overhang very much like that of an ocean liner.

## FISH-SCALING BRUSH



The brush is made of steel wire and is surrounded by a metal guard.

In scaling fish with the ordinary knife or scraper, the scales fly in all directions, but with this scaling brush, invented in France, the flying tendency of the scales is hindered.

## LONDON USES 6,000 PUBLIC MOTOR VEHICLES

Recent statistics show that almost 6,000 taxicabs ply the streets of London in place of the 11,000 horse-drawn vehicles of which the city formerly

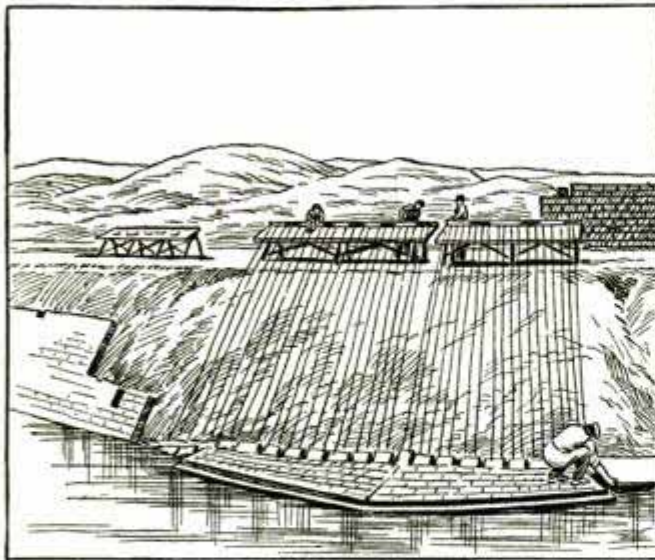
boasted. Motor cabs of all kinds have practically taken the place of horse vehicles in the English capital. There are some 7,500 of the former in the city, of which almost 6,000 belong to the public vehicle class. There are several of the motor-cab companies and the competition among them is keen. The vehicles are kept in good condition at all times

and the average rate is eight pence per mile (about 16 cents). It is stated, however, that, owing to the demand for finer vehicles, the companies operating them have found this rate insufficient.

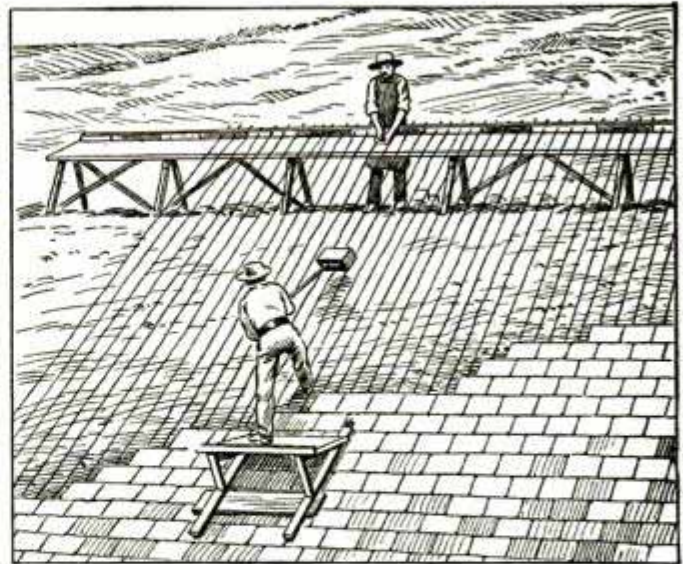
## THIRD-CLASS SLEEPING CARS IN SWEDEN

The Swedish State Railways have introduced third-class sleeping cars. These cars, first used on the route between Stockholm and Malmo, have six berths to a compartment, arranged in tiers of three, the berths being provided with a mattress, blanket, and pillow slip. First and second-class sleepers are also provided.

CA mushroom with a head 11 in. in diameter and a stalk 6 in. in diameter, the whole weighing 1  $\frac{1}{3}$  lb., was found recently near Yverdon, France.

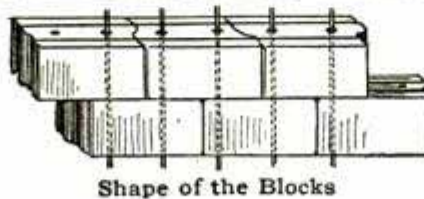


Making a Concrete Block Embankment



Stringing the Blocks on the Wires

**EMBANKMENTS OF WIRED**



Shape of the Blocks

**CONCRETE BLOCKS**

A unique method of concrete embankment construction, in which the concrete blocks are strung on wires, has been successfully used on the River Yonne in France. The idea was originated by an Italian engineer.

The bank of the river is first smoothed to a convenient slope, then the wires are strung the proper distance apart, fastened to a cable at the bottom, and to specially constructed frames at the top. Each frame, 10 ft. long and accommodating 25 wires, is in reality a bench on which the concrete blocks are placed and from which they are slipped onto the wires. The sections of these benches are alternately painted red and white to elimi-

nate error in stringing the blocks, which are made in two shapes and interlock. One shape is fed onto the wires fastened to the red sections of the frame and the other to the sections painted white.

The form of the concrete blocks and the method of operation are shown in the illustrations. When the embankment is completed the frames are removed, and the wires twisted together and wound around piles which serve as anchors. The bottom is held down by its own weight.

The concrete protecting curtain thus made for the slope of the River Yonne extended about 5 ft. below the water line.

**POINTLESS HATPINS**

A pointless hatpin with interchangeable heads has become popular in Paris. Having no point to protrude beyond the side of the hat, it is obvious that the pin will not endanger the eyes of other people. Each hatpin is in reality two pins with one head, the pin part sliding through a star-like fixture permanently attached to the hat. Heads of various designs are provided with each pin.

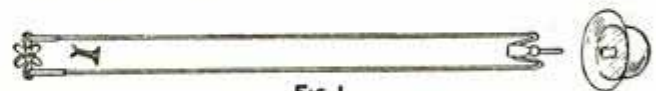


FIG. 1

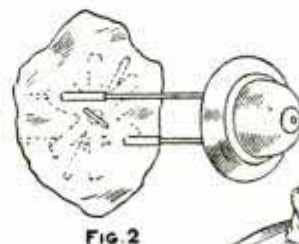
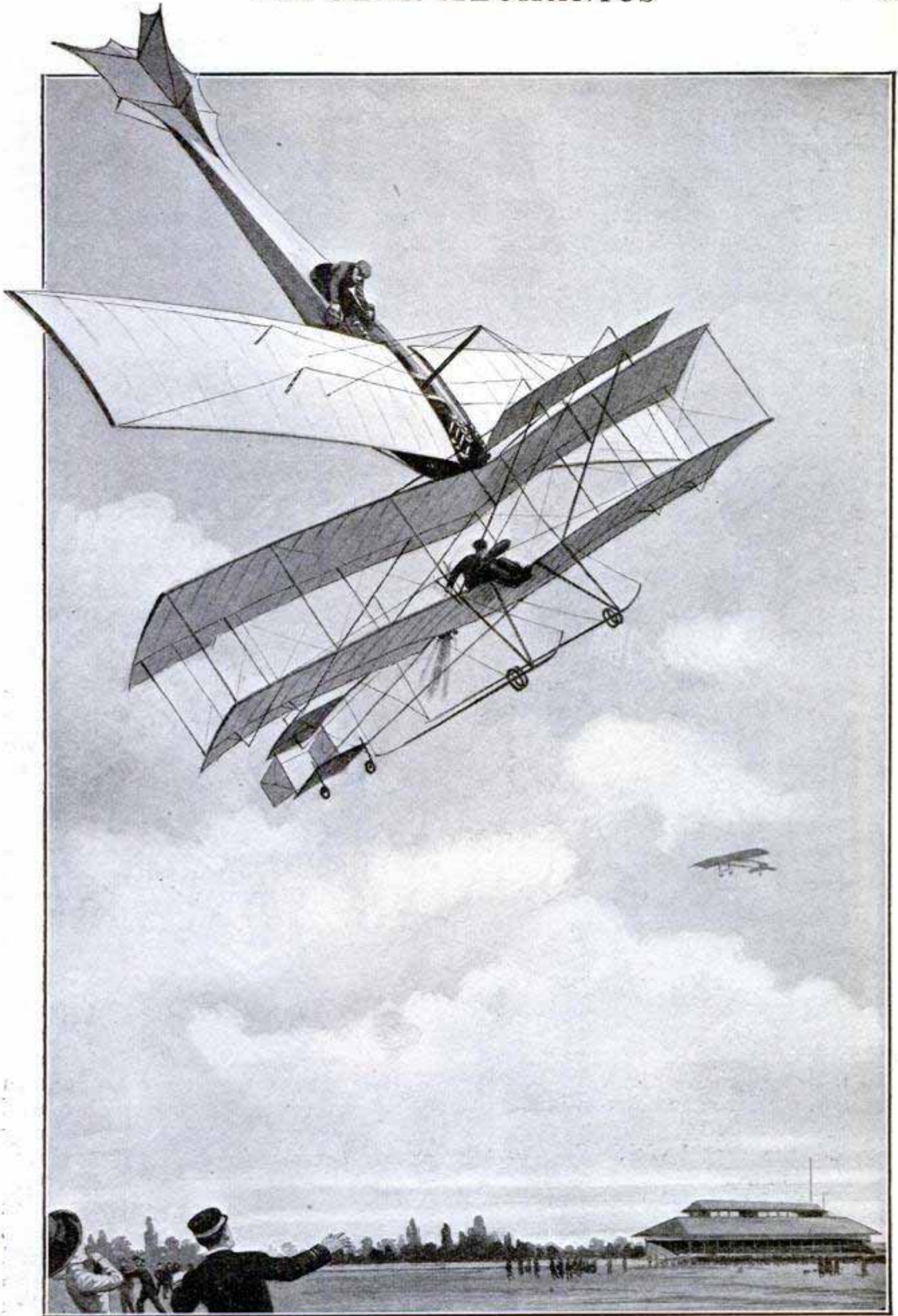


FIG. 2



FIG. 3

Fig. 1, Structure of the New Hatpin—Fig. 2, The Holder—Fig. 3, Manner of Arranging in Hat



#### AEROPLANES IN COLLISION

During a recent aviation meet at Milan, Italy, Capt. Dickson of the British army, in a Farman biplane, and M. Thomas, a Frenchman, in an Antoinette monoplane, collided in the air and crashed to the earth together. Both airmen were seriously injured. This was the first actual collision between airships.

## METAL FROM FRENCH RUINS USED FOR CANAL MEDALS

From old copper, tin and other metals found in the ruins of the buildings and machinery, which were left by the French and mark their failure to build the Panama Canal, experts of the Philadelphia Mint have fashioned handsome medals and bars to be distributed among the employes of the Isthmian Canal Commission as rewards for faithful service. Two years' continuous service makes an employe eligible to receive a medal, and each subsequent two years' service entitles him to a bar setting forth that fact. There are 1,035 medals to be distributed and it is expected that they will be given out with appropriate ceremonies next month.

The medal was designed by Victor D. Brenner, the artist who made the design for the Lincoln penny. It is about the size of a silver dollar. The obverse side bears a relief portrait of the head and shoulders of former President Roosevelt, the model for the work having been especially made at Oyster Bay during the last year of Mr. Roosevelt's administration. It is unique in that it depicts the ex-President without glasses. Around the edge of this side of the medal is the legend: "For Two Years' Continuous Service on the Panama Canal." The reverse side shows a bird's-eye view of the Culebra Cut as it will appear in the finished canal, with steamers passing through. Above the horizon in deeply incised letters is inscribed, "The Land Divided, the World United." Around the edge is inscribed "Presented by the President of the United States." Below the Culebra Cut is the coat-of-arms of Panama, and under it a space is left for the name of the recipient.

## WIRELESS DIRECTORY

With the publication of the government wireless telegraph directory, just

out, some idea is gained of the extent to which the wireless is now used. In this directory, perhaps the most extensive in existence, there are listed 1,520 stations. This total includes shore stations and ships, but does not take into consideration the battleships of foreign governments, nor are listed the

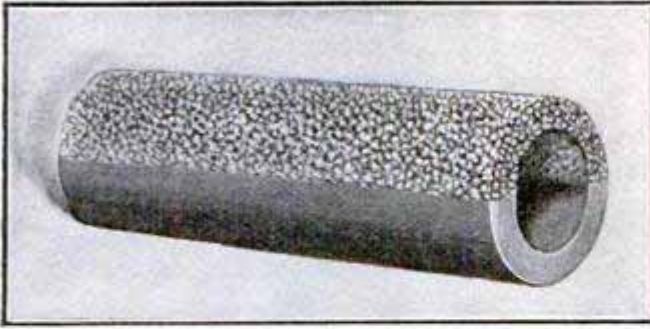


The Panama Canal Service Medal

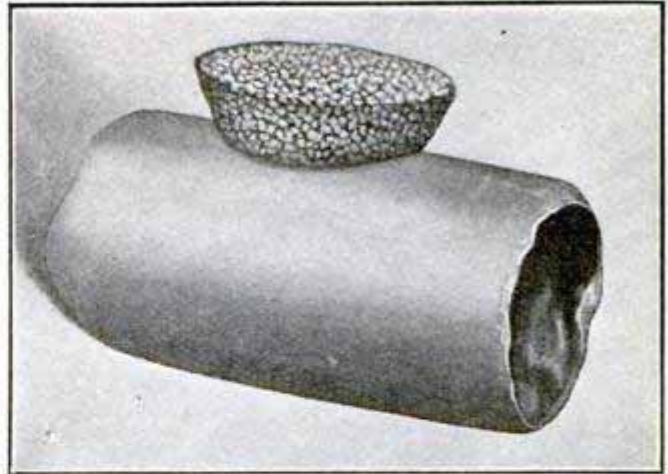
hundreds of stations equipped and operated by amateurs. The directory is the work of the Bureau of Steam Engineering of the United States Navy. There are about 700 shore stations scattered about the globe; of this number 88 are on the Atlantic and Gulf coast of the United States, 48 on the Great Lakes, 51 on the Pacific coast and 16 in Alaska.

## POROUS TILE FOR SUB-IRRIGATION

The porous tile designed for sub-irrigation by an inventor of Austin, Texas, is attracting much attention, particularly in the Gulf coast region of Texas. Experienced irrigationists have long been practically united in the opinion that watering of the soil from beneath is far superior to the surface system of irrigation, but in the absence of any practical method of distributing the water into the ground, comparatively little progress has been made in that direction. The tile which the Texas man has invented is of two kinds and the material used concrete. One is so cast that the upper half is composed of pebbles, which are stuck together by a thin coating of cement, leaving pores between them through which the water



Porous Tile Used for Sub-Irrigation



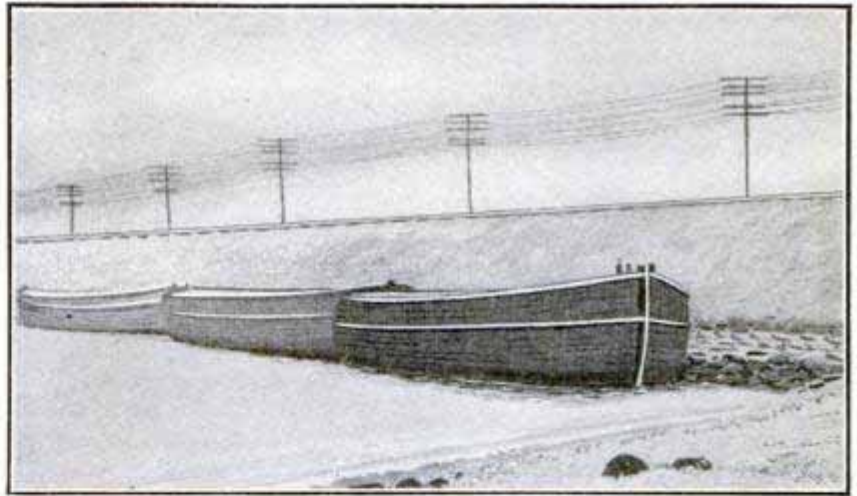
Another Type of Porous Tile

readily passes. The course of these pores is so tortuous, that roots or earth do not choke them and prevent the free distribution of the water into the soil. The other type of tile is solid. A hole is made in it, either on the top or bottom, and into this hole is fitted a diffusion block, composed of the gravel

material and containing pores for the distribution of the water. It is claimed that this system of tiling also serves the purpose of drainage, when the soil contains an excess of moisture.

## EMBANKMENT RETAINED BY OLD CANAL BOATS

In straightening the right-of-way of an eastern railroad, one section encroached upon the edge of a river, in one instance requiring a fill of more than 60 ft. Time was not available to construct a rip-rap or other usual type of retaining wall, so old canal boats, worthless for any other purpose, were utilized. These boats were hauled up on the bank by means of wire cables at bow and stern.



Canal Boats Moored into Position beside Railroad Tracks



Covered with Sand and Rock to Form Part of Railroad Embankment

When the sand fill had been carried out to a sufficient distance, the boats were buried under loads of sand and rock in order to give added stability to the work.

☐ An automatic, coin-in-the-slot gasoline dispenser, to be placed along country roads frequented by automobiles, has been patented by a Dayton, Ohio, man.

## CONSTRUCTING THE WORLD'S LONGEST CANAL LOCK

The longest canal lock in the world is now being constructed at the Soo. Its length will be 1,350 ft. and its width 80 ft., with a depth of  $24\frac{1}{2}$  ft. over the miter sill at low-water stage. At present the Canadian lock across the river, measuring 900 by 60 ft., is the longest. The largest American lock

fourths have already been excavated. In the construction of the lock, about 270,000 cu. yd. of concrete will be used. It is expected that the concrete work will be started next spring and the walls completed in two years.

A few weeks ago, work started on the upper approach to the lock. This will be a mile long and cost more than the lock itself. The total cost of the undertaking is estimated at \$6,000,000.



Present Appearance of Davis Lock Pit

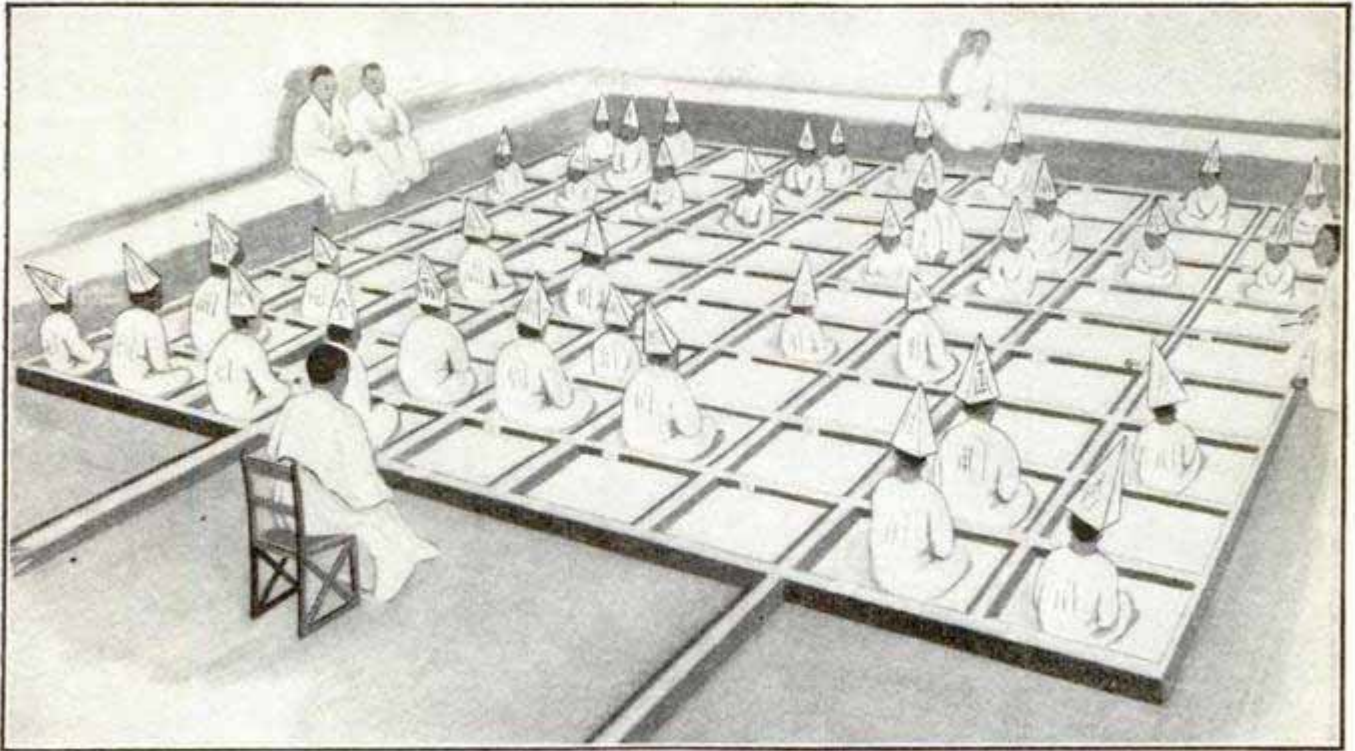
now is the Poe, which is 100 ft. shorter than the Canadian, but 40 ft. wider. In the new, or Davis, lock, vessels will not be allowed to pass through lying side by side, but only end for end, which will preclude many a chance for accident afforded by the other method, now used in the wider locks.

A photograph of the lock pit shows the work being prosecuted at present. The contract calls for the removal of 400,000 cu. yd., 250,000 of rock and 150,000 of earth, of which about three-

¶The enormous total of 261,400,000,000 tons is the estimate of the amount of coal in the Illinois coal fields. This figure is the result of calculations based upon the area of the coal veins as determined by the state statistician.

¶The German postal authorities are experimenting with an electric subterranean railway system for transportation of mail from the railway stations to the post offices, small locomotives and cars being used.





A Live Game of Chess

### PLAYING CHESS WITH HUMAN CHESSMEN

A strange game of Japanese chess, played with living men instead of ordinary chessmen, drew much attention at Osaka recently. Each man, wearing a white cap and gown, marked with the symbol of a chessman, took his proper place on a huge platform or board, and moved at the command of the two expert players matched against each other. The game was in progress for three days. Moves in chess require deep study, and many hours often elapse between, so the strain on the human chessmen while waiting for something to happen may be imagined.

### REFRIGERATED CASINGS FOR CHOCOLATE COOLING

Refrigeration as an aid in chocolate manufacture is used by a candy factory in Tiffin, Ohio. In the making of chocolate drops and other forms of chocolate-coated candies, the candy is dipped into warm liquid chocolate, and, to cool, requires a temperature of less than 72 deg.

In most factories, such temperatures are obtained by insulating the entire dipping room, but in the process

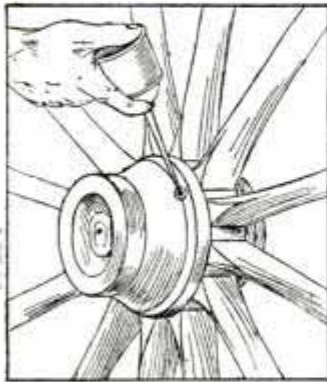
adopted by the Tiffin factory, the chocolates are cooled in closed cases, into which refrigerated air is forced. The chocolates are placed on trays, which are slid into the refrigerating cases at the bottom. There the trays are raised upward by spring-actuated catches and a treadle, until the case is filled to its capacity.



Chocolate Cooling Cases

### SELF-LUBRICATING HUB

A device, by means of which oil may replace grease in the lubrication of wagon and carriage wheels, has been brought out by a Seattle concern in the



form of a self-lubricating hub. The wheel box has the exterior appearance of the usual type, but on the inner surface, in the middle of the wheel, is a groove or channel, in which wool packing is placed. This channel provides a reservoir for ordinary machine oil, and distributes it to the bearing surface as required. A small oil hole runs from the outside of the hub to the inside, through which common machine oil is supplied by means of an ordinary oil can. A small groove around the inside of the box, near the inner end, is fitted with a felt ring, which prevents the entrance of dirt and grit.

The ordinary method of raising the vehicle on a jack, one wheel at a time, removing the wheel, applying the grease, and replacing the wheel, all of which takes considerable time and patience, is made unnecessary by this invention.

### UNITED STATES MAY LEAD WORLD IN CERAMIC ART

That there is a possibility of the United States leading in the excellence of ceramic production is the opinion of M. Taxile Doat, the eminent ceramist of Sevres, France.

"American clays are excellent for the work," says M. Doat, "and I confess that seldom has the cradle of the arts been guarded better by the good fairies than in this country, for one of the finest kaolin clays of the world has been found in Texas. It has given us the most unexpected results in the way of whiteness, translucency and plas-

ticity. It permits us to produce large vases, at least as thin as egg shells, directly from the wheel. To my surprise, this clay is to an extent translucent even before it is baked, and when it comes out of the kilns it is as beautiful as the finest Chinese porcelains, so that it takes rank with the most beautiful material of Sevres, Copenhagen, etc. Nevada also has kaolin just as wonderful as that found in Texas."

### CALIFORNIA TRACKLESS TROLLEY

A trackless trolley line is now in operation in Laurel Cañon, California, running between the Los Angeles Pacific Railway at the mouth of the cañon, and Bungalowland, a new settlement a mile and a half distant, near the Cañon's head.

The overhead wires and their supports look much like those of an ordinary electric railway, but two wires are

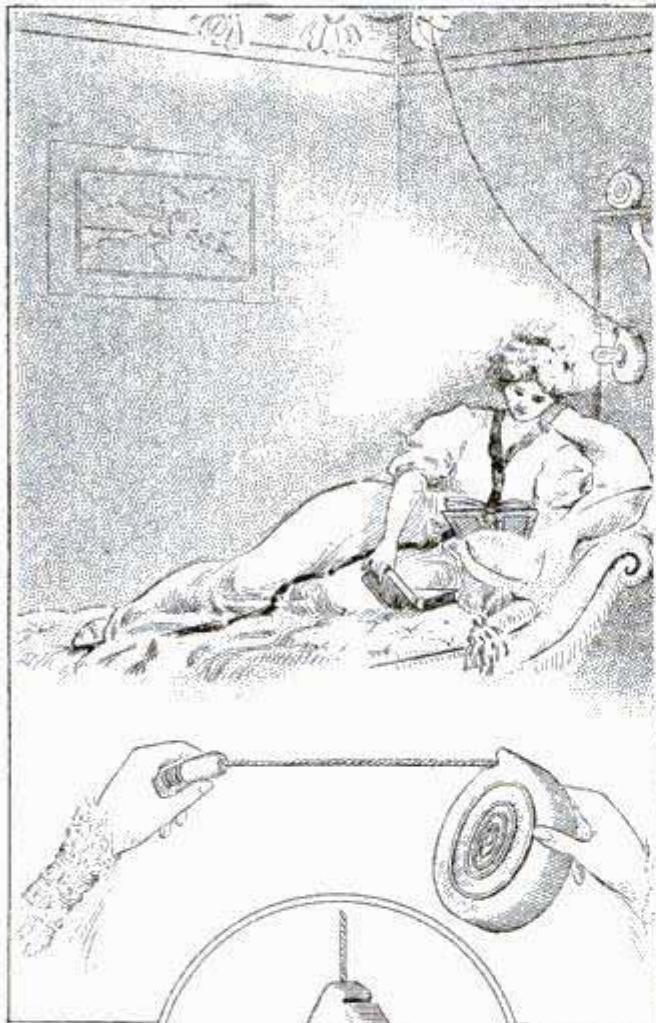


Trackless Trolley Car

required instead of one. Two trolleys are used, and these are so arranged that the car has a latitude of 11 ft. on either side of the road, thus making it possible to turn out for any passing vehicle without breaking the connection.

### PORTABLE ELECTRIC LIGHT

A flexible-wire, portable electric-light fixture, provided with a reel of the type used for flexible steel measures, has been patented. The reel contains about 15 ft. of lamp cord, and the central portion of the reel case has a lamp socket on one side and a crank for winding the cord on the other. The provision of the reel makes the flexible wire connection adjustable to any length and takes care of the surplus wire in a neat, compact manner.



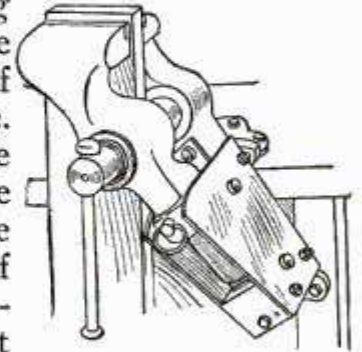
One Use for  
Fixture

Flexible  
Reel

Method of Attaching Bulb

### NEW SWIVEL VISE

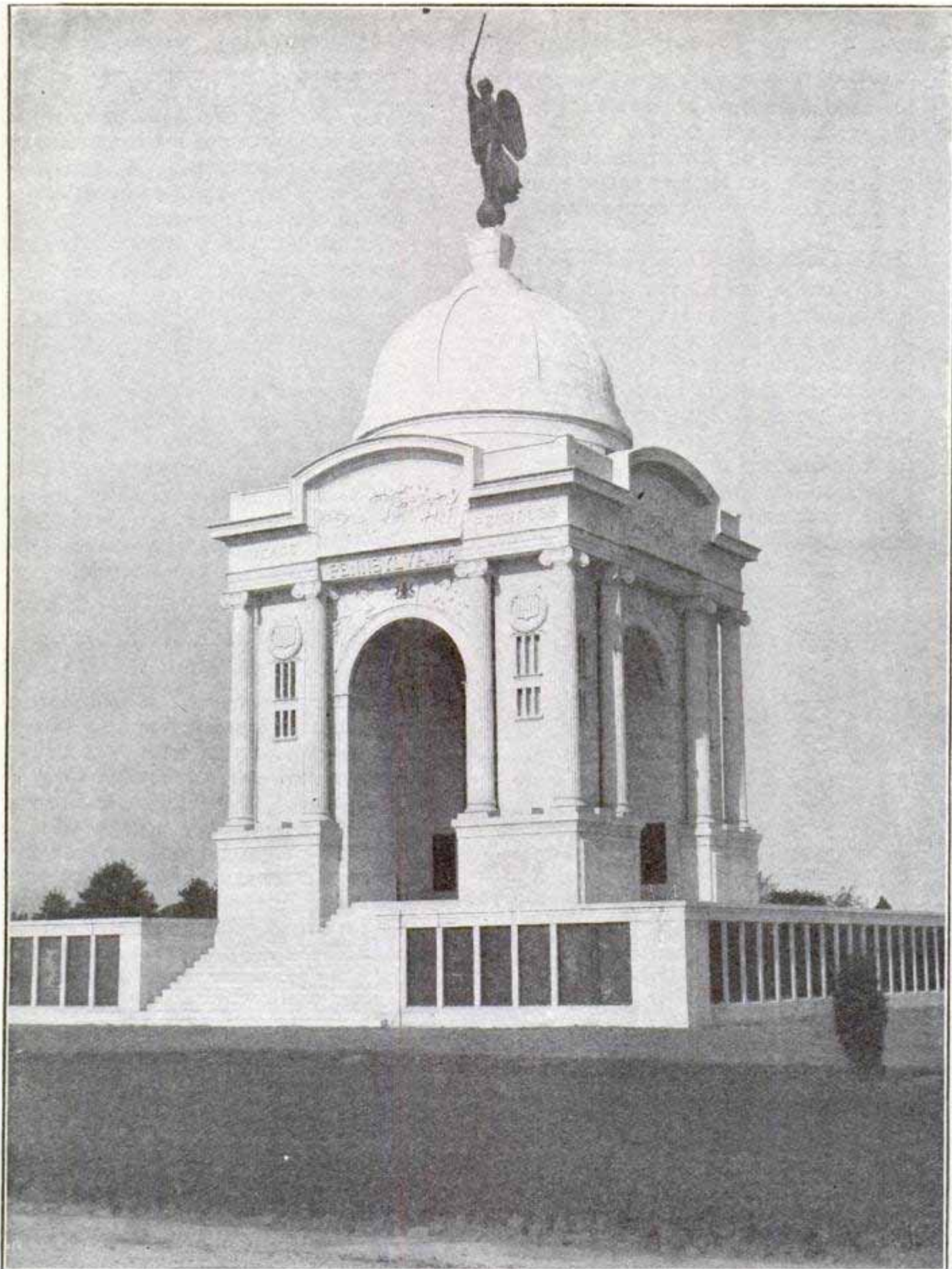
A vise that will grasp pieces of work too long and awkward for the ordinary vise is here illustrated. It is so designed that it may be fixed at an angle instead of having to remain in the upright position of the ordinary vise. Consequently the screw and the bottom part are out of the way of the work. A second important feature is that the outside jaw can be turned on a ball-and-socket joint by removing the pin shown just below the handle. This turning jaw makes possible the holding of taper work.



### LONGEST SUBMARINE CABLE IN THE WORLD

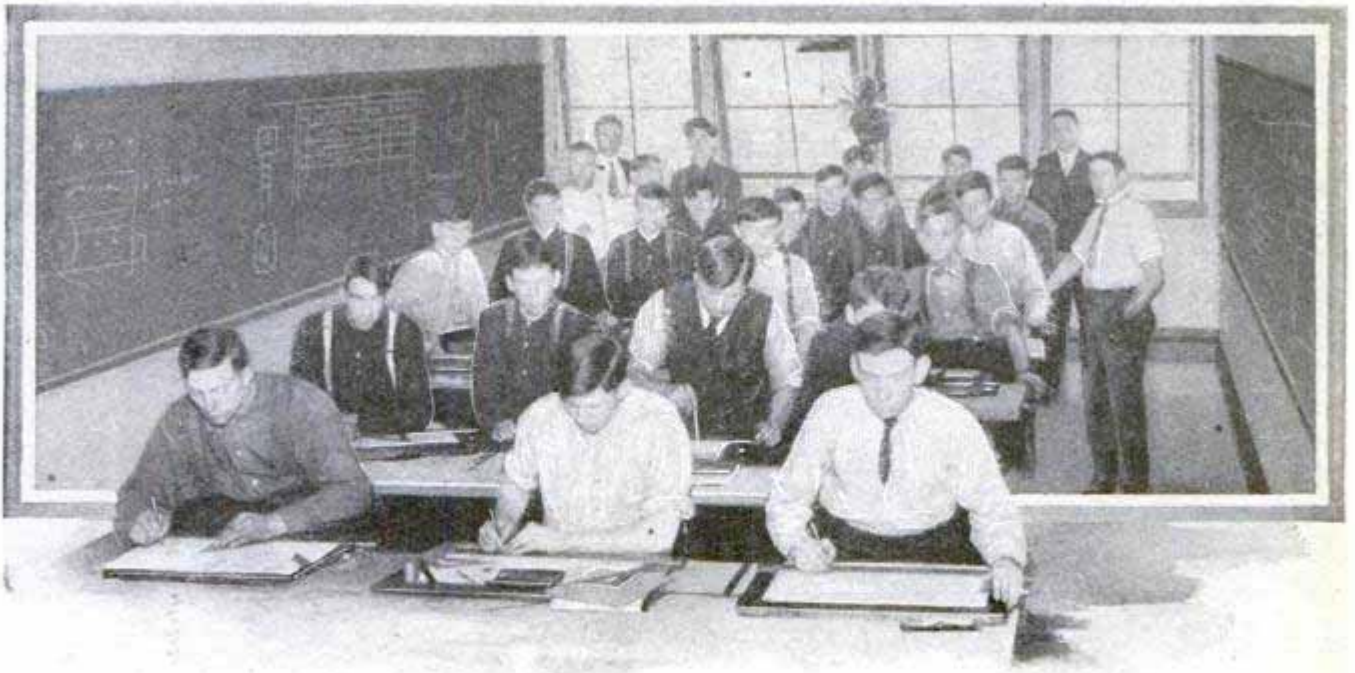
The longest stretch of submarine cable on earth connects Fanning Island in the South Pacific, with Vancouver Island on the coast of British Columbia, a distance of 4,000 miles, and forms a part of the recently completed all-British cable from London to Australia and New Zealand. The company controlling the line is now able to send messages direct with but one re-transmission, from Montreal to Fanning Island. Thence messages are sent on to Suva, in the Fiji Islands, and from there to Norfolk Island, where the messages for Australia are sent to Brisbane and those for New Zealand to Doubtless Bay. The new cable reduces the time for the transmission of dispatches 15 minutes. It is now proposed to build a government cable across the Atlantic and thus have the British empire bound together by a globe-circling girdle of cables.

¶ In deciding bagpipe competitions in Scotland, the judges have resorted to the use of a three-sided roofless shed, in which they sit with their backs to the competitors so that they can hear but not see them.



#### PENNSYLVANIA STATE MEMORIAL AT GETTYSBURG

**A**N imposing tribute to the memory of the sons of the Keystone State who fell on the battlefield. Erected at a cost of \$140,000, it is the most elaborate monument at Gettysburg. The name of every Pennsylvanian who fought in the battle is recorded on tablets of bronze at the base of the memorial. Its total height is 108 ft., and the "Angel of Victory," surmounting the monument, is 20 ft., 5 in. high.



Class in Mechanical Drawing in Westinghouse Training School

## Training Young Mechanics in Versatility

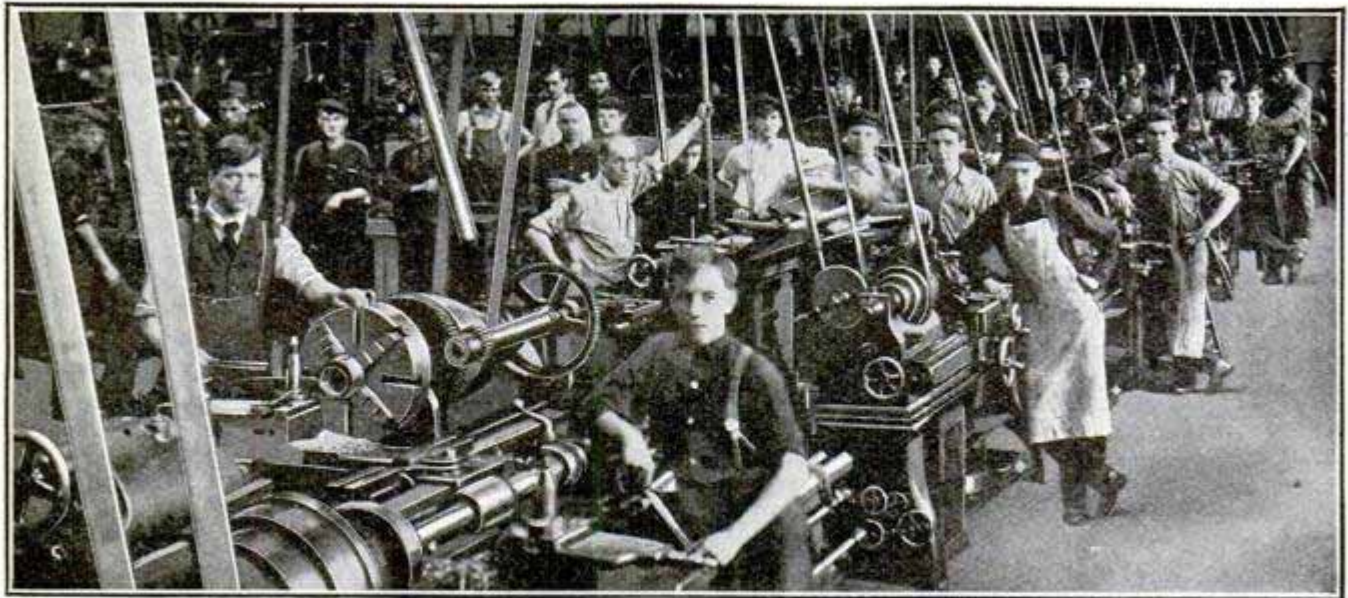
By HARTLEY M. PHELPS

**T**HE industrial establishments of the United States are suffering from a lack of trained, skilled mechanics. Ever since the close of the Spanish-American war, which marks the beginning of a period of phenomenal growth and prosperity for this country, the number of machinists and other artisans has grown steadily less, proportionately to the demand, until the problem now assumes a vital aspect.

Demand has outgrown supply, and to meet this situation, many large corporations, such as railroads and steel and electrical manufacturing concerns have been forced to establish training schools in mechanics and open night schools where instruction under practical men working in the shops is given young apprentices desirous of learning the various trades upon which these great industries are built. That these schools are thoroughly practical is attested by the fact that the learners are paid for their time, thus enabling poor boys to master a trade; something that

would be next to impossible did they not receive their bread and butter wage while learning. Among the leading corporations to establish such schools are the Baldwin Locomotive Works, the New York Central lines, the Pennsylvania railroad, the Northern Pacific railroad, the Westinghouse Electrical and Manufacturing company, the American Foundry and Machine company and the Allis-Chalmers company.

The officers of these companies say they were driven to this step by necessity. They point out that there are few "secondary" technical training schools in the United States, schools that train the subordinates on whose efficiency industrial supremacy rests. While the country has an abundance of technical colleges and universities of the first class, graduating leaders in industry such as engineers, it is woefully behind such nations as Germany where fine technical schools for the subordinate man are to be found in every part of the empire. And, parenthetically it may be observed, the extraordinary



Apprentices in the Machine Shops

commercial development and prosperity of Germany in the last decade is due to just these schools—and others—which turn out every year an army of highly trained workers. But in Germany, and in fact all over Europe, the product of such institutions is a “machine specialist,” a man who has been educated in one restricted branch of the machinist’s trade, for instance, and who can not, therefore, be transferred to another shop where a different branch of the work is carried on. In other words the foreign-trained mechanic is not versatile.

It is just this versatility in its workmen that the industrial establishment of America demands. The versatile employe is of more use and value both to his employer and to himself than a “machine specialist.” When there is a rush of work in one particular shop, men from another can be transferred there. This precludes the employing of new men who may at the same time be “green” men, a process entailing loss to the company in money and time, not to mention the uncertainty of being able to procure such men when they are wanted. To break new men in is also expensive, particularly during a rush season, when orders must be gotten out on time.

A representative of one of the great railroad systems entering Pittsburg was asked by the writer why trained mechanics and tradesmen could not be

gotten from the technical schools of this country. “The reason is two-fold,” he replied. “In the first place, our schools are not turning out enough of them and most of the men turned out have taken an engineering or other course that fits them to be leaders of industry. What we need are good, competent mechanics. We have found that the graduates of the technical schools and trade schools, where such men as we need are trained, lack practical knowledge of their trades. When they come to us, we have to teach them all over again. They are well grounded in theory but are not fitted to go into our machine shop and do the work assigned them.”

It is charged that the “machine specialist” referred to lacks initiative and ambition. His narrow training naturally produces this, and he does not aspire to become more than a mere mechanic, a cog in the vast industrial machine of which he is a part. American employers want brains and an employe who can think and reason. They are looking for such men every day, and they are ready and willing to pay for their services in full proportion to their worth in the business. They want men who can adapt themselves to the varying conditions of work and not trained soldiers who blindly execute orders.

The Westinghouse Electrical and Manufacturing company has, at its mammoth works at East Pittsburg,

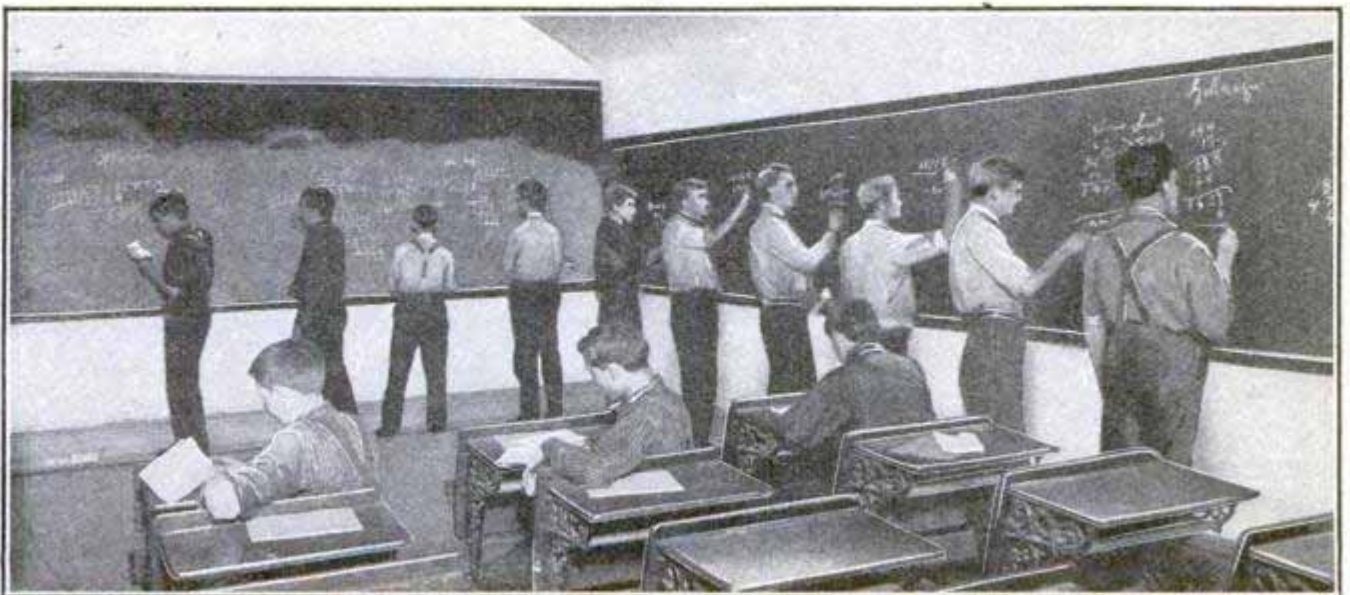
one of the largest and most thoroughly-equipped training schools for workmen in the United States. More than 300 men are taught by 25 or more instructors, every one of whom is either an officer of the company, the head of a technical department, or a foreman from one of the shops. There are two divisions of the instruction, one for engineering graduates and the other for non-technical men. The latter division has two departments: the apprenticeship and the night school, attendance at the last-named being voluntary.

In the apprenticeship department, systematic class instruction is given during working hours, the men being paid for their time. A section of the shops equipped with the most modern appliances and machinery for learning the machinist's trade is set aside for this work. The instructors are selected not only for their ability and their proficiency in imparting knowledge, but for the real and wholesome interest they take in their young charges. The course embraces two years, the men going from machine to machine. The second year is spent in the shops under the care of the apprenticeship department, but not under the direct supervision of the shop instructors. The men are then transferred to whatever branch of work they seem best fitted to succeed in.

The class work is comprised under two general heads: shop arithmetic and mechanical drawing, each embracing general subjects such as shop problems, tool construction, shop organization and system, and the fundamental science of the subject itself.

The technical training is under the general supervision of the consulting engineer of the company. Besides the work set forth, the young men are taken on visits to other electrical and manufacturing plants so they may obtain knowledge at first-hand of different shop practices and, vice versa, men from other plants visit the Westinghouse establishment.

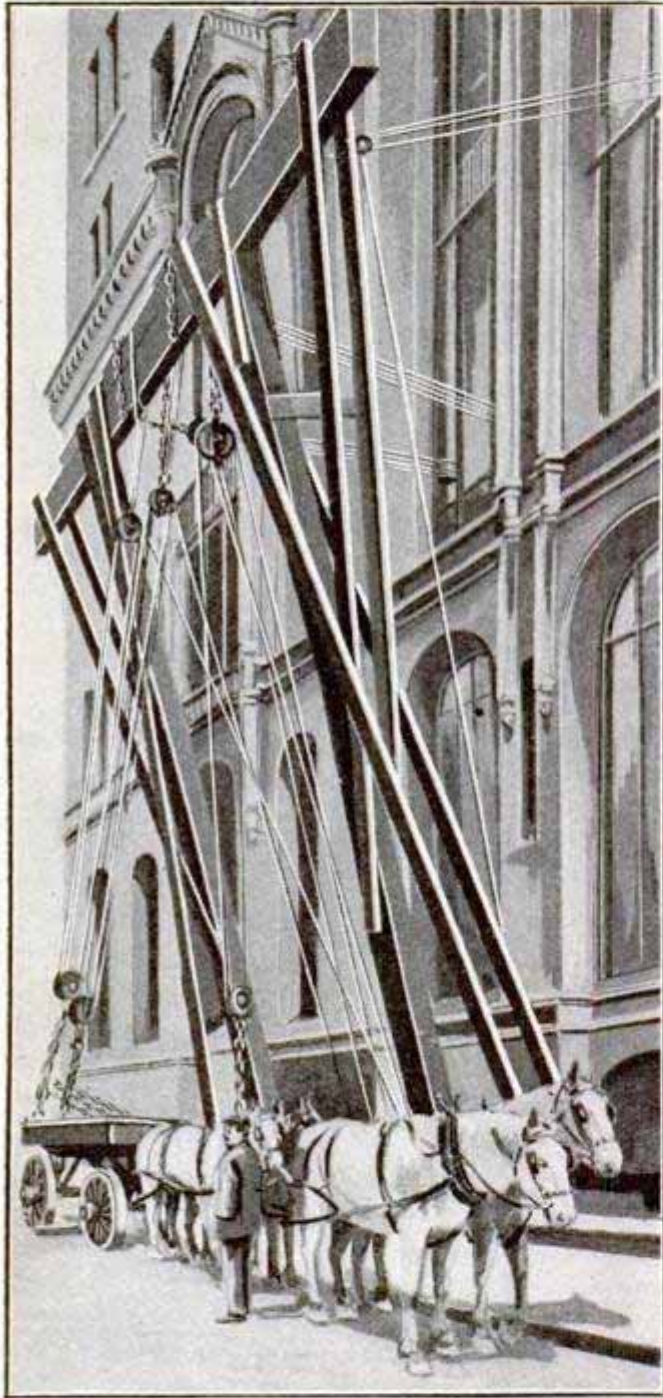
The night school is for men of more ambitious mind who wish a broader training, looking toward electrical and mechanical engineering. They are not content with merely learning a trade. They do practical work in the shops, in the power-house, on the wire gang and along other lines. The course includes mechanical drawing, mechanics, physics, theoretical and applied electricity, chemistry, shop practice in wood and iron, steam engineering and other subjects. The instruction period embraces three hours, three times a week. For the purpose of enabling men of ability but meager schooling to take advantage of these courses, the entrance qualifications are low.



Shop Problems are an Important Part of the Course

## TACKLE FOR UNLOADING VAULT SECTIONS

The 1,350 tons of armor plate in the great steel vault of the Carnegie Trust Co., New York, which had to be delivered in narrow, crowded streets, was successfully transferred from trucks to



Unloading Vault Armor Plate

basement by means of a wooden gallows frame set up as shown in the illustration. This work is ordinarily done by means of powerful hydraulic jacks, which lift the plate up and release the truck, permitting the plate to

be transferred to crib work, from which it is gradually and laboriously skidded into the cellar.

The gallows frame, which was about 30 ft. high, was made of 10 by 10-in. vertical timbers about 15 ft. apart and a 10 by 12-in. cap. It was placed in an inclined position over the sidewalk and truck to be unloaded, the heels resting against the front wall of the building, and the overhanging cap being sustained by six-part manila tackles. These ropes were passed through the window openings of the offices rented by the contractors for the purpose. The gallows frame was rigged with three six-part wire tackles, operated by a hoisting engine.

The average size of the armor plates was about 11 by 24 ft, weighing about 48,000 lb. The largest piece handled was an 11 by 27-ft. door frame, 2½ ft. thick, which weighed 30 tons.

## NEW TYPE OF SPRINGS AS PNEUMATIC TIRE SUBSTITUTE

A new arrangement of automobile springs, designed by a former German army officer, is said to do away with the necessity for pneumatic tires. The inventor has shifted the point of elasticity, which ordinarily consists of metal plates under the body, to the axles of the wheels, by an ingenious angle lever system.

The result, according to T. J. Albert, U. S. Consul at Brunswick, is astonishing. A machine so equipped rides smoothly over cobblestones, and bad roads of other types, as the jolts are not vertical, but move in a horizontal plane backward and forward. The machine can cross a pavement curbing without the occupants feeling a jolt, because the body does not rise, but draws under.

Miss Margaret Graham, of Ludlow, Mass., has established a world's record for women by throwing a baseball 262 ft. 6 in.





Private Depository for Cremated Dead

### PRIVATE COLUMBARIUM

A fine example of private columbarium, which is the name given to a sepulchral chamber with niches for holding urns containing the ashes of the cremated dead, is here illustrated. Although there are now about 25 public columbaria in this country, it is said that there are no more than four or five built to receive the ashes of the members of an individual family. This columbarium is located in New York.

On each side of the symbolic guardian figure are very plain bronze doors, which, when opened, reveal marble-paneled doors inscribed with the names of those whose ashes are deposited within.

### TO CLEAN AND PRESERVE MARBLE AND STONE

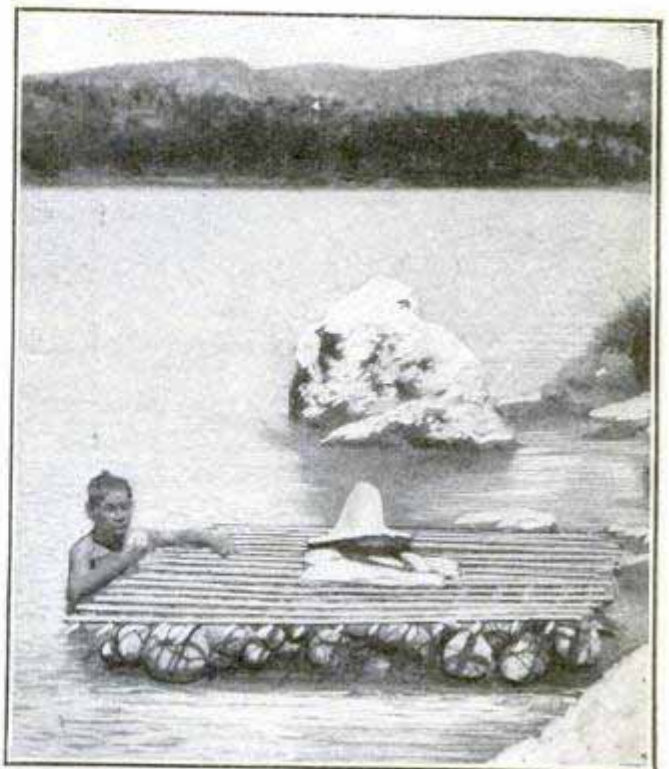
Several methods have been devised recently for cleaning and preserving marble and other stone exposed to the elements, except granite, the investigations of the experimenters being inspired by an attempt to secure a material that would save monuments and tombstones in cemeteries from disintegration. Ordinary soda lye, five per cent solution, has been found to be the best for the cleaning of marbles and other stones that might become discolored. Prof. F. P. Dunnington of the University of Virginia made a series of

tests of cleaning materials and found the ordinary household article to offer the best solution of the difficulty. The lye is applied with a stiff brush and after being washed away, the stone is scrubbed with sand and water if necessary.

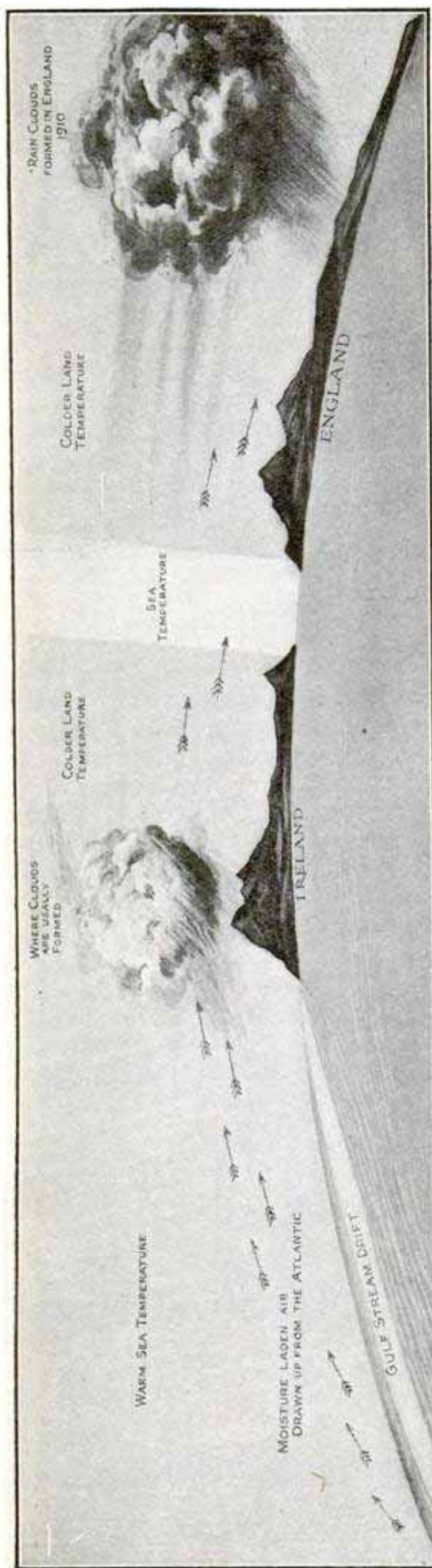
The preservation of stones was found to be a more serious problem and several methods were tried before a satisfactory one was secured. Of those that gave the best results, one that involved the use of a cement filler and spar varnish is given the most favorable report. One coat of waterproof cement filler—a thin varnish made by paint manufacturers—and two coats of spar varnish, applied evenly, were found to withstand the frosts of winter. Both constituents of this preservative method are cheap.

### PRIMITIVE NAVIGATION

The Indians of Southern Mexico, particularly in the State of Guerrero, still use a primitive raft for river transportation. It is made of light earthen jars (ollas) supported vertically by a framework of reeds as shown in the illustration. This raft is in very general use on the Balsas river, which flows into the Pacific ocean.



A Raft Made of Jars and Reeds



How England Received Ireland's Rain

Courtesy Sphere, London

## CAUSE OF ENGLAND'S GLOOMY SUMMER

The Gulf stream, which controls England's weather with a rule as autocratic as that of a monarch of old, is charged with serious misbehavior in providing that country with a gloomy instead of pleasant summer in the year 1910.

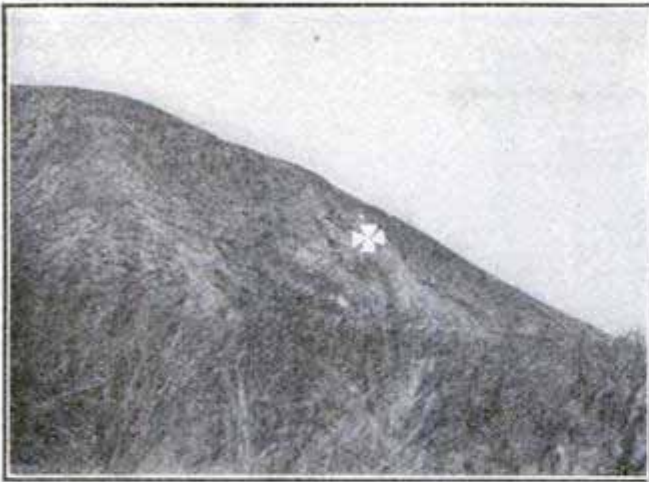
The warmer the sea, the more moisture is taken up by the atmosphere, with consequent precipitation on the neighboring land. During the past 12 months the Gulf stream drift was uncommonly cool, hence the winds blowing from it were not as heavily charged with moisture as usual. As a result, the clouds which usually form over Ireland did not form until eastern England was reached, and the rain which ordinarily would have fallen in Ireland fell in England.

## LARGE ELECTRIC PLANT AT SOURCE OF FUEL SUPPLY

Constructing a large electric generating plant at the source of a fuel supply instead of transporting the fuel to the location of the plant is the rather unique plan being carried out by a syndicate in Texas. The plant is to be erected in the center of a coal field at a point 35 miles above Laredo, Texas, on the Rio Grande, and the fuel will be coal screenings.

The energy will be transmitted to Laredo, Cotulla and Carrizo Springs, in Texas; to a number of places in Mexico, including Monterey and Lampazos; will drive 110 miles of railway, part of which is now operated by steam, and may also be used for irrigation pumping for a distance of 100 miles along both sides of the Rio Grande. The initial installation will be rated at 50,000 hp.

☞The people of Cape Town fight the high cost of living by using penguins' eggs instead of hens' eggs, 600,000 of them, coming from the Cape Colony Islands, being sold in Cape Town during the year.



View of Mountain Side before Blast—Cross Shows Where Charge was Placed



Mountain Side after the Blast—Cross Indicates Chasm Torn by Explosion

## MONSTER BLAST TEARS OUT MOUNTAIN SIDE

A charge of 12½ tons of dynamite and black powder which loosened 200,000 carloads of clay, recently fired at a cement plant in Prudo, California, is believed to be the biggest single blast ever exploded in this country. The concern operating the cement plant ran a tunnel 100 ft. into the side of a mountain and then worked lateral drifts, 50 ft. long, into the ends of which were set 540 cases of explosive. Electric wires were run to each charge, and when the spark was flashed the entire side of the mountain seemed to rise and disintegrate.

## USE ARTESIAN-WELL BORERS TO HUNT TREASURE

Artesian-well diggers are now being employed in the search for the Spanish

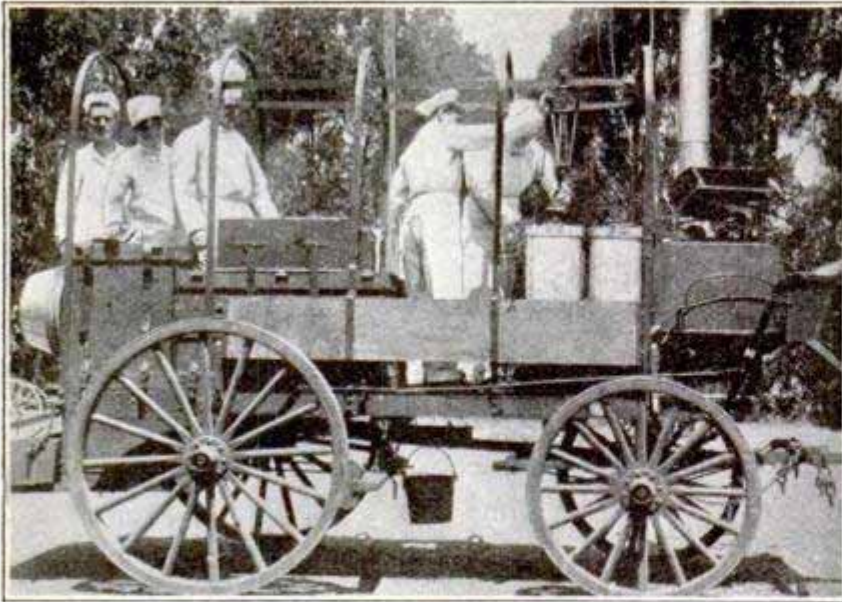
Armada's treasure ship "Almirante de Florencia" which was sunk off Tobermory, Scotland, in 1588, and has been the goal of treasure seekers ever since. No trace of the ship has ever been found, despite the many quests instituted and the scientific apparatus that has been in use since 1904. The "Pieces-of-Eight Syndicate" of London, which has been prosecuting the search recently, has engaged the services of a corps of artesian-well borers, who are now making borings in the bottom of the bay. Already 60 holes from 25 to 30 ft. deep have been sunk 15 ft. apart. It is estimated that an area of 1,000 sq. ft. has been searched without any sign so far of the lost treasure ship. The "cores" taken out of the borings are laid out and examined by the engineers in charge. At the first trace of wood found in these "cores," divers will be sent down to make further examinations.



Cracks in Mountain Side, 1,000 Feet from Blast



Opening of 100-Foot Tunnel into Mountain

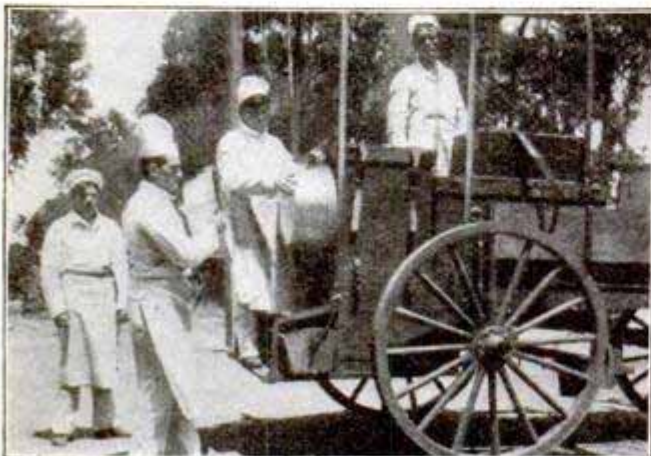


Complete Army Cook Wagon and Its Equipment

A wagon in which the rations for troops can be cooked while an army is on the march and delivered within a few minutes after a halt has been ordered, has been devised as the result of the researches of a board of army officers, who were appointed by the United States War Department one year and a half ago to plan a perambulating kitchen which should meet the strictest field tests that could be imposed upon it and would also satisfy all needs of an army on the march in actual war times.

Captain Frederick W. Stopford, post commissary of the Presidio at San Francisco, on whom fell the active work of devising the cook wagon, toiled unceasingly for a year and a half and it is under his direction that this most modern of army equipments has been perfected.

The plan of Captain Stopford does



Method of Packing Large Pans to Economize Space



The Range, 18-Gal. Boilers, and Oven Pan

NEW  
ARMY COOK  
WAGON  
FEEDS  
A BATTALION

not contemplate the building of a new wagon with its consequent high cost. On the contrary, the ordinary carrier for troops in the field, known commonly as the "escort wagon" drawn by two, four or six husky mules, is utilized and requires no rebuilding. So compact is the arrangement of utensils, etc., that but one wagon is needed for a battalion of four companies, 450 officers and men. For this same reason, the new wagon does not make any addition to the already long transportation trains of troops in the fields.

The army escort wagon is 42 in. wide by 9 ft. 6 in. long, and to accommodate the kitchen the sideboards are removed. At the front is placed the range, which is about 42 in. wide and about 4 ft. long, including the boiler, which goes under the driver's seat. On the range may be placed four aluminum boilers, sitting closely together and oc-

cupping the entire top of the stove. Each of these boilers holds 18 gal., while the boiler under the seat holds 100 gal. Oven pans are also provided, each of which will hold 40 lb. of meat or bread, or they may be used on top of the stove as frying pans. At either side of the wagon is a fireless cooking chest which may be used as a table, if desired, while boards at the back may be pulled out and used as

tables from which to serve the rations, each board being provided with a stout iron leg at one end, the other end resting on the wagon.

The cooking on the army wagon goes on from dawn to dark when the troops are on the march. Immediately after breakfast is served and before the wagons are started in the morning, the vegetables are put in the boilers and started cooking.

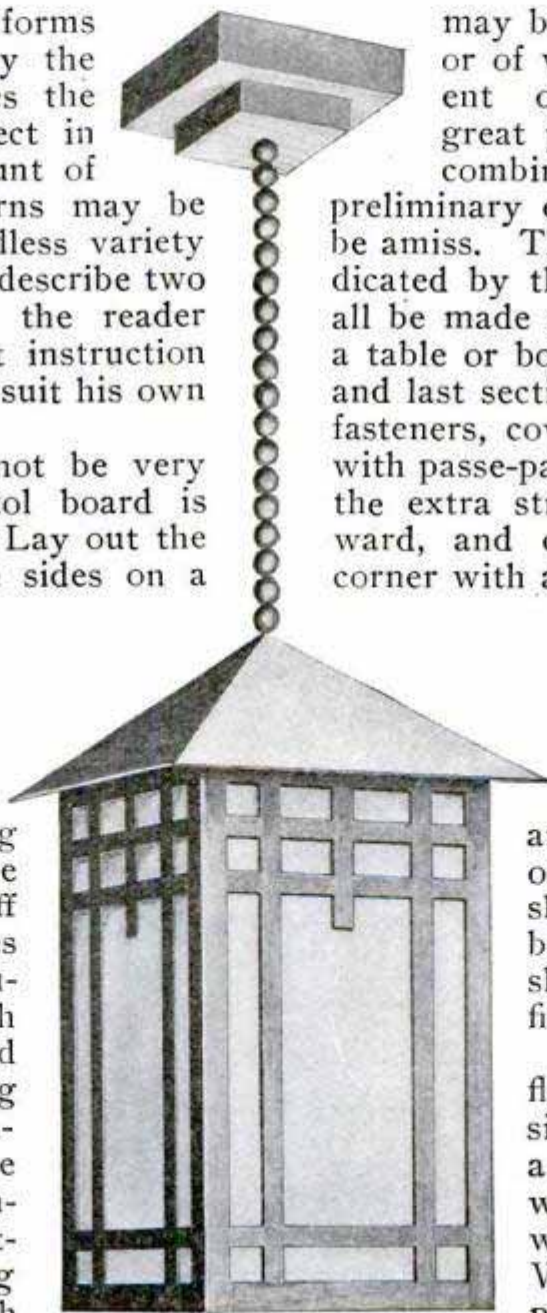
## THE MAKING OF ARTS-CRAFTS LAMPS

### PART VI

By JOHN D. ADAMS

**O**F all the various forms of lamps, probably the cardboard lantern gives the greatest decorative effect in proportion to the amount of labor. As these lanterns may be made in an almost endless variety of shapes, we will only describe two or three, after which the reader should be able without instruction to make other forms to suit his own fancy.

The material need not be very heavy. Four-ply bristol board is almost heavy enough. Lay out the pattern for one of the sides on a piece of heavy, flat paper, and then cut it out with a sharp knife. Mark this pattern off on the cardboard sheet with a sharp pencil, shifting the pattern over one space and marking off again, until all four sides are drawn in a continuous row, as shown. Each section or side should have an extra strip along the bottom, for stiffening, and a flap at the top, for making the connection with the slanting top. Before bending the framework, attach the colored paper, which

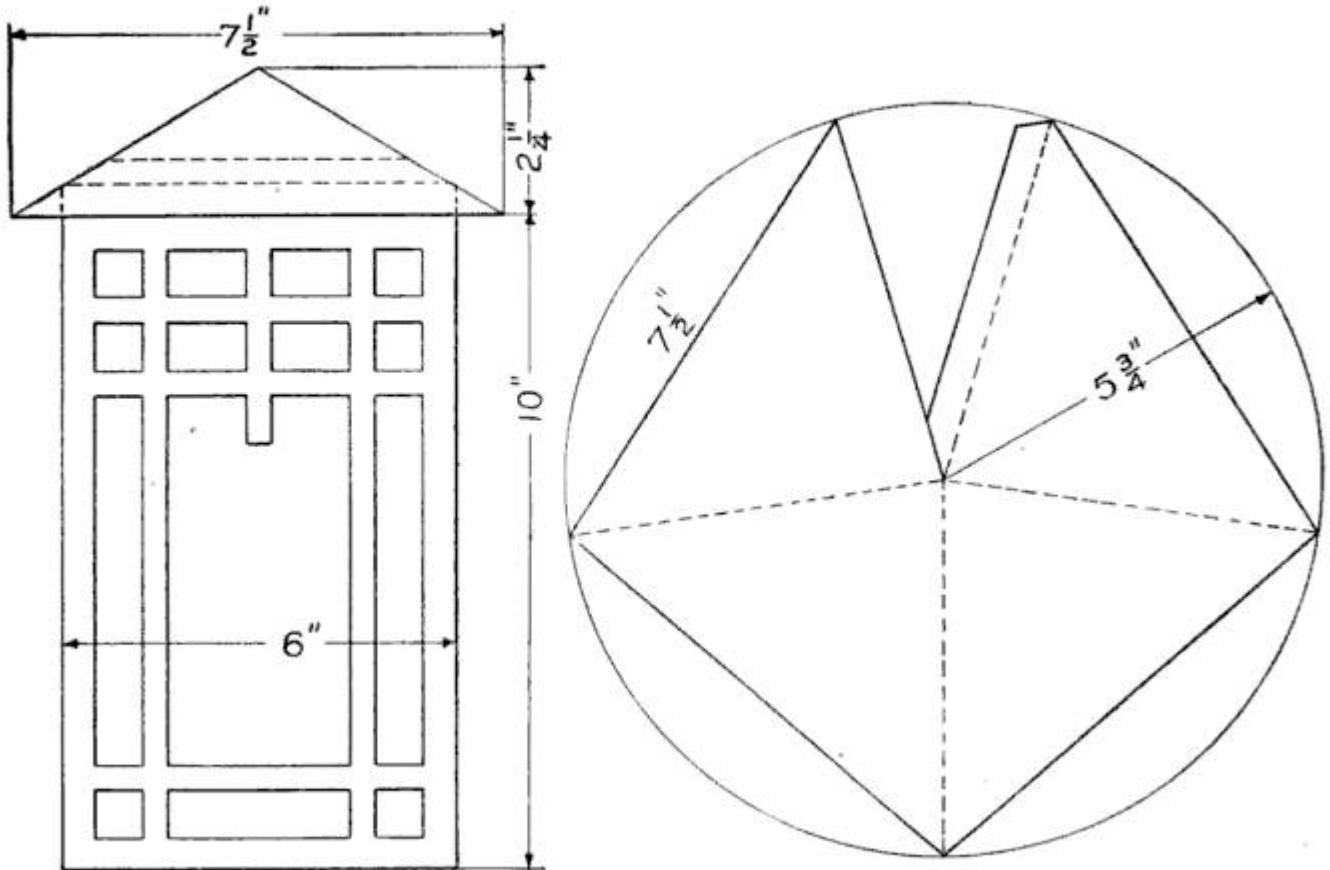


Parlor or Den Lantern

may be all of the same color, or of various colors in different openings. There are great possibilities for artistic combinations, and a little preliminary experimenting will not be amiss. The bends, which are indicated by the dotted lines, should all be made over the sharp edge of a table or board. Connect the first and last sections with glue or paper fasteners, covering the corner edge with passe-partout tape. Then bend the extra strips at the bottom inward, and connect them at each corner with a paper fastener.

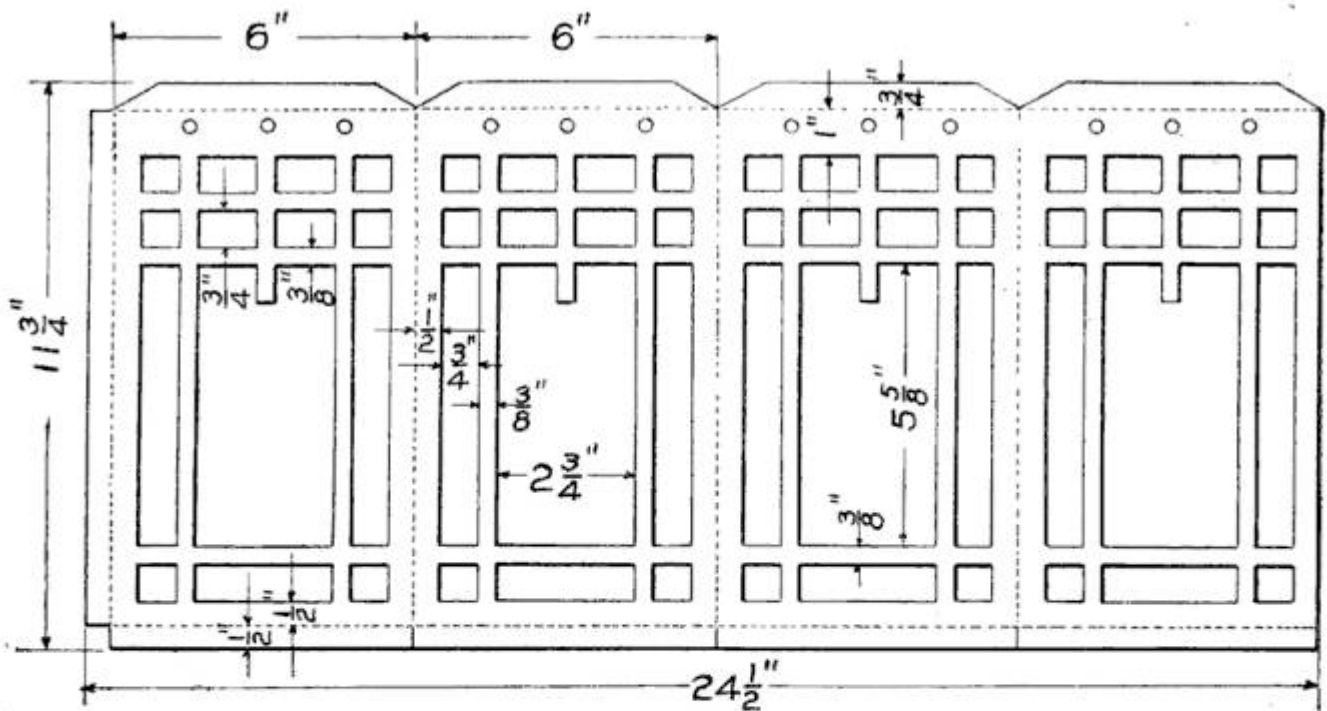
The top is made in the following manner: On a second piece of cardboard draw a circle  $5\frac{3}{4}$  in. in diameter, and space off four chords of  $7\frac{1}{2}$  in. each, as shown. Cut out and bend the pattern into shape and connect the first and last sections.

Finally, bend in the flaps at the top of each side of the lantern to an angle corresponding with the slope of the top, which is now fitted on. With one hand inside, put in three or more paper fasteners on each



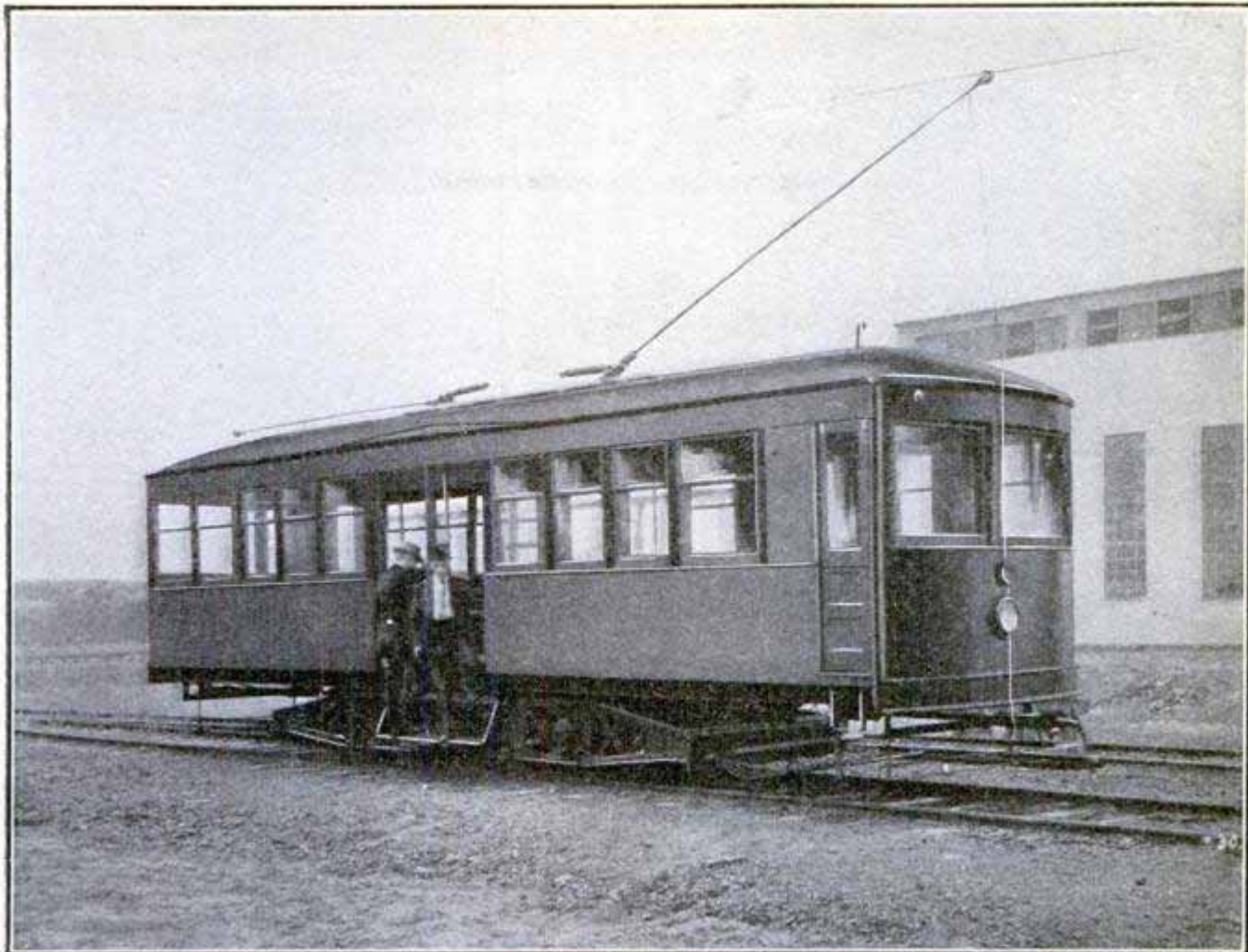
side through the top and flap, clinching them inside, and the lantern is complete. An 8-cp. lamp is strong enough for ordinary purposes. The

cord may be left plain, or large wooden beads, or even small spools (such as silk comes on), painted black, may be strung on it.

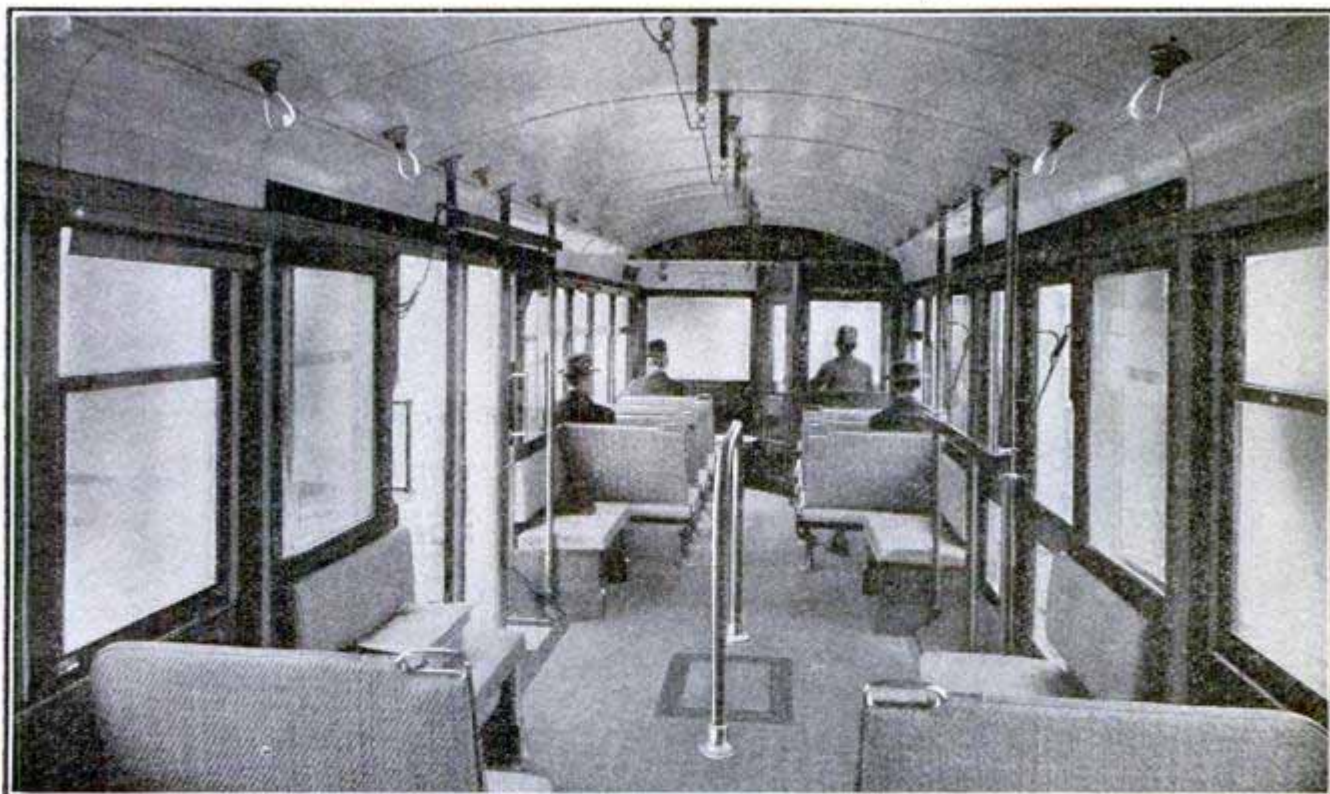


☐ A map of the North American Continent, 35 ft. wide by 45 ft. high, drawn on a scale of eight miles to the inch, showing all the railroads of the country, has been made for the directors of the Missouri Pacific.

☐ The establishment of a crematorium on every ocean liner was advocated by the recent International Congress on Cremation at Brussels, as a means to avoid burial at sea of persons dying on ocean liners.

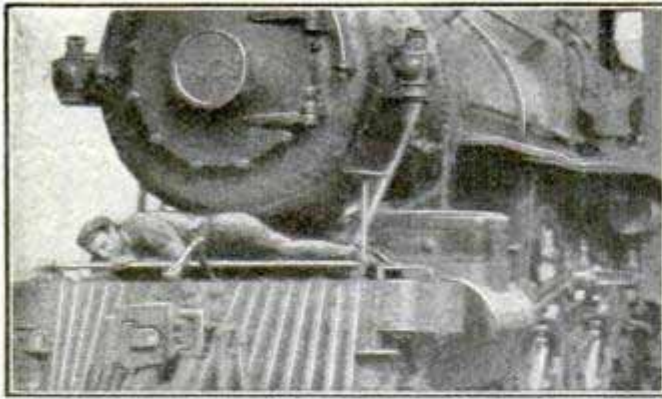


Side-Entrance Trolley Car, Showing Manner of Exit and Entrance



Interior View of New Side-Entrance Trolley Car

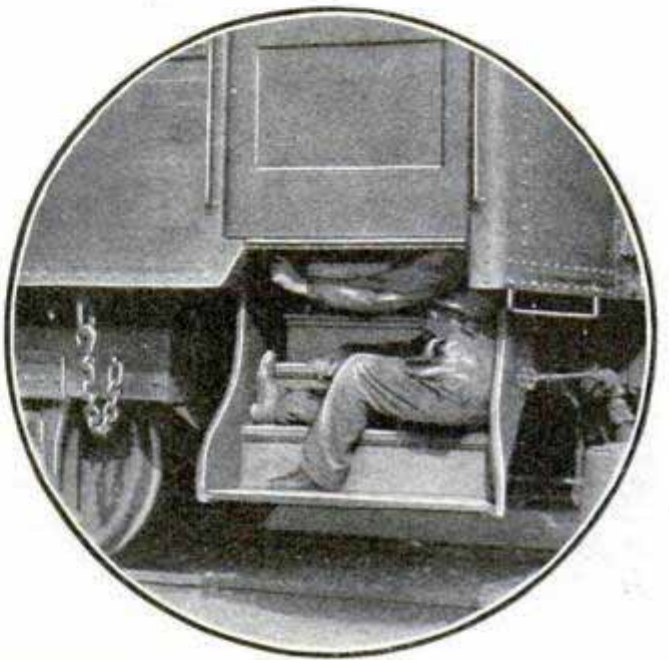
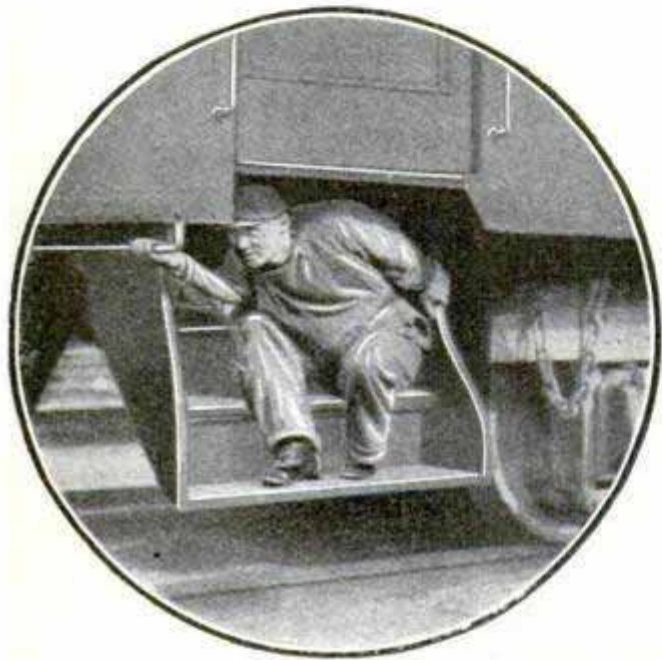
**A** SIDE-entrance trolley car is being tested on lines in Pennsylvania and Iowa and has so far been found to have several advantages over the old style car. The car has a motorman's platform in front, partitioned off from the body of the structure, but is entered by passengers from double doors placed in the center of each side. It is asserted that the car can be loaded and unloaded much more rapidly than the usual type. The cars so far put in service are 34 ft. long and can carry 44 passengers comfortably.



On the Pilot—A Warm Ride on a Cold Day



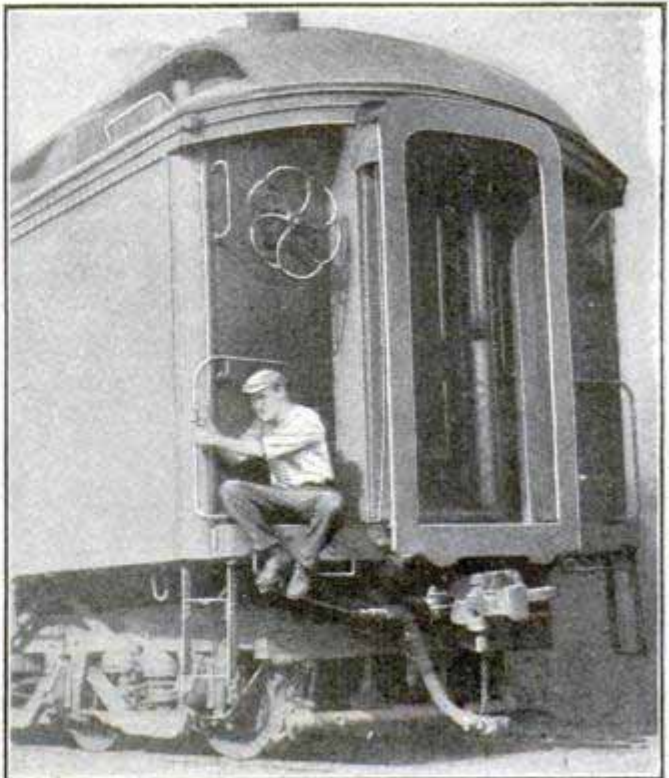
Across a Plank Between the Rods—Gritty and Perilous



Under the Vestibule Door

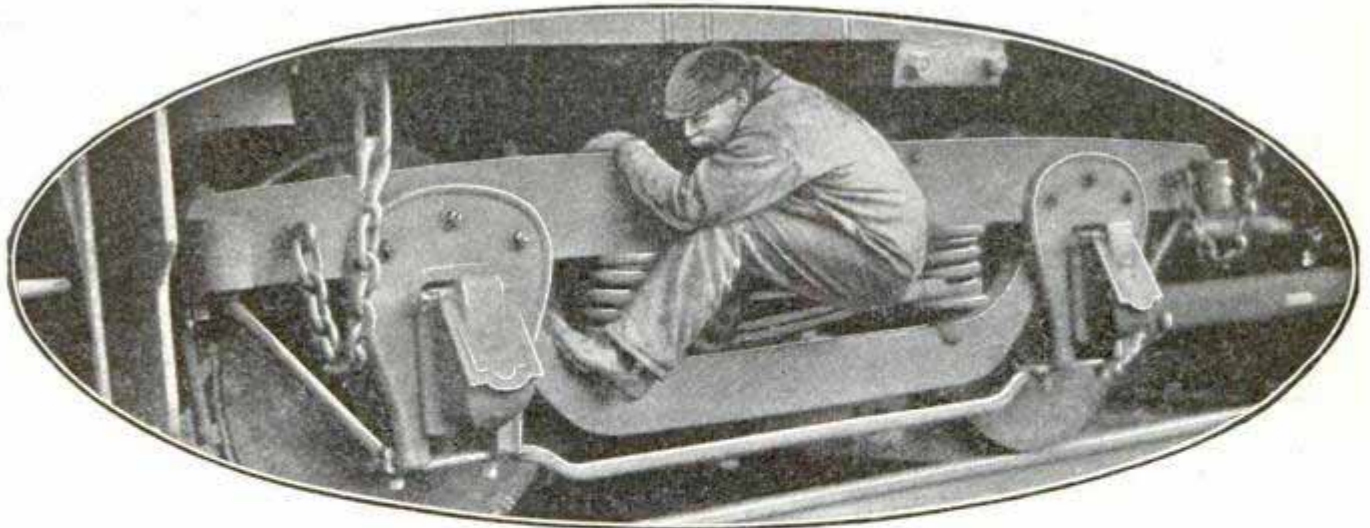


Most Comfortable of All Free Rides



The Blind Baggage Method a Favorite





On the Springs—a Risky Ride

## THE HOBO TOURIST EN ROUTE

By F. J. SCHULTE

**T**HE "Knight of the Road," who reckons not the manner of his going so long as he goes without cost, has not been the least bit disturbed by the numerous improvements of the modern railroad car. A careful study of these vehicles of commerce by those who are afflicted with the "wanderlust" has led to the discovery of several ingenious ways to avoid the payment of railway tariffs. Some of these are almost as comfortable as a seat in the coach, for which good money must be given up. Some are safe but decidedly uncomfortable, and others can only be adopted by men who are willing to take their lives in their hands every mile of the journey.

These last are not for the professional wanderer. He knows enough about the construction of a railroad car to select a place for free travel that will be safe as well as cozy. Despite the efforts of the railroad companies to keep the hoboes from finding free riding accommodation in the hidden

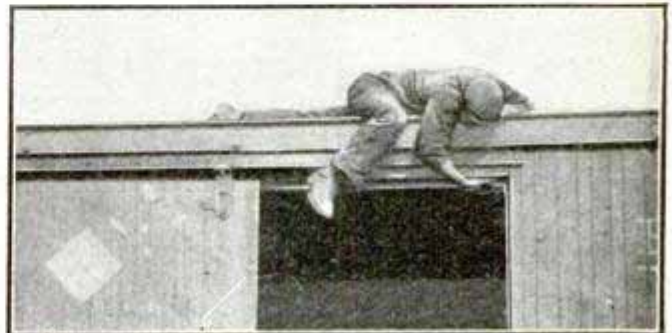
corners of the car, the deadheads contrive to travel free and laugh at the efforts of the employes of the road to dislodge them and keep them off the trains.

One of the officials of a leading American railroad furnished a number of illustrations showing exactly how the tramps, who are up-to-date and accomplished in their profession, have reduced almost to a science the means of riding on trains, hidden from the sight of their enemies, the trainmen.

The most comfortable riding place on a freight train is to be found on the coal trucks, those huge affairs that the trainmen call "battleships." They are constructed, as can be seen in one of the illustrations on this page, with a cut-under at one end. This is the tramp's favorite traveling compartment. Not only is he effectively hidden, but the projecting part of the truck overhead protects him to a certain extent against rainstorms. In this snug hiding place, he can lie full length



Riding Between Cars—a Dangerous Perch



A Way of Getting into a Freight Car

with little fear of being thrown off, if he should fall asleep while the train is in motion. There are plenty of rods and uprights for the hobo to hold on to should the train be traveling over a rough track. Two or three tramps can be accommodated in this cozy little den so that, if the hobo fancies company, he can find room for it without overcrowding his retreat.

But in bitterly cold weather this perch is no longer inviting. Then, where does the hobo turn for warmth while riding to his unknown destination? Why, to the pilot of the engine, called in more popular phraseology the "cow catcher," although it is long since the days of its cow-catching utility. It will puzzle the ordinary traveler to understand how a man can find room to travel there. A glance at the picture illustrating this mode of travel will give the solution. He does not ride on the "catcher" proper, but on the upper part of the pilot, where the boiler thrusts its round body out over the base of the "catcher." Here the tramp is not only safe from being thrown off but, warmed by the heat from the boiler, he is as snug and comfortable as might be. There is, at a pinch, room for two men in this place, but that would be overcrowding it a little, and one is considered the limit by fastidious tramps.

It seems almost incredible that anyone could travel in the position shown in the picture of a man bracing himself between the tops of two cars, but two men recently rode from Pittsburg to Philadelphia in this manner. The advantage of this method of stealing a ride is that no trainman can see the rider, as he is perched above the door, out of sight.

Fashions have changed a little in the ever popular "blind baggage" method of tramp travel. The "blind baggage" is the car used to convey valuable consignments, such as bullion or money. It was formerly made with only one door. Now it has two, but one is always kept locked. This locked door is the one selected by the tramps for a ride in the way shown in another

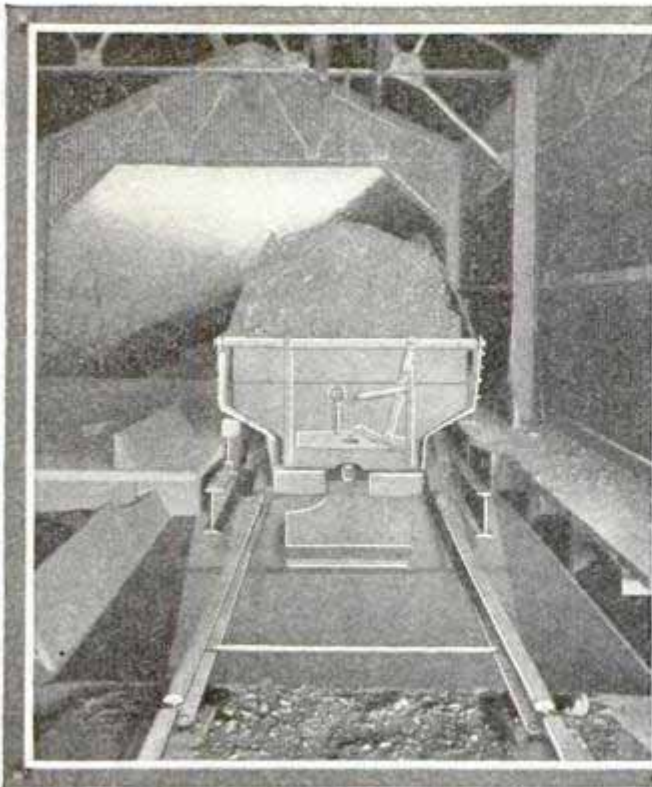
illustration. No one can see them while perched on the step. The only drawback to this perch is that sleep is out of the question. In that respect other methods of free travel are superior, but the "blind baggage" way has its points too, for a tramp is fairly safe from the disagreeable railroad hands.

A gritty, disagreeable ride falls to the lot of the tramp who lays a plank across the rods beneath the railroad car, in the manner shown in one of the pictures. The tramp who knows his business prepares a plank of the right length to reach from side to side of the car and then insures his safety while riding on this improvised platform by studding it on each side with nails that cling to the rods and keep the plank from sliding off when the train bumps. As said before, it is a most uncomfortable method of traveling from the viewpoint of the traveler who pays for his railroad accommodation, but the free riders think it is not to be despised in fine weather.

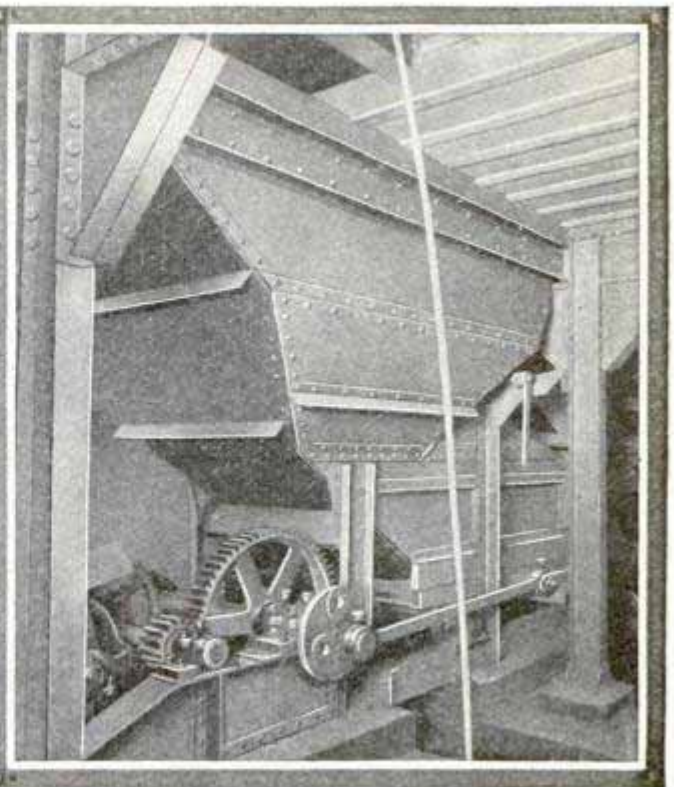
Riding the springs is another risky and uncomfortable hobo method of travel. The tramp rides immediately over the wheels and has only a precarious hold to the truck. He cannot release it for an instant, and once he has taken his place there, he must hold on as long as the train is in motion, or be dashed to death on the track.

A much easier way of riding and one greatly in favor with the tramps, since the arrival of the vestibuled train, is to crawl under the doors of the cars and hide on the step. The tramp must be careful not to try this before the doors are closed, but once these have been shut and the train has started, he is safe from view until the next stopping place, when he must be ready to jump off and remain in the vicinity until the train starts again.

The manner of stealing a ride on a freight train in the conventional way is shown in one of the pictures. The tramp boards the train, scrambles along the roof of the freight car, leans over and slides back the door and then lowers himself into the interior.



An interior view of the dump house with a loaded car ready to be discharged into the steel hopper. The coal has come direct from the mines, and is about to start through the cleaning and grading processes.



The pit of the dump house, showing the dump hopper the top of which is shown in the other view, and a section of the scraper conveyor. The hopper has a capacity of ten tons of coal.

## Cleaning and Grading Coal by Electricity

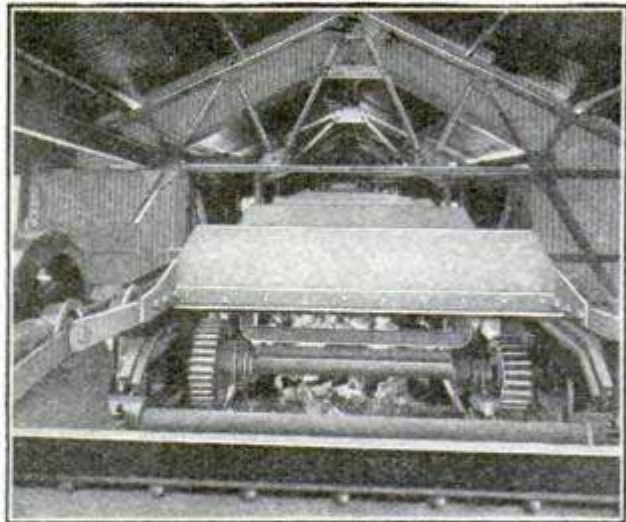
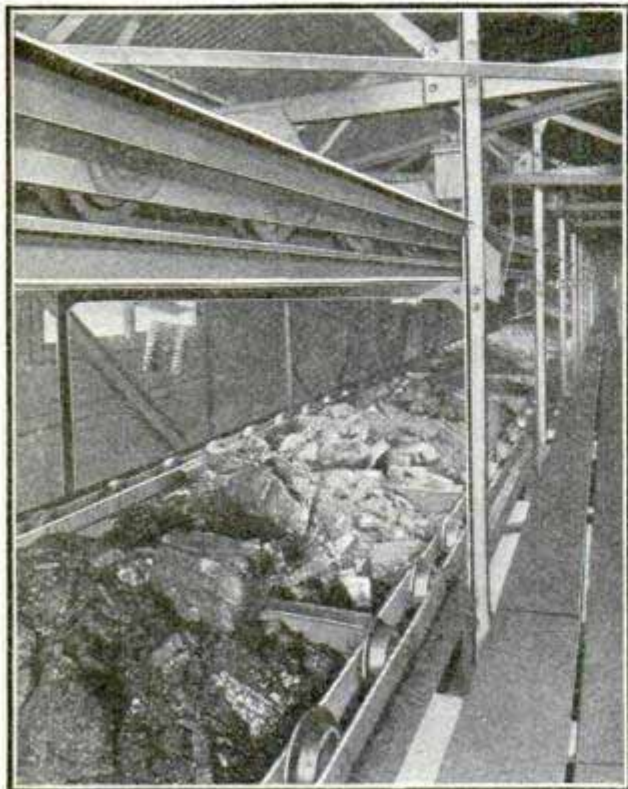
The process of cleaning and grading coal in an up-to-date, electrically operated picking house, or tippie, is shown in the accompanying illustrations. Operating at slow speed, this plant will handle 375 tons of coal per hour, and at highest speed will almost double this output.

The coal, received from the mine in steel cars, is dumped into a steel hopper having a capacity of 10 tons. This hopper is provided with an automatic plate-feeding device operated by a 10-hp. motor, and is so arranged that the amount of coal discharged to the conveyor may be varied as desired. The conveyor carries the coal to the screens, a distance of about 130 ft., the return chain passing up the incline at the top at a pitch of  $4\frac{1}{2}$  deg.

Four sets of shaker-screens receive the coal from the conveyor, three of them placed end to end and forming a continuous line with the lump-pick-

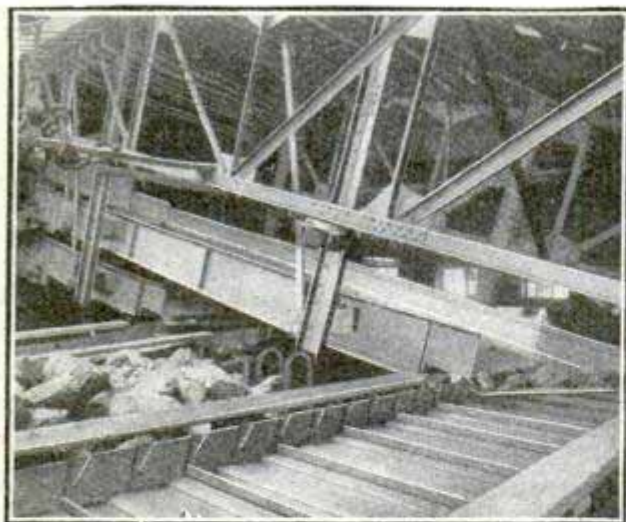
ing tables, while the fourth, for the nut coal, is located directly below the second screen. A 75-hp. motor supplies the shaking power, transmitted by belts to eccentric shafts. The slack and fine coal falls through to the slack bin while the mass is passing over the first screen. The lump coal is transferred from the second screen to the picking table through the third screen, which is a shaking chute. The coal dropping through the second screen falls into the fourth screen, the nut coal passing from it through the revolving screen to the nut-picking table.

The picking tables are arranged about 25 ft. above the railroad tracks, so that the coal, after passing over the tables, may run down an incline into the cars. The adjustable loading booms are designed to reduce the breakage of coal, as it drops to the cars, to a minimum.



The Conveyor at Point of Discharge, with Coal Falling through to Screens. The Direct-Current Motor Which Drives the Conveyor is Shown at Right. Speed-Changing Gears are Shown in Foreground.

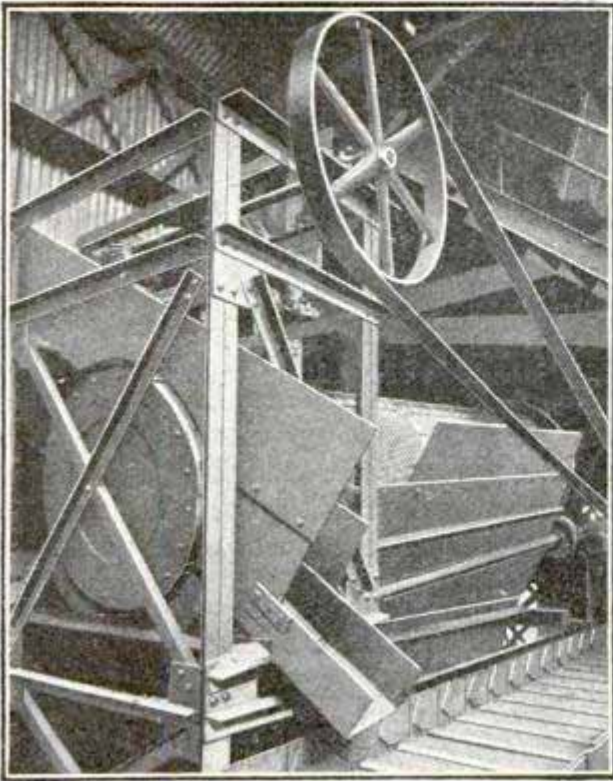
In This Illustration may be Seen Another Section of the Scraper Conveyor Line, Showing the Return Chain at the Top. The Trough through Which the Coal is Pushed Consists of Flanged Steel,  $\frac{3}{8}$ -in. Thick.



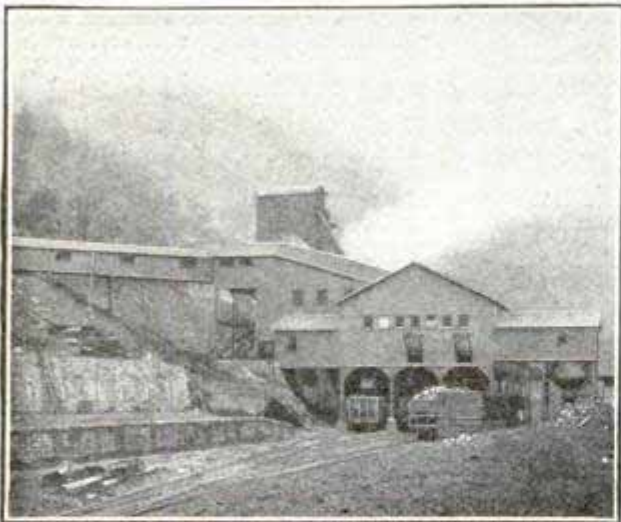
The End of the Shaker-Screens Which Receives Discharge from the Conveyor Line. No. 1, 2 and 3 Screens Form the Upper Section, with the Fourth Screen Directly Underneath. These Screens Discharge to Tables.



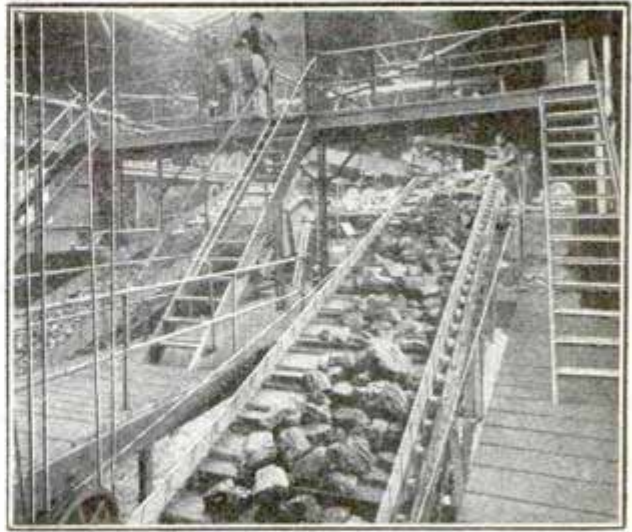
The Coal on This Nut-Picking Table is That Which Fell into the Fourth Screen in the Opposite Illustration. It had to Pass Through a Revolving Screen Before Reaching the Table.



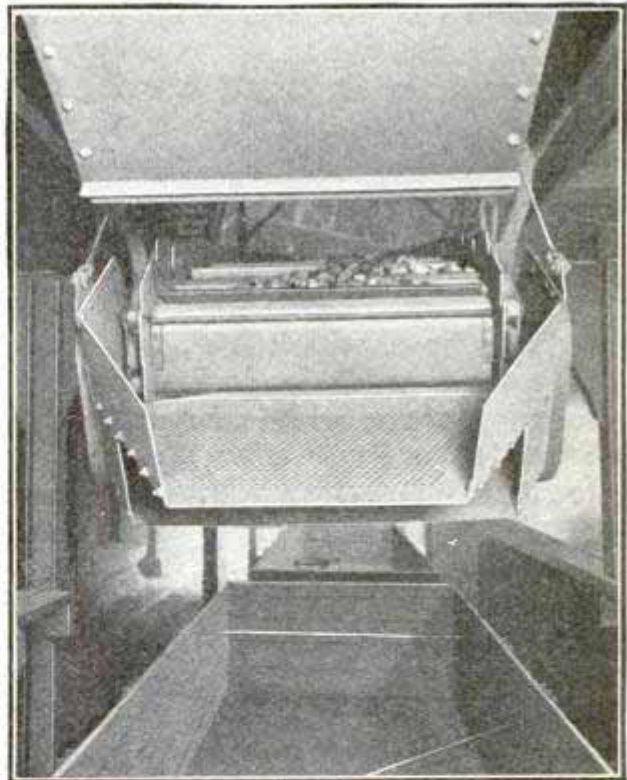
This is the Revolving Screen Which Handles the Fine Coal. The Nut Coal Passes through the Chute to the Nut-Picking Table, while the Smaller Particles Fall through the Mesh.



Exterior View of Building in Which the Electrically Operated Devices Shown in Preceding Illustrations are Located. Cars are in Position to Receive the Different Grades of Coal.



Interior of Picking House with Lump-Picking Table in Foreground. The Egg-Picking Table is Shown at the Left. Both Loading Booms are Down, Showing Method of Delivering Coal to Cars.



The End of the Lump-Picking Table, Which is Termed the Adjustable Loading Boom. Underneath is Shown the Coal Cars, One of Which is in Position to Receive the Discharge.

### BRAZILIAN WAR MUMMY

It is an old and still surviving custom among the Indians of the upper



Gross and Embalméd Head

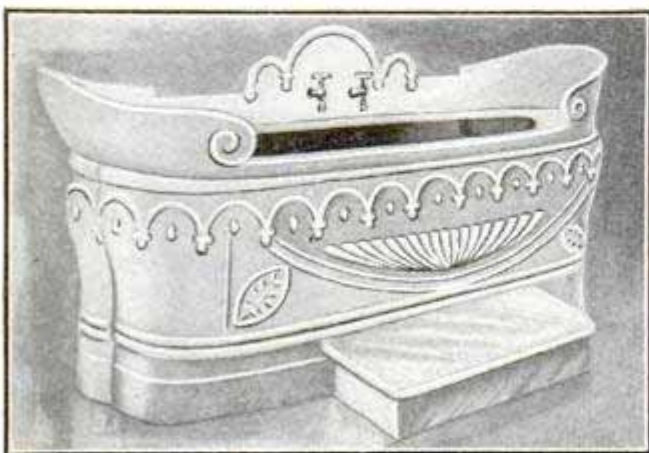
Amazon River basin to cut off the heads of fallen enemies, and to embalm and decorate them as trophies. The illustration shows such a head embellished with feather pendants and other decorations. In lieu of glass eyes, the eye cavities are filled with the incisors of a large amphibious rodent. The strings that hang from the mouth are intended to form a gag, which serves to prevent the soul of the departed warrior from opening the lips to insult its victor.

It is an old and still surviving custom among the Indians of the upper Amazon River basin to cut off the heads of fallen enemies, and to embalm and decorate them as trophies. The illustration shows such a head embellished with feather pendants and other decorations. In lieu of glass eyes, the eye cavities are filled with the incisors of a large amphibious rodent.

The strings

### SPANISH QUEEN'S MARBLE BATH IN A HOTEL

A Paris hotel which is classed as one of the best in the world, boasts the possession of the identical marble bathtub made for and used by the late Queen Isabella of Spain. The hotel



The Late Queen Isabella's Bathtub as it Now Appears in a Paris Hotel

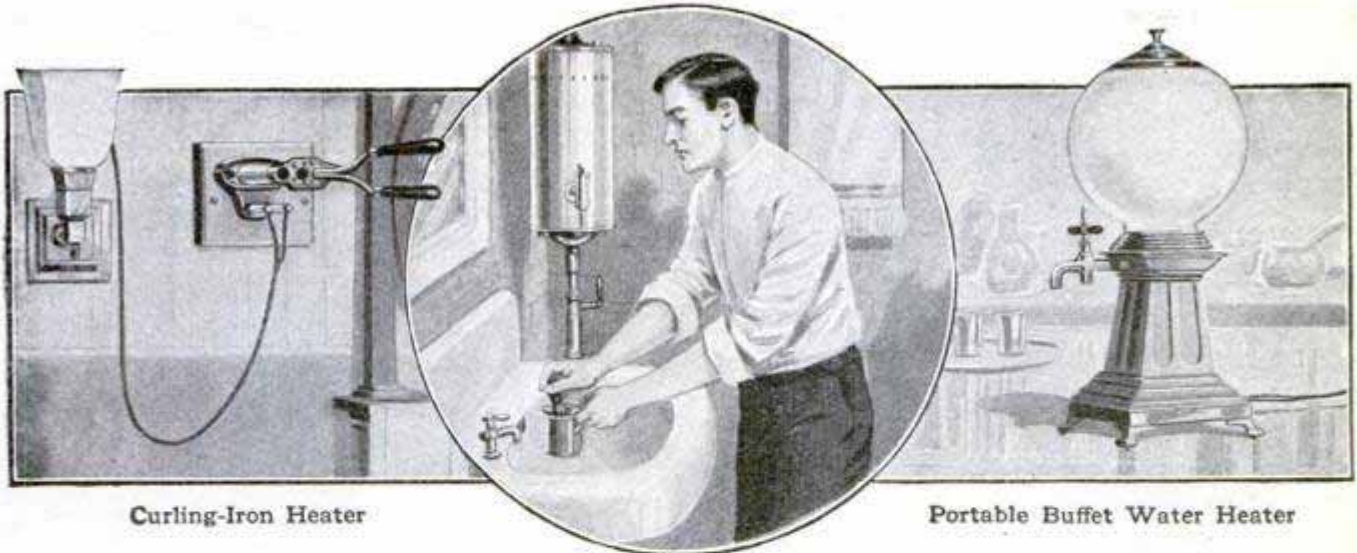
is built on the site of an old palace that was long occupied by the Spanish diplomatic representatives in France and is fitted up in luxurious style. The Queen Isabella bathtub forms part of the equipment of one of the many private bath rooms. It is constructed entirely of marble and is beautifully carved. It is much higher than the ordinary bathtub, its sides being at least 4 ft. from the floor at either end and not more than a foot lower in the center where the bather is supposed to climb in. A high step is provided for the person seeking cleanliness. The high ends are formed by elaborately carved scrolls. The bath is provided with hot and cold water faucets.

### NEW TYPES OF ELECTRICAL HEATERS

New types of electrical heaters for three purposes are shown in the accompanying illustrations. The electric curling-iron heater may be attached to the wall or used on a dressing-table. The nickel-plated casing is provided with four openings, the two outer ones being designed to hold the curling-irons when not in use. The two inner openings lead to the heating-chamber, where an automatic switch closes the circuit to the heating element as soon as the iron is thrust in. The withdrawal of the iron automatically cuts off the supply of energy.

The portable buffet heater is designed for household use, and has a capacity of 3 qt. Filled with cold liquid, the first glassful can be drawn, steaming, in 45 seconds; a second glassful, 15 seconds later, and so on until the globe is emptied.

The lavatory heater, permanently attached to the water supply as shown, is ingenious. The heating element consists not of wire, but of the water in the heater itself, through which current is passed by carbon-rod electrodes. These rods are incased in a metallic cylinder through which the water flows, and are so arranged that there is an open circuit between them. The heater cannot become operative until



Curling-Iron Heater

Lavatory Heater

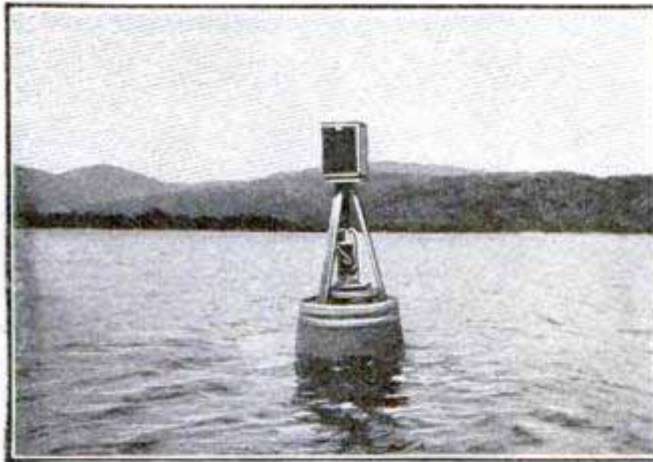
Portable Buffet Water Heater

water enters the compartment, since the water itself forms the connecting link between the carbons. Thus current is only used while the water is

running from the spigot below, and the switch operating the heater can be turned on all day without wasting current.

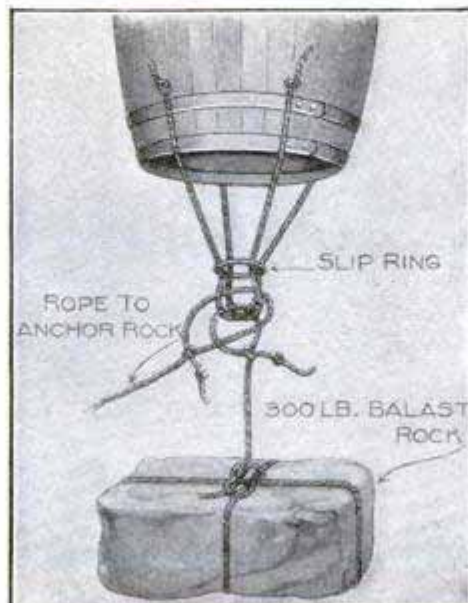
## A SIMPLE MAIL FLOAT

By H. R. BENJAMIN



On New Found Lake, N. H., as on nearly all other lakes, the mail is delivered by small steamers. It is placed in mail boxes supported on small floats, which are moored as near the shore as the steamer can run. Many of these floats are not only unsightly, but very liable to capsize in a storm.

The writer has just made a mail float which is neat, exceptionally



stable in rough weather, and very simple and inexpensive to build. It consists of a good oil barrel, with a 2-ft. high tripod on one end and the mail box firmly attached to its top. The barrel was thoroughly tested to make sure that it was watertight, and after the tripod had been attached, the whole was painted a dark green. A large stone was fastened very close to the

other end of the barrel to maintain it in an upright position. The method of attachment was as follows: The ends of a piece of rope about  $4\frac{1}{2}$  ft. long were fastened by means of staples to opposite sides of the barrel very near its lower end. Another rope was similarly affixed at right angles to the first, taking care that both ropes hung very loosely and exactly alike. Where they crossed they were pulled through a brass ring, thus making two small loops the position of which could be adjusted by pulling the ropes through the ring in either direction. Through these loops was passed a short rope to the other end of which the anchoring stone was attached. The arrangement is shown in the accompanying illustration.

To put the float in position, soundings were taken near the shore to find a suitable place, which was marked by sinking a small stone attached to a long cord and tying a piece of wood at the upper end. Next, the anchoring stone was made fast to its rope and a piece of wood tied at the other end. The stone was rolled into shallow water and supported under the stern of a rowboat with a short piece of rope. By walking to the bow of the boat, the stern was made to rise sufficiently to lift the stone off the ground, after which it was rowed out to place and

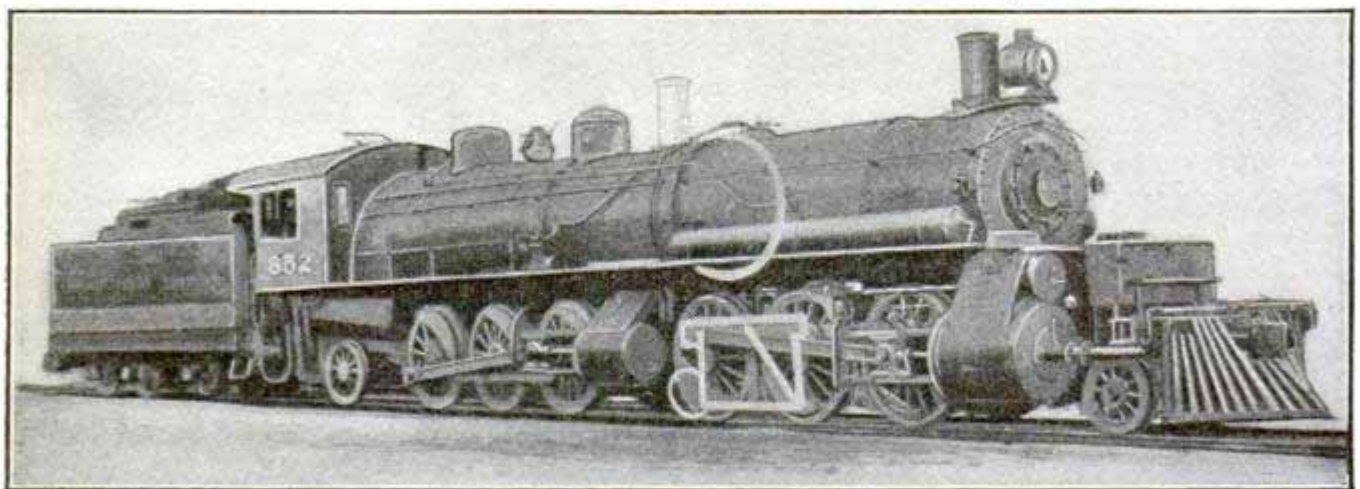
to have the loops as nearly as possible under the center of the barrel. This stone was also carried beneath the boat in the same manner as the other, except that a separate short loop was attached to it and that it was supported from the boat with a rope passed through two pulley blocks. It was towed out to place and attached to the anchor rope. When lowered into place, the barrel was found to tilt, so it was again lifted, the ring pulled up to loosen the ropes, and the loops moved slightly to one side. After several adjustments it floated properly, and the lifting gear was unhooked.

The finished float is so buoyant that a man's weight will not sink it. A lighted red lantern, firmly attached to the tripod, marks its position at night and prevents collision.

#### A UNIQUE JEWELRY STORE IN SAN FRANCISCO

San Francisco has a jewelry store that, while comparatively small, is notable for the elegance of its decorations and the elaborate scheme of illumination and methods of display. It is lighted by 1,800 electric lamps of from three to 32 candlepower.

The stock and fixtures are valued at \$2,000,000. The fixtures alone costing



A Converted Locomotive—The White Lines Show Old Front of "Prairie Type."

the supporting rope cut. The stone to hold the barrel upright was then attached as described, care being taken

\$50,000. The store room is only 65 ft. long and 19 ft. wide, but the walls being made of mirrors, it looks much

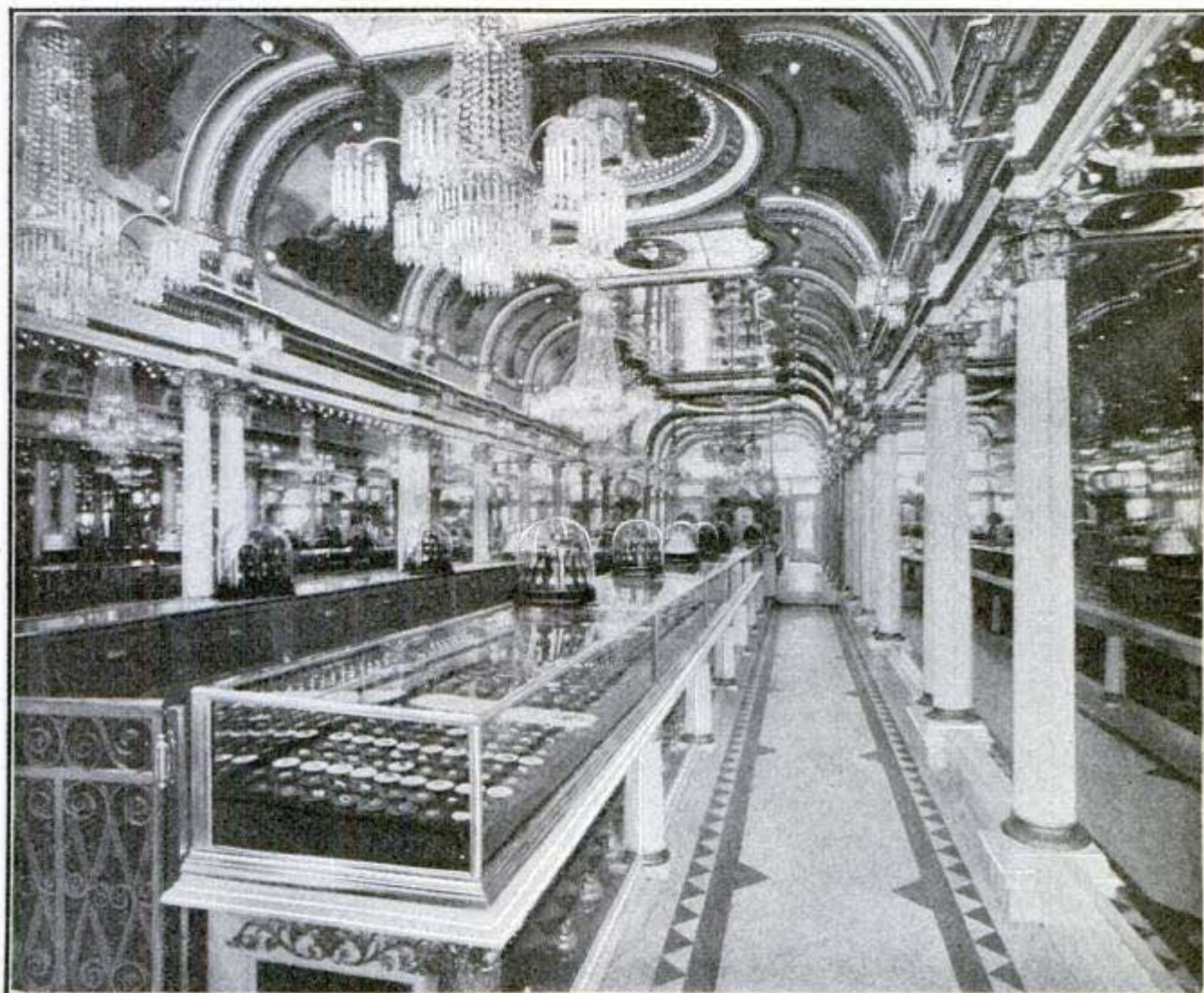


larger. There are eight mirrors on each side, one in the rear and three in the ceiling.

The 15 beautiful oil paintings in the panels of the ceiling are from the brush of the artist Elorado Tojetti, and the

## TURBINES DOUBLE CAPACITY OF SUBWAY POWER PLANT

The means by which the capacity of the power plant of the New York subway was doubled to meet the requirements of the greatly increased traffic



Jewelry Store with Many Extraordinary Features

entire collection cost about \$20,000. In the center of the ceiling is an art glass panel picture of the owner of the store. This picture is so arranged that the store-keeper's face is reflected in each show case. He had the pictures so placed as to remain a monument of his great work. It has been his life's ambition to impress his likeness upon the minds of the thousands of people who visit the store.

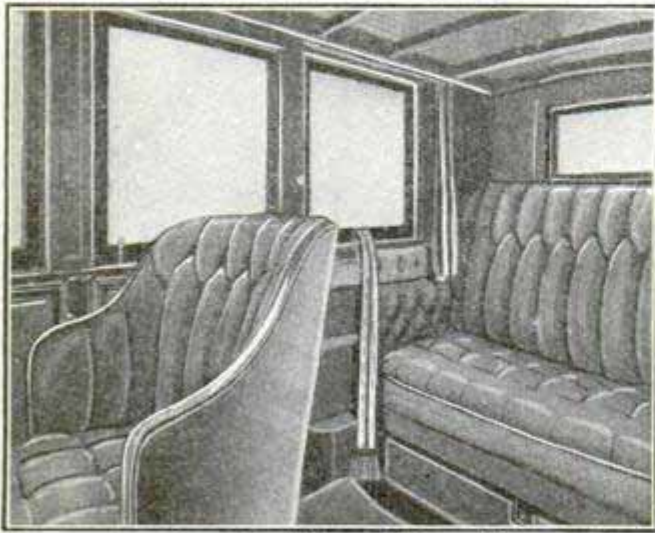
Visitors are especially interested in the paintings of Cleopatra, Queen Esther, Zaida, Diana and many others whose jewels and crowns are represented by genuine diamonds and other precious stones.

is of considerable interest. When the power plant was completed a few years ago its huge, compound reciprocating engines were the largest in existence.

Instead of increasing the capacity of the plant by adding more such engines, low-pressure turbines have been installed to operate in connection with them, taking the steam from the low-pressure cylinders and utilizing the formerly wasted heat energy of the condenser water. As the result, it is now possible not only to run the engines at an economical water rate at their full overload, but the total output of each unit has been doubled.

## AUTOMOBILE PROVIDED WITH ARM CHAIRS

A slight change from the conventional in automobile interior furnishing is shown in the accompanying illustration.



An Arm Chair in an Automobile

tion of the interior of a 25-hp. car. The forward seat in the limousine body of ordinary cars is replaced in this instance by two sumptuous arm chairs, either one of which can be removed to provide space for luggage.

## MACHINE SORTS DIAMONDS

The story of the invention of the machine that has almost wholly superseded the hand-sorting of diamonds in the African diamond fields, is intensely interesting.

The hard diamond-studded earth lifted to the surface from the mines is spread over the ground to undergo the softening influence of heat and cold, for several months, after which it is shoveled into washing-machines, where the dirt is separated from the rough diamonds and other large mineral substances. The mass of minerals remaining is known as "concentrates," and it was formerly necessary to go over this by hand and pick out the garnets and other foreign substances until nothing remained but the rough diamonds.

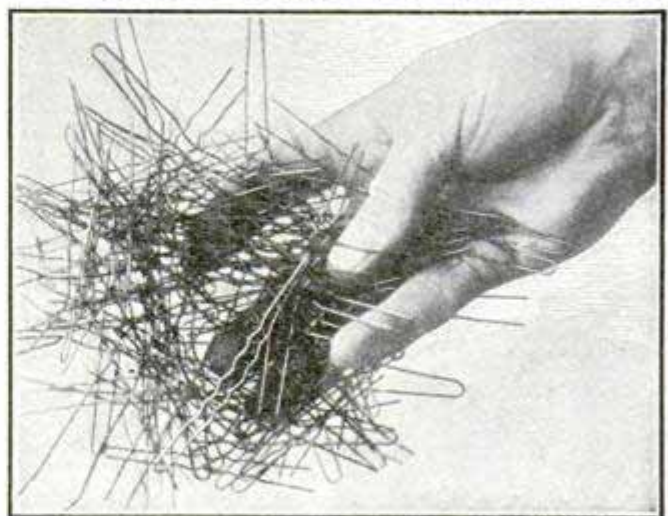
One day a young employe in one of the sorting-rooms happened to slightly raise a board on which a rough diamond and a garnet were lying. The garnet slipped off, but the diamond re-

mained. This was worth investigation, and he found a coating of grease on the board, which had retained the diamond, but not the garnet. He then procured a wider board, coated one side with grease, and dumped a few handfuls of concentrates upon it. He found that by holding the board in a slightly inclined position and vibrating it, all the concentrates except the diamonds moved to the lower end and fell off, while the diamonds remained in place.

A short time later, he invented the machine that is now in almost universal use in the Kimberly district. Much study was required to perfect the apparatus, but the young inventor brought it to complete success.

## HAIRPINS WOMEN LOSE AS THEY WALK THE STREETS

Hairpins as a by-product of the woman's club have not been given a very prominent place in the public recitals of the benefits of such institutions but the gain to the janitors or scrubwomen must be enormous. This assertion is based on an investigation carried on in the streets. According to these figures, 200 hairpins can be found in every 50 sq. yd. of pavement along which women pass in large numbers. At one place, in front of the show window of a large dry goods establishment, an investigator picked up a hand-



Handful of Hairpins Picked Up in Front of a Show Window

ful of these little necessities of the toilet and on counting them found he had 254.

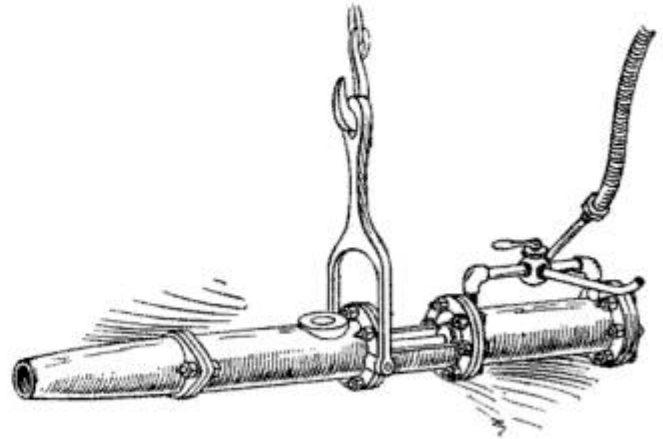
# SHOP NOTES

## A Mud Gun

The purpose of the mud gun, shown in the illustration, is to stop up the tap-hole through which the iron pours when casting. It consists of a steam cylinder, a mud cylinder and a nozzle. The piston rod of the steam cylinder is fitted on its other end with a mud plunger, working in the mud cylinder. Steam is supplied, through a hose, to a four-way valve, from which it passes to either end of the cylinder. The whole machine is hung from a small jib crane, mounted on one of the columns of the furnace.

When the desired quantity of metal has been tapped, a signal is given and the hot-air blast is turned off. The gun, the mud cylinder and nozzle of which have been packed tightly with mud (moist fireclay), is swung into position over the "runner" or stream of iron, and the nozzle tilted downward and dipped into the iron; a pair of hooks, mounted on a shaft over the runners, engage the projections of the flanges between the nozzle and the mud cylinder, which is used to jam the nozzle forcibly into the tap hole. The operator then quickly turns the valve, and the plunger rams a slug of mud, 3 ft. long and 6 in. in diameter, into the hole. Another turn of the valve brings the plunger back. An assistant quickly throws three or four balls of mud into the opening in the top of the mud cylinder, and the operator rams another charge into place. This process sometimes has to be repeated until 20 or 30 balls are rammed into the tap hole, and then the signal to turn on the blast is given. All this should be done as quickly as possible, for the heat is terrible and the length of time the blast is shut off is a matter of dollars and cents, as the furnace cools much faster than it heats up again.

The work requires men who are strong and active and resourceful in

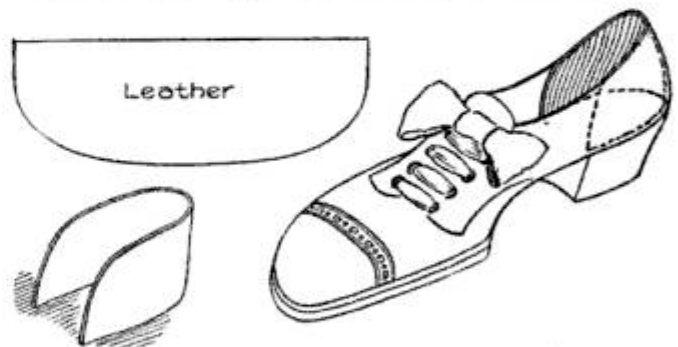


Steam and Mud Cylinders

an emergency.—Contributed by J. J. O'Brien, Buffalo, N. Y.

## Preventing Holes Worn in Stockings by Oxfords

The wear on a stocking heel caused by the slipping up and down of the oxford or pump can be eliminated by cutting a piece of leather the shape of the heel and pasting it in the shoe, as shown in the illustration. The unfinished side of the leather must be next to the stocking. Pieces of leather the color of the shoes can be bought at any leather-findings store for a few cents.



Leather Piece Cemented in Heel

If preferred, a piece of velvet may be used instead of the leather.—Contributed by Kathrine D. Morse, Syracuse, New York.

### Recording the Amount of Coal Used in Steam Boilers

In the plant where I am employed, we must keep a record of the quantity of coal we use in the steam boilers. The plan we adopted does not record

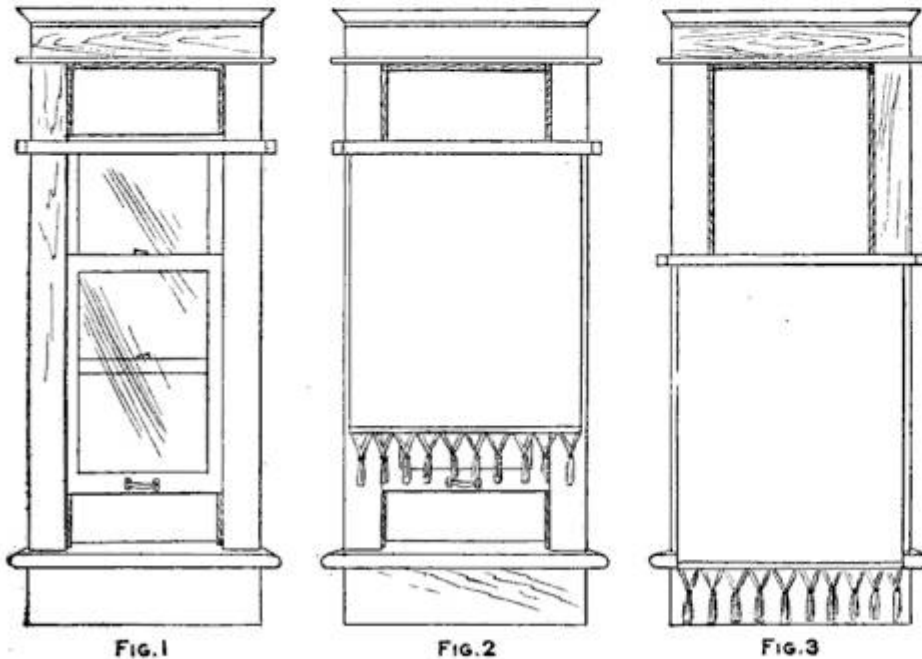


Fig. 1  
Fig. 2  
Fig. 3  
Shade Roller Attached to Window Sash

the exact weight, but it comes very close to it. We weigh a certain box filled level with coal and then keep account of the number of boxes used in each firebox. The boxes are fixed permanently on the wheelbarrows used for transferring the coal from the bins to the boilers; and as each man wheeled in a load he was supposed to mark it down on a record sheet. But as he sometimes did not find the pencil, this would be neglected. Therefore we made a dial, using the figures from an old calendar, and a pointer that turned hard, and when a man delivered his box of coal, he had only to move the pointer on the dial to the next number. —Contributed by James E. Noble, Toronto, Canada.

☞The lathe is not the place to knock a file to remove the filings.

☞As a preventive against deterioration and protection from moisture, new leather fan belts should be rubbed frequently with castor oil.

### Sash Shade Holder to Permit Ventilation

A shade fastened to the casing at the top of a window always hinders the free passage of air when the top sash is lowered. A simple arrangement to remedy this and provide free circulation of air is shown in the illustration.

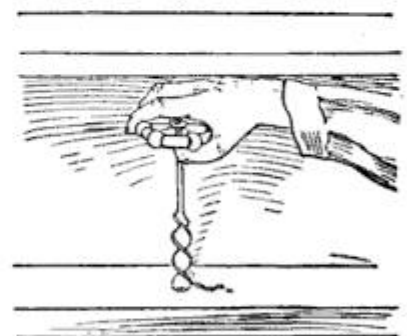
Fasten the short side of a 4 by 5-in. bracket on each side of the upper sash, 1 in. from the top. Attach a strip of wood, 1 in. wide and as long as the curtain is wide, to the projecting ends of the brackets with two T-bolts, put through the hole at the end of the metal, Fig. 1. Fasten the shade brackets with small screws to the ends of this strip of wood and

insert the shade roller (Fig. 2). The shade and roller will then follow the upper sash in its upward and downward movements, Fig. 3. If the upper sash is lowered and the lower sash raised, perfect ventilation is obtained. —Contributed by Victor Labadie, Dallas, Texas.

### Turning a Bit with a Valve Wheel

One of our men was putting up shelving, and some holes had to be bored in the crosspieces which were only 15 in. apart. This space did not

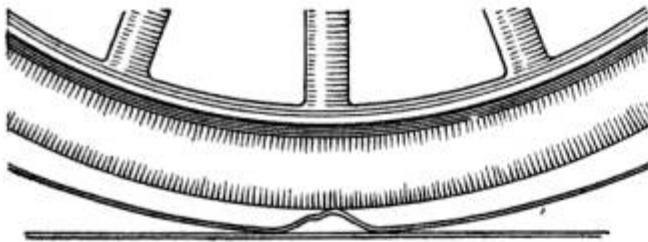
allow the use of a brace and bit. But the man had evidently run up against such difficulties before, for he had in his kit a hand wheel from a  $\frac{3}{4}$ -in. valve with a tapered square hole which just fitted the tang of the bit. The wheel



gave him enough leverage to drive the necessary holes through 1-in. pine boards about as easily as with a brace.—Contributed by A. R. Cuning, Staten Island, N. Y.

### Removing a Dent in an Automobile Fender

A bad dent in an aluminum fender was taken out in this way: The fender was removed from the irons and laid on a piece of cloth which was spread on the floor to protect the varnish against scratches. One of the rear wheels of the car, with the tire fully inflated, was then run back and forth on the concave side six or eight times. The car was next rolled off the fender, and the dent was found to have been removed without breaking the enamel. Small dents may be removed



Dent Pressed Out by Tire

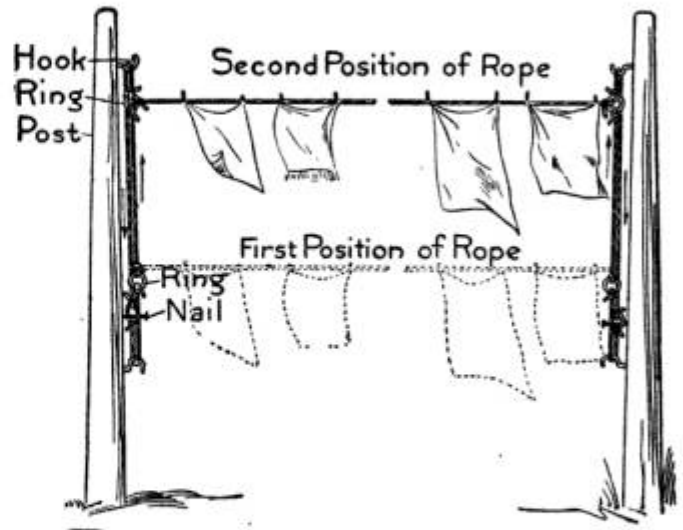
by laying a piece of wood on the surface to receive the blows and striking it with a hammer.—Contributed by Paul B. Wright, Twin Falls, Idaho.

### Elevating a Clothesline

A clothesline which requires no prop, and yet can be raised out of the way after the clothes are hung on it, is shown in the accompanying sketch. It consists of three parts, two end ropes with rings and attachments as shown, the remaining part being the clothesline itself, preferably arranged with hooks at the ends so as to be easily removable. The supporting hooks are attached to walls or posts at either end of the yard and the loops hung on them.

The dotted lines show the line in a position convenient for hanging the clothes, and the other in an elevated

position for drying. If necessary, another clothesline can be hooked into

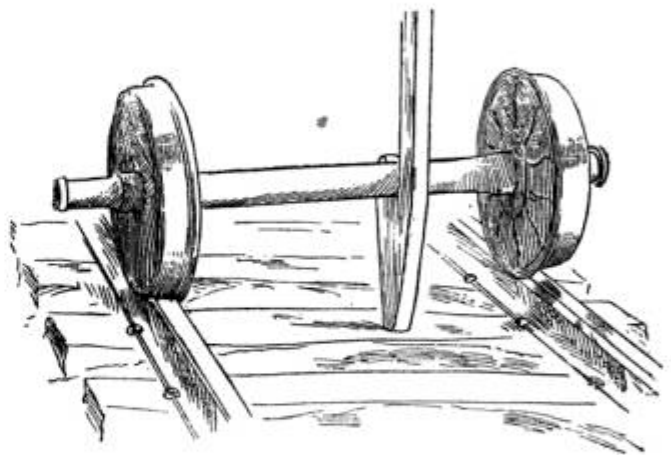


High and Low Position of Line

the extra rings.—Contributed by A. P. Connor, Washington, D. C.

### Lever for Lifting Car Wheels on Axles

Sometimes it is necessary to turn a pair of car wheels in the shop, and this is a difficult matter without some means of raising the flange of one wheel over the rail. A lever cut from an old piece of scrap hard wood, as shown in the sketch, will make the job easy. The hook is placed under the axle and the wheel is raised by pushing against the lever. As the height of axles varies, the lever should be made

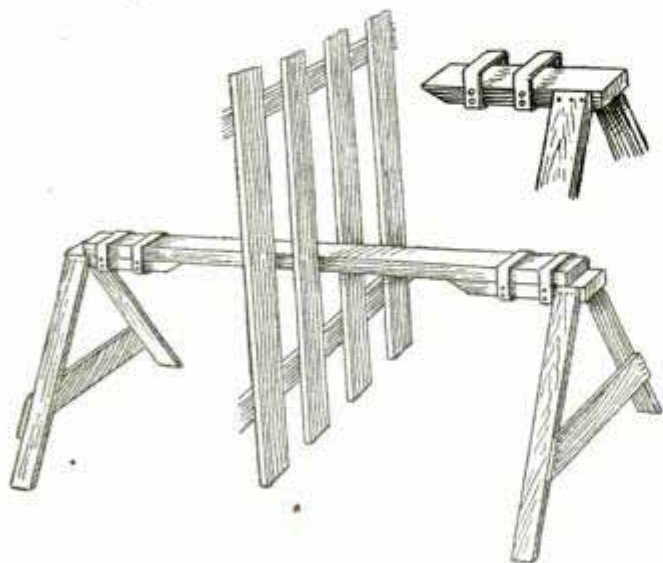


Lever for Raising Axle

to fit the lowest, and a plank or board may be used under the lever to adjust it for higher axles.—Contributed by Urban A. Towle, Portland, Me.

### Extension Trusses

A truss or horse, that can be taken apart quickly and lengthened, makes a handy scaffold for some kinds of

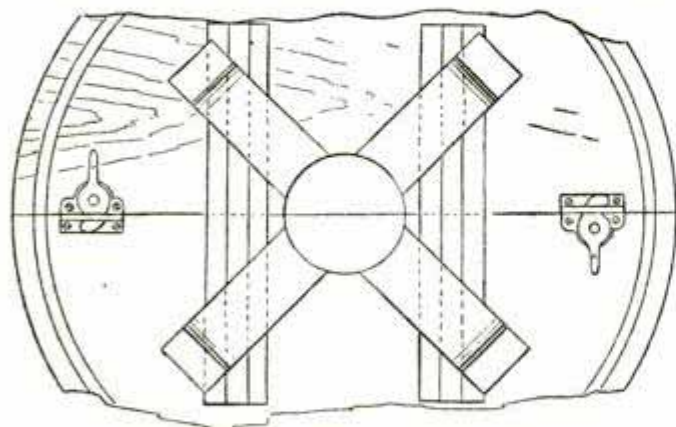


Separable Shop Horse

work, and especially for painting high picket fences. The crew can work on both sides at the same time. The sketch shows how each pair of legs is attached to a short block top, having two loops made of strap iron into which a long top piece can be inserted.—Contributed by W. A. Jacquythe, Richmond, Cal.

### Fastening Extension-Table Parts Together

The extension dining-room table annoyed us a great deal by pulling apart, as it was not provided with locking



Window Fasteners on Table Parts

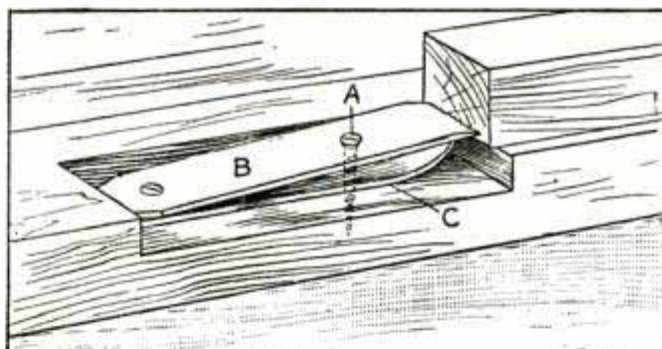
devices. I took two ordinary window fasteners and put them on the under side of the top, attaching one of the pieces on each side of the division.

After pushing the table parts together, they are held closed by locking the fasteners. Extra leaves can be put in by turning the levers and unlocking the catches.—Contributed by B. V. Showalter, Philadelphia, Pa.

### Bench Stop for Varied Thicknesses

A good bench stop for holding thin or thick stock while dressing the surfaces can be made from the back iron of an old plane. Cut a recess, about  $\frac{1}{4}$  in. deep and the shape of the back iron, into the bench top. File teeth—about six to the inch—in the broad end of the back iron. Procure a piece of thin straight spring about 1 in. wide and 3 in. long; bore in one end of it a hole as large as the hole in the back iron, and bend the other end in an upward curve.

A large screw put through the holes



Stop Attached to Bench

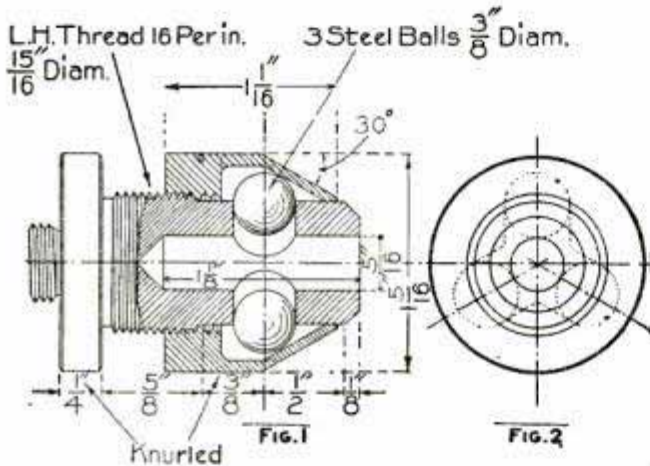
in the back iron and spring and turned into the bench holds the stop in the depression cut in the top of the bench and makes a stop adjustable for thin or thick stock. It can be turned down far enough to be out of the way while other work is being done.—Contributed by George Schellberg, Omaha, Nebraska.

### A Ball-Grip Self-Centering Drill Chuck

The small chuck shown in the accompanying sketch can be easily made by any one who has access to a screw-cutting lathe. As the diagrams show, three steel balls replace the usual

jaws, the balls fitting in guides consisting of radial holes drilled in the body of the chuck. The balls are closed on the tool to be held by the hollow sleeve, which is bored out with an internal taper, and screws on to the body of the chuck with a left-hand thread. When the drill to be held is pushed in, its end centers itself in the taper end of the hole and the balls grip it centrally when tightened up by the sleeve.

It is important that the sleeve should be attached by a left-hand thread, as this makes the chuck self-tightening. Looking along the drill at the front end of the chuck it rotates, when slipping, in a clockwise direction. This causes the balls to roll in the opposite direction, and to trans-



Details of the Chuck

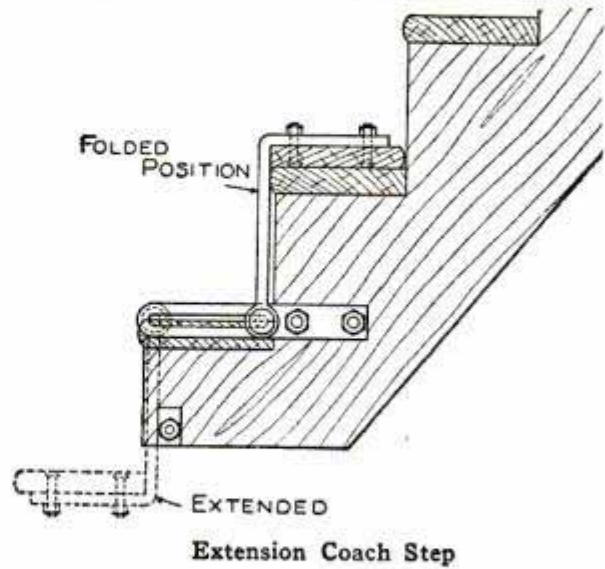
mit a similar rotation, i. e., counter-clockwise, to the sleeve, which is thus tightened up.

A sectional view through two of the balls is shown in Fig. 1, and an end elevation from the front of the chuck in Fig. 2. The size given is for holding drills up to 1/8 in., 1/8-in. drills being the smallest it will hold. The balls are 3/8 in. in diameter, so they cannot fall out through the center hole.

The holes for the balls should be carefully drilled and filed or scraped so that the backs of all the holes are at the same distance from the front. This insures the proper centering of the drills. The chuck is improved by case-hardening the sleeve and ball guides, but this is not necessary.

### An Auxiliary Step for Cars

Some railroads are attaching to their coaches an auxiliary step similar to



the one shown in the accompanying sketch. This step does away with the familiar brakeman's "stepping box," which has always been more or less of a nuisance. The idea might easily and profitably be applied to trolley cars and other vehicles where a high step cannot be avoided and the stepping box is not available or desired. The step is fastened on the "L"-shaped brackets which slide back in a groove when the step is reversed or folded back on to the second step.—Contributed by D. A. Hampson, Middletown, N. Y.

### Medicine Dropper

Take a piece of wire a little more than twice as long as the bottle, double and twist it like a rope, then bend about 1 in.

of one end to a right angle. Place the other end in the bot-

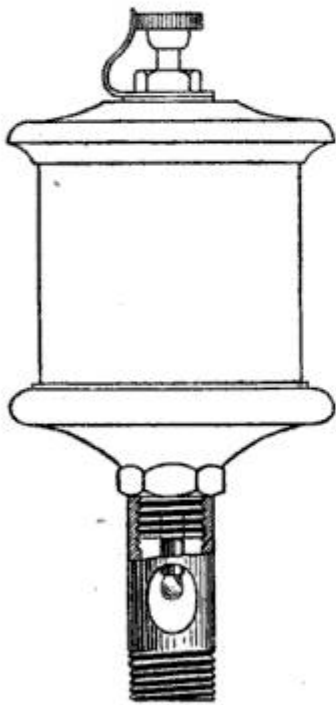


tle, tip the liquid well on the wire and it will drop steadily. This will only apply to liquids that do not act upon the metal.—Contributed by R. H. Workman, Loudonville, Ohio.

Ⓒ Always make sure that calipers are properly set before using them.

### Home-Made Sight-Feed for an Oil Cup

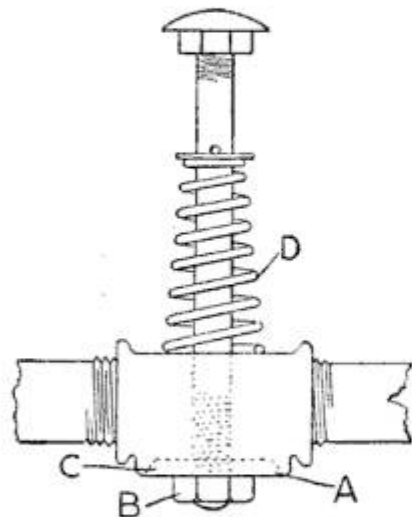
The common set-feed oil cup can be easily changed to a sight-feed in the following manner: A short piece of pipe is threaded on the inside at one end to take the thread of the oil cup. The other end is threaded to fit the hole in the bearing to be oiled. An oval hole is cut through the center of the pipe, as shown. A small brass pipe is fitted in the lower end of the oil cup. The



parts are assembled as shown.—Contributed by C. C. Brabant, Alpena, Michigan.

### Exhaust Cut-Out Made from Pipe Fittings

A very satisfactory cut-out valve may be made from an old tee pipe fitting in the following way: Take a tee fitting the size of the exhaust pipe and drill a  $\frac{3}{8}$ -in. hole in the center,



o p p o - site the side opening. Turn a seat for the valve at a 45-deg. angle, as shown at A. Thread a rod and fit the nut B. Turn a disk, C, and thread it to screw on the stem, so that it will lock with the nut B. Place in position, as shown, and put on an open coil spring to keep the valve seated. Drill a

$\frac{1}{8}$ -in. hole in the stem and place a washer and pin to hold the spring in position. Cut the rod long enough to pass through the footboard, thread the upper end and turn on a round-headed nut taken from an old buggy top. This will serve as a head for the valve stem.—Contributed by J. N. Bagley, Webber, Kan.

### An Indicator for the Lathe

Obtain a piece of sheet steel and shape it as shown at A, Fig. 1. Drill a taper hole in the middle, and drill and tap a hole for a small machine screw at the narrow end. Make the pointer C of drill rod and screw it to the plate. Great care should be taken to make the small screw J a close fit, so as to insure an accurate reading.

A ring, E, Fig. 2, is made with a slot in the top to receive the flat spring G, the extreme end of which should be

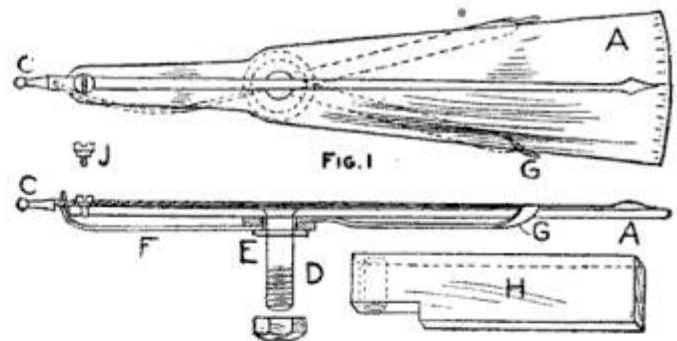


FIG. 2  
Details of Indicator

twisted at a right angle. The stud D is riveted to the sheet metal, so that the ring E turns easily. Connect the pointer with the ring with a piece of spring wire, F, which completes the instrument. The indicator can be changed from left to right, or right to left, by simply pushing the flat spring G to the respective side. A suitable holder for use in the tool-post is shown at H.—Contributed by Max Lange, Hartford, Conn.

Ⓒ Allow plenty of time for the under coats of paints to dry before varnishing and there will be no danger of stains showing after the job is in service.

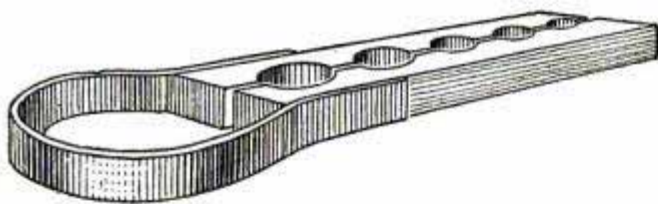


### Handling Large Piston Rings

In setting up an engine having a cylinder 24 in. in diameter, considerable difficulty was caused by the springing out of the heavy piston rings so that the piston could not enter. The trouble was overcome by using a circular band of  $\frac{1}{8}$ -in. flat iron, about 1 in. wide, with right-angle pieces welded to its ends and drilled for a  $\frac{3}{8}$ -in. bolt. By means of this device, the rings are drawn down tightly to the surface of the piston, so that it can be driven in easily. The circular band is driven up and loosened for a second ring, and if there are more than two rings, the process has to be repeated for each one.—Contributed by Sidney K. Eastwood, Detroit, Mich.

### Holding Screws for Slotting

The little clamp shown in the sketch herewith was made by me



Screw-Holding Clamp

some years ago and I have found it very useful for holding screws. It consists of a piece of brass plate,  $\frac{1}{2}$  in. thick, 1 in. wide and 3 in. long, with a spring bow soldered on one end to keep the pieces in place and allow them to separate. The holes, which are different in size, should be drilled first and then a saw cut made through their centers. If you have to make a slot in the end of a setscrew, it can be cut by putting the screw in one of the holes and then clamping the plate in an ordinary vise. The thread of the setscrew will not be damaged in the soft metal. It is the best thing for holding nickel-plated or brass pipe when cutting threads, or anything round that must be handled with care. The plate should be annealed and the holes slightly countersunk.—Contributed by Harold James, New York City.

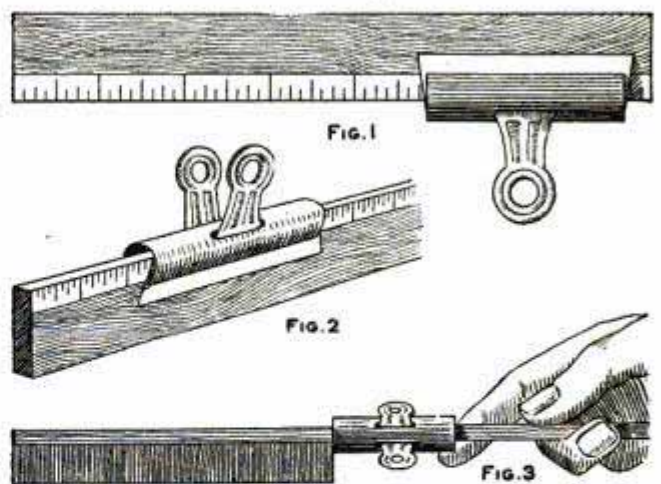
### A Broom-Holder

Take a length of old stove pipe and cut it to the shape shown in the illustration. The sides should be doubled over for stiffness and a center hole cut,  $\frac{3}{8}$ -in. larger than the diameter of the broom handle. Punch a hole at one side and fasten the device to the wall with a small staple. The handle of the broom is pushed through the hole, and its weight will keep the broom in the position where it is placed.—Contributed by Jas. Fregard, Mount Boydges, Canada.



### Scale Indicator and Gauge

An ordinary paper clip can be used as a scale indicator as shown in Fig. 1. The same clip can be used on a lumber rule as shown in Fig. 2, or on a yardstick when gauging materials as in Fig. 3. The clip is clamped over



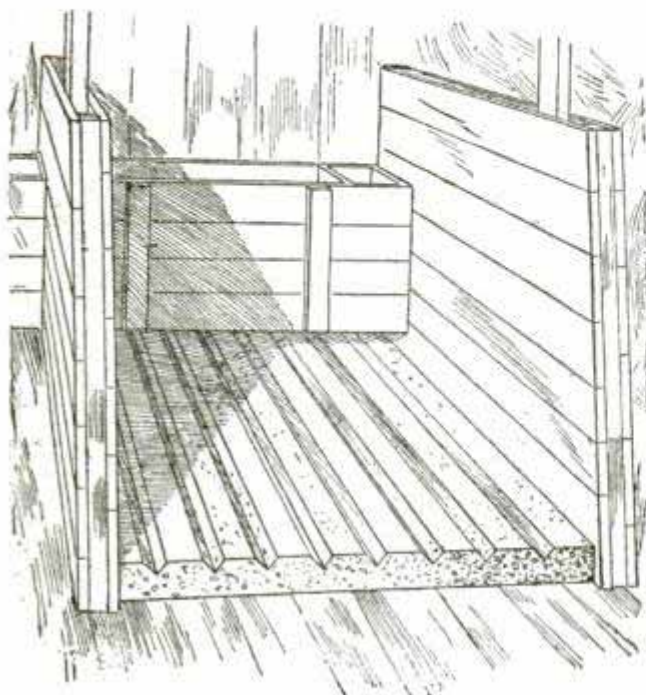
Clamps on Rules

the rule the same as over papers.—Contributed by James M. Kane, Doylestown, Pa.

CA tool for turning steel will not do for brass.

### Dry Concrete Floor for Stalls

The method of constructing concrete floors for barn stalls which is shown in the illustration will overcome the



Cement Stall Floor

prejudice against this style of floor, as the channels will carry the water to the gutter easily and quickly, thus keeping the bedding perfectly dry at all times.

The floor is laid in the usual manner, with a proper slant toward the gutter. When finishing the top of the concrete, a straightedge is laid from gutter to manger and with the point of a trowel, grooves or channels are cut the entire length. These should be 3 in. apart and not over  $\frac{1}{2}$  in. deep. With such a depth there will be no danger that a sharp-shod animal might wrench a limb by catching the shoe-calks in the grooves when turning around. This floor will give the animals greater comfort and save much labor in grooming them.—Contributed by A. A. Houghton, Northville, Mich.

### Trapping Insects for a Collection

Wishing to catch specimens of insects that frequent the night air, I devised the following arrangement to that end: Upon a high support I placed a shallow plate almost filled

with glycerine. About 2 ft. above this I suspended an electric light. Insects attracted by the light were decoyed to the white plate and entangled in the glycerine. Many hundreds of different "bugs" were caught in this way in a few hours. The arc light is best suited for the purpose.

Night-flying birds can be caught in this manner by using a 2 by 5-ft. board, painted white and placed on a high pole. The bird will be attracted by the white board just as by a lit up window in a dark wall, and rush toward it with increasing speed. When striking the board, it falls half stunned to the ground and can be easily captured. It is surprising what great variety of uncommon birds and insects frequent the night air, and the collector will be able to make many an interesting addition to his store by using this method.—Contributed by Loren Ward, Des Moines, Iowa.

### Protecting the Edge of a Workbench

It is very handy for the home mechanic to use the bench edge as a support for holding a block while countersinking or boring a hole, but the bench edge becomes badly damaged by the point of the bit or countersink, and a handy device to protect the bench edge should therefore be welcome. Such a device is shown in Fig. 1 and

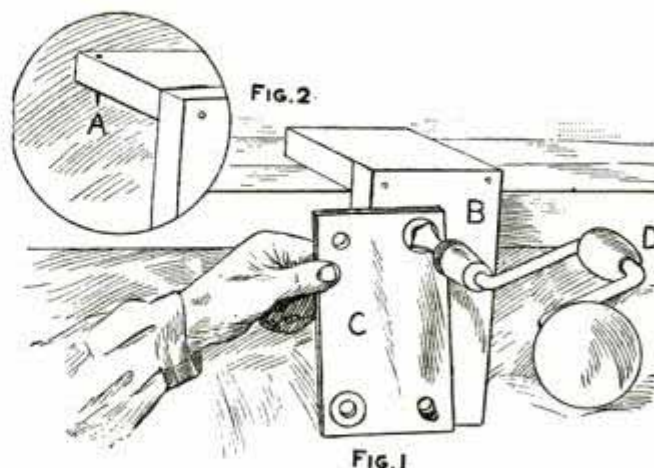


FIG. 1  
Bench Protector

can be made from two blocks of wood, nailed together at right angles. Two small brads or nails are driven through

the back edge of the horizontal block (A, Fig. 2) to keep the piece from slipping off the bench top.—Contributed by Chester Purdy, Ghent, O.

### A Cooking-Ventilator

This ventilator is made of an old, large frying-pan—even one that is ready to be thrown away will do—by cutting out the bottom, as shown in the sketch, leaving four lugs. These lugs are bent up inside, the ventilator placed on the stove, the frying-pan

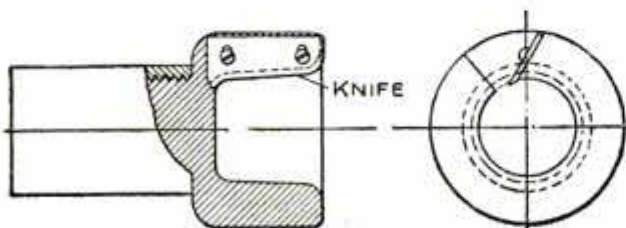


Vent for Odors

placed inside and the cover put on. When cooking steak or onions, the odor and smoke will pass from the frying-pan with the draft and out through the chimney.—Contributed by Chas. W. Thiede, Denver, Colo.

### A Wood-Turner's Tool

A device for rounding one or both ends of irregular shaped pieces of wood to a size and shape that may be conveniently secured into a chuck, and held firmly with one end free, is shown in the accompanying sketch. It is made by using a pipe coupling that will fit on the spindle, then screwing a piece of hard wood into one end firmly and turning it to a suitable size and shape. After the hole is bored, trim it out and fasten a knife by means of screws as

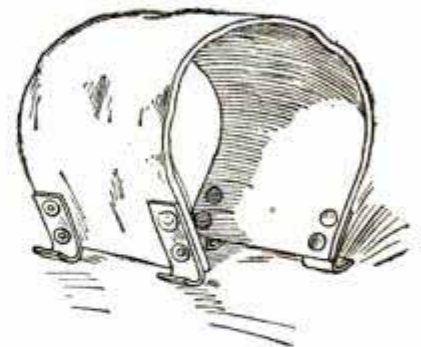


Knife in Coupling

shown. The screw-holes in the knife are slotted so that it is adjustable.—Contributed by P. H. Campbell.

### An Automobile Tire Sleeve

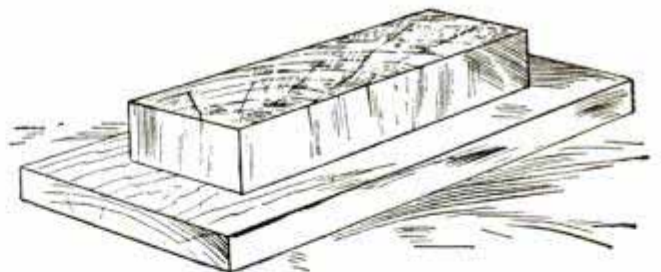
Get a piece of 5-in. rubber belting, some copper rivets and a piece of steel,  $\frac{1}{8}$  in. thick by  $\frac{3}{4}$  in. wide. Cut the steel into four pieces, bend them as shown in the sketch, and smooth the corners and edges with a file, so that they will not cut the tire. Drill holes and rivet one on each corner as shown.



A piece of the material cut from a discarded casing can also be used for the purpose.—Contributed by Claud M. Sessions, Waynesville, Ill.

### A Knife Hone

An excellent knife hone for the kitchen or workshop can be made of a block of wood the same size as an ordinary oil stone. Basswood is best



Hone on End Grain of Wood

for the purpose, but any soft wood will do. Cut the block so that the end of the grain shows on the upper surface. If the block is small, glue it on a base-board to prevent checking. Soak the top with oil and then dust on a small quantity of powdered emery, a heap not larger than a small pea being sufficient. Rub the powder in well and it will last a long time without renewing. This makes an ideal hone for the workbench or desk, and is much better than an oil stone where constant attention is needed to keep a fine edge on a tool.—Contributed by J. J. O'Brien, Buffalo, N. Y.

### A Nail Box

A nail box, like the one illustrated, can be made with any number of divisions, but one of medium size answers

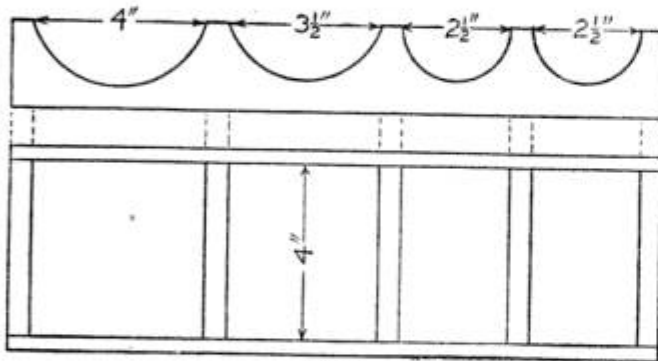


FIG. 1

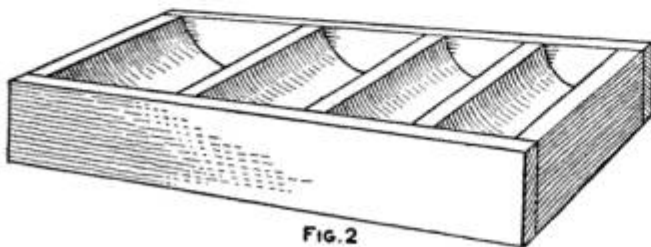


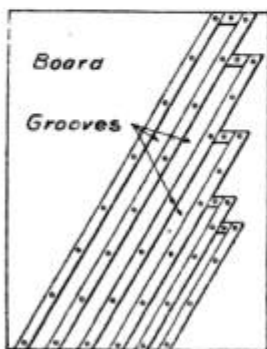
FIG. 2

Receptacles for Nails

most purposes. This particular one is made of white pine of the dimensions given in the detail, Fig. 1. Fasten sides on, Fig. 2, with a little glue and brads; then cover it over with a coat of shellac. This makes a very convenient box, as there are no corners and no need of always "fishing" for a nail.—Contributed by W. A. Lane, El Paso, Texas.

### A Templet for Cutting Spiral Piston and Valve-Rod Packing

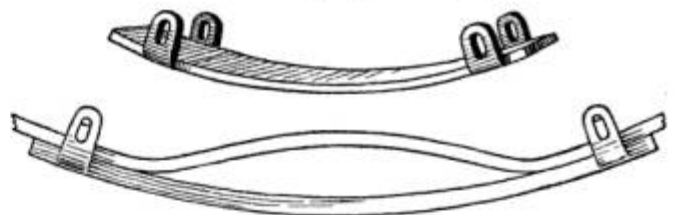
First cut a ring of packing for each piston and valve rod you have in charge. Cut these very accurate, as they are to be used for making the templet shown in the accompanying sketch. The board should be large enough to take diagonally across it the longest piece of packing used on your engine or pump. Then nail small strips on the board, forming grooves the width of



the packing, until you have a groove for each size, and fasten small blocks in the grooves so that you have also a groove for each length wanted. By laying the packing in the proper groove and cutting it off flush with the end of the board, you will always have a ring that will fit the rod perfectly.—Contributed by E. J. Berry, Lake Providence, La.

### Upsetting Wagon Tires

A wagon-tire upsetting machine is too expensive for the small shop and more so for the farm. The home-made affair, illustrated in the sketch, makes a good substitute. It is made of wrought iron,  $\frac{1}{2}$  in. thick, 1 ft. long and as wide as the tire. Four lugs are welded on the edges, as shown, keyways cut and keys to fit them made, and then the lugs are turned up at right angles. Make a bend in the tire and heat it well, quickly place it in



Tire Upsetter

the upsetter and drive in the keys as shown. Hammer the bend down, and the tire is upset.—Contributed by W. C. Parker, Olaf, Iowa.

### Repairing a Mirror

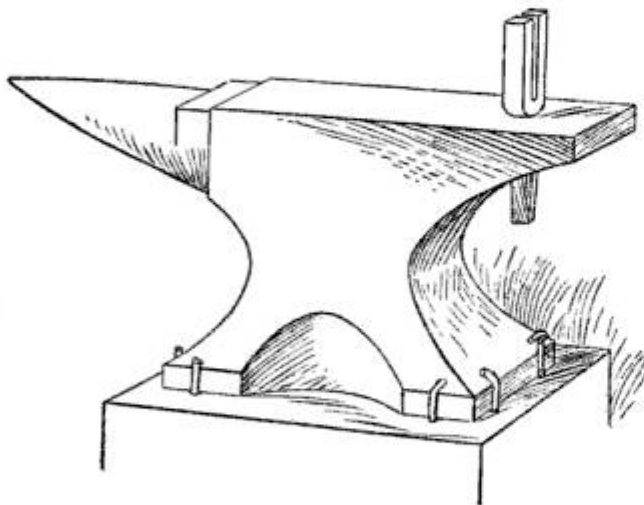
We doubt whether an amateur can patch the amalgam back of a mirror so as to make a satisfactory job, says the Druggists' Circular, but we know of nothing to prevent one from experimenting along this line if he wants to, and here is some advice which may be of assistance to the experimenter: First clean the bare portion of the glass by rubbing it gently with fine cotton, taking care to remove every trace of dust and grit. If this is not done carefully, defects will appear around the place repaired.

Outline on the back of another looking-glass a piece of silvering of the required form, but a little larger, and with the point of a penknife cut through the amalgam along the outline. Upon this piece of amalgam place a small drop of mercury. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may now be lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton. It hardens almost immediately, and the glass is uniform in appearance.

Another way is to pour upon a sheet of tinfoil about 3 drams of quicksilver to the square foot of foil. Rub smartly with a piece of buckskin until the foil becomes brilliant. Lay the glass upon a flat table, face downward; place the foil upon the damaged portion of the glass; lay a sheet of paper over the foil, and place upon it a block of wood or piece of marble with a perfectly flat surface. Place sufficient weights upon it to press it down tight and let it remain in this position a few hours. The foil will then adhere to the glass.

### An Anvil Yoke

The yoke illustrated in the sketch is for bending metal into circles or bands of any kind. The jaws should be about  $\frac{3}{8}$  in. apart and 4 in. long.



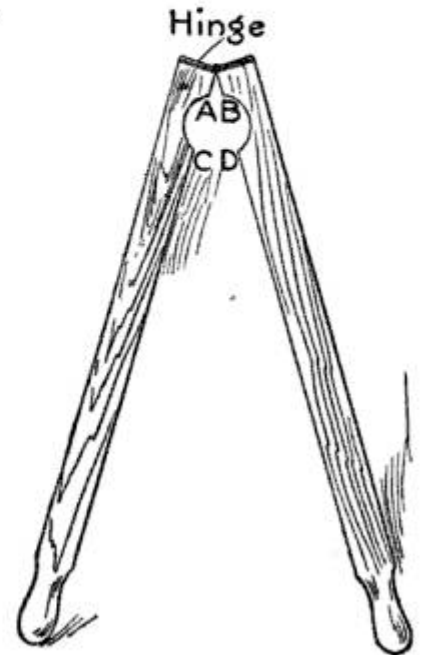
Bending Tool in Anvil

It is best to make it of  $\frac{7}{8}$ -in. square iron.—Contributed by D. O. Wilkins, Hempstead, Texas.

### Cleaning a Rusty Shaft

The light shafting used for driving sewing machines in a factory easily becomes rusty, and as I wished to keep mine clean and bright, I made a polisher from

two pieces of wood, each 2 in. square and 16 in. long. One end of each stick was shaped into a handle, and the other ends joined together with a hinge, so that the device had the appearance of a large nutcracker.



A piece of emery cloth was then stretched tight from A to B on the wood, left a little slack between A C and B D, and tacked in place. When polishing, the device is clamped over the shaft while it is turning. If the lever is held on a slant, it will travel along the shaft.—Contributed by C. F. Matzek, Milwaukee, Wisconsin.

### Repairing a Hole in a Cistern

Several attempts were made to patch a hole worn in the bottom of a cistern by a chain pump, but all failed because water would soak up through the cement, before it had time to set. I wiped the hole out dry, put in dry cement to absorb the water and then mixed up some cement with very little sand, to make it set quickly. This method failed just as the others. Then I removed the cement, cleaned the hole dry and sealed the bottom and all the cracks with common sealing-wax. A neat mixture of cement on this made a watertight bottom.—Contributed by C. M. Rogers, Wellington, O.

☞ Keep your oil can full.

### Home-Made Vegetable Paring-Knife

A simple vegetable peeler can be easily made as follows: Secure a block of wood, 1 in. thick, 2 in. wide

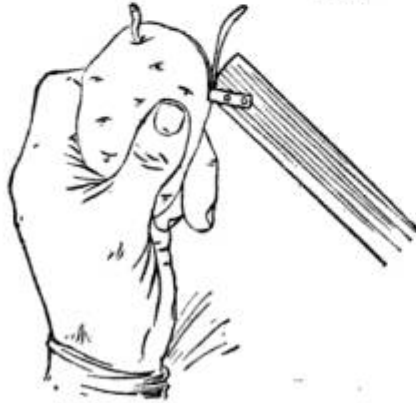
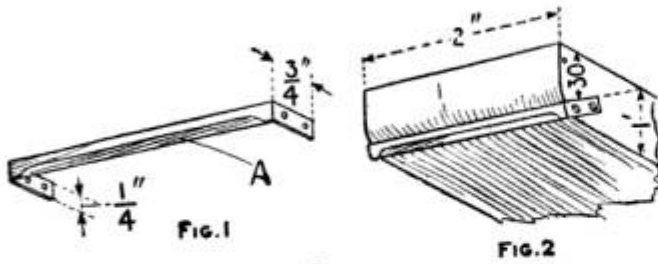


FIG. 3

Knife on Rounded End of Stick

and 6 in. long, and a piece of tin, iron or brass,  $\frac{1}{4}$  in. wide by  $3\frac{1}{2}$  in. long. Bend the metal as shown in Fig. 1, and fasten it to the rounded edge of the block by means of four nails or tacks, as shown in Fig. 2. File it down at A, Fig. 1, to make the cutting edge, which should be no more than  $\frac{1}{8}$  in. from the surface of the block. The peeler is used as shown in Fig. 3. —Contributed by K. Kuga, Hoquiam, Washington.

### A Handy Ladle

A ladle with an adjustable handle is shown in the accompanying illustration.



Movable Ladle Handle

The ladle when filled with metal will remain in an upright position, no matter at what angle the handle is

held. This is because the handle is flattened and loosely riveted to the ladle, which allows it to adjust itself. —Contributed by W. A. Jaquythe, Richmond, Cal.

### Making an Old Soft-Wood Floor Smooth

An old warped, shrunken and generally dilapidated soft-wood floor can be renovated so that rugs may be used on it instead of unsanitary carpets.

Give the floor one coat of white lead and oil paint, tinted buff with yellow ochre and a very little burnt umber. When dry, putty only the very bad places. If the boards are wide, as is usually the case, take a strip of wood as a guide and, with a 5 or 6-in. wire nail, score a number of lines about 2 in. apart down each board. This gives the floor the appearance of being laid with 2-in. material. Apply a second coat of paint, same as the first, and when this is thoroughly dry, stain with a mixture of turpentine, yellow ochre and burnt umber (but no lead), using much more umber than in the paint, so as to effect a sharp contrast. A very small quantity of Van Dyke brown may also be added, if obtainable. While the stain is still wet, run over the floor with an ordinary coarse comb or a stubby whisk-broom, if you cannot procure a painters' graining comb.

After the stain has dried, apply a coat or two of a good floor varnish, and the result will exceed your expectations. You will have a fine imitation of an oak floor at a slight cost. If the parts, subject to wear, are recoated with varnish occasionally, the color will not wear off. Either the whole floor or merely a strip around the base may be so treated, if a single large rug is to be used. —Contributed by Norval Bradley, Paterson, N. J.

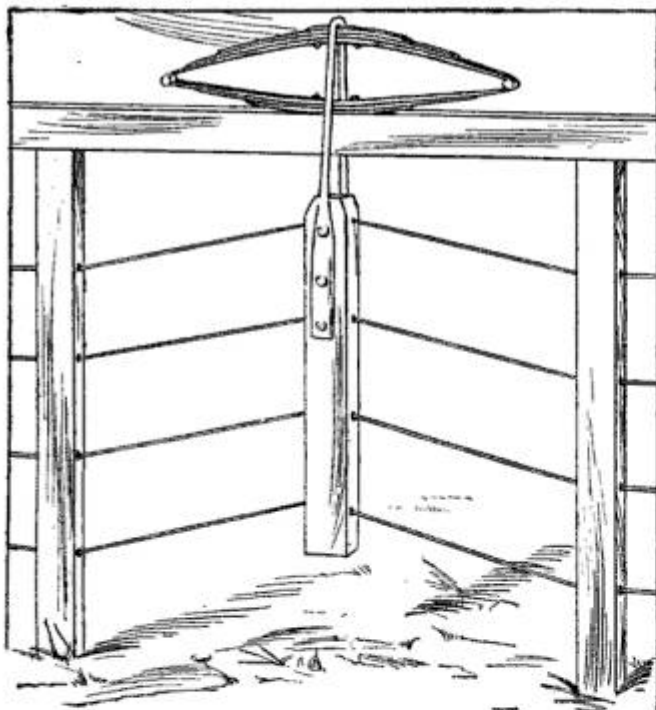
¶ An old ivory effect may be made by applying two coats of white shellac and when it is dry scumbling with raw umber, rubbing it partially off with a rag, so as to leave a mottled effect.

### Moving a Steel Water Tower

A large steel water tower, weighing 45 tons, in the Union yards at Peoria, Ill., had to be moved to provide additional space for tracks. As the tank was in almost constant demand, it could not be long spared from service. The method adopted for moving it was to swing the tank, using one post as a center. Sawed timber ties were laid close together to make the base of a semi-circular track, and curved steel rails of the proper radius were spiked to them. Rollers of 2-in. round iron were used on the rails. It required only a few hours to move the tank a distance of 20 ft.

### A Tension for Wire Fences

The accompanying illustration shows how a farmer applied a tension to the wires on his fence to keep them taut, at the same time allowing for the contraction and expansion of the metal. The principle of the device



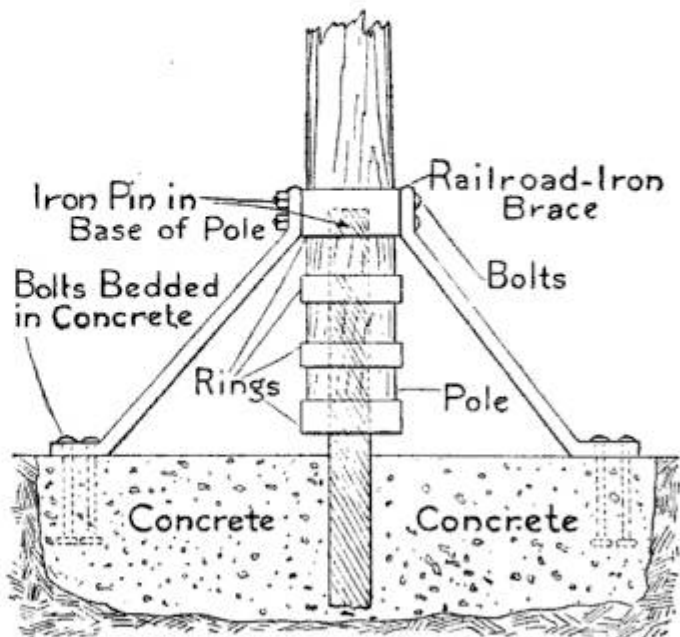
Tension on the Wires

can be readily understood from the sketch.—Contributed by R. Homer Edson, Middletown, Ohio.

☞ A file may be kept from filling up with lead by applying a coat of thin oil just before filing.

### Erecting a Flagpole

The accompanying sketch shows how to erect a flagpole so that the wood will have no contact with the



Pin Embedded in Concrete

earth and therefore not decay. A large iron pin is stuck into the base of the pole and extends into the concrete base. The end of the pole is well protected against splitting by shrinking several rings on the wood. Braces are attached to the top ring and to the concrete.—Contributed by James M. Kane, Doylestown, Pa.

### Inexpensive Foundation Covering

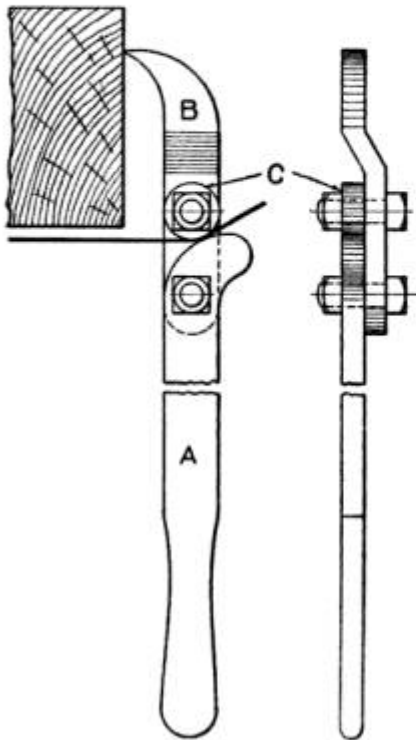
When houses rest on inexpensive wood foundations, these are usually boarded up to keep out the cold. A good substitute for the boards is the material used in making a gravel roof. This is cheaper and easier to apply. No wind or frost can penetrate this covering, and it gives the appearance of a stone foundation.

☞ A piece of sandpaper is an excellent thing to keep near a gasoline or kerosene can to remove the cap when it is stuck.

☞ Holes in grain sacks can be patched by shaking out the dust and pasting a piece of the same material on the inside over the opening.

### How to Make a Wire Stretcher

A wire stretcher made as shown in the accompanying sketch will prove a



very useful tool, as it will hold all kinds of wire and can also be employed for pulling bolts, if they are easily accessible. The handle, A, is forged from  $\frac{1}{2}$  by  $1\frac{1}{4}$ -in. stock and should be about 18 in. long.

Shape it as shown, and drill a hole for a  $\frac{1}{2}$ -in. bolt or rivet at the upper end. The upper part B is made of the same material and is shaped with an offset as shown. This offset allows the pressure at the post to be in line with the handle, thus preventing the tool from having a tendency to turn in the hand. The roller C is  $\frac{1}{2}$  in. thick and  $1\frac{1}{4}$  in. in diameter and is also attached with a  $\frac{1}{2}$ -in. bolt or rivet. Drill a hole in the handle to hang it up by when not in use.—Contributed by J. N. Bagley, Webber, Kan.

### Non-Sagging Doors

An article in a recent number of Shop Notes suggested an idea for a novel door fastening. The idea is to hang a door on two sets of loose bolt butt hinges, one set on each side of the door. This makes it possible to lock the door by the hinges on one side and to prevent it from sagging. The door can be opened on either side.—Contributed by L. Alberta Norrell, Augusta, Ga.

### Cracking Nuts

Heretofore only the wild pecan has been seen in the markets, but selected cultivated varieties are growing in commercial importance from year to year. Of late, large plantings of the latter kind have been made in the southern states and the product of these will soon become common in our markets. As prices are likely to remain high for some time to come, owing to the varied uses to which the meats are put, it is timely to describe the proper way to crack the nuts without damage to the kernels. The cultivated nuts, like fruits, are marketed according to varieties which will be sold under distinctive names. Each variety is uniform in size, and the shell on all is of about the same strength, so that the nuts should crack under about the same pressure. This quality will make it possible to avoid crushing the kernels, which means a great deal of waste. Excellent results can be obtained with the ordinary hand cracker if the following hints, plainly illustrated in the sketch, are observed:

With the nut in the left hand insert one end between the jaws of the cracker, using only enough pressure to crack the shell and rotating the nut until a seam is opened all the way around it. Treat the other end in the same way. You can then slip off both ends of the shell and see how the kernel lies within. Then apply pressure at the middle of the nut and the shell will split longitudinally into two



Proper Way to Crack Nuts

halves, from which the kernel may be easily extracted.

The machines used in cracking nuts for the confectioner's trade do perfect work and operate on the same principle, except that pressure is exerted on



both ends of the nut at the same time, causing the shell to burst along the middle.—Contributed by Victor Labadie, Dallas, Texas.

### An Emergency Gasket Repair

A ship on a long trip encountered a gale, and it required all the power of the engines, running at full speed, to hold the vessel "head on" and keep it out of the trough of the sea, when about one-half of the gasket blew out of the high-pressure steam-chest bonnet, the cover being about 14 in. by 38 in. long.

Something had to be done at once, and as it was out of the question to stop the engine, the chief engineer ordered some pine boards brought up from the hold. The boards were cut in lengths of 6 ft. and sharpened to a thin wedge at one end, and when all was ready, two oilers stood by to slacken the nuts a turn, while the steam was shut off just for a moment. During that moment the end of a board would be driven into a section of the leaky joint, and then the steam would be turned on again to bring the ship up to her course. This operation was repeated until the leak was wedged all the way around, which required two hours. The nuts were then set down tightly and the wedges cut off flush. They swelled up during the first watch and stopped the leak entirely. The ship completed her voyage of 18 days with this emergency repair.—Contributed by M. C. Lord, Vallejo, Cal.

### Kettle Lid Retainer

The loose kettle lid, that is always falling from its place every time the contents are poured, is a cause of much annoyance, which can be done away with by the use of a simple wire retainer, as shown in the sketch. The retainer is made of a piece of heavy wire, 17 in. long, bent as shown in Fig. 1. The wire is fitted on the inside of the lid, as shown in Fig. 2. The spring of the wire will keep it in place.

The bend of the wire passes under the top of the kettle and prevents the lid

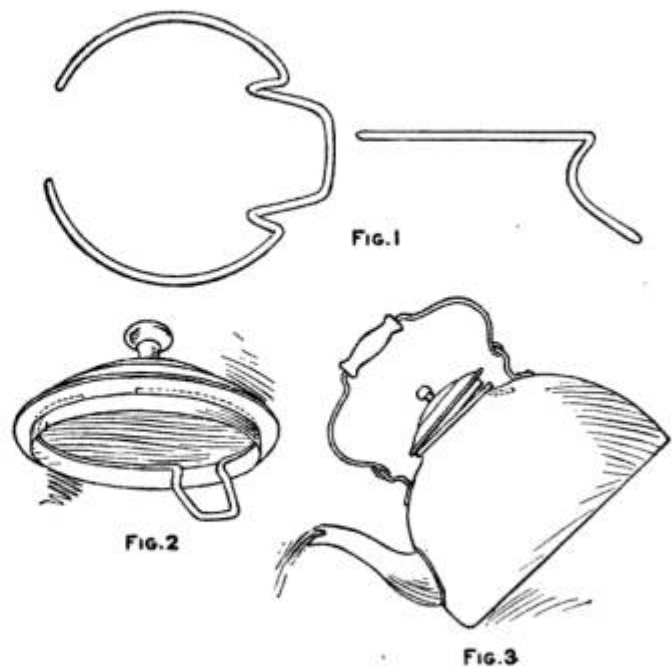
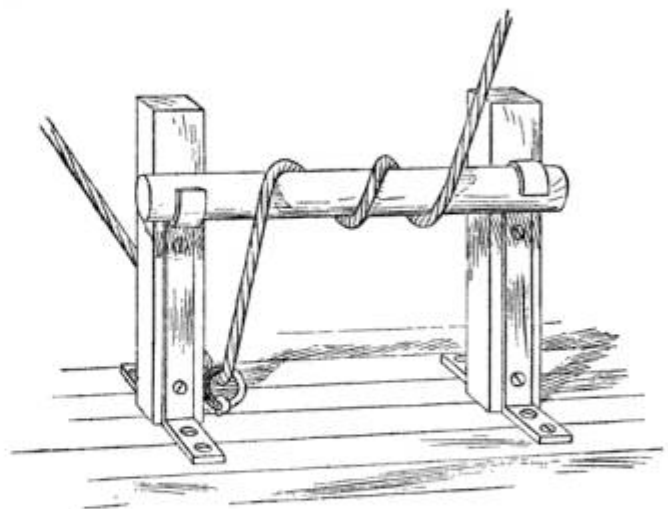


Fig. 1  
Fig. 2  
Fig. 3  
Holding Lid on Kettle

from falling.—Contributed by K. Kuga, Hoquiam, Washington.

### Substitute Turnbuckles for Ropes

The substitute for a turnbuckle shown in the illustration is especially adapted for the stays on a sailboat, but can be applied to many other purposes. For ordinary use the standards are made of timbers 1½ in. square, and the

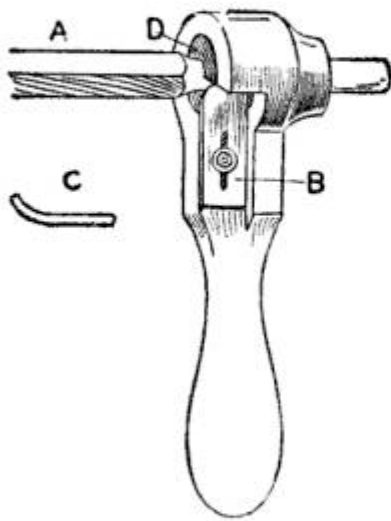


Rope around Cross Bar

cross bar 1 in. in diameter. The sketch clearly shows how the device is used.—Contributed by Arthur L. Chetlain, Chicago.

### Hand Wood-Turning Tool

The tool illustrated is for turning round sticks of wood of uniform size in a lathe. The sketch shows a square

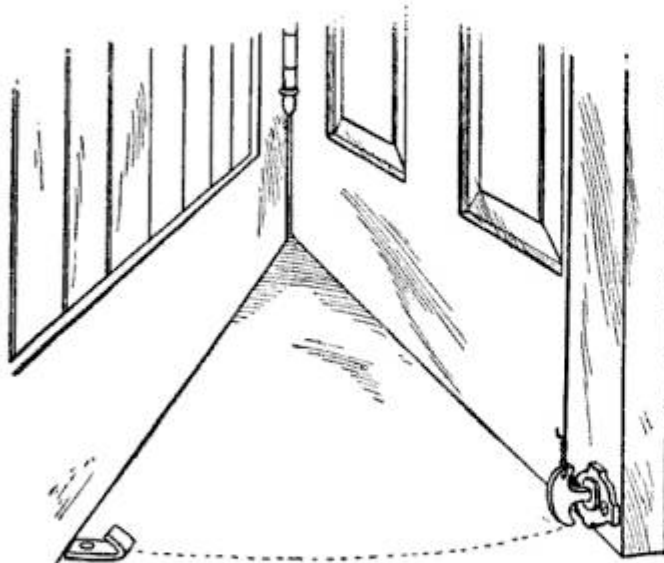


stick, A, with a part of it already turned, and the hand tool B in place. The knife or cutter has a slight bend, as shown at C. The stick to be turned is placed in a square-

hole mandrel, the left hand holds the cutter and pushes it along the revolving stick, and the right hand grasps the finished rod as it is cut by the knife. This simple tool can be adjusted to turn rods of different sizes.—Contributed by C. Purdy, Ghent, Ohio.

### Catch for Holding a Door Open

Secure a catch used on shutters and fasten the part to be attached to the sill on the floor near the wall, as shown in the sketch. The other part of the catch is screwed to the bottom edge of the door where it will be in line to



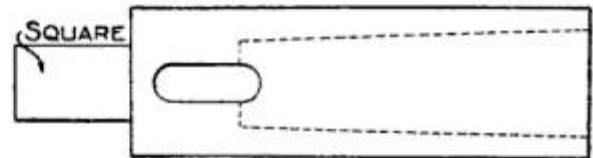
The Hook as Applied

hook in the part fastened on the floor. An easy way to release the catch is

to attach a string between the door knob and the catch, as shown.—Contributed by Thos. E. Ryan, Chicago, Illinois.

### A Socket for Ratchet Drills

As nearly all ratchets are made with a square driving hole, the drills used in them must have square shanks. This means keeping a large stock of the square-shanked drills on hand or forging a shank on a twist drill, which operation usually spoils the tang of the drill. If a socket is made like the one shown in the accompanying sketch, this trouble is overcome. One end of the socket is bored to a Morse taper and the other end has a square shank that will fit the ratchet. By the use of this socket and the regular sleeves, most any sized twist drill can be used. This



Square Shank Socket

affords a saving of much time when a number of different sized holes are being drilled.—Contributed by D. A. Hampson, Middletown, N. Y.

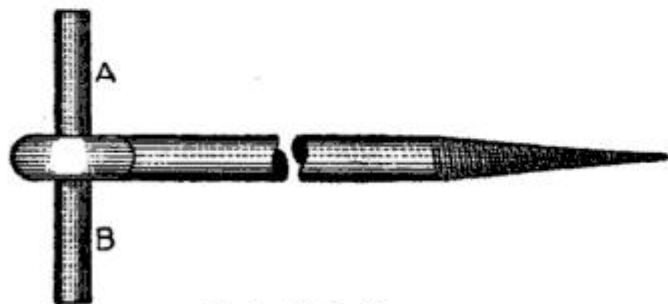
### How to Set a Tool for a Close Cut

When doing fine work on a lathe, tools must be changed as well as on rough work, and it takes some skill to set them again without gouging into the last cut or leaving a ridge. One reason why this is difficult to do is because the work, tools and machine are almost the same color and it is hard to see so closely. If there were a contrast somewhere interposed, all would be different. This contrast can be furnished by placing a piece of white paper on the carriage of the lathe under the work and tool. When the tool is moved up close to the work the light background will make it possible to see the space quite plainly when it is only one-thousandth part of an inch wide. When truing up a pulley or a

turned piece that must be set exact before cutting, this method is a great help to the lathe man.

### Removing Spoke Stubs

A tool for removing spoke stubs can be made from a  $\frac{5}{8}$ -in. lag screw having a good, sharp thread, says a correspondent of the American Blacksmith. Cut the head off and draw it out, turn an eye and then weld a  $\frac{5}{8}$ -in. round



Spoke Stub Remover

iron in the eye. Bore a hole in the stub and turn the lag screw in as an auger. Take hold of the handle A and tap with a hammer at B.

### Preventing the Clouding of Sight Feed Oil Glasses

The clouding of sight feed glasses, which very quickly become opaque, can be prevented in a simple manner, says the Automobile Dealer and Repairer. The cause of the trouble is that the heat of the lubricating oil in the crank chamber generates a smoke, which goes up in the oil pipes and renders the glasses opaque. To prevent this, make a U-bend in each of the oil pipes, as shown in the sketch, at some

point in their length where they are horizontal. This makes a "trap" that

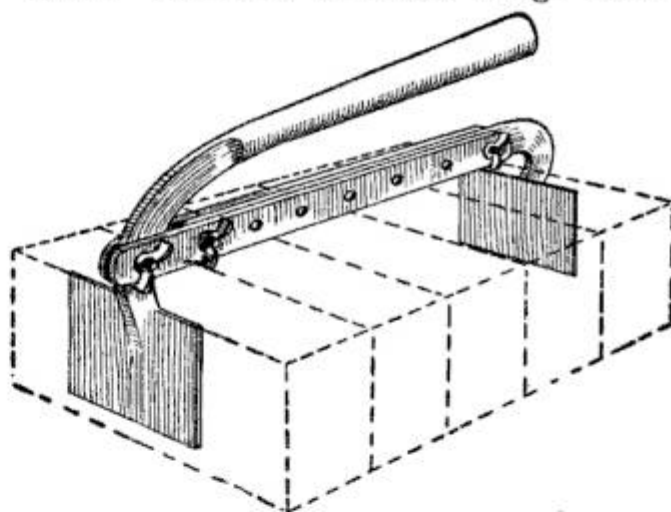


Bend in Pipe

will in no way obstruct the flow of oil, yet keep the smoke from circulating in the pipes.

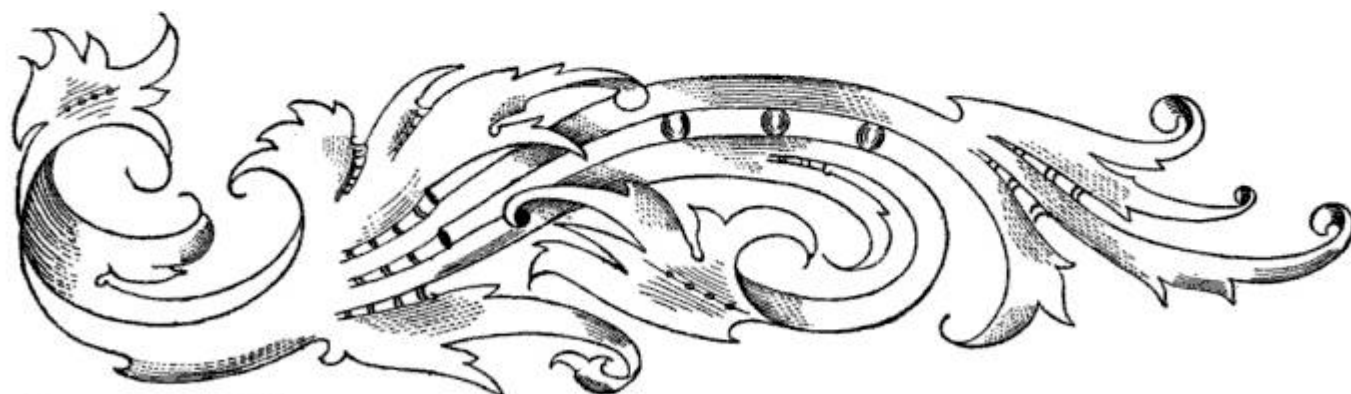
### Brick Tongs

Tongs for carrying bricks are shown in the accompanying sketch. The length is adjustable to fit different sizes of brick. When unloading brick from cars into wagons, the tongs holding four or six bricks are handed to the driver, who is thus enabled to pile that number about as quickly as one brick. The use of these tongs elim-



Tongs Clamped on Bricks

inates the old "chain gang" or hand to hand method and effects a large saving of time and labor,

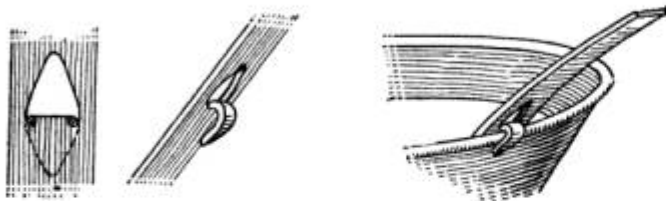


Courtesy American Vehicle

One Half Design for a Short Panel

### Hook on a Spoon Handle

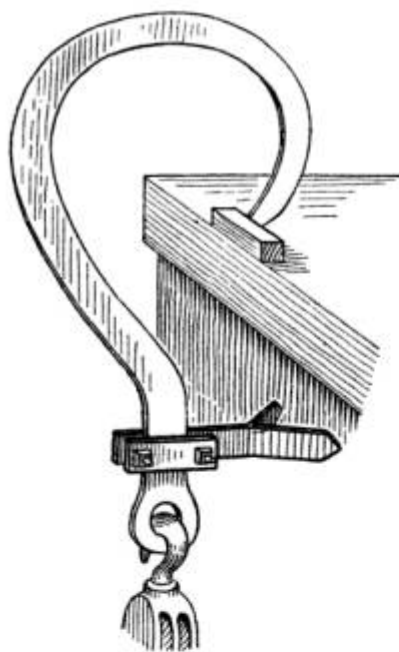
Spoons can be kept from falling into a soup bowl or kettle by making a small hook on the back of the handle,



Hook on the Spoon Handle

as shown in the sketch. A part of the metal of the handle is cut through on three sides and the piece bent back and down. The little hook thus formed slips easily over the edge of the vessel and prevents the spoon from sliding into the liquid.—Contributed by Charles Homewood, Waterloo, Iowa.

### Holding-Bracket for Painter's Scaffold Hooks



The large hooks for holding the tackle on a painter's scaffold have a tendency to keep the scaffold too close to the surface being painted. The little bracket shown in the illustration not only prevents the

hook from swinging sidewise, but also keeps the scaffold out at a convenient distance from the wall. It is nothing more than a forked piece of strap iron clamped to the shank of the hook. The ends of the fork are pointed.

☞ Rub dry castile soap on the automobile wind shield and polish with a silk cloth to prevent the deposit of moisture.

### Babbitting Boxes

When rebabbitting boxes, first remove all the old babbitt metal and give the box and shaft a good cleaning with gasoline or benzine. It is necessary to remove the old grease from the box with something of this nature to prevent "blow holes" when the hot metal is poured in.

If the box to be babbitted is a solid one, the shaft should be covered with paper which is drawn tightly and the edges stuck with mucilage. If this is not done, the shrinkage of the metal in cooling will make it so tight on the shaft that it cannot be turned. The use of the paper leaves the box just tight enough around the shaft to run smoothly. Before pouring the box, the shaft should be blocked up until it is in line, and as near as possible to the center of the box. Use a good stiff putty, placing it around the shaft and against the end of the box to prevent the babbitt metal from running out. Place a small, round stick in the oil hole, letting it rest on the shaft. This will leave a hole through the box to the shaft and will save the time of drilling one. Be sure to leave small air holes at the top by moulding the putty into a funnel around each hole. It is also necessary to make a funnel around the pouring hole. Heat the metal until it is just hot enough to flow freely, then pour it rapidly into the box until it appears at the small air holes.

In babbitting the split box, the operation is the same, except that liners made of cardboard are placed between the two halves of the box and against the shaft to divide the metal. To let the metal run from the upper half of the box to the lower, cut a few small notches in the liner close up to the shaft. The liner should consist of a number of thin pieces of cardboard, rather than one thick one, as they can be removed one at a time to take up the wear of the box. Bolt the box down tightly when pouring the metal. When the babbitt is cool, remove the bolts and cut apart by driving a sharp chisel between the two halves. Cut away the

sharp edges and make the oil channels leading from the oil hole to the outer end of the box.

The ladle used for the ordinary box should hold from five to seven pounds of metal, this being as large as can be easily handled, and if this amount of metal will not run the box, it is a good plan to use another ladle and have an extra helper to handle it. In case of emergency, when no babbitt is at hand, ordinary zinc will be found a good substitute. A small piece of rosin dropped into the melted metal just before pouring helps to make a perfect box.

### Handle Attachment for a Scrubbing Brush

With the common scrubbing brush the worker must perform his labor in a stooping position. To lighten this hard task, I provided a handle for an



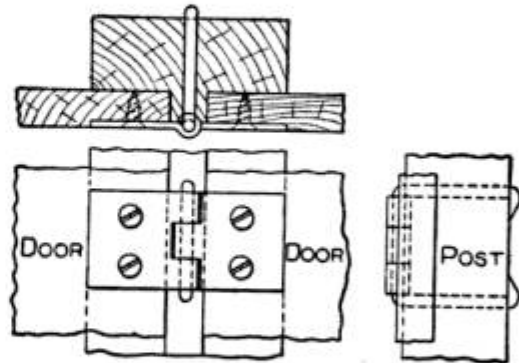
ordinary brush by attaching a socket on the wood back. The socket was made of light metal cut  $\frac{1}{2}$  in. smaller all around than the top of the brush. The metal was cut in from both sides about one-third the way lengthwise, and the shorter end formed into a ferrule. The other end was bent up at an angle and fastened with screws to the back of the brush. To add strength, an extra strap of iron was put around the ferrule part and fastened to the brush top. An old broom handle was inserted in the ferrule and fastened with screws.

By means of this device which can be attached to a new brush when the first is worn out, scrubbing can be done in a standing position just as effectively as in the old way.—Contributed by W. A. Lane, El Paso, Texas.

⌋The rear axle and driving pinion of an automobile should be kept well oiled and the universal joints never allowed to become dry.

### One Pair of Hinges for Two Doors

A simple method of attaching hinges so that they will swing two doors is shown in the accompanying sketch. A

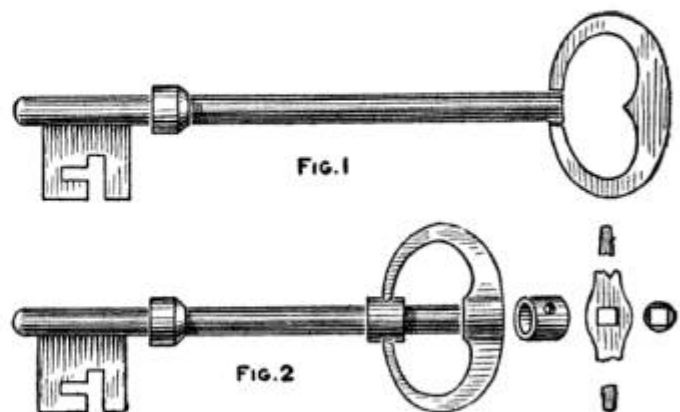


Hinge on Doors

post is set between the doors and the hinges fastened to it by means of U-shaped staples as shown. These staples are long enough to go through the post and clinch on the back side. Only one hinge is shown, but of course two or more are used.—Contributed by C. C. Brabant, Alpena, Mich.

### Repairing a Broken Key

When the handle of a heavy key is broken off as shown in Fig. 1, a strong repair may be made as follows: Square the head of the stem and fit a sleeve over it. The sleeve, with two holes drilled in its sides, is then shrunk on the key stem, if this be steel or iron, or soldered in place, if the key is of brass. Place the handle on the square end of the stem and

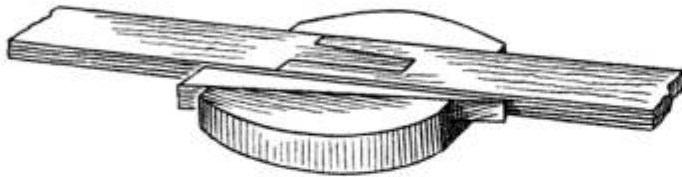


Putting New Ring on a Key

bend it, until the ends will fit into the holes in the sides of the sleeve. The ends may be further secured with a little solder.

### Extension Trammel Point Rod

Large circles must be described at times and an extra length trammel point rod is necessary to cover the distance between the center point and the

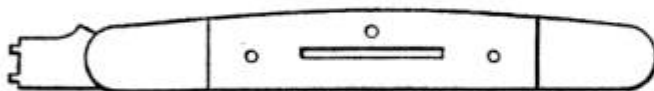


Clip on the Joint

circumference. The length of such a rod makes it inconvenient for storing in an ordinary tool chest. For radius of circles that would require a rod longer than the tool chest, sections of a rod can be joined together. These joints are hard to make so as to keep the rod perfectly rigid, but the one illustrated has proven entirely satisfactory. The clip can be made of either metal or hard wood. The method of joining the lengths together is so plainly shown it needs no explanation. The parts can be easily stored in a draftsman's tool chest.—Contributed by D. O. Wilkins, Hempstead, Texas.

### A Handy Compass Key

A separate key is usually provided in sets of instruments containing compasses with the style of joint shown in the sketch. This key is small and inconvenient to use, and is often lost from the set in a little while, says a writer



Key on Knife Blade

in Machinery. A broken knife blade with its end filed to the shape shown, makes a good compass key. If a two-bladed knife is used, the other blade can be kept very sharp for erasing.

☞Color sifted on a cut-in sign in the place of smalts looks good.

### Polishing Joints in Automobile Lamps

The seams and corners of automobile lamps are difficult to clean and polish, as the metal polish is apt to stick in these places. A toothbrush is the best thing to use for this purpose. It gets the polish out of the recesses and polishes them at the same time.—Contributed by A. Donley, Valparaiso, Indiana.

### How to Properly Key a Pulley

It is something of a trick to key a pulley so that it will not work loose after a time, especially if the pulley is large and runs at a high rate of speed. In making the key, care must be taken that it be of uniform width and fit the seat in the shaft and the pulley snugly. The key should be driven tight, but not so tight that it will kink under the blow.

If the pulley runs with the hub against the box, which is the usual way, allow only about 1-32 in. end play between the box and the pulley.

When an old key is worn too thin, but fits properly otherwise, place a strip of tin under it to make it fill the keyway closely. To draw a key, a small end of which is projecting, hold it with a pair of pliers, pry against the hub of the pulley, at the same time driving the hub on the shaft with a hammer. This will loosen both the pulley and the key. If the key is cut off flush with the pulley, it may be necessary to remove the shaft and drive from the inside, in which case it is well to drive the pulley on a little, to loosen the key.

### Rust-Proof Needle Protector

Cover a cake of high-grade soap with a dainty white linen or cotton cloth. Needles or pins stuck through the cloth into the soap will remain free from rust indefinitely.—Contributed by L. Alberta Norrell, Augusta, Ga.

☞Never leave your shirt sleeves unbuttoned when working about machinery.

# AMATEUR MECHANICS

## How to Make an Electric Stove

The parts necessary for making an electric stove are: Two metal pie plates of the same size; 4 lb. of fire clay; two ordinary binding-posts; about 1 lb. of mineral wool, or, if this cannot be obtained, thick sheet asbestos; one oblong piece of wood, 1 in. thick, 12 in. wide and 15 in. long; one small switch; one fuse block; about 80 ft. of 22-gauge resistance wire,—german silver wire is better, as it stands a higher temperature; two middle-sized stove bolts with nuts; one glass tube, about  $\frac{1}{4}$  in. in diameter and 9 in. long, which can be bought from a local druggist; and two large 3-in. screws.

If a neat appearance is desired, the wood can be thoroughly sandpapered on one side and the corners and edges rounded off on the upper side. Punch holes in one of the pie plates, as shown in Fig. 1. The two holes E and F are on the rim and should be exactly on a line with the hole D punched in the center. The holes B and C are about 3 in. apart and should be at equal distances from the center hole D. The rim of the second plate is drilled to make two holes, AA, Fig. 2, that will match the holes E and F in the first plate, Fig. 1. A round collar of galvanized iron, FF, Fig. 4, 3 in. high, is made with a diameter to receive the first plate snugly. Two small flaps are cut and turned out and holes punched in their centers, AA, to receive screws for holding it to the base. Two bolts are soldered in the holes E and F, Fig. 1, and used to hold the rims of both plates together, when they are placed in opposite positions, as shown in Fig. 4. This will make an open space between the plates. The collar is then screwed to one end of the base, as shown in Fig. 2.

Two holes are bored through the base to correspond with the holes D and A in the bottom plate. The glass

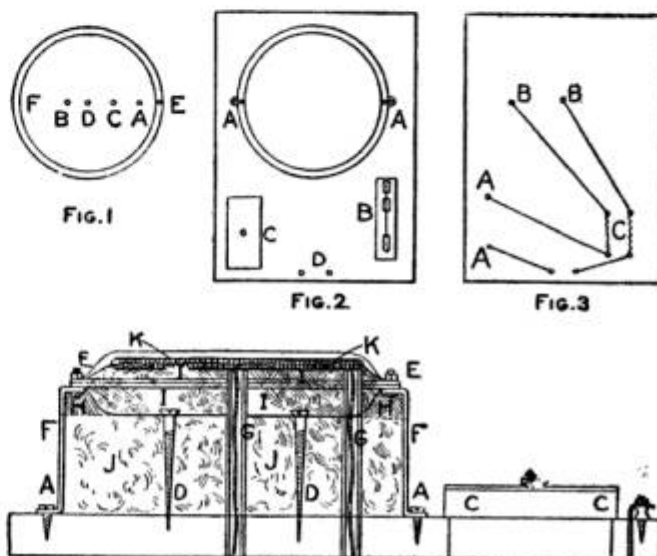


Fig. 4  
Details of an Electric Stove

tube is cut to make two pieces, each  $4\frac{1}{2}$  in. long. This can be done easily by filing a nick in the tube at the proper point and breaking it. These tubes are forced into the holes bored in the base, and, if the measurements are correct, should extend about  $\frac{1}{4}$  in. above the collar. The mineral wool, JJ, Fig. 4, is then packed down inside the collar, until it is within 1 in. of the top. This will allow the plate, Fig. 1, to rest on the wool and the ends of the glass tubes, GG, Fig. 4, to project through the holes D and A of the plate, Fig. 1. The rim of the plate should be level with the top edge of the collar. If asbestos is used, the sheets should be cut into disks having the same diameter as the inside of the collar, and holes cut to coincide with the holes D and A of the plate. The small scraps should be dampened and made into pulp to fill the space H, Fig. 4. The plate, Fig. 1, is held to the base by two

screws which are run through the holes BC and take the position shown by DD, Fig. 4.

The two binding-posts are attached on the base at D, Fig. 2, also the switch B and the fuse block C, holes being bored in the base to make the wire connections. The reverse side of the base, with slits cut for the wires, is shown in Fig. 3. The points marked BB are the glass tubes; AA, the holes leading to the switch; and C, the fuse block. The wires run through the glass tubes GG, Fig. 4, are allowed to project about 1 in. for connections.

The best way to find the correct length of the resistance wire is to take a large clay or drain tile and wind the wire tightly around it, allowing a space between each turn. The tile is then set on its side with a block or brick under each end. It should not be set on end, as the turns of the wires, when heated, will slip and come in contact with each other, causing a short circuit. When the tile is in place, a short piece of fuse wire is fastened to each of its two ends. A 5-ampere fuse wire is about strong enough. A connection is made to these two wires from an electric-light socket. The wire will get hot but probably remain the same color. If this is the case, one of the feed wires is disconnected from the fuse wire and gradually moved farther down the coil until a point is found where the resistance wire glows a dull red. This point marks the proper length to cut it, as the wire should not be allowed to become any

hotter. If the wire gets bright hot when the current is turned on, more wire should be added. The wire is then made into a long coil by winding it around a large wire nail. The coils should be open and about  $\frac{1}{8}$  in. apart.

Next, the fire clay is moistened and well mixed, using care not to get it too wet. It should have the proper consistency to mould well. The clay, II, Fig. 4, is then packed in the first plate to a height of about  $\frac{1}{4}$  in. above the rim. While the clay is damp, one end of the coil is connected with the wire in the central glass tube, and the coil laid in a spiral winding on the damp clay, KK, and pressed into it. When this is done, the other end is connected to the wire projecting from the outer glass tube. As these connections cannot be soldered, the ends of the wires should be twisted closely together, so that the circuit will not become broken. Make sure that the coils of wire do not touch each other or the top plate. The fuse wire (about 5 amperes) is put into the fuse block, and wires with a socket adapter connected to the two binding-posts. The top plate is put in place and screwed down. This completes the stove.

It should be set aside in a warm place for a few days to dry out the packing. If it is not thoroughly dry, steam will form when the current is applied. It should not be left heated in this condition. The top plate is used when cooking and removed when making toast.—Contributed by R. H. Cnonyn, St. Catherines, Can.

### How to Make Weights for Athletes

Many times boys would like to make their own shots and weights for ath-

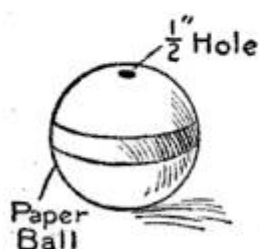


FIG. 1

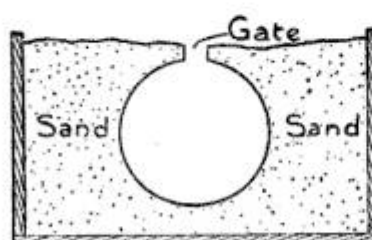


FIG. 2

Mold for the Lead

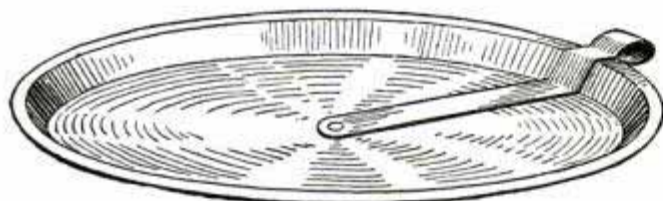
letic stunts, but do not know how to go about it to cast the metal. In making a lead sphere as shown in the illustration, it is not necessary to know the method of molding. The round lead weight for shot-putting or hammer-throwing can be cast in a hollow cardboard or pressed-paper ball, sold in department and toy stores for 10 cents. Cut a  $\frac{1}{2}$ -in. hole in the ball as shown in Fig. 1 and place it with the hole up



in damp sand and press or tamp the sand lightly around the ball as shown in the section, Fig. 2. Cover over about 1 in. deep. A wood plug inserted in the hole will prevent any sand falling inside. When the sand is tamped in and the plug removed, it leaves a gate for the metal. Pour melted lead into the gate until it is full, then, when cool, shake it out from the sand and remove the charred paper. A file can be used to remove any rough places. The dry paper ball prevents any sputtering of the hot lead.—Contributed by W. A. Jaquythe, Richmond, Cal.

### Removing Pies from Pans

Sometimes the juices from a hot pie make it stick to the pan so tightly that a knife blade must be run under to cut it loose. If a knife with a flexible blade is not used, the pie will be dam-



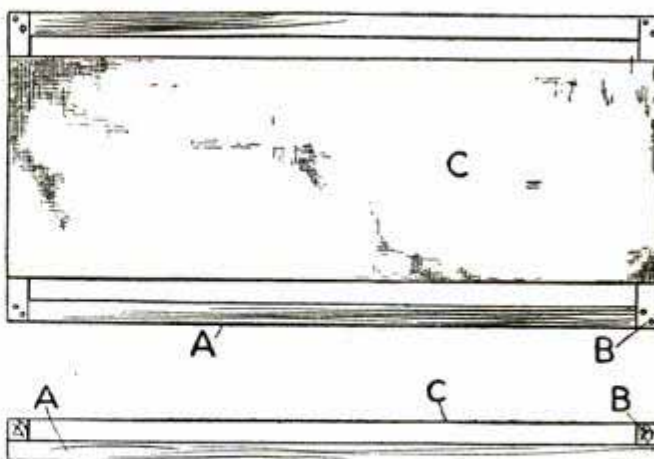
Separating Pies from Pans

aged. If the pie pans are provided with the simple attachment shown in the accompanying sketch, the baked dough can be separated from the tin with one revolution of the cutter. The cutter is made from a piece of heavy tin, bent to the same outline as the inside of the pan and pivoted at its center.

### Stretcher for Drying Photograph Prints

A quick and convenient way to dry prints is to place them on a cheesecloth stretcher. Such a stretcher can be made on a light wood frame, constructed of  $\frac{3}{4}$ -in. square material in any size, but 12 by 24 in. is large enough. The end pieces B are fastened on top of the long side pieces A, and the cheesecloth C stretched and tacked over them, as shown.

The prints should be placed face up on the cloth, and the frame set near a window. If the stretcher is made in

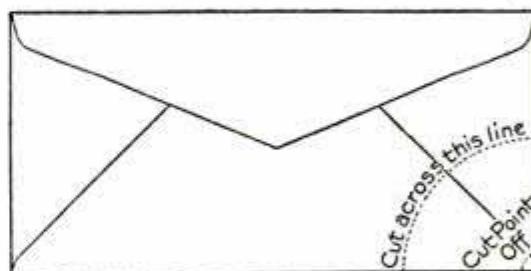


Cloth on the Frame

this way, the air can enter from both top and bottom, and the prints will dry rapidly. Several of these frames can be stacked and a large number of prints thus dried at the same time.—Contributed by Andrew G. Thorne, Louisville, Ky.

### A Temporary Funnel

The amateur photographer often has some solution which he desires to put into a bottle which his glass funnel will not fit, says the Photographic Times. The funnel made by rolling up a piece of paper usually allows half of the solution to run down the outside of the bottle, thereby causing the amateur to be dubbed a "musser." A better way is to take an ordinary envelope and cut it off as shown by the dotted lines. Then clip a little off the



Paper Funnel

point, open out, and you have a funnel that will not give any trouble. It is cheap and you can afford to throw it away when dirty, thereby saving time and washing.

### A Plant-Food Percolator

Obtain two butter tubs and bore a large number of  $\frac{1}{4}$ -in. holes in the bottom of one, then cover the perforated part

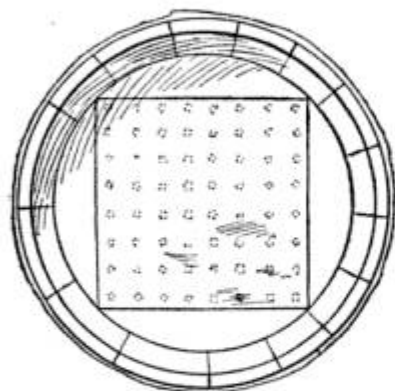


Fig. 1

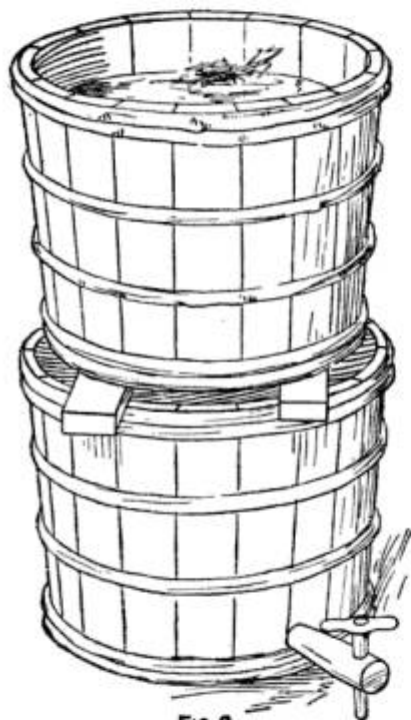


Fig. 2

with a piece of fine brass gauze (Fig. 1), tacking the gauze well at the corners. The other tub should be fitted with a faucet of some kind—a wood faucet, costing 5 cents, will answer the purpose. Put the first tub on top of the other with two narrow strips between them (Fig. 2). Fill the upper tub, about three-fourths full, with well packed horse manure, and pour water on it until it is well soaked. When the water has percolated through into the lower tub, it is ready to use on house and garden plants and is better than plain water, as it adds both fertilizer and moisture.—Contributed by C. O. Darke, West Lynn, Mass.

☞ Always caliper the work in a lathe while it is standing still.

☞ Never use the ways of a lathe for an anvil or storage platform.

### Folding Quilting-Frames

The frame in which the material is kept stretched when making a quilt is usually too large to be put out of the way conveniently when other duties must be attended to; and especially are the end pieces objectionable. This can be remedied by hinging the ends so they will fold underneath to the center. The end pieces are cut in two at one-fourth their distance from each end, a hinge screwed to the under side to hold them together, and a hook and eye fastened on the other side to hold the parts rigid when they are in use. When the ends are turned under, the frame is narrow enough to be easily carried from one room to another, or placed against a wall.

### A Drip Shield for the Arms

When working with the hands in a pan of water, oil or other fluid, it is very disagreeable to have the liquid run down the arms, when they are raised from the pan, often to soil the sleeves of a clean garment. A drip shield which will stop the fluid and cause it to run back into the pan can be easily made from a piece of sheet rubber or, if this is not available, from a piece of the inner tube of a bicycle tire. Cut a washer with the hole large enough to fit snugly about the wrist, but not so tight as to stop the circula-



Shields for the Arms

tion of the blood. A pair of these shields will always come in handy.—Contributed by L. M. Eifel, Chicago.

## Wood-Working for Beginners

By IRA S. GRIFFITH

## CHAPTER X

## Grinding Plane-Irons and Chisels

When plane-irons have been whetted repeatedly, the end of the tool becomes so blunt that it will not do satisfactory work, and it cannot be made to do so by any amount of whetting, until the surplus metal at the heel of the bevel has been removed on a grindstone.

Figure 53 shows the manner of holding a chisel on the stone. The plane-iron is held similarly. The tool should make an angle of about 20 to 25 deg. with the stone. If the tool is to be used for cutting hard wood, it will need to be ground at about 20 deg. If it is to be used in cutting soft wood, it will take a longer bevel. The rule is: Keep the bevel as long as the temper of the tool and the nature of the wood to be cut will allow. The sharper the angle, the easier the tool cuts. It must not be so sharp as to become nicked or break in usage.

Plenty of water should be kept flowing upon the stone, or the resulting friction will heat the steel and draw the

temper, making the metal soft so that it will not stand up or hold an edge. Then, too, the water helps to keep the stone clean by washing off the parti-

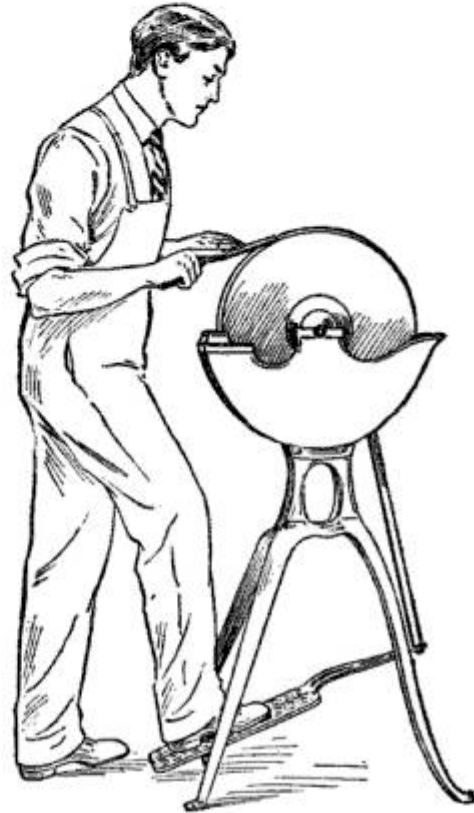


Fig. 53—Position in Grinding

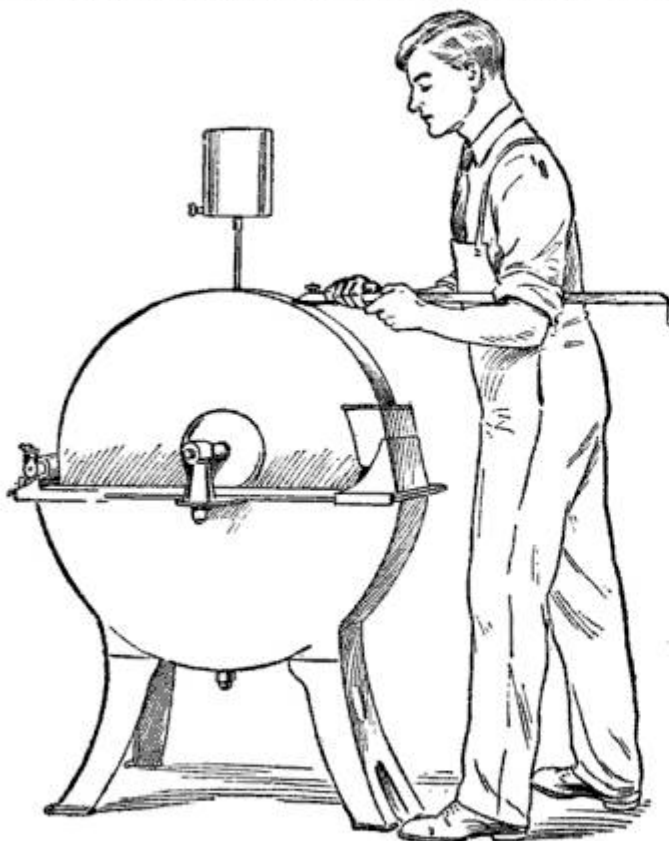


Fig. 54—Attachment Fastened to Wall

cles of steel which would clog up the pores of the stone.

In freehand grinding, the stone should revolve toward the worker. It will cut faster and also help to prevent the forming of a wire edge. Try to keep the tool at a constant angle. Frequent changes of angle, intentional or not, will cause much extra labor and result in either a poor job or a waste of good metal. Move the tool across the entire width of the stone so as not to form a hollow in the center of the stone.

Grinding freehand is not so easy as it looks, and a beginner may find it convenient to rig up a grinding device. He should, however, practice the freehand grinding until he masters it. With the rig now to be described, excellent results will be obtained with but little practice: The stone should be placed near a wall, preferably in a cor-

ner of the room. Unless the stone is to be kept true by means of a truing

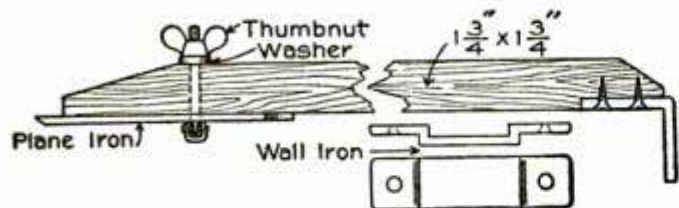


Fig. 55—Detail of Grinding Attachment

device, it will be safest to have it revolve from the tool. Cut a piece of oak or other hard wood,  $1\frac{3}{4}$  in. square. Shape the ends as shown in Fig. 55. Fasten an angle iron at one end and in the other bore a hole and insert the metal holder. This holder-toggle bolt is simply one of the irons used by marble workers to fasten the marble

slabs to the wall and can be bought at any hardware store for a few cents. The common nut which ordinarily comes with it should be exchanged for a thumb nut to facilitate rapid adjustment.

The plane-iron is fastened by slipping this holder through the slot in it, giving the holder a quarter turn and tightening the thumb nut. For chisels, a block of wood will be needed to place under one side of the holder to make it bear on the tool properly.

The length of the wooden arm can only be determined by trial, as the distance of the stone from the wall, the size of the stone, the position of the rest upon the wall, and the cutting angle desired, all are factors to be considered.

*(To be Continued.)*

## Home-Made Tricycle Motor Car

The illustration herewith shows a small motor car whose propelling power comes from the ordinary tricycle pedals. My little girl had an old three-

from a repair shop.—Contributed by H. R. Roney, Philadelphia, Pa.



Miniature Motor Car

wheeled tricycle which had seen better days, so by retaining the rear wheels and driving-rods I constructed the car in which she takes great delight. The car has a steering wheel, copper mesh wire radiator front, and is equipped with a horn and lamp. Soap boxes, canvas and odds and ends found in the basement were used, and baby carriage front wheels and springs were obtained

## Breaking a Toothpick in a Handkerchief Trick

A puzzling trick that will amuse a company of friends is breaking a toothpick in the folds of a handkerchief and apparently removing the same whole. The only articles necessary to perform this trick are two toothpicks and an ordinary handkerchief. Prepare the handkerchief first, before you announce the trick, by inserting one of the toothpicks into the hem so that it is entirely concealed. When performing the trick before the audience, show both sides of the handkerchief so they can see it is empty, and then place a toothpick in the center and fold the handkerchief over it. When folding be sure to have the toothpick placed in the hem between your fingers. Have some one in the audience break this toothpick into small pieces. Your audience will be greatly surprised when the unbroken toothpick is shaken from the handkerchief.—Contributed by Edwin Marshall, Oak Park, Ill.

How to Cane Chairs

There are but few households that do not have at least one or two chairs without a seat or back. The same households may have some one who would enjoy recaning the chairs if he only knew how to do it, and also make considerable pin money by repairing chairs for the neighbors. If the following directions are carried out, new cane seats and backs can easily be put in chairs where they are broken or sagged to an uncomfortable position.

The first thing necessary is to remove the old cane. This can be done by turning the chair upside down and, with the aid of a sharp knife or chisel, cutting the cane between the holes. After this is done the old bottom can be pulled out. If plugs are found in any of the holes, they should be knocked out. If the beginner is in doubt about finding which holes along any curved sides should be used for the cane running nearly parallel to the edge, he may find it to his advantage to mark the holes on the under side of the frame before removing the old cane.

The worker should be provided with a small sample of the old cane. At any first-class hardware store a bundle of similar material may be secured.

The cane usually comes in lengths of about 15 ft. and each bundle contains

rind, a square pointed wedge, as shown in Fig. 1, and 8 or 10 round wood plugs, which are used for temporarily holding the ends of the cane in the holes.

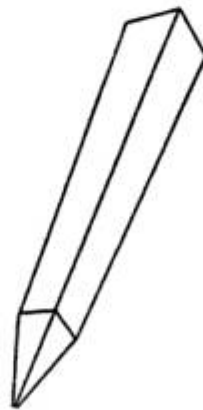


Fig. 1

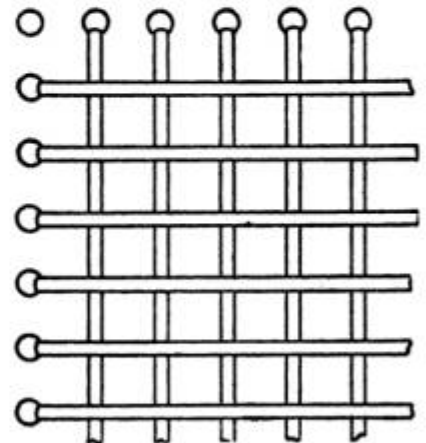


Fig. 2

First Layer of Strands

A bucket of water should be supplied in which to soak the cane just before weaving it. Several minutes before you are ready to begin work, take four or five strands of the cane, and, after having doubled them up singly into convenient lengths and tied each one into a single knot, put them into the water to soak. The cane is much more pliable and is less liable to crack in bending when worked while wet. As fast as the soaked cane is used, more of it should be put into the water.

Untie one of the strands which has

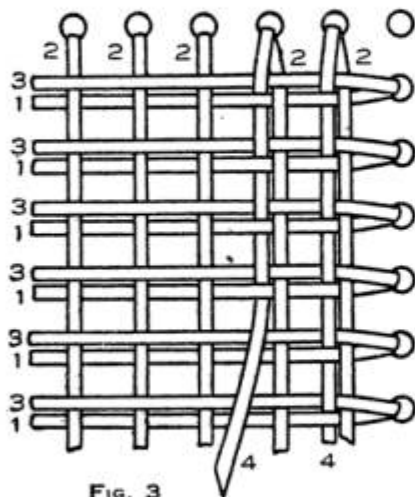


Fig. 3

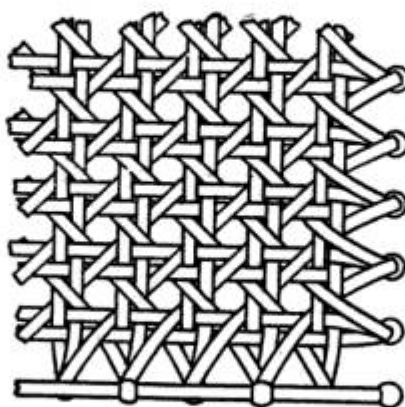


Fig. 5

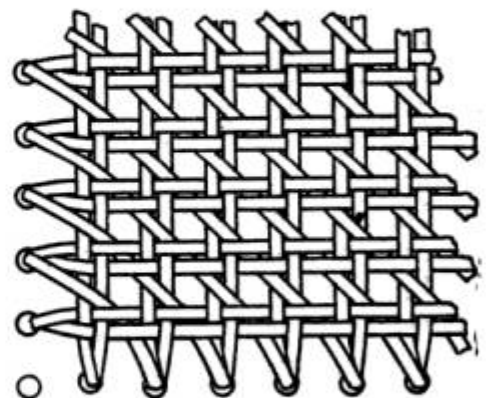


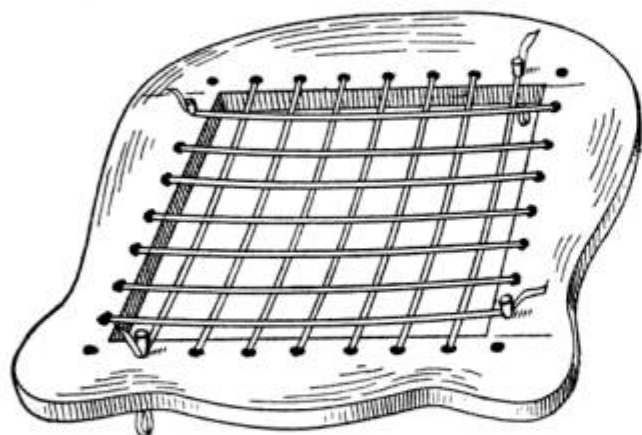
Fig. 4

Three Stages of Weaving

enough to reseat several chairs. In addition to the cane, the worker should provide himself with a piece of bacon

been well soaked, put about 3 or 4 in. down through the hole at one end of what is to be the outside strand of

one side and secure it in this hole by means of one of the small plugs mentioned. The plug should not be forced in too hard nor cut off, as it must be re-



First Two Layers in Place

moved again. The other end of the strand should be made pointed and passed down through the hole at the opposite side, and, after having been pulled tight, held there by inserting another plug. Pass the end up through the next hole, then across and down, and hold while the second plug is moved to the last hole through which the cane was drawn. In the same manner proceed across the chair bottom. Whenever the end of one strand is reached, it should be held by a plug, and a new one started in the next hole as in the beginning. No plugs should be permanently removed until another strand of cane is through the same hole to hold the first strand in place. After laying the strands across the seat in one direction, put in another layer at right angles and lying entirely above the first layer. Both of these layers when in place appear as shown in one of the illustrations.

After completing the second layer, stretch the third one, using the same holes as for the first layer. This will make three layers, the first being hidden by the third while the second layer is at right angles to and between the first and third. No weaving has been done up to this time, nothing but stretching and threading the cane through the holes. The cane will have the appearance shown in Fig. 3. The next thing to do is to start the cane across in the same direction as the second layer and begin the weaving.

The top or third layer strands should be pushed toward the end from which the weaving starts, so that the strand being woven may be pushed down between the first and third layers and up again between pairs. The two first strands of the fourth layer are shown woven in Fig. 3. During the weaving, the strands should be lubricated with the rind of bacon to make them pass through with ease. Even with this lubrication, one can seldom weave more than half way across the seat with the pointed end before finding it advisable to pull the remainder of the strand through. After finishing this fourth layer of strands, it is quite probable that each strand will be about midway between its two neighbors instead of lying close to its mate as desired, and here is where the square and pointed wedge is used. The wedge is driven down between the proper strands to move them into place.

Start at one corner and weave diagonally, as shown in Fig. 4, making sure that the strand will slip in between the two which form the corner of the square in each case. One more weave across on the diagonal and the seat will be finished except for the binding, as shown in Fig. 5. The binding consists of one strand that covers the row of holes while it is held down with another strand, a loop over the first being made every second or third hole as desired. It will be of great assistance to keep another chair with a cane bottom at hand to examine while re-caning the first chair.—Contributed by M. R. W.

### Repairing a Cracked Composition Developing Tray

Fill the crack with some powdered rosin and heap it up on the outside. Heat a soldering-iron or any piece of metal enough to melt the rosin and let it flow through the break. When cool, trim off the surplus rosin. If handled with a little care, a tray repaired in this manner will last a long time. The chemicals will not affect the rosin.—Contributed by E. D. Patrick, Detroit, Michigan.

## Cutting Lantern Slide Masks

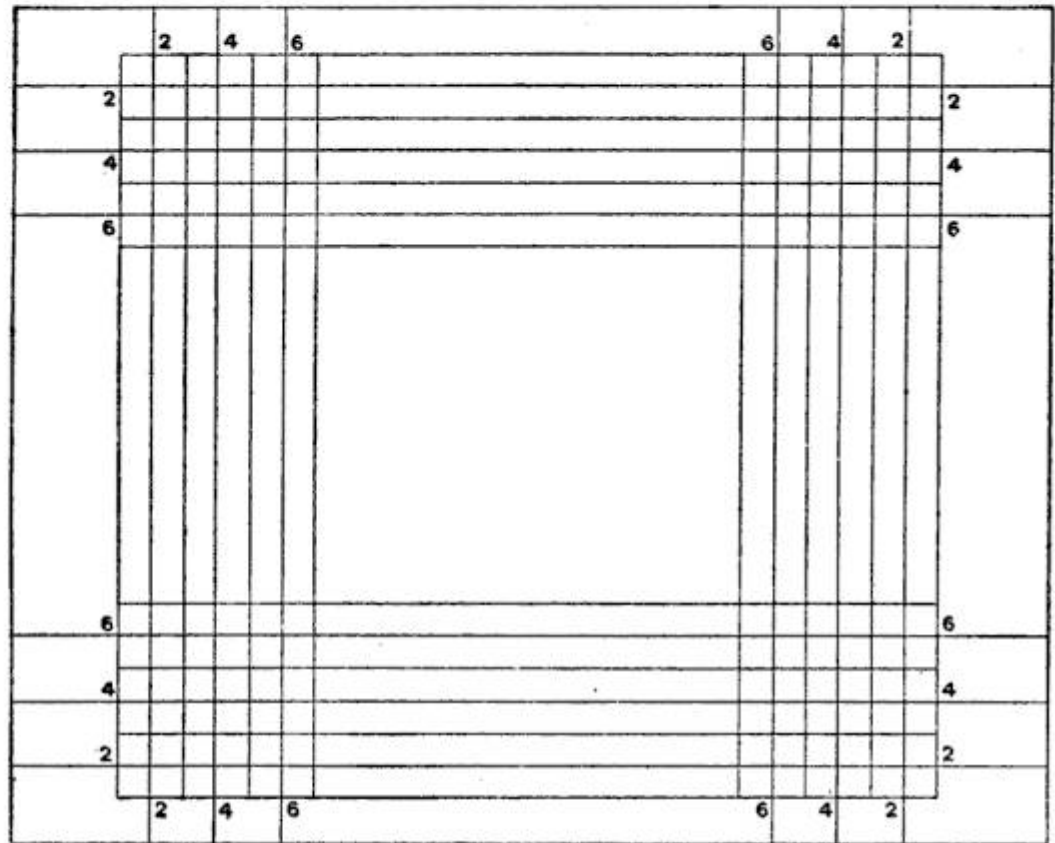
It has long been a puzzle to me why round cornered masks are almost invariably used for lantern slides, when most works of art are included within rectangular spaces, says a correspondent of Photo Era. Certainly the present commercial masks are in very poor taste. The worker who wishes to make the most of every slide will do well to cut his own masks, not only because of the fact just mentioned, but also because he can suit the size of the opening to the requirements of each slide. Slides

can be works of art just as much as prints; so that masking a slide becomes just as important as trimming a print, and equally worthy of individual treatment. It is folly to give each slide a mask opening of uniform size and shape.

When many slides are to be masked, it becomes tedious work to treat each one separately, unless some special device is used. The accompanying drawing shows a way to mark masks which is simple, practical and costs nothing. The drawing is exactly lantern slide size.

Lay the slide over such a guide and note the size of the opening best suited to the picture. This will be determined by the intersection of the ruled lines, which are numbered for convenience in working. If the size wanted is No. 4 for width and No. 2

for height, place the guide over a piece of black mask paper and prick through the proper intersections with the point of a pin. This outlines the desired



Form for Marking Out Rectangular Lantern Slide Masks

opening, which may then be cut out easily with a knife and straight edge.

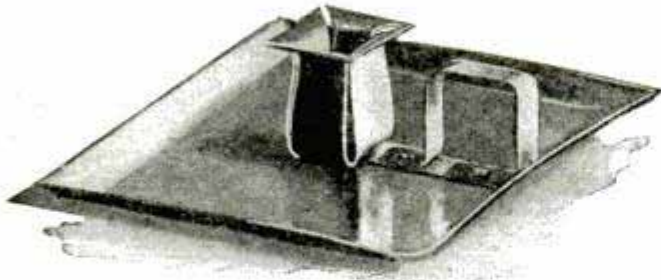
The black paper from plate boxes and film rolls is excellent for making masks. It should be cut up in pieces  $3\frac{1}{4}$  by 4 in. and kept ready for use at any time.

### Relieving the Weight of a Talking-Machine Reproducer

Too loud reproduction from a record, the scratching noise sometimes heard and the forcing of the needle into a soft record, because the extension arm and reproducer are too heavy, can be remedied in the following manner: Attach a small ring to the under side of the horn and use a rubber band to lift the extending arm slightly.—Contributed by W. A. Jaquythe, Richmond, Cal.

### How to Make a Candlestick Holder

A candlestick of very simple construction and design can be made as follows: Secure a piece of brass or



Candle Holder Complete

copper of No. 23 gauge of a size sufficient to make the pieces detailed in the accompanying sketch. A riveting hammer and a pair of pliers will be needed, also a pair of tin shears and a piece of metal upon which to rivet.

Cut out a piece of metal for the base to a size of  $5\frac{1}{2}$  by  $5\frac{1}{2}$  in. Trim the sharp corners off slightly. Draw a pencil line all around the margin and  $\frac{5}{8}$  in. away from the edge. With the pliers shape the sides as shown in the illustration.

Next lay out the holding cup according to the plan of development shown, and cut out the shape with the shears. Polish both of these pieces, using any of the common metal polishes. Rivet the cup to the base, and then, with the pliers, shape the sides as shown in the photograph. The manner of making and fastening the handle is clearly illustrated. Use a file to smooth all the cut edges so that they will not injure the hands.

In riveting, care should be taken to round up the heads of the rivets nicely as a good mechanic would. Do not be content merely to bend them over. This rounding is easily accomplished by striking around the rivets' outer circumference, keeping the center high.

A good lacquer should be applied after the parts have been properly cleaned and polished, to keep the metal from tarnishing.

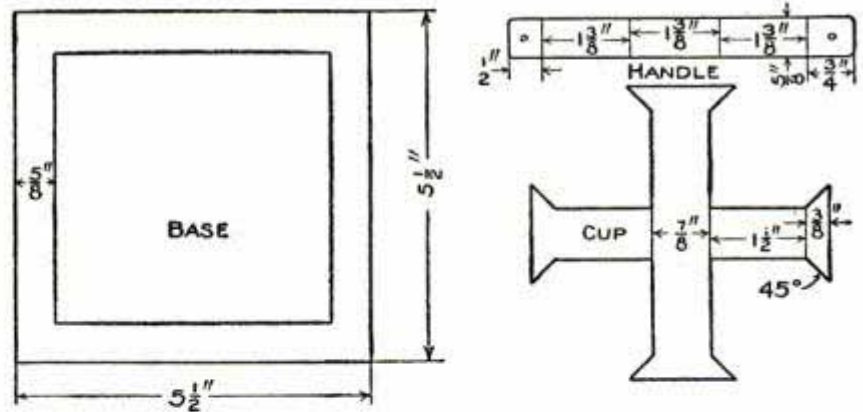
### A Home-Made Duplicator

The usual gelatine pad, which is the principal part of the average hectograph or duplicator, is, as a rule, unsatisfactory, as it is apt to sour and mold in the summer and freeze in the winter, which, with other defects, often render it useless after a few months service.

A compound that is almost indestructible is the preparation sold at art stores as modeling clay. This clay is as easily worked as a putty and is spread into the tray, which may be of wood or tin, and the surface leveled by pounding with a mallet or hammer, then by drawing a straightedge over it.

The surface of the pad is now saturated with pure glycerine. This is poured upon the surface after it is slightly warmed, covering the same and then laying a cloth over the pad and allowing it to stand long enough for the clay to absorb the glycerine, after which it is ready for use.

The original copy is written with a copying pencil or typewritten through a hectograph ribbon. A sheet of newspaper is laid upon the pad and a round stick or pencil is passed over it



Details of Candle Holder

to make the surface level and smooth. Remove the newspaper and place the original copy face down on the leveled surface and smooth it out in the same way so that every part touches the pad. Remove the copy in about five minutes and place the clean sheets of paper one after another on the surface and remove them. From 50 to 75 copies of the original can be made in a short time.

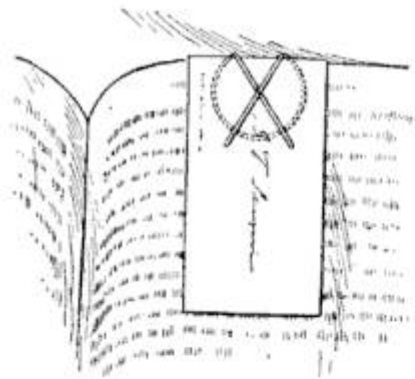


This compound is impervious to water, so the negative print is removed by simply washing with a damp sponge, the same as removing writing from a slate. This makes it possible to place another original on the pad immediately without waiting for the ink to vanish by chemical action as in the original hectograph.

The action of the weather has no effect upon this compound and it is proof against accident, for the tray may be dropped and the pad dented or cut into pieces, and the clay can be pressed back and leveled. The only caution is to keep it covered with a cloth saturated in glycerine while not in use.—Contributed by A. A. Houghton, Northville, Mich.

### Paper-Clip Bookmark

The combination of a paper clip and a calling card makes a good book-



mark. The clip and card can be kept together by piercing the card and bending the ends of

the wire to stick through the holes. The clip is attached to a page as shown in the sketch.—Contributed by Thos. DeLoof, Grand Rapids, Mich.

### Aerating Water in a Small Tank

A simple way of producing air pressure sufficient to aerate water is by the use of a siphon as shown in Fig. 1. The siphon is made of glass tubes, the longer pieces being bent on one end as shown. The air receiver and regulating device are attached to the top end of the lower tube, as shown in Fig. 2. The receiver or air inlet is the most important part. It is made of a glass

tube,  $\frac{3}{4}$  in. in diameter and 5 in. long. A hole is filed or blown through one side of the glass for the admission of air. The ends of the smaller glass

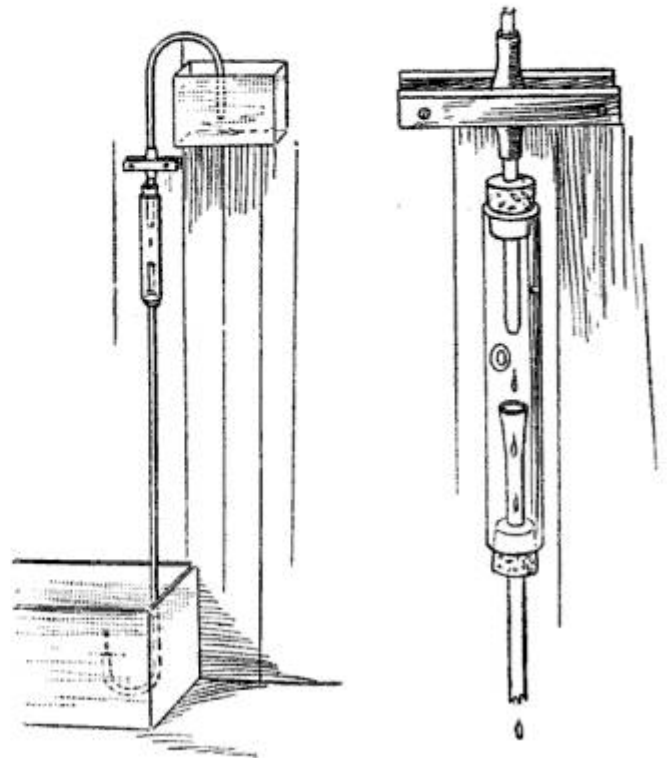


FIG. 1

FIG. 2

Forcing Air Through Water

tubes are passed through corks having a diameter to fit the ends of this larger tube. The ends of these tubes should be so adjusted that the continuous drops of water from the upper will fall into the tube below. The succession of air bubbles thus imprisoned are driven down the tube and into the tank below.

The regulator is placed in the tube or siphon above the air receiver. Its purpose is to retard the flow of water from the siphon above and make it drop rapidly. It consists of a rubber connecting tube with two flat pieces of wood clamped over the center and adjusted with screws. The apparatus is started by clamping the rubber tube tightly and then exhausting the air in the siphon tube, then placing the end in the upper reservoir and releasing the clamp until the water begins to drop. If the reservoir is kept filled from the tank, the device will work for an indefinite time.—Contributed by John T. Dunlop, Shettleston, Scotland.

## INTERESTING PATENTS

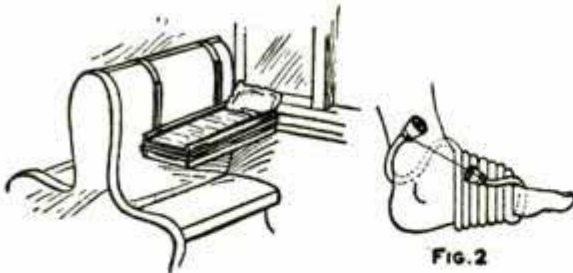


Fig. 1

Fig. 2

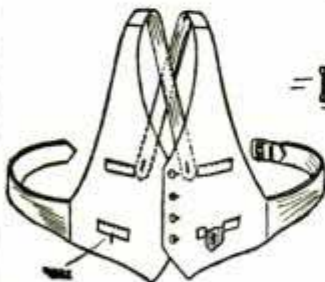


Fig. 3

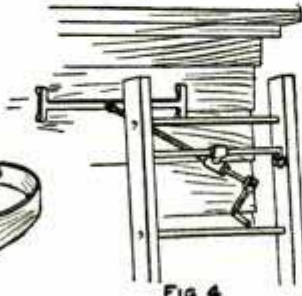


Fig. 4

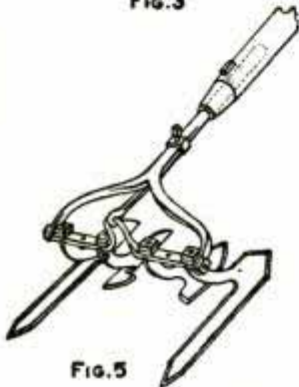


Fig. 5



Fig. 6

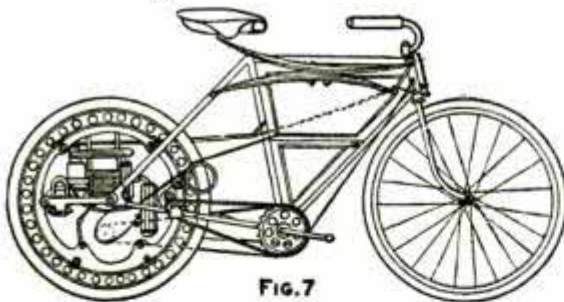


Fig. 7

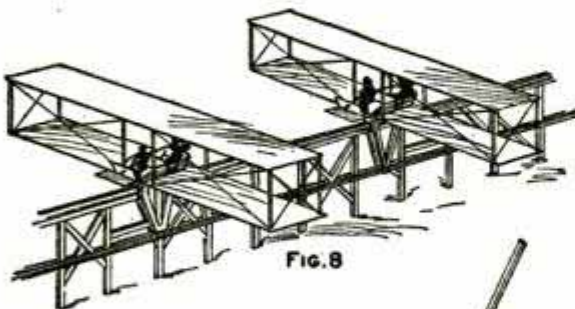


Fig. 8

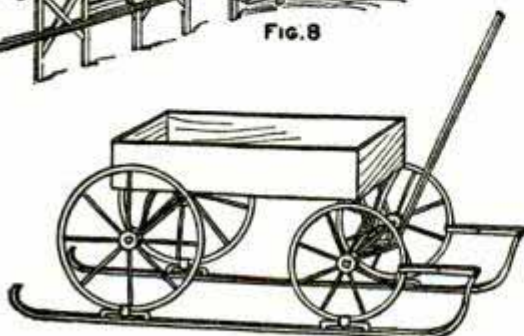


Fig. 9

**TRAIN BERTH FOR INFANTS**—The necessity of holding an infant in the arms during long railroad journeys is considered by a Californian inventor to be sufficiently serious to require a remedy. He proposes, therefore, a collapsible berth (Fig. 1), provided with a folding hanger frame which will engage with the back of the ordinary car seat.

**HOT-WATER BANDAGE**—A hot-water bandage that may be wound around the foot as shown in Fig. 2, or applied to any part of the limbs, is one of the latest things in surgical and medical bandages. It consists of a length of rubber hose, provided at each end with a cap similar to those used for hot-water bags. Filled with hot water, it is wound around the afflicted member and made fast with the cords provided at each end.

**COMBINED VEST AND SUSPENDERS**—Figure 3 shows an ingenious combined vest and suspenders arrangement. The front of the vest appears like that of the customary article, but the front halves diminish in width upwardly and taper to the shoulders, ending down the back in crossed suspender straps which engage with the buttons at the back of the trousers. The back walls of the lower vest pockets are provided with buttonholes adapted to engage the buttons on the front of the trousers.

**WALL-ENGAGING SUPPORT FOR LADDERS**—The illustration designated as Fig. 4, which shows a wall-engaging attachment for ladders, also clearly illustrates its purpose. The distance between the top of the ladder and the wall is regulated by turning the crank.

**HAND CULTIVATOR**—This little cultivating tool (Fig. 5) is designed for use in kitchen gardens. Pushed along between the rows of the lettuce or radish bed, it is claimed to be just as effective in this sphere as the large cultivators in the fields.

**A REMOVER OF FACIAL LINES AND DEFECTS**—It is hardly necessary to state that this wrinkle eradicator (Fig. 6) is only worn at night and in strictest privacy. It is a facial mask comprising a rigid plate having symmetrical ends fashioned to fit the cheeks of the wearer, and a rigid connecting section that sits beneath the nose. A central opening is left for the lips.

**MOTORCYCLE WITH MOTOR IN REAR WHEEL**—An interesting idea for motorcycle construction is shown in Fig. 7. The motor is within the rear wheel instead of being set in the frame, where it is always more or less in the way.

**AEROPLANE AMUSEMENT DEVICE**—The aeroplane has not yet reached a stage that would warrant its use as a means of thrills for the general public at amusement parks. The next best thing, therefore, is some device that will give as close an imitation of flight as possible without the attendant danger of real flight, and the apparatus shown in Fig. 8 has been evolved to this end. The aeroplanes used are provided with two comfortable double seats, and have bearing wheels which run on an elevated monorail. Guide rails are located three or four feet below the bearing rail to keep the aeroplanes from tipping over. To carry the deception of actual flying as far as possible, each machine is provided with a guiding or elevating plane and a controlling wheel.

**SLEIGH RUNNERS FOR CHILDREN'S WAGONS**—By means of the runners shown in Fig. 9, the toy express wagon may be converted into a sleigh when the first snow falls. The runners are provided with clamps adapted to engage with the wheel fellys.

**AMPLIFIER FOR TELEPHONES**—An amplifier that may be attached to any standard telephone set is illustrated by Fig. 10. The bracket carrying the horn has an upwardly extended arm so arranged that when the receiver is set in it, contact is made with the amplifier.

**DOUBLE-END CAP FOR FOUNTAIN PENS**—A new idea in fountain-pen construction is a double-end cap, one end to cover the pen when not in use and the other for the back end of the holder when the pen is in service. Figure 11 shows the location of the pen in its vacuum chamber when not in use. There being no air holes, evaporation is impossible. It is claimed that a pen so fitted may be laid away for a considerable time and found as serviceable as ever when picked up again.

## PRACTICAL OR UNIQUE

**FOOT-REST FOR ROCKING CHAIRS**—Figure 12 is an adjustable, rubber-wheel foot-rest for rocking chairs, said to permit an easy, continuous rocking motion, without the least exertion. The foot-rest is fastened to the chair by means of a curved rod, which does not interfere in any way with the occupant of the chair.

**NEW DRIVING GEAR FOR AUTOMOBILES**—An interesting driving gear for automobiles is shown in Fig. 13. It consists of a conical drum set into the space beneath the seat, with its smaller end near the engine, and a friction roller which comes in contact with its under surface. The friction roller is shifted on its shaft so as to come in contact with the conical drum at its larger or smaller end and intermediately, this being the means of regulating the speed.

**SHOWER-BATH APPARATUS**—Figure 14 illustrates a shower-bath apparatus for use while reclining in an ordinary tub, altogether doing away with the overhead sprinkler-ring idea. A flexible tube connects the faucet of the tub with two spray tubes, which are hung just below the rim of the tub on each side by means of four hangers. The perforations in the tubes are so arranged as to throw the spray from the ends toward the center and across the tub, while the perforation nearer the centers of the tubes throw the sprays downward and across the tub at various angles.

**IMPROVED FACTORY TRUCK**—With this truck (Fig. 15), one man is able to handle a load as heavy as the truck will carry, this being made possible by means of the hook attachment and the spurs which take the place of the nose or blade of the ordinary truck. The truck is constructed on the principle of the lever. It is merely pushed up against the load, the sliding hook adjusted and locked back, and the truck pulled over, bringing the load with it.

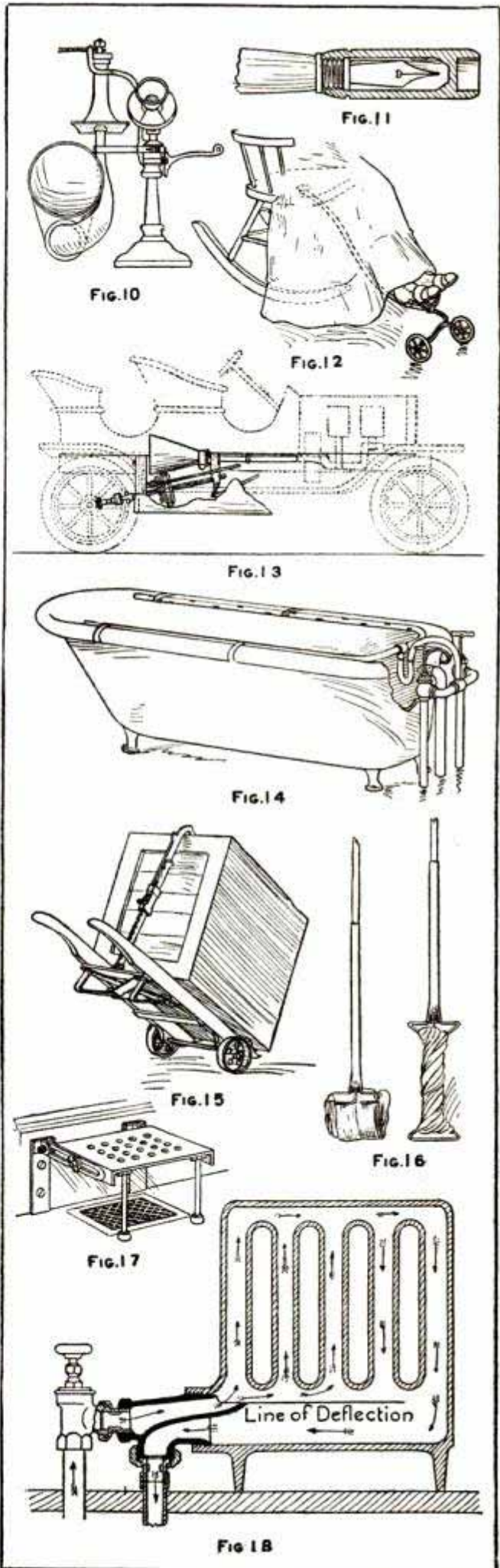
**SELF-WRINGING MOP AND DUSTER HANDLE**—A self-wringing handle is illustrated in the set of drawings designated as Fig. 16. In the first drawing, the handle is shown with cloth ready for use as mop, duster, window washer, or floor oiler, while the second shows the cloth twisted to wring. The change from the rolled or matted position to the twisted is accomplished by merely drawing the collar along the handle.

**FOOT-REST FOR HOT-AIR REGISTERS**—A foot-rest for use over the registers of hot-air furnaces is shown in Fig. 17. The rest proper is a sheet of metal, provided with perforations to allow the heat to escape through, and supported by means of attachment to the baseboard and by two hinged legs.

**COMPOUND HOT-WATER CIRCULATING COUPLING FOR RADIATORS**—Figure 18 illustrates an improved connection between the service pipes and radiators of hot-water systems. It is a compound coupling consisting of a single casting divided into two channels by a diaphragm. The hot water from the valve passes over the diaphragm and is directed by the nozzle up into the first loops of the radiator and on through the other loops. The cold water returns under the diaphragm to the return pipe. The hot and cold water are thus practically separated. The hot water, being directed to the top of the radiator, the cold water meets with no resistance while returning through the radiator and coupling. Both the supply and return piping are above the floor, and, as the radiator is only connected with piping at the one end, it can be changed for one of more or less coils without change in piping.

## NEW BOOKS

**HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES FOR BUYERS AND SELLERS**—The nineteenth annual edition of this valuable work is improved by numerous revisions and additions, bringing it strictly up to date. The total number of classifications in the book is 35,481, each representing some machine, tool, specialty or material required in the architectural, engineering, mechanical, electrical, railroad, mine and kindred industries. These classifications are so arranged that the book can be used for either purchasing or mailing purposes. Price, \$10.00. S. E. Hendricks Co., New York.



**PIETRO** had drifted down to Florida and was working with a gang at railroad construction. He had been told to beware of rattlesnakes, but assured that they would always give the warning rattle before striking.

One hot day he was eating his noon luncheon on a pine log when he saw a big rattler coiled a few feet in front of him. He eyed the serpent and began to lift his legs over the log. He had barely got them out of the way when the snake's fangs hit the bark beneath him.

"Son of a guna!" yelled Pietro. "Why you no ringa da bell?"

Freshman—"Where are the bathrooms to be in the new dormitory?"

Sophomore—"It's a Freshman house; there won't be any bathrooms! they're going to put in vacuum cleaners."—Buffalo Courier.

"Giles," said De Whizz to his chauffeur, before he started on his run across the State, "have you oiled the machine thoroughly?"

"Yes, sir."  
"Are you sure, Giles?"  
"Yes, sir; I have filled the spring cups and the engine reservoir, and I have greased the cornet-a-piston, the pluribus unum, the exhaust pipe, the muffled tread, the thingumbob, the rigamajig, and both the hot boxes."

"Are those all the parts you have oiled, Giles?"

"Yes, sir."  
"You have forgotten the most important place of all. Take the can and squirt a few drops of oil on the license number, so that the dust will collect on it and make it hard to read. Always remember to lubricate the license number, Giles."—Newark News.

"I give you my word, the next person who interrupts the proceedings," said the judge, sternly, "will be expelled from the courtroom and ordered home."

"Hooray!" cried the prisoner.

Then the judge pondered.—Judge.

A chauffeur, who had just returned to the garage after taking the State's examination to determine his fitness to be licensed, was asked by a fellow worker what the questions were:

"One of them was about meeting a skittish horse," he replied. "They asked me what I would do if I approached a horse which showed signs of being afraid of the car and its driver held up his hand to me."

"What's the answer?" asked a bystander.  
"Oh, I had that, all right," the chauffeur replied. "I told 'em I'd stop the car, take it apart and hide the pieces in the grass."—New York Sun.

She is a charming old lady, but somehow, she has never been quite able to reconcile herself to the telephone. The other day she was called up by Mrs. B—, a friend of many years, and the two had a long chat.

"There," said the first old lady, just after she left the telephone, "there, I meant to give Mrs. B— that handkerchief she left here yesterday."—New York Sun.

"What animal," said the teacher of the class in natural history, "makes the nearest approach to man?"

"The flea," timidly ventured the little boy with the curly hair.—Chicago Tribune.

Dr. Harvey W. Wiley, the Government's food expert, was talking about a notorious case of food adulteration.

"The morals of these people!" he said, "It is incredible. But I know a little boy who will grow up and join them some day."

"I was walking one morning in a meadow when I saw this little boy gathering mushrooms."

"Have you had good luck?" I asked.

"Fair," he answered, showing me his basket.

"But I gave a cry of alarm."

"Why, my lad," I said, "those are toadstools you've got. They're poison, deadly poison."

"He tipped me a reassuring wink."

"Oh, they ain't for eatin', sir," he said; "they're for sale."

While driving along a country road a man saw the roof of a farmer's house ablaze. He gesticulated and called to the farmer's wife, who was calmly standing in the doorway:

"Hey, your house is afire!"

"What?" she bawled out.

"I say, your house is afire!"

"What did y'say? I'm a little deaf!"

"Your house is afire!" again yelled the man at top of his lungs.

"Oh, is that all?" calmly replied the woman.

"It's all I can think of just now," responded the man in a rather weak voice as he drove on.

Reporter—"How did your assistant happen to fall from the parachute?"

Aeronaut—"He belonged to the union."

Reporter—"What did that have to do with it?"

Aeronaut—"He was two miles up when he heard a whistle blow, and thought it was time to quit work."

"How do you find your way home when out of sight of land?" asked the girl of the captain.

"By means of the compass," he replied, genially.

"Oh, yes," she exclaimed, delightedly, "and when you are going from home I suppose you use the gopass."

After that he kept busy and allowed no passengers to come near him.—Buffalo Express.

"See here, waiter! I found a collar button in this pie!"

"Didn't see nothin' of an umbrella, did you, boss? Dah was one lost heah las' night."—Minneapolis Tribune.

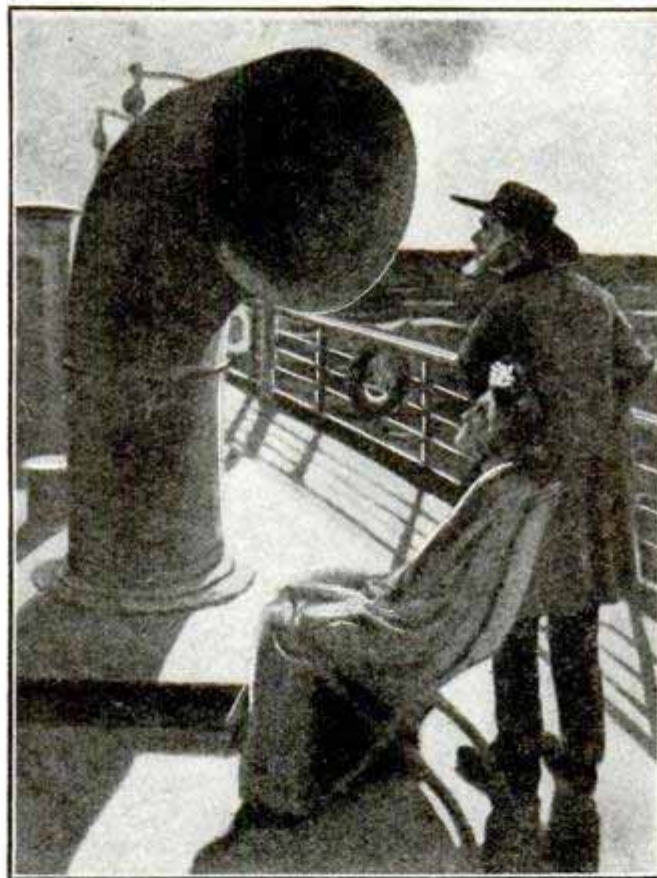
"Waiter, you're the biggest fool I ever saw."

"Yes, sir. Why, sir?"

"Didn't I ask you to get me a water cracker?"

"Yes, sir."

"And here you bring me an ice pick."—Cleveland Leader.



Courtesy Harper's Weekly  
"Mandy, This be the Largest Funnygraf I Ever See."

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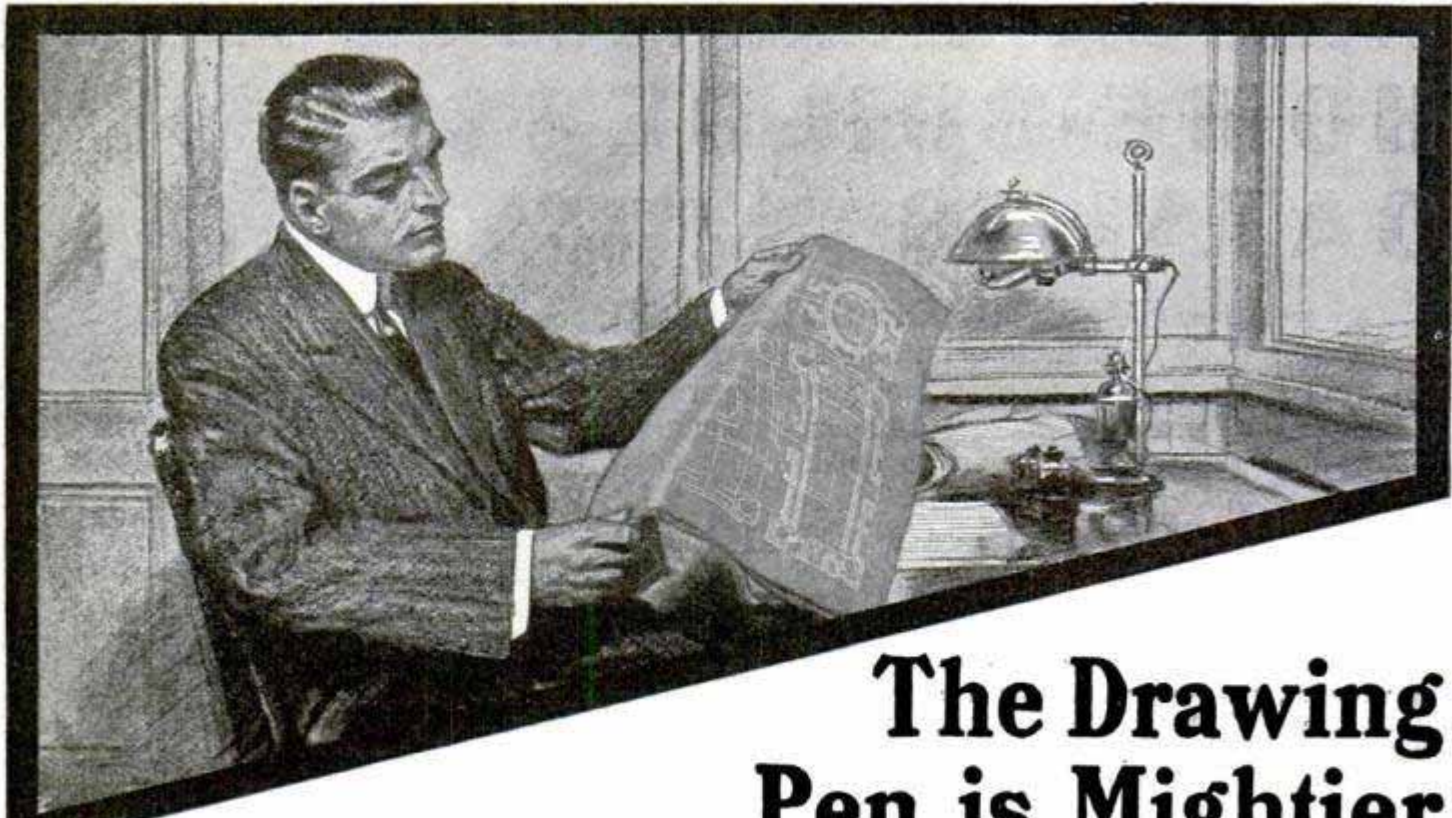


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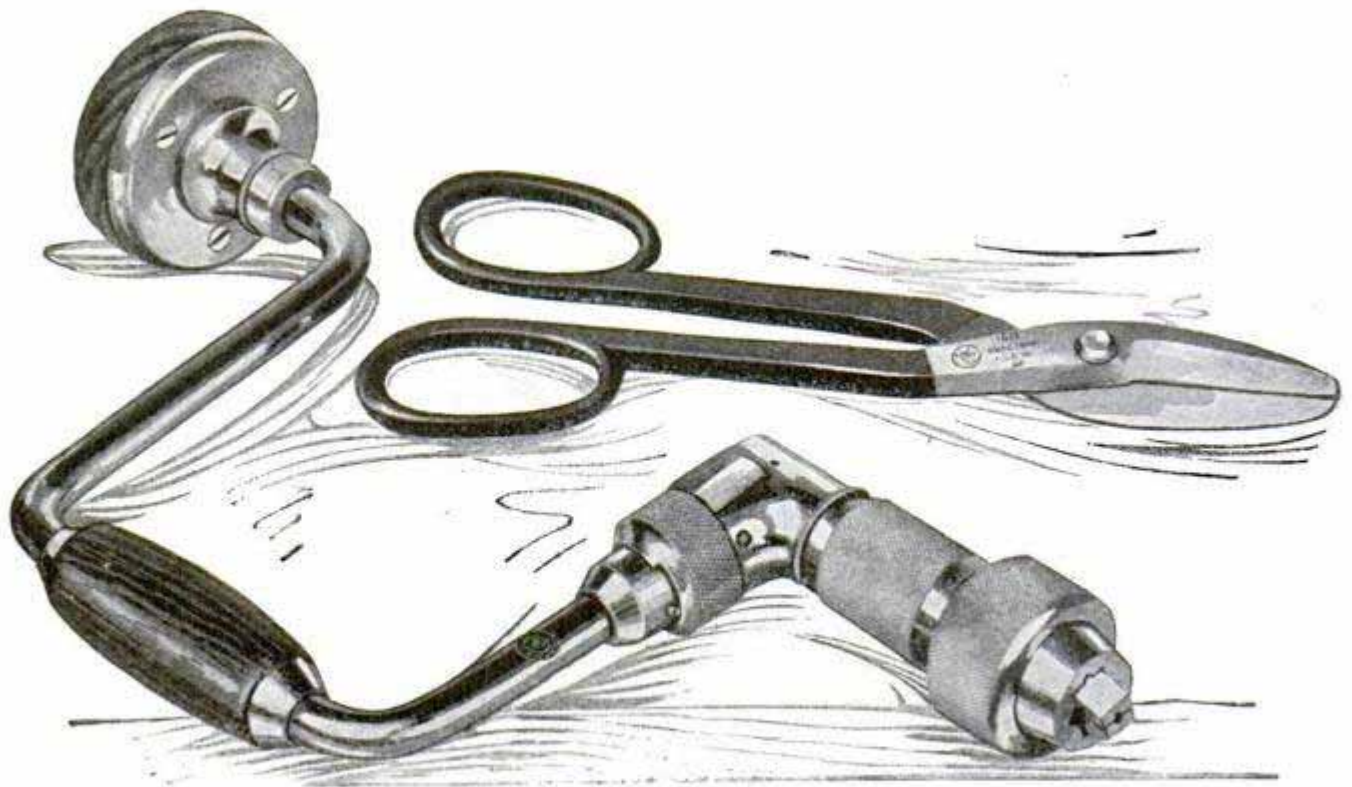
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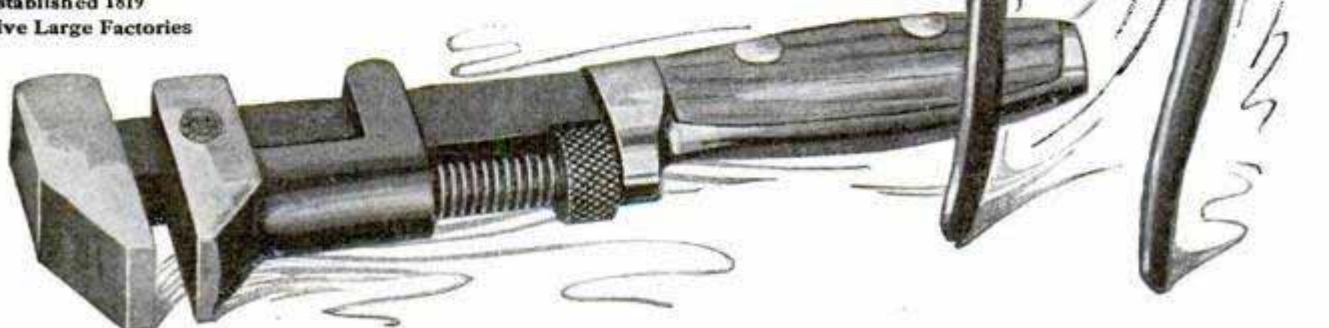
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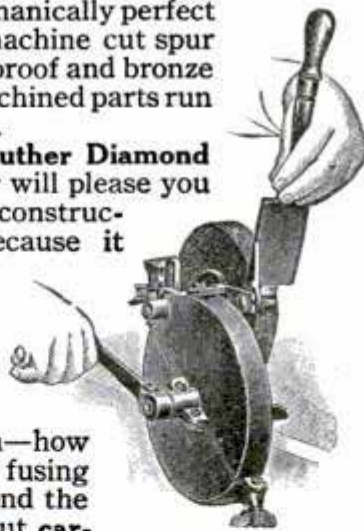
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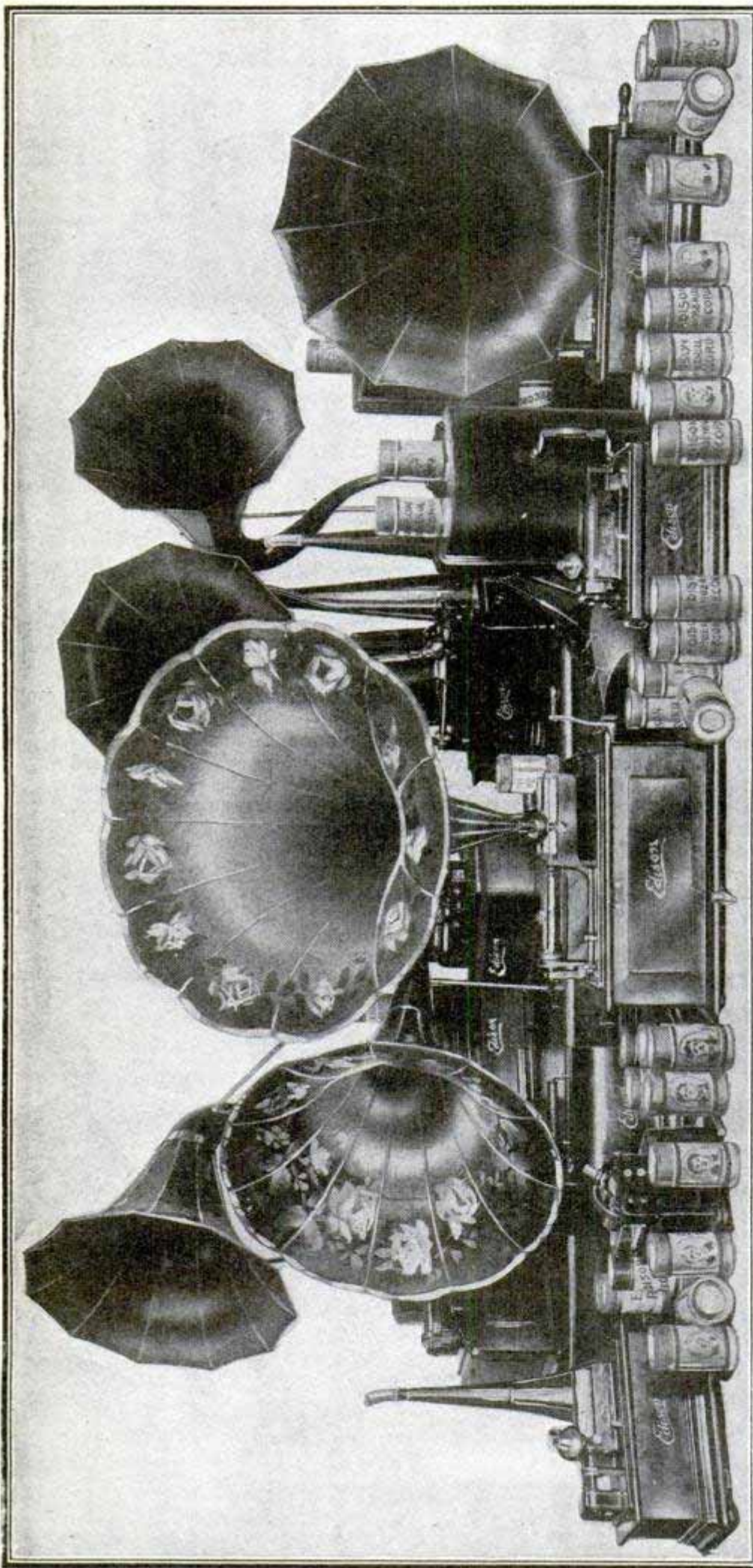


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# WING PIANO



## Guaranteed for 40 Years

Behind every Wing Piano there is a guarantee of forty years—**YES, 40 YEARS.** We waited for 40 years before making this guarantee, a guarantee which is longer than any other guarantee ever made.

The reason we waited was to see in what condition the pianos we shipped out forty-two years ago were in today. We found them to be almost as good as they were when they left our factory. So we *know* that we can safely guarantee the Wing Piano for forty years.

Our desire is to ultimately give a guarantee of 50 years with every Wing. When our pianos have been out for fifty years we will inspect them and if they are in the condition we know they should be, we will give with every piano a guarantee for fifty years.

The pianos which already have been in use for 42 years look now as if they would still be good twenty-five or thirty or even forty years from now, but to us a guarantee means a **Guarantee**—not merely a few words written on paper for effect.

Think for a moment of what our guarantee really does mean. It means that the great resources of the Wing Piano Co. are behind it. And the resources of this company with 42 years of prosperous business are equal, if not superior, to the resources of a large bank. Compare this Wing guarantee to the guarantees given by "mushroom" selling companies (just plain piano agents) which have sprung up almost in a day—companies which have no factory and which sell pianos made "just to sell" and branded with a name only. For forty-two years it has been our aim to build the very best piano in America. Fifty thousand pianos in the hands of 50,000 satisfied customers attest to the great success we have won. Deal with the factory if you want the best—if you want the protection of the factory guarantee. Send the free coupon on the opposite page and let us tell you how we will ship a Wing to you absolutely free.

### We Will Buy Your Old Organ or Piano

If you have an old organ or piano we will pay you a good price in exchange for a Wing Piano. Get our free book which explains all about it. We will tell you just what we will give you in dollars and cents. Find out how much you can get for that old organ or piano anyway. Send the free coupon for our big free book.

# SHIPPED FREE

We, the manufacturers of Wing Pianos for 42 years, will send you a genuine Wing Piano, tested and guaranteed by us, without one penny from you. We will ship the piano free with all freight paid in advance by us. You are not out one cent in money or trouble. This is an offer never equaled before by a big manufacturer. An offer direct from one of the largest manufacturers of pianos in the world. This offer is backed by a forty-year guarantee by the manufacturer. This offer places you in the very same position as if you were a dealer. You buy at exactly the same price as the dealer pays. You do business direct with the factory which has sent out more than 42,000 pianos.

Think of what this offer means! We allow you to keep the genuine Wing Piano in your house for four full weeks without paying anybody anything. You play on it. Use it just as if it were your own. Take music lessons on it. Test it in every way. Compare it with any other piano you wish. Decide yourself. There won't be any salesmen around to bother you. You may be sure that if you decide to keep the Wing none of the money goes into the salary of salesmen. Every cent goes into the piano because you deal with the men who make the piano.

## Did You Ever Have a Piano in Your Home?

If not, haven't you often—often—wished that you did have one? The delights of sitting before a splendid instrument—the supreme pleasure it gives—is known only to those possessing a good piano. Your opportunity is here now. You may have a piano in your home any time you want it. You may use it for 4 weeks positively without expense to you. After the four weeks' free trial are up make your decision. Either keep the piano, or send it back, just as you choose. We ask you not to keep it unless you are fully satisfied—more than satisfied. Unless you are charmed with the delightful tone—the splendid beauty of the Wing Piano—we would rather you would not have it. Because we want every Wing to sell another Wing.

If for any reason—any reason whatsoever—you desire to return the piano you are at liberty to do so. Then we will pay the freight back to our factory. You are not out one cent. You have had the use of a Wing Piano for four weeks. Send the free coupon for our big piano book. This book tells you all about this tremendous offer.

## Send FREE Coupon

Now for Free Piano Book

Free Coupon

We furnish the following articles FREE with every Wing Piano:

Handsome Stool, A Beautiful Brocatel Drapery, French Velour Drapery, Japanese Silk Scarf, China Silk Scarf or a Satin Damask Scarf (your choice). Free Musical Education—a positively free scholarship. Let us tell you all about this most wonderful opportunity.) OUR FAMOUS NOTE-ACORD (The automatic music teacher which aids you in learning to play. It is a teacher which never becomes tired and never makes a mistake.) Send the free coupon.

This book is positively free. It is the biggest piano book ever published. It tells you just how to judge a piano. It contains ten tests to apply to every piano. Apply these tests to any piano and you will know absolutely whether that piano is a good piano or not. This book is invaluable to anybody who intends to buy a piano now or in the future. It tells how the forests of the world are searched for timber for the Wing Pianos. How this timber is seasoned for three years — then how it is placed in a steam room for four months and made bone dry and impossible to warp before it is used in a Wing. You see WHY we can give you an absolute forty-year guarantee—a forty-year guarantee from the manufacturer. Isn't this better than a second-hand guarantee from a small dealer? Besides, you know HOW Wings are made because you get them straight from the factory. Why take a chance on a piano when you don't know where it is made — a piano which is merely branded with a name — a name which CANNOT mean the seasoning and workmanship which goes into a Wing. Don't neglect to get our free book. Send the free coupon today.

**WING & SON (Est. 1868)**

13th St. and 9th Ave., Dept. 1191, NEW YORK CITY

## Piano Player also shipped FREE



If you wish a Piano Player, a piano which you can learn to play in five minutes, we will ship the Wing Player to you on the same liberal terms as on regular pianos. We will include some rolls of the finest piano music and the minute the piano comes into the home you can sit right down and begin playing. Send free coupon for this extraordinary offer.

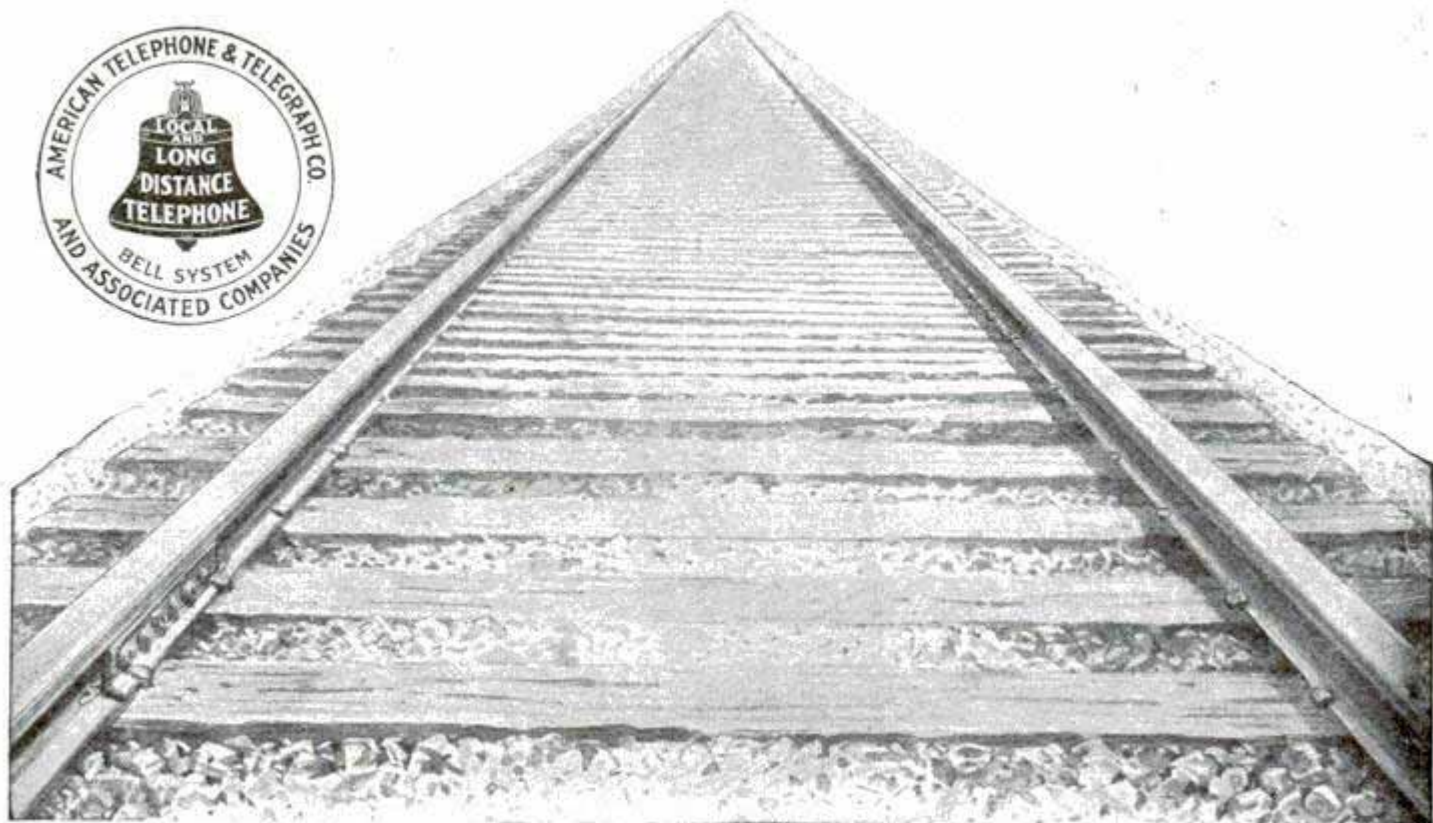
**WING & SON**  
(Est. 1868)  
13th St. and 9th Ave.  
Dept. 1191  
NEW YORK CITY

GENTLEMEN:—With the distinct understanding that I am not buying anything I would like to have you explain your free shipments on the Wing Piano. Also you may send free the 156-page book giving the ten tests for judging the value of a piano and other important information for people who may want to buy a piano.

NAME.....

ADDRESS.....

No letter necessary; coupon will do.



## “The Clear Track”

Two men a thousand miles apart talk to each other by telephone without leaving their desks.

Two wires of copper form the track over which the talk travels from point to point throughout a continent.

Moving along one railroad track at the same time are scores of trains carrying thousands of passengers. The telephone track must be

clear from end to end to carry the voice of one customer.

The Bell system has more than ten million miles of wire and reaches over five million telephones. This system is operated by a force of one hundred thousand people and makes seven billion connections a year—twenty million “clear tracks” a day for the local and long distance communication of the American people.

*The efficiency of the Bell system depends upon  
“One System, One Policy, Universal Service.”*

**AMERICAN TELEPHONE AND TELEGRAPH COMPANY  
AND ASSOCIATED COMPANIES**

*Please Mention Popular Mechanics*

# Fighting the Trust

**READ!**

## A Watch Offer Without Parallel

Write for our **FREE** book on watches; a book that posts you on "selling systems," and explains the reasons for our most remarkable rock-bottom-price offer **DIRECT TO YOU** on the highest grade Burlington.

**IF YOU WANT** a highest grade watch (ladies' or gentlemen's), or if you ever expect to own such a watch, write **NOW** for the free Burlington book. See coupon below.

We won't "knuckle down" to selling systems among dealers, so we have decided to make such a tremendous and wonderful offer direct to the public on a first-class time piece, that no trust, no dealers under contract will or can stop us.

**BURLINGTON DIRECT GUARANTEE**  
ON BOTH CASE AND MOVEMENT



You too will seize this opportunity to get the "Burlington Special" direct on this wonderful offer.

You should not buy a worthless watch just because it is cheap. Nor need you pay trust prices now for a top-notch watch. The free Burlington book explains.

## \$2.50 A Month At An Anti-Trust Price

\$2.50 a month for the world's most superb time piece! The easiest payments at the rock-bottom—the **Anti-Trust** price. To assure us that everybody will quickly accept this introductory direct offer, we allow cash or easy payments just as you prefer.

**No Money Down** We ship the watch on approval, prepaid (your choice of lady's or gentleman's open face or hunting case). You risk absolutely nothing—you pay nothing—not one cent—unless you want the great offer after seeing and thoroughly inspecting the watch.

### Get the FREE Burlington Book

**THIS BOOKLET** will quickly convince you too that you **DO** want an Anti-Trust watch—made in the independent factory that is fighting the trust as best it can by giving better quality and superior workmanship throughout; we will quickly convince you that the Burlington watch, on which there is only **one** rock-bottom price (the same rock-bottom price everywhere) is **THE** watch for the discriminating buyer; that it is **THE** watch for the man or woman who wants, not the largest selling brand which everybody has, but the **best** watch, the watch bought by experts, **THE** watch that is absolutely perfect in its many points of superiority—the **Burlington Watch**.

You will be posted on **inside facts** and prices when you send for the Burlington Company's free book on watches.

**BURLINGTON WATCH COMPANY**  
Dept. 1191, 19th and Marshall Blvd., Chicago, Ill.

**Now Write** for the free book. It will tell you what you

ought to know before you even examine a watch. It will tell you the inside facts about watch prices, and will explain the many superior points of the Burlington over the double priced trust products.

Just send your name and address.

**No Letter Is Necessary—COUPON Will Do**

**BURLINGTON WATCH CO.**  
Dept. 1191, 19th and Marshall Blvd.  
CHICAGO - ILLINOIS

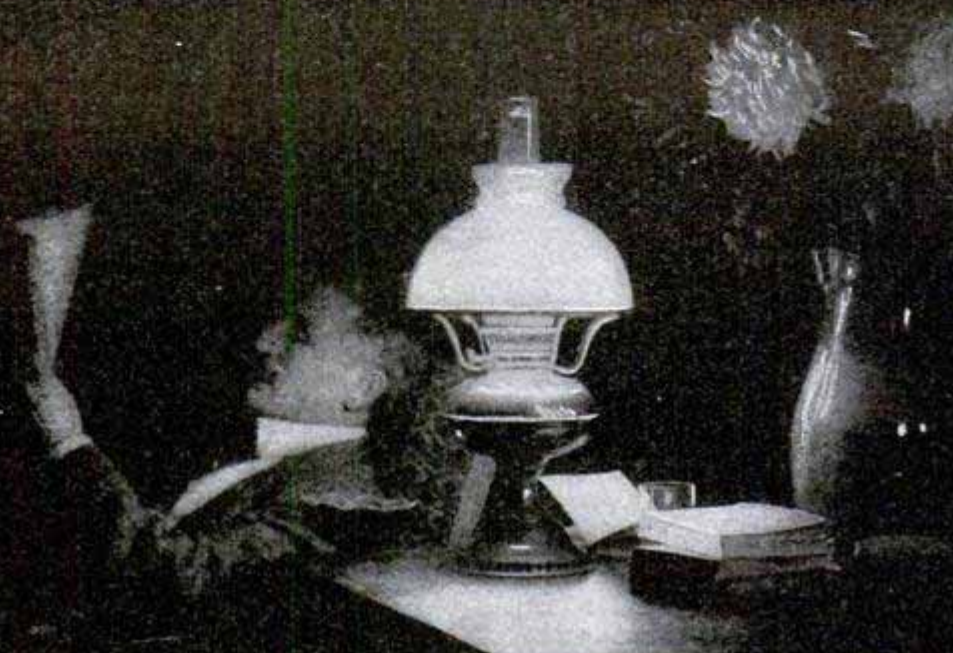
Please send me (without obligations and prepaid) your free book on watches and copy of your \$1,000 challenge, with full explanations of your cash or \$2.50 a month offer on the Burlington Watch.

.....  
Name.....  
.....  
Address.....  
.....

THE Famous

# Rayo Lamp

Once a Rayo user, always one



**The Rayo Lamp is a high-grade lamp,  
sold at a low price.**

It gives the white, soft, mellow, diffused light, which is easiest on the eye; and you can use your eyes for hours under Rayo light without eye strain, because there is no flicker. The Rayo Lamp may be lighted without removing shade or chimney. This season's burner adds strength and appearance. You may pay \$5, \$10, or \$20 for lamps other than the Rayo and get more costly decorations, but you cannot get a better light than the low-priced Rayo gives.

Dealers Everywhere. If not at yours, write to the nearest agency of the

**Standard Oil  
Company**  
(Incorporated)



# ENLIST AS LOCAL AGENT

## for the Fast-Working, Fast-Selling

# Oliver Typewriter!

The battle lines of the Oliver Typewriter forces are forming for another campaign of conquest. The triumphs of 1910—the most brilliant ever achieved by a great sales organization—have served to inspire to more mighty deeds in the coming year.

The roll-call of the Oliver Sales Organization shows over 15,000 men **under arms**—the most magnificent body of trained salesmen in the world.

This Sales Force, great as it is, cannot cope with the tremendous increase in business which the popularity of the Oliver Typewriter has created.

### Resident Agents Wanted in Every Town and Village

This advertisement is a call for reinforcements—to enable the Oliver Sales Force to extend its skirmish lines to all sections of the country.

The central idea of our selling system is to have—**everywhere**—a vigilant agent of the Oliver Typewriter constantly **on the ground**. Whether that agent devotes part or all of his time to the sale of the Oliver Type-

writer is left to his own discretion.

Teachers, tradesmen, doctors, ministers, lawyers, stenographers, telegraph operators, printers, mechanics—men and women in a multitude of different occupations—can succeed as Local Agents for the Oliver Typewriter. If you have the **will to take up this work, we will point out the way.**

## The OLIVER Typewriter

### The Standard Visible Writer



The Oliver Typewriter has been breaking records since the day it was placed on the market. **Efficiency records, speed records, endurance records**—it has won them in quick succession. It sets the swiftest pace in sales by giving unparalleled **service**.

With **several hundred less parts** than other standard typewriters, its **simplicity, strength, ease of operation, versatility and convenience** are correspondingly increased.

### "17-Cents-a-Day" Plan A Wonderful Aid to Agents

This machine, with all of its advantages, all of its time and labor-saving devices, the Local Agent can buy—and sell—for Seventeen-Cents-a-Day.

The Oliver Typewriter No. 5—the newest model—the \$100 machine—equipped with a brilliant array of new devices and conveniences, actually offered for **pennies!**

This irresistible offer enables the Local Agent to succeed right from the word "go!"

### Write for Inspiring Book, "The Rise of the Local Agent"

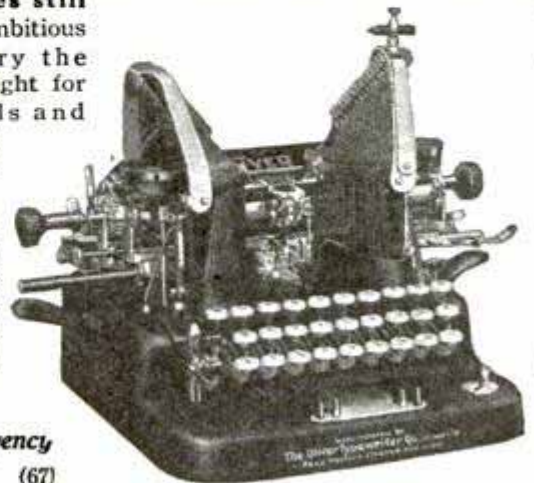
Read the life stories of men who rose from the Local

Agency ranks to positions of great importance in the Oliver Organization—How one Local Agent is today the Typewriter King of Mexico. (Mexican Government reports show that more Oliver Typewriters are imported than all other typewriters combined.)

These inspiring stories will open your eyes to the **big opportunities still open** for ambitious men to carry the Oliver flag, fight for new records and reap the rewards of success.

Send a personal letter today while the **Call for Volunteers** is ringing in your ears.

Address Agency  
Department (67)



THE OLIVER TYPEWRITER CO., 201 Oliver Typewriter Bldg., Chicago

Please Mention Popular Mechanics

# A LIVING FROM POULTRY

*\$1,500.00 from 60 Hens in Ten Months on a City Lot 40 Feet Square*

*To the average poultryman that would seem impossible and when we tell you that we have actually done a \$1500 poultry business with 60 hens on a corner in the city garden 40 feet wide by 40 feet long, we are simply stating facts. It would not be possible to get such returns by any one of the systems of poultry keeping recommended and practiced by the American people, still it can be accomplished by the*

## PHILO SYSTEM

### THE PHILO SYSTEM IS UNLIKE ALL OTHER WAYS OF KEEPING POULTRY

and in many respects just the reverse, accomplishing things in poultry work that have always been considered impossible, and getting unheard-of results that are hard to believe without seeing.

### THE NEW SYSTEM COVERS ALL BRANCHES OF THE WORK NECESSARY FOR SUCCESS

from selecting the breeders to marketing the product. It tells how to get eggs that will hatch, how to hatch nearly every egg and how to raise nearly all the chicks hatched. It gives complete plans in detail how to make everything necessary to run the business and at less than half the cost required to handle the poultry business in any other manner.

### TWO-POUND BROILERS IN EIGHT WEEKS

are raised in a space of less than a square foot to the broiler, and the broilers are of the very best quality, bringing here 3 cents a pound above the highest market price.

### OUR SIX-MONTH-OLD PULLETS ARE LAYING AT THE RATE OF 24 EGGS EACH PER MONTH

in a space of two square feet for each bird. No green cut alone of any description is fed, and the food used is inexpensive as compared with food others are using.

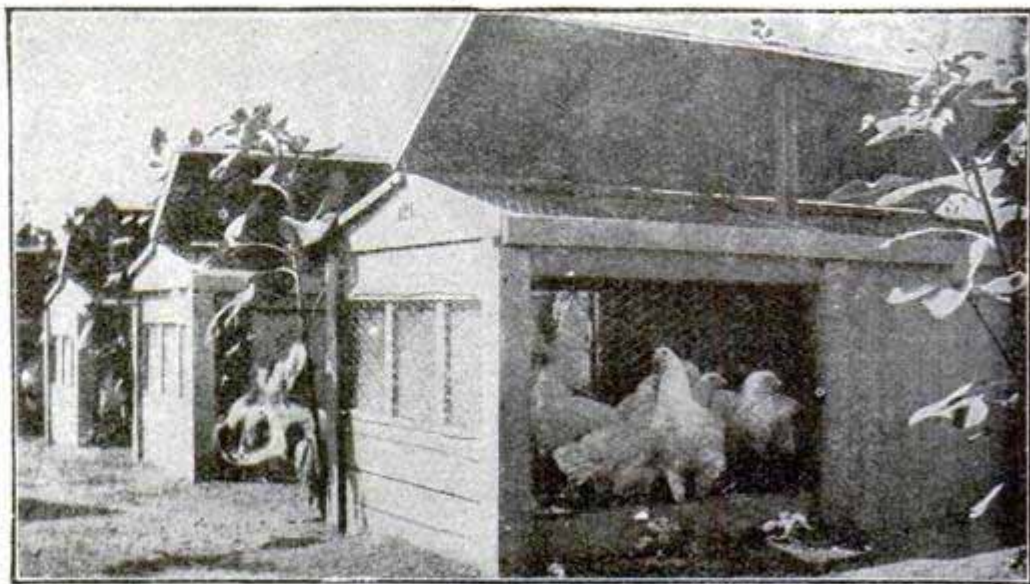
Our new book, **THE PHILO SYSTEM OF POULTRY KEEPING**, gives full particulars regarding these wonderful discoveries, with simple, easy-to-understand directions that are right to the point, and 15 pages of illustrations showing all branches of the work from start to finish.

### DON'T LET THE CHICKS DIE IN THE SHELL

One of the secrets of success is to save all the chickens that are fully developed at hatching time, whether they can crack the shell or not. It is a simple trick, and believed to be the secret of the ancient Egyptians and Chinese which enabled them to sell the chicks at 10 cents a dozen.

### CHICKEN FEED AT FIFTEEN CENTS A BUSHEL

Our book tells how to make the best green food with but little trouble and have a good supply any day in the year, winter or summer. It is just as



Note the condition of these three months old pullets. These pullets and their ancestors for seven generations have never been allowed to run outside the coops.

impossible to get a large egg yield without green food as it is to keep a cow without hay or fodder.

### OUR NEW BROODER SAVES 2 CENTS ON EACH CHICKEN

No lamp required. No danger of chilling, overheating or burning up the chickens as with brooders using lamps or any kind of fire. They also keep the lice off the chickens automatically or kill any that may be on them when placed in the brooder. Our book gives full plans and the right to make and use them. One can easily be made in an hour at a cost of 25 to 50 cents.

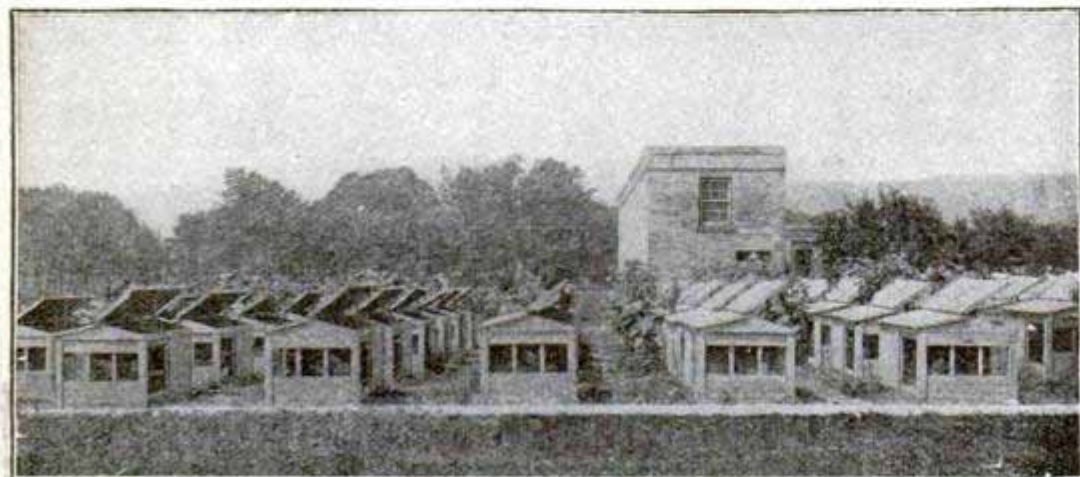
### TESTIMONIALS

MY DEAR MR. PHILO:— Valley Falls, N. Y., Oct. 1, 1910.  
After another year's work with your System of Poultry Keeping (making three years in all) I am thoroughly convinced of its practicability. I raised all my chicks in your Brooder-Coops containing your Fireless Brooders, and kept them there until they were nearly matured, decreasing the number in each coop, however, as they grew in size. Those who have visited my plant have been unanimous in their praise of my birds raised by this System.

Sincerely yours, (Rev.) E. B. Templer.

MR. E. R. PHILO, Elmira, N. Y. Elmira, N. Y., Oct. 30, 1909.  
Dear Sir:—No doubt you will be interested to learn of our success in keeping poultry by the Philo System. Our first year's work is now nearly completed. It has given us an income of over \$500.00 from six pedigree hens and one cockerel. Had we understood the work as well as we now do after a year's experience, we could easily have made over \$1000.00 from the six hens. In addition to the profits from the sale of pedigree chicks, we have cleared over \$960.00 running our Hatchery plant, consisting of 56 Cycle Hatchers. We are pleased with the results, and expect to do better the coming year. With best wishes, we are Very truly yours, (Mrs.) C. P. Goodrich.

MR. E. R. PHILO, Elmira, N. Y. South Britain, Conn., April 19, 1909.  
Dear Sir:—I have followed your System as close as I could; the result is a complete success. If there can be any improvement on nature, your brooder is it. The first experience I had with your System was last December. I hatched 17 chicks under two hens, put them as soon as hatched in one of your brooders out of doors, and at the age of three months I sold them at 35c. a pound. They then averaged 2½ lbs. each, and the man I sold them to said they were the finest he ever saw, and he wants all I can spare this season. Yours truly, A. E. Nelson.



Photograph Showing a Portion of the Philo National Poultry Institute Poultry Plant Where There Are Now Over 5,000 Pedigree White Orplingtons on Less Than a Half Acre of Land.

### SPECIAL OFFER

Send \$1.00 for one year's subscription to the *Poultry Review*, a monthly magazine devoted to progressive methods of poultry keeping, and we will include, without charge, a copy of the latest revised edition of the *Philo System Book*.

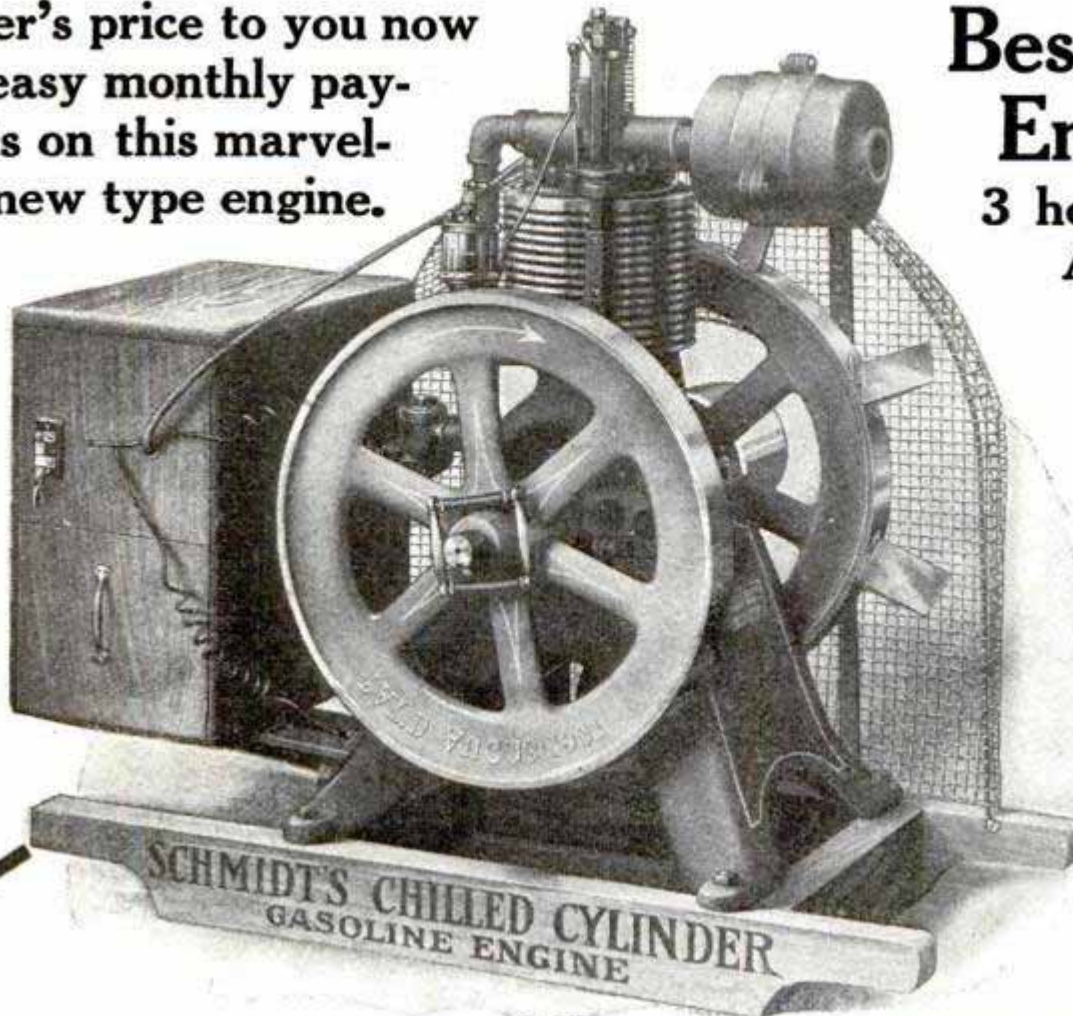
E. R. PHILO, Publisher

2645 Lake St., Elmira, N. Y.

Dealer's price to you now and easy monthly payments on this marvelous new type engine.

# Best Shop Engine

3 horsepower.  
Air cooled.  
Send free coupon.



TAKES UP LESS FLOOR SPACE.

# FREE

This Marvelous Chilled Cylinder Gasoline Engine sent Free

Yes, absolutely free on the most liberal offer ever made. Use this engine ten days on your own place then send it back at our expense or keep it on easy monthly payments at dealer's price just as you choose. Send direct to the engine works and save dealer's profits.

**Send No Money  
Easy Payments**

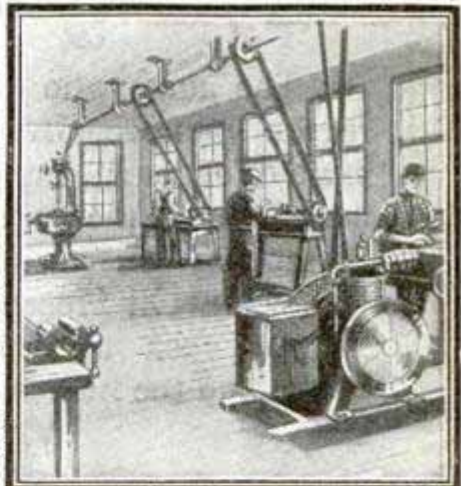
**5 Years' Guarantee**

SCHMIDT'S Chilled Cylinder Gasoline Engine is absolutely guaranteed in every part for five full years. You take no risk of any kind. You get the best and most economical engine on earth. The only engine with a chilled cylinder for all kinds of power work at the engine works' price. Send the free coupon now for catalogs and all particulars free.

**Schmidt Bros. Co. Engine Works  
Dept. 1191 Davenport, Iowa**

## Power Equipment for FARM OR SHOP.

Have your own power plant. With Schmidt's easy new type hangers, pulleys, shafting, bearing, etc., at small cost. On this special introductory offer you can get engine and power equipment at dealer's price. SEND FREE COUPON NOW



We send the engine to you on your request without a cent down in any way. Get all particulars of this amazing free offer.

Take long time to pay on your own security. No notes or mortgages. Same price as for all cash. Most liberal terms ever made to you.

### FREE COUPON

**Schmidt Bros. Co. Engine Works  
Dept. 1191, Davenport, Iowa**

Gentlemen: Without any obligations on me you may send me free and prepaid catalog explaining your new free offer on Schmidt's Chilled Cylinder Gasoline Engine.

Name .....

Address .....



## Staying Overnight

The guest who arrives upon short notice or the guest who for some reason unexpectedly stays overnight feels uncomfortable at any sign of extra effort or inconvenience on his account. In winter on such occasions there is often the question of quickly heating the "spare" room or guest chamber. You can avoid all trouble and inconvenience by taking your Perfection Oil Heater to his room. You can light the heater in a jiffy, and be back in a minute or two. When he goes to bed his room is warm, and the heat is under his own control—little or much, as he desires.

## PERFECTION SMOKELESS OIL HEATER

*Absolutely smokeless and odorless*

The Perfection has an **AUTOMATIC-LOCKING FLAME SPREADER**, which prevents the wick from being turned high enough to smoke, and is easy to remove to clean and drop back. The burner body or gallery cannot become wedged, because of a new device in construction, and it can be easily and quickly unscrewed for rewicking.

An indicator shows the amount of oil in the font. Has a cool handle. Filler-cap is put in place like a cork in a bottle, and is attached to the font by a chain. Finished in japan or nickel; strong and durable, well-made; built for service, and yet light and ornamental.

*Dealers Everywhere. If not at yours, write for descriptive circular to the nearest agency of the*

**Standard Oil Company**  
(Incorporated)



# PATENTS



NEW YORK OFFICE, 359 BROADWAY

☐ **FREE NOTICE.** All patents secured through our house receive a free notice in the **SCIENTIFIC AMERICAN**. No better or more economical method of introducing your invention to the attention of the public could be devised.

☐ **OUR OFFICES.** Our Washington office is located in our own building, near the Patent Office. This permits of our attorneys making special oral arguments with the Patent Office Examiners—an advantage not enjoyed by local attorneys.

☐ We are prepared to conduct Interference Proceedings, Infringement Suits, give Validity Opinions, draw up contracts and attend to all branches of legal work connected with Patents, Trade Marks, etc.

☐ We do not offer prizes or other specious inducements, but rely upon our recognized reputation of over half a century. Our fees are as low as is consistent with good work.

**WASHINGTON OFFICE**  
625 F Street, N. W.  
Washington, D. C.

**MUNN & CO., Attorneys**  
359 Broadway, New York, N. Y.

**F**OR SIXTY-FIVE YEARS the firm of MUNN & CO. has conducted the largest patent practice in the country. We file thousands of applications for patents every year. Our system is so perfected that every case receives the best of attention and is prepared by experts who have had special training in handling every class of invention.

☐ **SEND SKETCH.** If you will send us a sketch, no matter how crude, we will give you a fair and candid opinion as to whether it is probable a patent can be obtained. All matters of this kind are strictly confidential and the description and sketches will be dated and placed in our secret archives for future reference. This service and our Hand Book on Patents are free if you will write us at once.

☐ **QUALITY.** The quality of our work has given us an unrivalled reputation among Patent attorneys and we are the recognized American attorneys for many leading Foreign Patent Solicitors. Our staff consists largely of Examiners from the United States Patent Office, who are therefore familiar with the latest procedure and the best practice. Our draftsmen are all expert mechanical constructors who are able to show the invention in operative form.



→ **Protect Your Idea!** ←

# PATENTS THAT PAY

"My Trade-Mark"

## Special Offer:

Mr. Inventor: I invite you to come to see me, and bring, or send (by registered mail), sketches or photograph or model and description of your idea or invention for FREE examination of U. S. PATENT OFFICE Records and report as to patentability of the same;—to find out as to whether you are entitled to a patent will not cost anything;—then, if your invention is new, upon receiving instructions, I will prepare ALL necessary (application) papers.

DO THIS AND SAVE TIME AND MONEY!

**WRITE NOW!**

### Highest References:

Lincoln National Bank,  
Washington, D. C.

NOTE: When writing these clients send two-cent stamp for reply.

Little Giant Hay Press Co.,  
Alma, Mich. and  
Dallas, Texas.

Gray Lithograph Co.,  
New York City, N. Y.

Farmers Mfg. Co.,  
Norfolk, Va.

New Era Mfg. Co.,  
Fairfield, Iowa.

Bernhard Furst,  
Vienna,  
I. Austria-Hungary.  
Otto von Rottenburg,  
Schwindstrasse 20,  
Frankfort a. M.,  
Germany.

H. A. Fonseca,  
Rua Dos Ourives 20,  
Sobrado, Rio de Janeiro,  
Brazil, S. A.

A. J. Corsi,  
Irish Town,  
Gibraltar.

Bell Show Print Co.,  
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The Camp Conduit Co.,  
Cleveland, O.

The Iowa Mfg. Co.,  
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Sam'l Allen & Son Mfg. Co.,  
Danville, N. Y.

The Gari Electric Co.,  
Akron, O.

Superior Mfg. Co.,  
Sidney, O.

Tidnam Tel. Pole Co.,  
Oklahoma City, Okla.

Edw. H. Smith,  
Aberdeen, Wash.

C. O. Cracroft,  
Cordova, Alaska.

V. C. de Ybarrondo,  
Los Angeles, Cal.

Wm. H. Garlock,  
Leland Hotel,  
Seattle, Wash.

F. Rutherford,  
Copper Queen Con. Min. Co.,  
Douglas, Arizona.

Gas Range & Heater Co.,  
S. Pasadena, Cal.

Newberg Brick & Tile Co.,  
Portland, Ore.

## INFRINGEMENT, VALIDITY AND INTERFERENCE WORK SOLICITED

I am admitted to practice before the United States Supreme Court and all others

"I want to thank you for the most excellent services you have rendered me in this suit [B. Williams vs. Central Drug Co., U. S. C. C., Northern District of Illinois—E. Div.], and assure you that I appreciate it very much, and if at any time I can secure some business for you, I will be only too glad to do so."

September 19, 1910.

(Signed) J. THOMPSON, Mgr. Central Drug Co., Sioux City, Iowa.

**FREE: Two Books—61-page "Inventor's Guide" and 64-page "Proof of Fortunes in Patents—What and How to Invent"**

### Foreign Patents a Specialty

If you have a U. S. application write me for excellent literature and terms for promoting your Foreign Patents. Liberal discounts.

### I Advertise My Clients' Patents Free

in a publication having over 2,000,000 circulation. Write for Special Offer. Successful clients in every section of the U. S.



My Office and the Patent Office  
(I give you proof of my location)

Across the street from the U. S. Patent Office

Expert—Prompt Services

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**\$205,340.00 \$**  
MADE BY MY CLIENTS

**YOU Should Have My FREE BOOK**

Telling HOW OTHERS will do the same IN THE FUTURE. "WHAT and HOW to INVENT" BOOK FREE!

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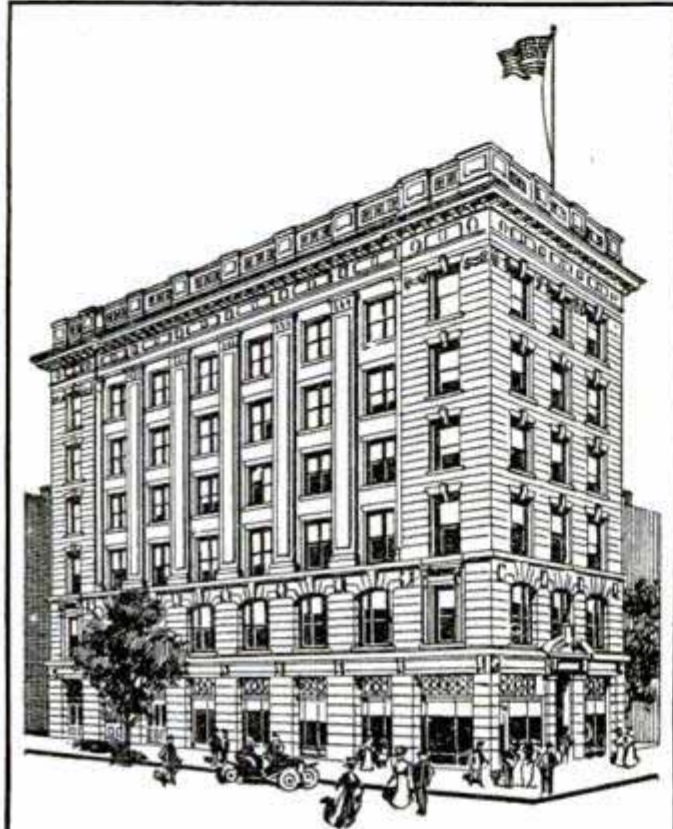
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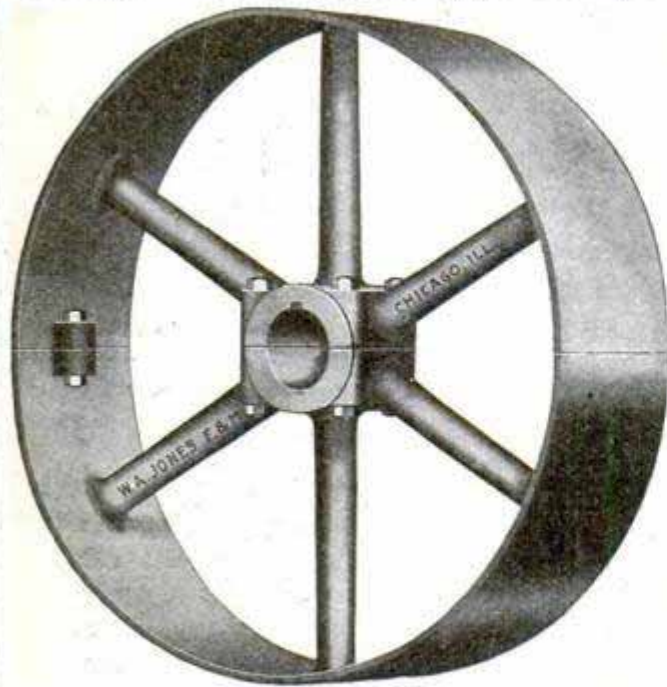
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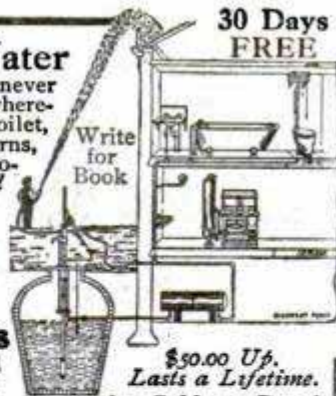
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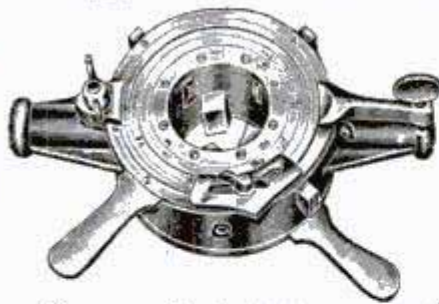
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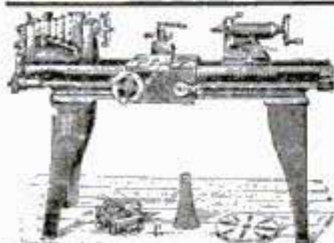
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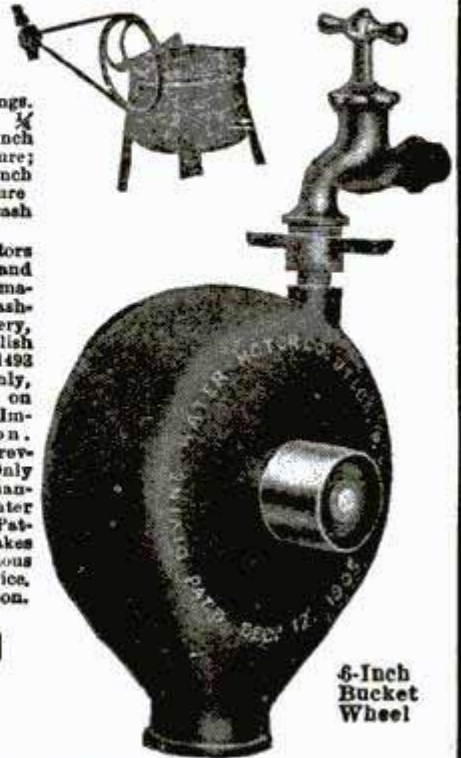
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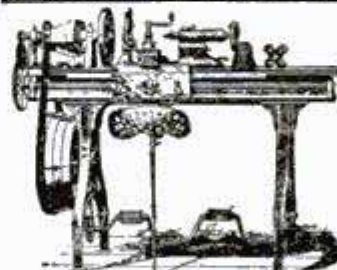
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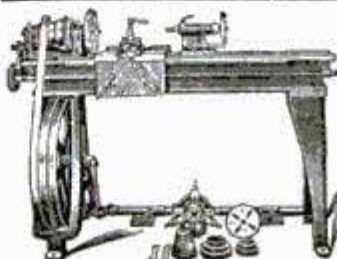
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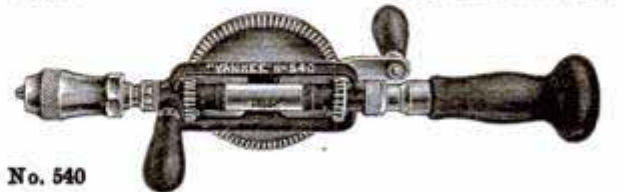
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## This \$20 Morris Chair, \$8.75



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Order today for prompt shipment or write for free catalog of 200 other bargains in Mission and Bungalow Furniture, direct from our factory to you.

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We'll engage you if you're honest and will work.

Mr. J. W. Whipple, Texas, sold 28 Ever-Ready Tool Kits in 8 hours. Profit \$19.60. W. W. Strauss, Pa. (Lawyer):

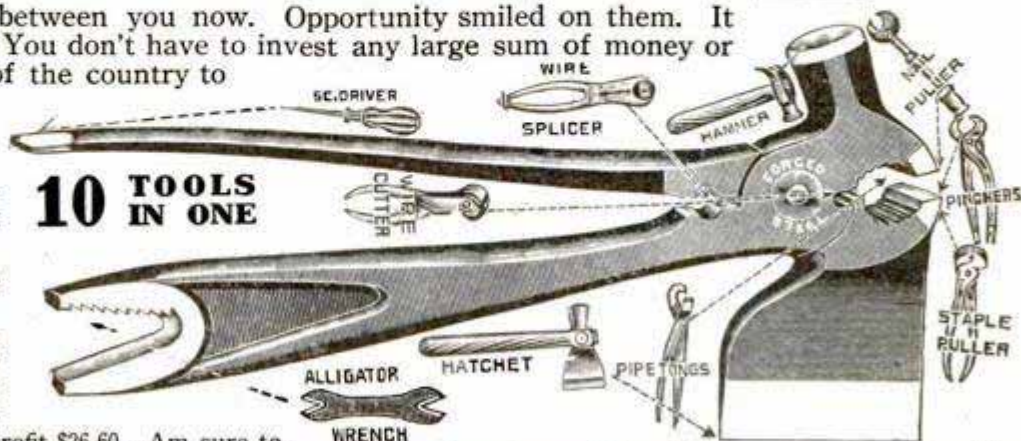
"Your tool kit sells like hot cakes; sold 38 first 4 hours; profit \$26.60. Am sure to sell them by the hundreds." And Frank Clayton, Mich.: "Received hatchet and found it more than you claimed for it. Took 28 orders in one afternoon; did not half try, and have never been an agent before." Arthur Hason, Ohio: "Worked 10 hours and took 20 orders; all one has to do is to show the Ever-Ready and you have made a sale."

**WEAVER MADE \$1,500 Last Year.** Marcellus D. Finch, S. C., made \$31.50 first nine hours. Nothing wonderful about these records. They're not even our best ones. It's not

salesmanship; it's the article. Any man with an honest face and willing to simply take orders could do as well—yes, better. Every one of these is genuine. We have the letters on file in our office and will furnish address of any or all to anyone interested. Listen to this: "Stood around one afternoon and sold a dozen." Delvinie Poivier (Preacher), Conn. **ORDERS, ORDERS, ORDERS** everywhere for this great and wonderful Ever-Ready Tool Kit, 10 Tools in One. Think of the convenience. No worry. Keeping one in place is keeping them all. Every home in America needs tools—a hatchet, hammer, screw driver, wrench, pipe tongs, nail puller, wire cutter, wire splicer. They're all in one; not scattered from garret to basement—but in one piece. No tools lost—none misplaced. No matter what you want, it's here. 100,000 now in use—a million more wanted. "Where did you lay the hatchet last time?"—Don't know. Or hammer or screw driver?—Don't know. That's it! You never know. But you ALWAYS know where to find just what you want with the EVER-READY Tool Kit in the house. You have a home! You know the annoyances of lost tools. How often have you wanted just such a combination tool? Why not go to work, supplying the demand, appointing agents, collecting. Earn some of this easy money yourself. We'll help. Do something—do it now. Send postal with your name and address. Send it today—right now—then live—live in luxury, like high salaried people do.

**SEND NO MONEY—** Just your name and we'll send back our proposition and plan by next mail.

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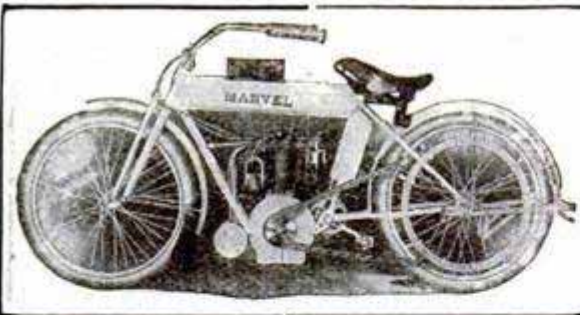


This Extension is made to follow a 5/8-inch bit into a hole. The four jaws are made from one piece of steel and are solid at base in their finished state.

The tool is strong and the grip on the shank to bit positive. Therefore there is no danger of losing the latter between partitions. Electricians will appreciate the value of this Extension. It is made in lengths of 12, 15, 18, 21 and 24 inches.

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Ming dynasty early in the seventeenth century they ordered the Chinese to adopt their own fashion of shaven heads and pigtails. This is first mentioned at the capture of Liaoyang, about 1618. The Chinese resented the disgrace, and stone tablets in Japan record that many fled the country to escape it. But the astute Manchu Emperor made the pigtail popular by decreeing that only honorable men might wear it and that criminals should lose it.—London Chronicle.

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Either style with any three letters and figures, one or two colors of enamel. Sterling Silver, 25c each, \$2.50 doz.; Silver Plate, 10c each, \$1.00 doz. Catalog free. Special designs also made for any School or Society, at attractive prices. Send idea for estimate. BASTIAN BROS. CO., Dept. 487 ROCHESTER, N. Y.

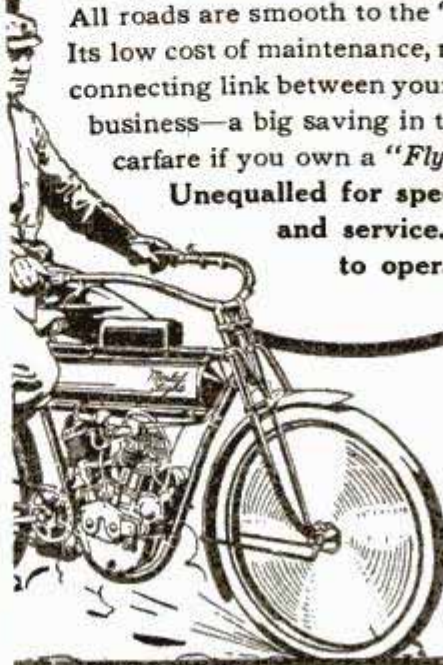


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See page 121

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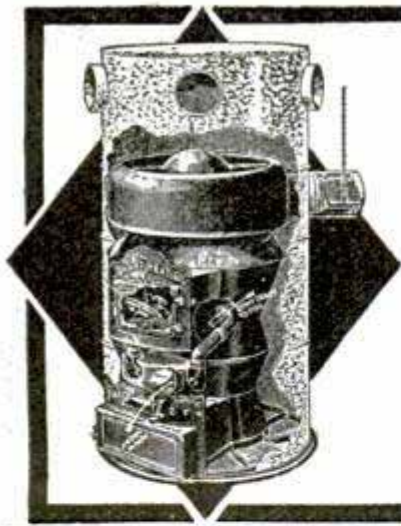
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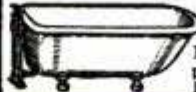
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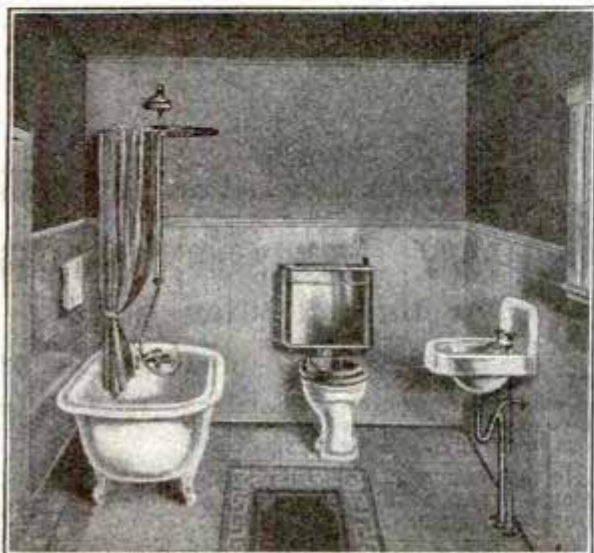
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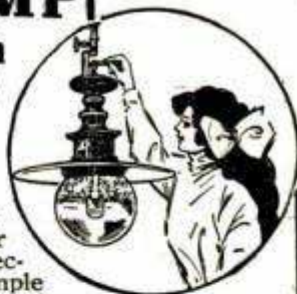
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Amount of orders from R. V. Zimmerman, Indiana, farmer (address upon request), for our



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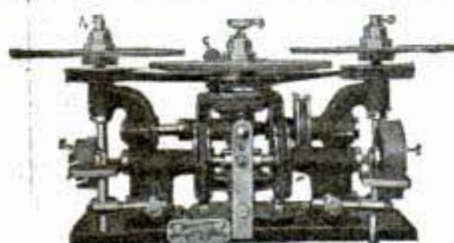
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 A beautiful lamp for homes, hotels, offices, stores, banks, cafes. Portable, safe; can be turned up-ide down or rolled on the floor without danger or affecting the light. 300 c p. of soft, brilliant light, 1/2 c per hour. Also 200 different styles of lamps and systems.

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The "American" machines are money makers. The only successful machine ever invented. With these machines anyone without previous experience can hone razors, sharpen all kinds of safety razor blades, clippers, scissors, etc.

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At Kneppworth, Leicestershire, England, a bird has built its nest in the side pocket of a scarecrow.—Williamsport, Pa., Grit.

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See page 121

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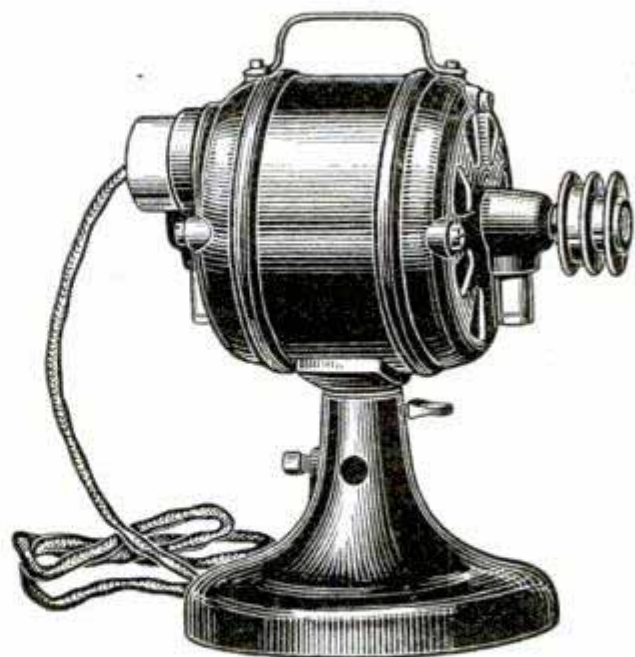
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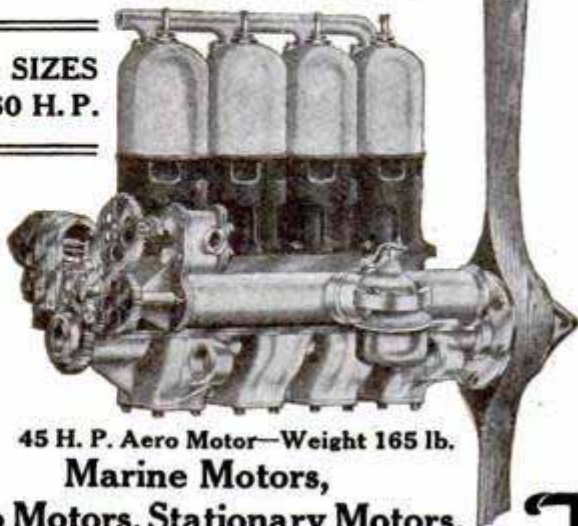
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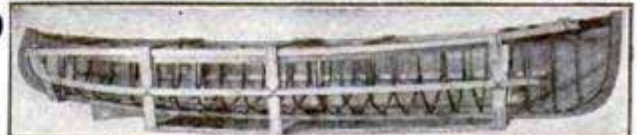
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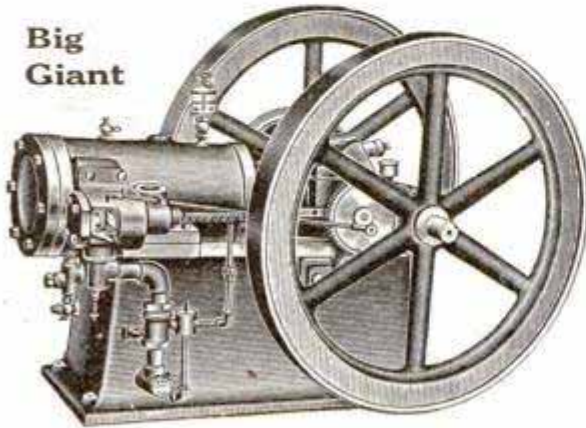


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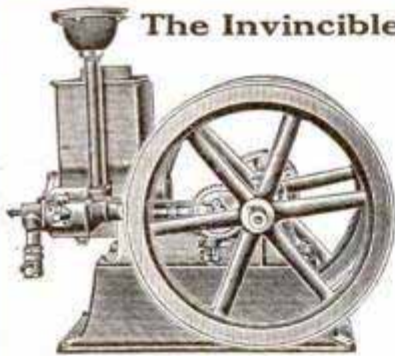


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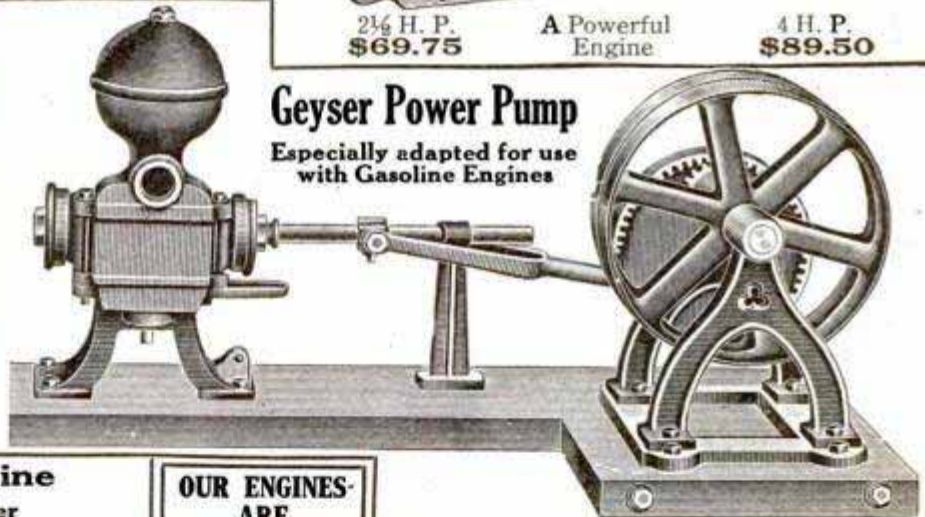


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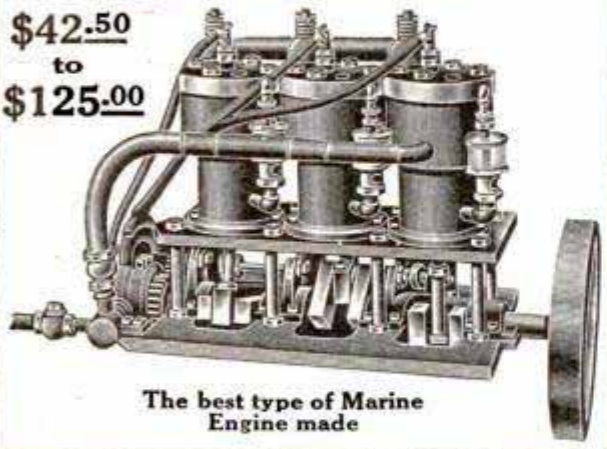


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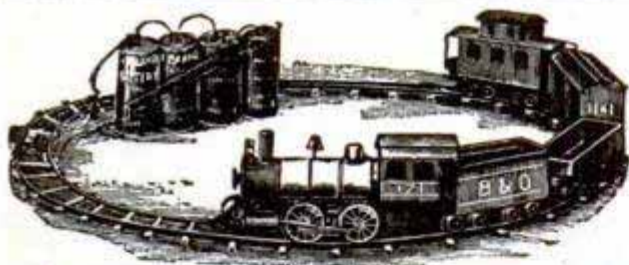
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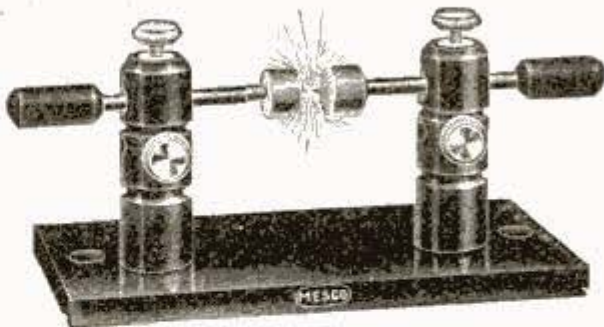
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709 Marquette Bldg., CHICAGO, ILL., 612 N. Main St., LOS ANGELES, CAL.



**PRICE \$12.00 AT FACTORY**

**This Cabinet** made of Oak, finished golden, 44" long, 24" wide, has drawers, extension slide, roll front, paper cabinet, etc., as shown. We sell it at low price to introduce our OFFICE FURNITURE—Desks, Chairs, Tables, Files, Book Cases, etc. ASK FOR PRICES AND CATALOG No. 211.

We make UPHOLSTERED FURNITURE—Turkish and Odd Rockers, Parlor and Library Suites, Davenport and Couches in Oak and Mahogany. Flanders, mission and regular. Covered in best leather money will buy—every piece guaranteed. Ask for prices and Catalog No. 411.

E. H. STAFFORD MFG. CO., 242 Adams St. Chicago, Ill.



## "VULCAN" STYLOGRAPHIC PENS

In Two Sizes, 4 1/4 and 5 1/2 inches.  
**\$1.00** Red or Black Rubber.  
(Extra large size, 8 inches, black only, \$1.25)

**\$2.00** with No. 2 Gold Pen  
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**"VULCAN" SELF-FILLING FOUNTAIN PEN**

Unequaled for Fast Writing, Ruling and Manifolding.

Fills and cleans itself with Simple Safety Device. Black Rubber, highly finished; fitted with 14-Karat Gold Pen

**J. C. ULLRICH & CO., 135 Greenwich Street, NEW YORK CITY**



# Many Dollars Saved in Building

Write for FREE Samples and Booklet Describing

## BISHOPRIC WALL BOARD AND SHEATHING

**Bishopric Wall Board is cheaper and better than lath and plaster; also saves time in building**

This practical substitute for lath and plaster is easily nailed to studding. Being applied dry, it is at once ready for decoration—paint, paper or burlap. Saves time and labor; is clean and sanitary; proof against cold, heat, dampness, vermin.

Bishopric Wall Board is made of kiln-dried dressed lath, IMBEDDED in hot Asphalt Mastic, and surfaced with sized carboard; is cut at the factory into uniform sheets 4x4 ft. sq. and three-eighths of an inch thick. These sheets (delivered in crates) are easily and quickly nailed to studding ready for wall paper, paint or burlap.

### Guaranteed Proof Against Moisture, Heat, Cold, Sound and Vermin

ITS MANY USES:—Bishopric Wall Board is used for dwellings, pleasure, health resort and factory buildings, new partitions in old buildings, finishing attics, cellars, porches, laundries, garages.

Price \$2.50 per 100 sq. ft., or \$6.40 per crate of 256 sq. ft., f. o. b. factories, New Orleans, Cincinnati, or Alma, Mich.

Write today for Free Samples and Booklet, describing Bishopric Asphalt Mastic Wall Board, Sheathing and Roofing. DEALERS, WRITE FOR PROPOSITION.



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Bishopric Sheathing is both better and cheaper than lumber. It's the same material as Wall Board, but finish is not necessarily so fine; therefore costs less. Quickly nailed to studs with laths and asphalt exposed, forming dead air space between laths and weather-boards. Makes smoother and more solid job than lumber; no holes, no shrinking, Proof against heat, cold and moisture. Saves fuel.

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**CUTTING OUT HORSES**—Reliable authorities estimate that there are over 7,000,000 horse-drawn vehicles used daily in the United States, while the total number of horses and colts in the country exceeds 21,000,000, besides 3,000,000 mules. American manufacturers produce yearly about 1,750,000 vehicles, of which 940,000 are passenger conveyances, with an estimated value of \$110,000,000. In addition there is a yearly expenditure of \$125,000,000 for horses and \$52,000,000 for harnesses, so that it seems fair to assume that the United States

**MORE MONEY** is being made by those who invest in town lots at the beginning of Western Canada's future industrial and commercial centers than in any other way. It is estimated that

### ONE HUNDRED MILLION DOLLARS

was made in the year ending July 1, 1910, by those who had the foresight and courage to make such investments.

### IT IS ALL GOOD, CLEAN MONEY, TOO

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easy payment plan.

is the result from operating one American Box Ball Alley. Two others cleared over \$2,000.00 first year. Four others over \$1,200.00 in two months. Four others took in \$3,200.00 in nine months. Go in this business yourself. You can start with \$50.00. Nearly 7,000 alleys sold to date. More popular today than ever. These alleys pay from \$30.00 to \$75.00 each per week in any town.

No gambling device, but the best thing on earth for clean amusement and physical exercise. Patronized by the best people, who form clubs and bring their friends. No expense to install or operate. No special floor required, no pin boy needed. Receipts nearly all profit. We sell only one customer in towns of moderate size. Write today for booklet and

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expends yearly for its horse vehicles a total of \$290,000,000. Automobile makers claim that already the automobile has displaced 500,000 horses and wagons, the average upkeep of which is 65 cents a day, compared with the average upkeep for an automobile of 30 cents a day.—Los Angeles Times.

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Your NAME PRINTED in our Mailing Directory and sent to 10,000 firms all over the world so they can send you **FREE** Samples; Catalogs, Books, Papers, Magazines, etc., etc. Send 2¢ cents to cover cost of printing your name and you will receive a big mail **FREE**.

Ingram, Va., Jan. 7, 1910. Mr. Anderson, I have already received more than 2,000 parcels of mail, and still they come, scores of papers, samples, magazines, etc., for which I had often paid 10 to 25 cents each. R. T. James. Send to **ANDERSON, "The Mail Man," Box 5656, JAMESTOWN, N. Y.**

## ATTENTS YOUR IDEAS MAY BRING YOU A FORTUNE! TALENTS

**H. ELLIS CHANDLEE & CO.**  
55 Bornot Building, WASHINGTON, D. C.

See page 121

**BIG PROFITS  
FOR MEN OF  
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No. 43

**\$37.50**  
BIG BARGAINS. Diamond Rings, any style mounting. Terms: \$3.75 per Month.

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In Fine 20-Year Gold-Filled Case. Guaranteed to Keep Accurate Time  
SENT ON FREE TRIAL, ALL CHARGES PREPAID

You do not pay one penny until you have seen and examined this High-Grade, Full Jeweled Waltham Watch, with Patent Hairspring, in any style plain or engraved Case, right in your own hands.

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No matter how far away you live or how small your salary or income, we will trust you for a high-grade adjusted Waltham Watch, in gold case, warranted for 25 years, and guaranteed to pass any railroad inspection.

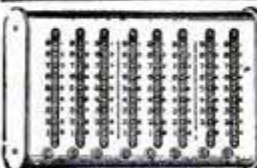
Write for our handsome Holiday Catalog, filled with beautiful photographic illustrations of Diamonds, Watches, solid gold Jewelry, Silverware and choice Novelties for Holiday presents. Select any article you would like to own or present to a loved one; it will be sent on approval.



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THE OLD RELIABLE ORIGINAL DIAMOND AND WATCH CREDIT HOUSE

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Put one of these practical little machines on your desk or in your pocket for instant use. It adds and subtracts. Quickly, Accurately and Handily. Capacity, 9999,999.99. Quickly resets to zero. Machine is 16 times size of illustration. Send us your order with \$1.00, today, NOW, and the adder will be mailed quick, PREPAID. Yes, it is GUARANTEED. Exclusive territory to good agents.

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**METALLIC SIGN LETTER CO., 406 N. Clark St., Chicago**

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A sloop, the "Sea Queen," engaged in trading round the Seychelles Islands, was shipwrecked and the crew of four hands had to take to a small boat, which drifted

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YOUR IDEAS MAY BRING YOU A FORTUNE!  
**TENTATIVE**

**H. ELLIS CHANDLEE & CO.**  
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See page 121

## A STEADY INCOME

from operating our automatic vending machines. Our line comprises machines for vending Gum and Chocolate, Safety Matches, Salted Peanuts, Perfume, Candy, General Merchandise (shoe laces, notions, etc.), Weighing Machines, Electric Treatment Machines, etc.

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Furthermore, a machine which is GUARANTEED to operate under ALL conditions without continual repairs, will save its cost within a few months. Our machines are built to fill these requirements and should certainly appeal to the prudent investor.

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Send 10 cts. for full size **TAT'S GRIT SOAP**  
can and particulars.  
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You Are the Only Judge of the engine and its merits. 25,000 satisfied users. Material and workmanship guaranteed for five years.

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Fewest moving parts of any practical engine on the market. Nothing complicated or liable to get out of order. Only three moving parts. Extra long plastic white bronze bearings. Vanadium steel crankshaft. Adjustable steel connecting rod. All bearing surfaces ground. French gray iron castings. Water-proof ignition system. Runs at any speed from trolling to racing.

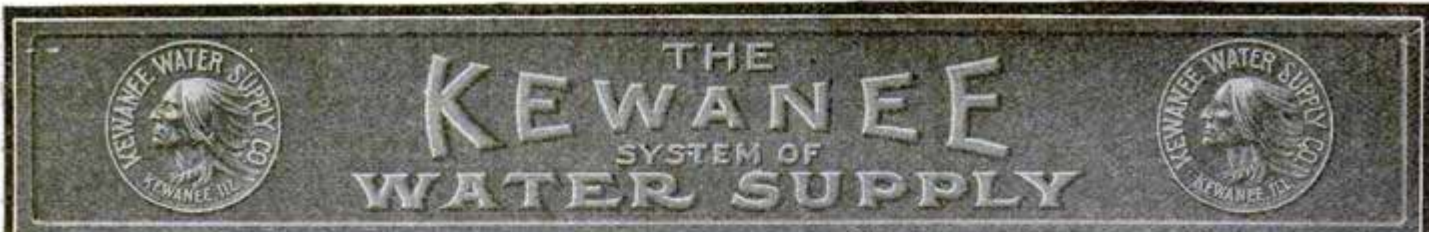


Starts without cranking. Reversible while in motion. Perfectly counter-balanced. No vibration.

**30 Days' Trial** Try the engine for 30 days. If you are not fully satisfied, return it and we will promptly refund all money paid us.

Demonstrator Agents wanted in every boating community. Special wholesale price on first outfit sold. Single cylinder, 2-8 h. p. Double cylinder, 8-20 h. p. 4-cylinder, 20-50 h. p. Thoroughly tested before shipment. Comes to you complete with boat fittings and ready to run. Write for free catalog, testimonials and details of the greatest protective guaranty ever offered. Suitable for any boat from canoe to cruiser. Also railroad track car. All sizes in stock ready to ship. Write today for our wonderful demonstrator offer. [74]

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No matter how far from a city water supply you live, or what kind of place, building or institution you want supplied, or under what conditions you want water, investigate the Kewanee System. One of our plants will provide all the sanitary conveniences and fire protection, which are only possible with the very best city water system. An abundance of water—under strong pressure—day and night. Ask for catalog No. 14.

**Kewanee Water Supply Company, Kewanee, Ill.**

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Reputable agents wanted to handle popular-priced marine engine. Absolutely guaranteed for 5 years.

Thirty days' trial by the purchaser. Your money promptly refunded, without question, if not satisfactory.

A sure favorite and quick seller. Big returns assured. Simplicity the keynote of construction.

Just the engine you have been looking and waiting for. Combines the good features of the best, with all the bad ones eliminated.

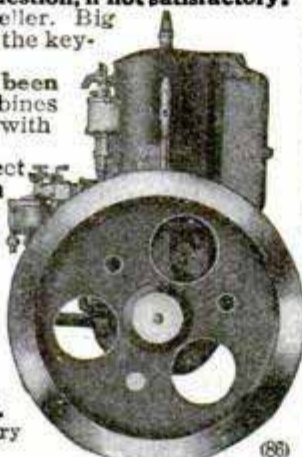
Fool-proof. As near perfect as anything mechanical can be produced.

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A year's sub. to "Keith's" and any 2 books \$3.00; any 5 books, \$5.00  
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1,040 miles out of its course. For four months the four were afloat in the Loat, and one by one the party succumbed until only a man named Green was left.

Green saw several steamers pass him without being able to attract their attention. Eventually the "Tele-machus" saw the boat and rescued the man, who was worn almost to a skeleton.—London Daily Mail.

**Remoh Gems**



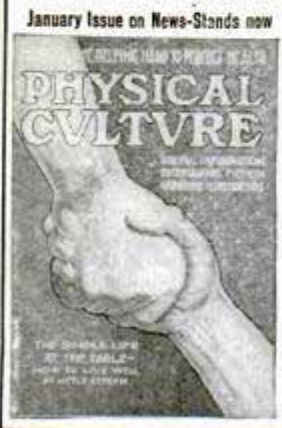
Looks like a diamond—wears like a diamond—brilliance guaranteed forever—stands filing and fire like a diamond—has no paste, foil or artificial backing. Set only in 14k. solid gold mountings. 1-20th the cost of diamonds. A marvelously reconstructed gem. Not an imitation. Guaranteed to contain no glass. Sent on approval. Write for catalog, it's free.  
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**SEE THEM BEFORE PAYING!**  
These Gems are chemical white sapphires. Can't be told from diamonds except by an expert. Stand acid and fire diamond tests. So hard they can't be filed and will out glass. Brilliance guaranteed 25 years. All mounted in 14k solid gold diamond mountings. Will send you any style ring, pin or stud on approval—all charges prepaid—no money in advance. Write for Free illustrated booklet, special prices and ring measure. **WHITE VALLEY GEM CO., 900 Saks Building, INDIANAPOLIS, IND.**

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This \$25 Solid Oak Mission Library Suite \$11.75  
Completely Finished in Golden or Weathered

Three splendid chairs, correctly designed, special "DIRECT LEATHER" seats, and a handy, substantial desk with large drawer, shipped in sections, all in one box, ready to set up in a few minutes, on UNLIMITED APPROVAL, \$11.75.



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The project involves certain difficulties. Office boys, unless watched, will devour stamps. Postmasters will at least lick them. But let us not look upon the dis-

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We can save you from 25% to 40% on your diamond purchases. Only \$97.50 per carat for perfect cut, genuine diamonds—guaranteed by the firm of L. Basch & Co., known for 31 years as The Great Diamond House of Values.



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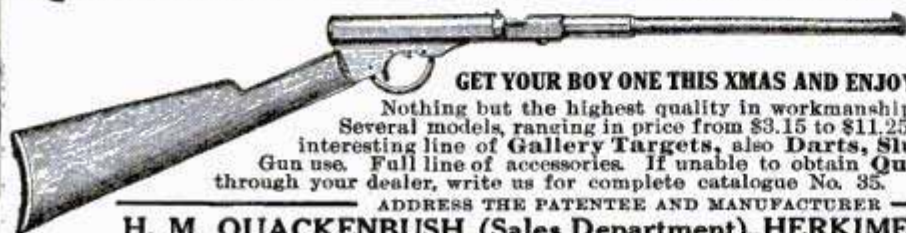
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of purebred poultry, for 1911, over 200 pages, 57 large colored pictures of fowls, calendar for each month, illustrations, descriptions, photos, incubators, brooders, information, and all details concerning the business, where and how to buy fine poultry, eggs for hatching, supplies, etc. at lowest cost, in fact the greatest poultry catalogue ever published. Send 15c for this handsome book. B. H. GREIDER, BOX 2, REEMS, PA.



# Quackenbush Air Guns and Rifles



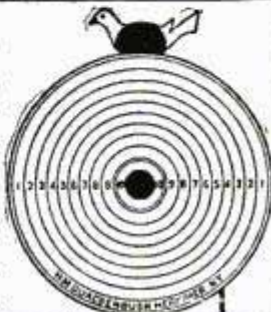
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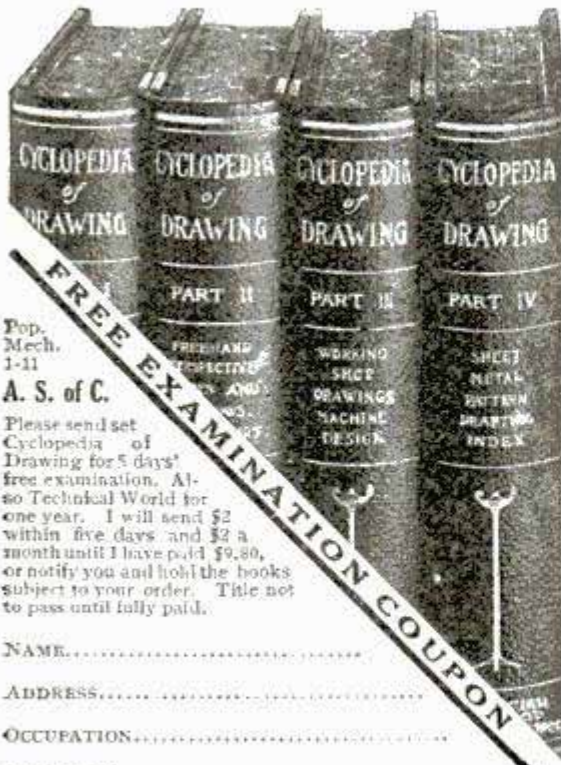
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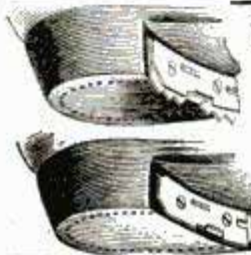
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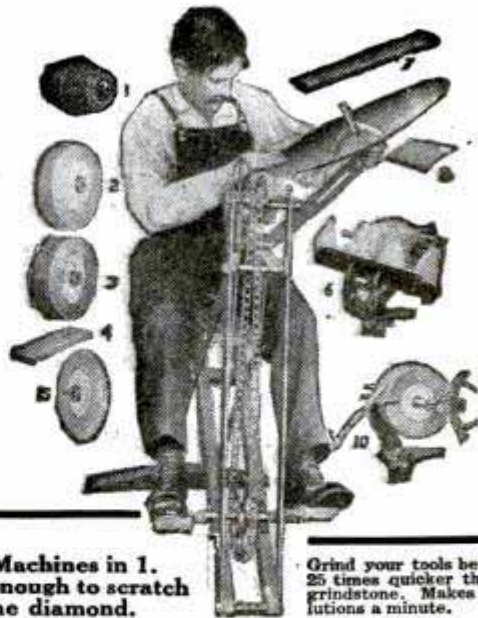
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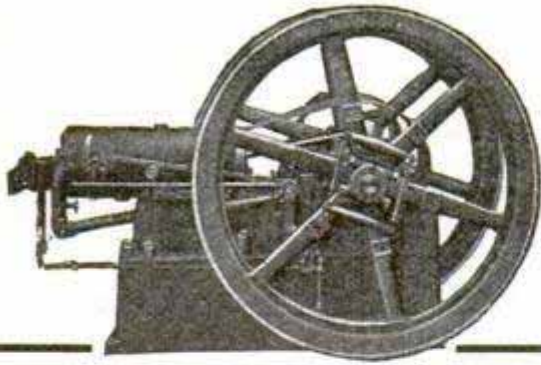
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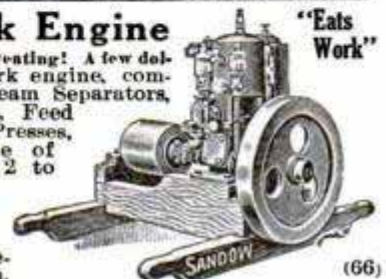


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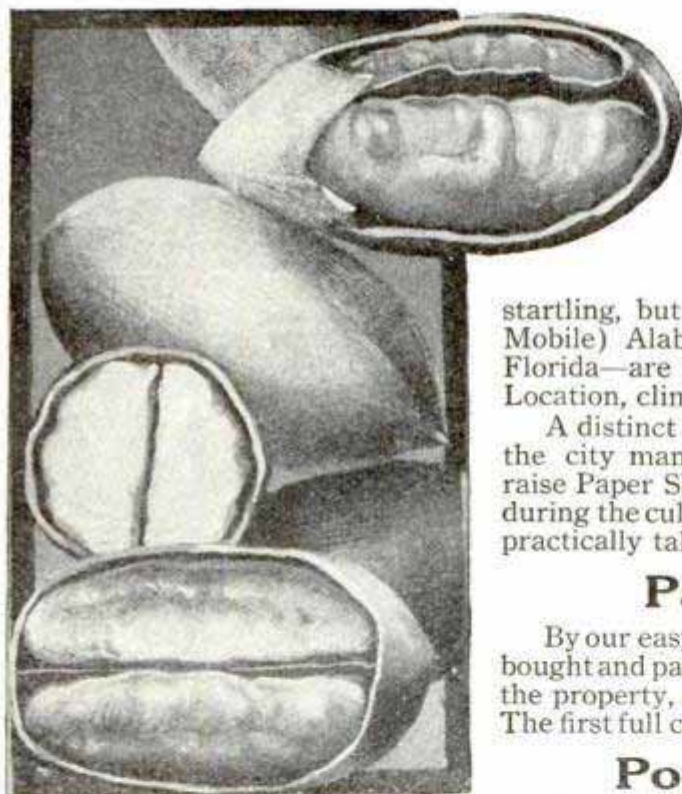
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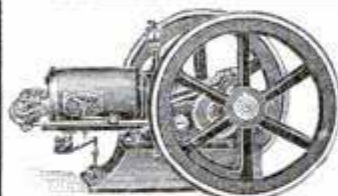
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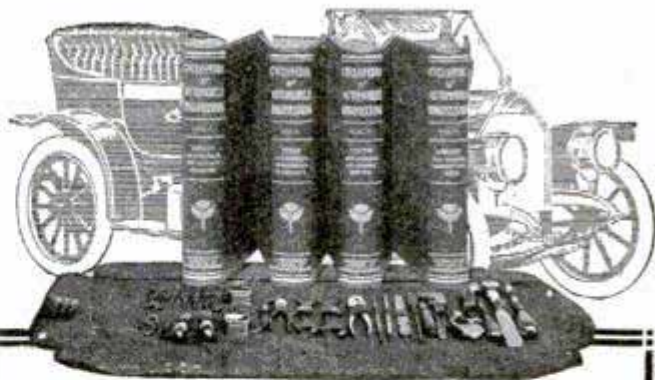
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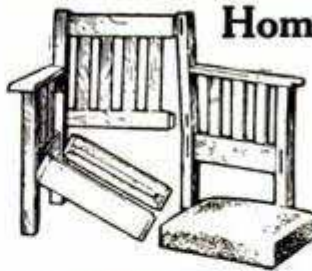
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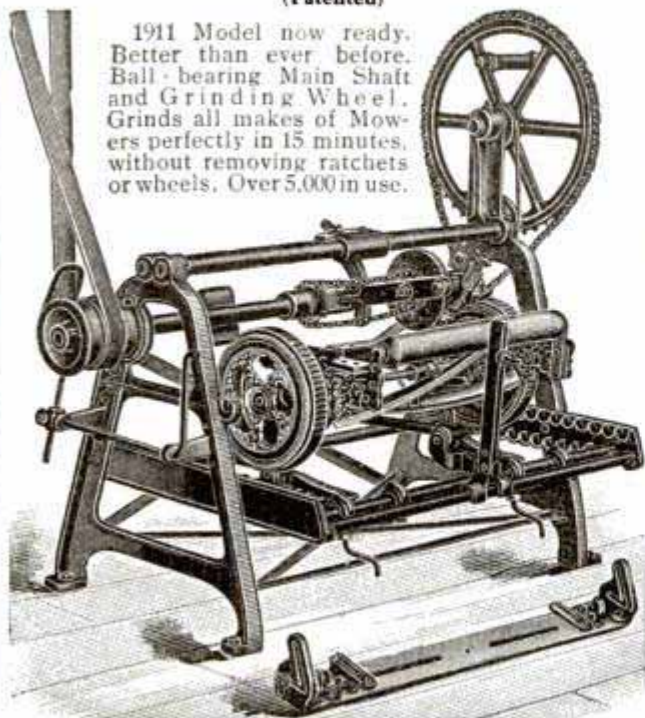
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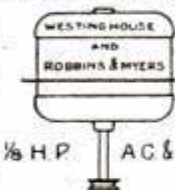
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which hitherto only fragments have been rescued from the sands of Central Asia. It is quite possible that, by means of these five leaves, an important literary language, of whose existence the world has had no suspicion, may be rescued from oblivion. The paging on the reverse of each leaf shows that they once formed part of an extensive work.—London Daily Mail.

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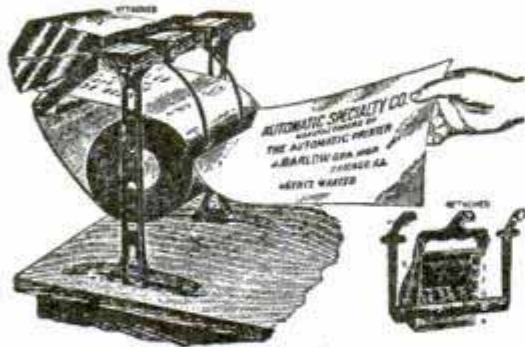
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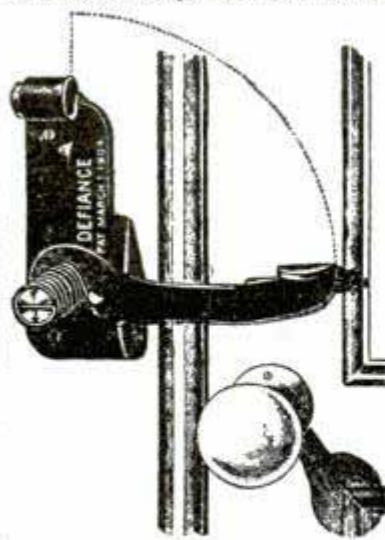
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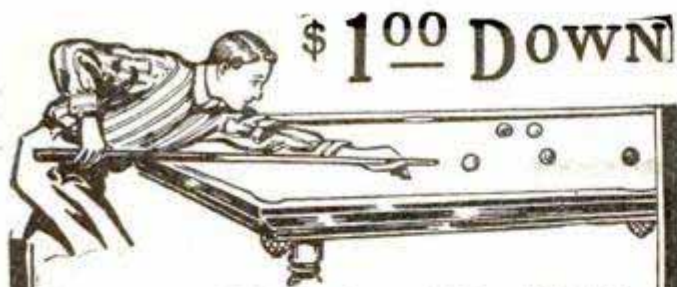
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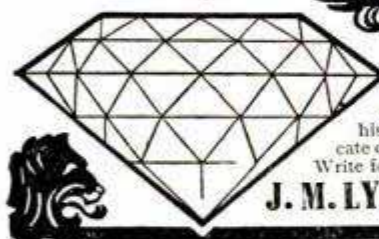
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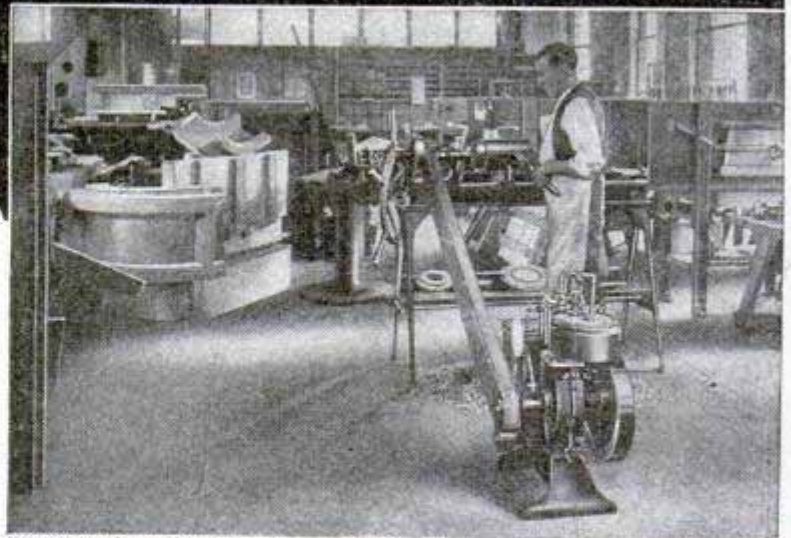
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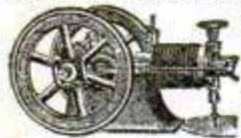
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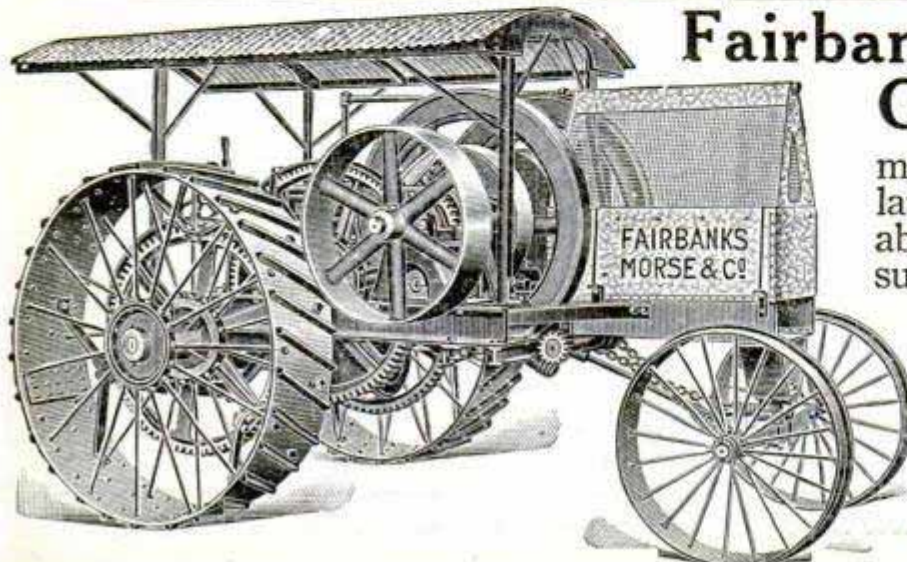
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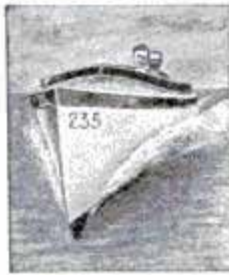


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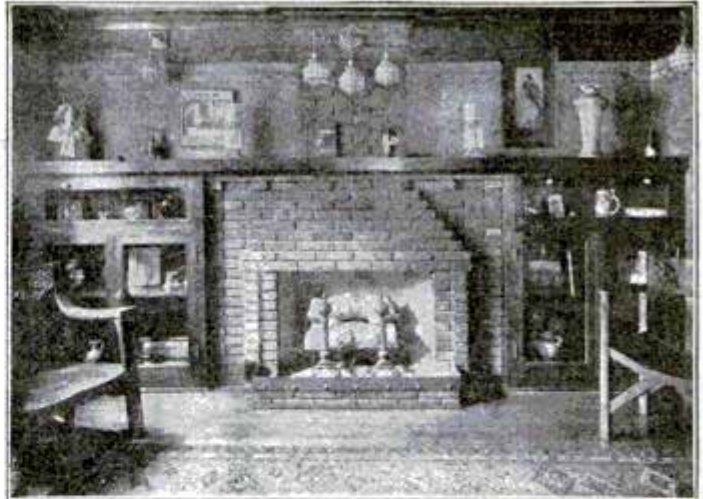
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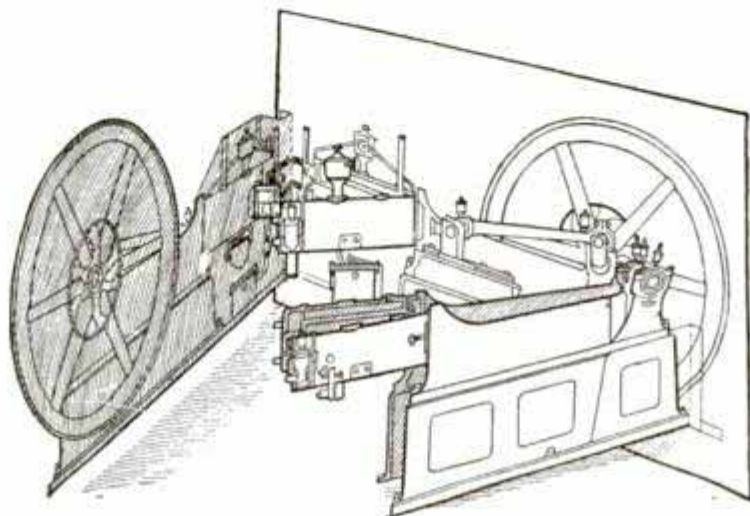
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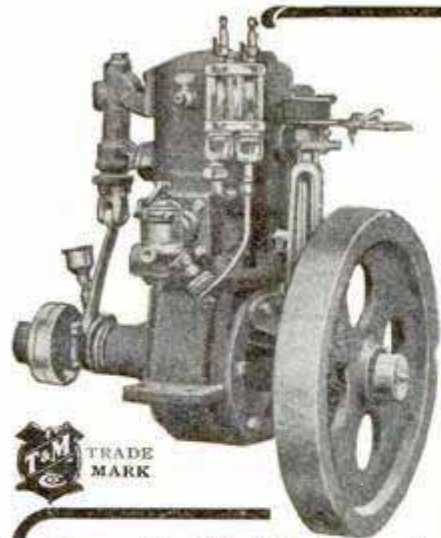
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Gary, Ind., shows the largest rate of population increase. It is somewhat more than ten billion per cent. The advance is from 0 in 1900 to 16,802 in 1910.—Cleveland Plain Dealer.

## MONTHLY CASH PRIZES

Until further notice in this magazine the Editor of Popular Mechanics will pay two cash prizes each month for the best original contributions to its

### SHOP NOTES DEPARTMENT

**\$10 for the Best Contribution**  
**\$5 for the Second Best**

THIS IS IN ADDITION to our usual rates for such contributed articles.

Quality, not length counts.

Checks will be sent on the last day of each month for the prize articles received during that month. Publication in the magazine will follow in about two months.

### PRIZES AWARDED FOR NOVEMBER, 1910

**First Prize—WALTER JOHNSON, St. Paul, Minn. . . . . \$10**  
"Tool for Finding the Center of Shafts"

**Second Prize—VICTOR LABADIE, Dallas, Texas. . . . . \$5**  
"Wood Box in the Wall of a House"

### EXTRA AWARD

On account of there being six contributions this month, each of which deserved second prize, we have made an EXTRA AWARD of five additional second prizes, as follows:

**C. R. POOLE, Los Angeles, Cal. . . . . \$5**  
"A Shaft's Speed Determined without a Speed Indicator"

**L. S. BUNKER, Vallejo, Cal. . . . . \$5**  
"Centrifugal Force Pressure on Grease in Cups"

**WALTER W. WHITE, Denver, Colo. . . . . \$5**  
"Holding a Hot Cutting Chisel on a Handle"

**C. E. DILLEY, South Haven, Mich. . . . . \$5**  
"Pin Cushion and Spool Holder"

**L. A. PRINCE, Cincinnati, Ohio. . . . . \$5**  
"Finding Loose Bearings in Automobile Engines"

All accepted contributions to our departments, "SHOP NOTES" and "AMATEUR MECHANICS," are paid for immediately; checks for prize awards are sent at the end of each month.

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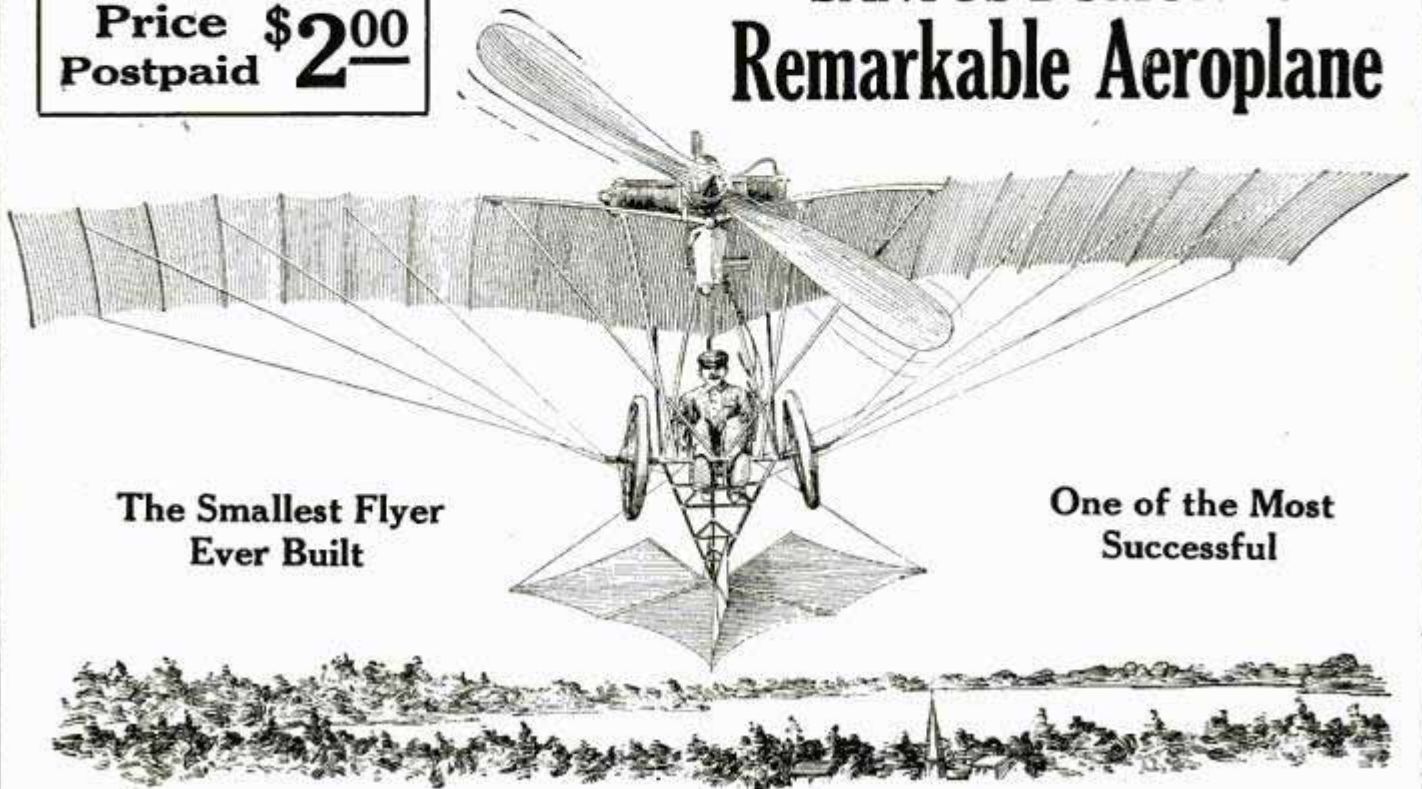
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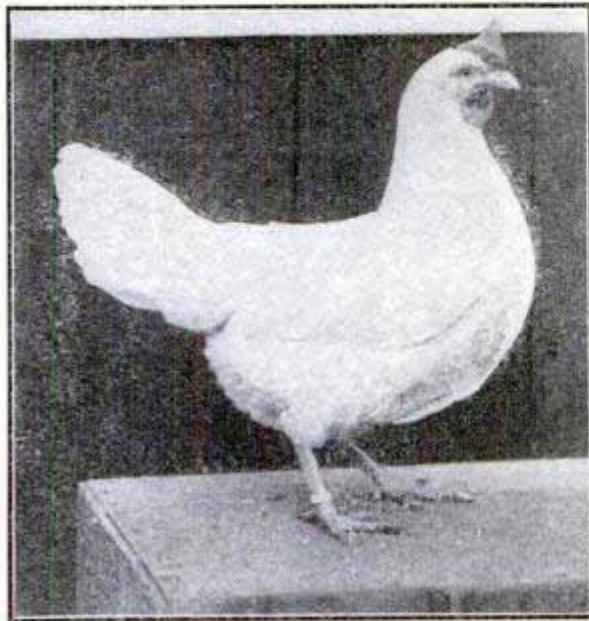
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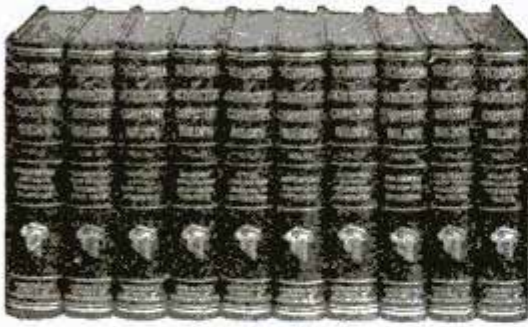
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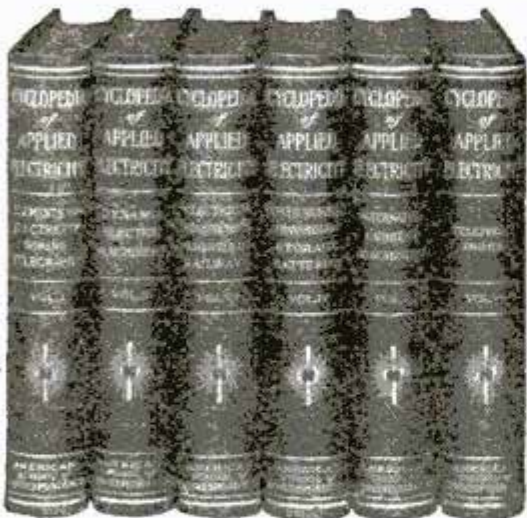
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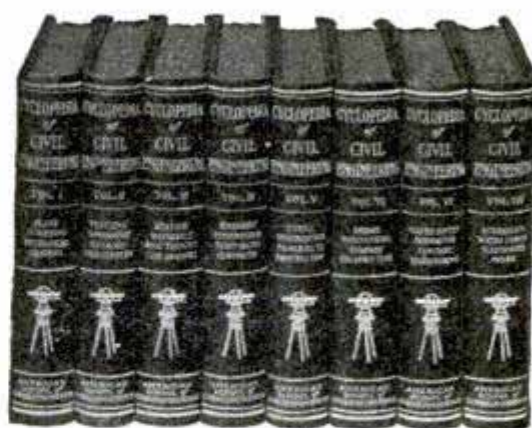
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