

June

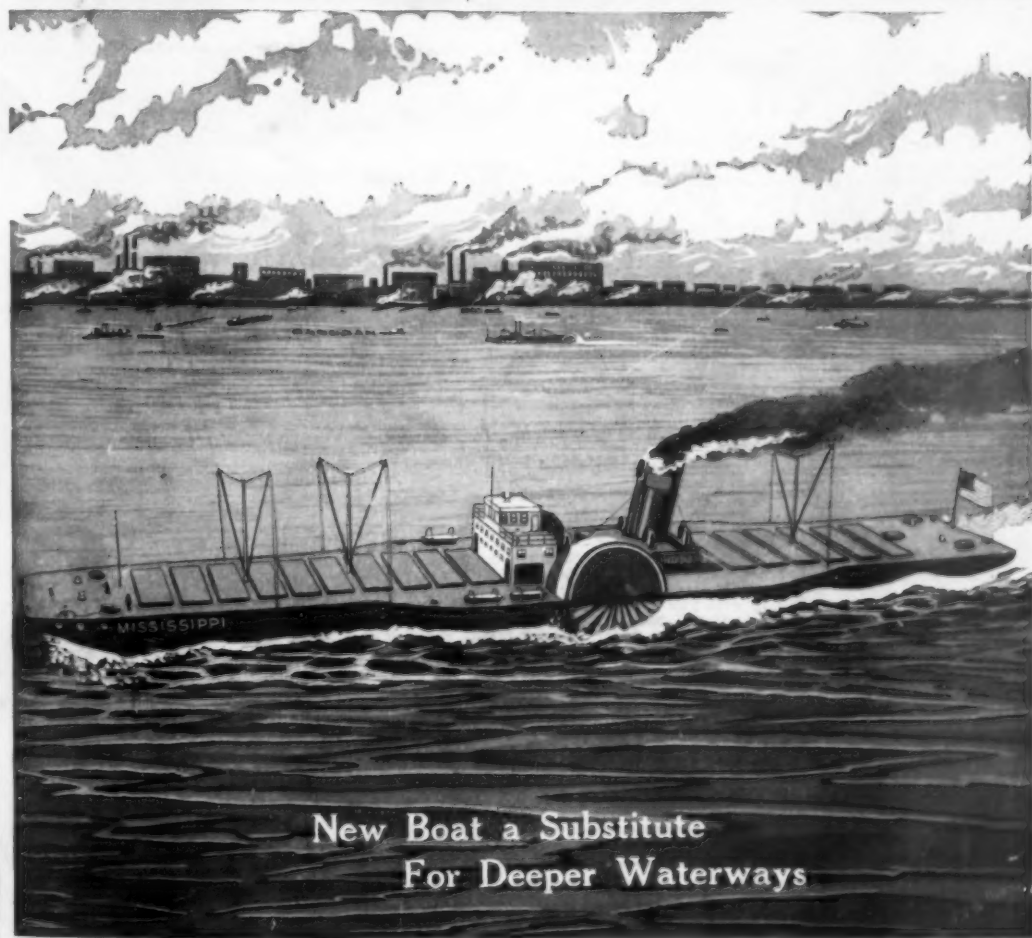
This Issue 251,000

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POPULAR MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT

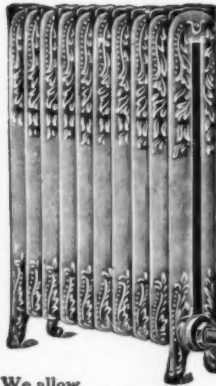
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Popular Mechanics

Written So You Can Understand It

Vol. 13

JUNE, 1910

No. 6

LARGEST HOSE EVER MADE

The section of flexible rubber piping shown in the illustration is the first of a number which will constitute the largest rubber hose ever manufactured. Each of the sections has an outside

of flexible rubber tubing are necessary to permit the rise and fall of the pontoons with the tide.

The groundwork of each section of rubber hose was made by forming a



Section of Hose Weighing 4,000 Lb.

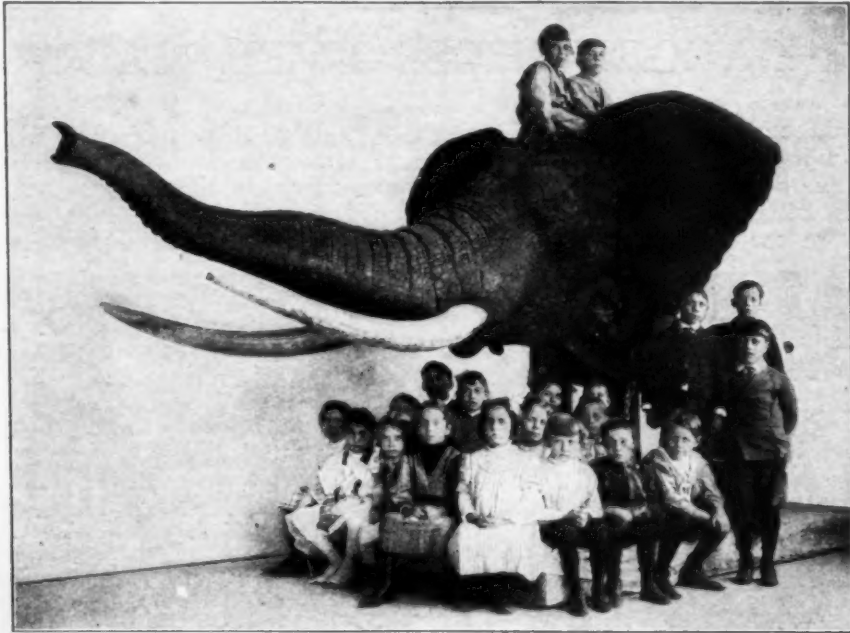
diameter of 33 in., inside diameter 29 in., and weighs 4,000 lb. They will be used as part of the equipment of a giant suction dredge, and will connect the lengths of iron piping forming the line carrying the dredged material away. The iron pipes are mounted on pontoons, and the connecting sections

cold-rolled-steel rod, 1 in. in diameter and weighing 1,290 lb., into a spiral spring having the desired length and inside diameter. Pure rubber in sheet form was then applied by hand, it being intended that any slight imperfection in one layer of rubber would be offset by the next layer applied. In

this way a lining was formed, such as would best withstand the action of sand, shells, and other material. The outer coat is composed of alternate layers of specially constructed duck and rubber, with a surfacing of gum to protect the hose from the action of the water. Each section contains 2,310 lb. of fabric and rubber, the latter material having a value of \$2.50 per pound. As the rubber was "green" the final opera-

Nearly 30 years ago 13.5-in. guns were introduced in the British navy, while the "Benbow," completed in 1885, carried two 16½-in. guns, each weighing 248,640 lb., and firing 1,800-lb. projectiles with a powder charge of 960 lb.

The 13.5-in. guns were carried by ships laid down from 1882 to 1891. Then the bore of 13.5 in. was abandoned for smaller bores.



Trunk, Head, and Tusks of Elephant Said to Be Largest Ever Killed

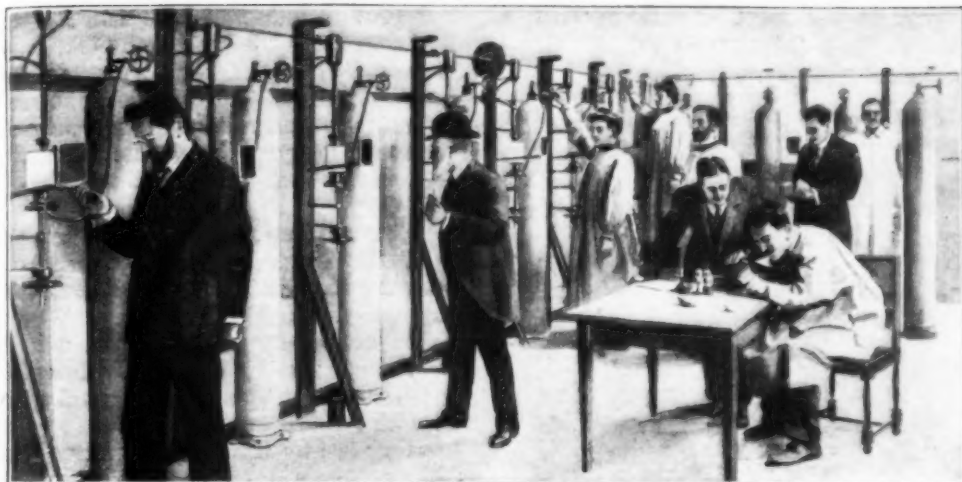
tion consisted of vulcanizing it. This was accomplished by placing the section in a steel container, where, by the action of steam, it was cooked to the degree required to produce the utmost elasticity and toughness.

LARGER BORE BATTLESHIP GUNS IN PAST THAN PRESENT

The agitation for 14-in. guns on the 26,000-ton battleships to be built by the U. S. navy, and the decision of the British admiralty to mount 13.5-in. guns on four of the ships authorized in 1909, draws attention to the fact that British battleships of the past carried guns of even larger bore.

HEAD OF LARGEST ELEPHANT ON RECORD

The elephant of which this monster head and trunk was once a part is said to be the largest ever killed. It was shot in British East Africa last year, and was larger than the famous "Jumbo," being 25 ft. long and 12 ft. high at the shoulders. The head was presented to the New York Zoological park, for the national collection of heads and horns. The ivory tusks are 8 ft. long, and weigh 200 lb. each. None of the elephants killed by Theodore Roosevelt were as large as this. One man and 19 children are included in the photograph.



Laboratory That Equals Nature in Production of Real Sapphires

THE MANUFACTURE OF REAL SAPPHIRES

The manufacture of imitation sapphires is not difficult, but the manufacture of real sapphires, that is, absolutely like natural sapphires in composition and coloring, is a very different matter. Yet it is being done successfully in a famous laboratory in Paris.

What gave the blue color to the sapphire, or blue corundum, had never been definitely established when Professor Verneuil, of Paris, aided by I. H. Levin, a young American chemist, commenced experiments with a number of different coloring oxides. At last they became satisfied that "titanium," in combination with some oxide of iron, was the basis of the blue coloring. They kept working along this line until in January of this year the first "boule" having the true blue color of the sapphire was produced. In a number of successive experiments under varying conditions, the result was always the same, and this proved that the true coloration of the gem was finally discovered.

Several of the blue crystals were submitted to eminent mineralogists, and they pronounced them real and as true as the sapphires produced by nature.

NAVAL SEAMEN TRAINED AS DIVERS

The free instruction given by the U. S. navy at its seamen gunners' school includes a course in diving, and many of the younger blue-jackets become very proficient in this work. Besides his regular pay the



Diving Instruction at Naval Seamen's School

member of a ship's crew, if a diver, receives an extra compensation of \$1.20 per hour for the actual time he is employed under water.

WAGON BUILT TO FIGHT FOREST FIRES

The state forester of Massachusetts recently inaugurated a vigorous campaign for the prevention of forest fires.



First Forest-Fire Fighter

In connection therewith he has had a wagon for fighting the fires built under his supervision which is the first wagon ever constructed for this express purpose. The rear wheels are large and equipped with wide tires, while the front wheels are small, so as to allow turning in narrow places. The body is very much on the order of the ordinary chemical engine with side-rails and extinguishers. The equipment includes shovels, hoes, axes, rakes, lanterns, and buckets.

ORE-LOCATING DEVICES

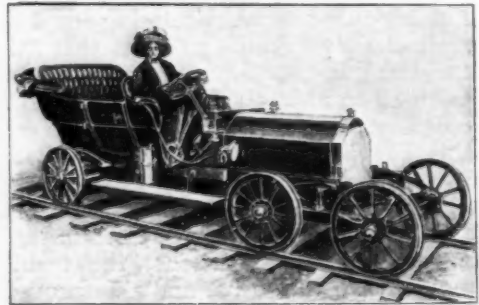
A would-be prospector recently wrote to a mining publication for the address of a dealer in instruments for locating minerals such as gold, silver,

copper, and hidden treasures. He was told to trust to his luck with pick, shovel, and frying pan, with the added information that the prospector who really wants to find a mine stands the best chance if he goes into a likely country and makes an intelligent search for it.

"The magnetic needle is sometimes used for locating bodies of ore that possess magnetic properties, such as magnetite," says the Mining World. "This use of the magnet, however, is based upon purely scientific principles, witches and spooks having nothing to do with it. If there were a sure way of locating ore by the mere investment of \$25 or \$50 in a piece of apparatus, it goes without saying that well-managed mining companies would not go to thousands upon thousands of dollars expense to attain the same object."

AUTOMOBILE RUNS ON RAILS

Stone Canon, an isolated mining town in central California, has been brought nearer to civilization by a railway on which automobiles, adapted to run on rails by substitution of flange wheels for pneumatic tires, will be the vehicles of transportation. The scheme is believed to be the first in which a rail track has been constructed for the special purpose of automobile service. The condition of road surface made the



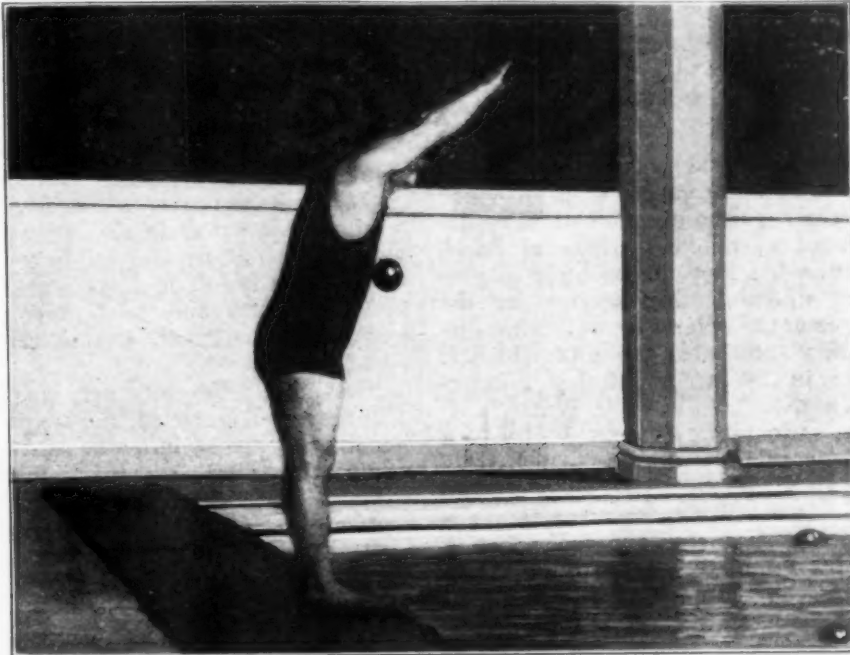
Automobile Running on Rails

building of a railway for the machines more economical than the building and keeping up of a regular wagon road. Long stretches of sand intervene between the two places.

The line runs between Chanslor and Stone Canon, a distance of about 25 miles. Switches and spur tracks will make an auto-truck service possible to the mines along the line, and the carrying of freight will become an important item, although the line was designed primarily for passenger service. The first automobile on the line is shown in the illustration. It is provided with six wheels with cast-iron rims, four of the

toy balloon of the kind sold by street vendors is fastened around the neck of each swimmer. When he dives into the tank the balloon rises to the surface and floats along above him.

Experienced swimmers can go the entire length of the big tank at the Pennsylvania university without showing their heads above water. Various colored balloons are used by different swimmers, the color being printed on



Swimmers Equipped with Balloons

wheels being forward. It carries seven passengers and makes the trip in less than an hour. The rails used are of exceedingly light weight.

UNDERWATER SWIMMERS SHOWN BY FLOATING BALLOONS

Owing to the fact that the spectators of a swimming match wish to know the exact position of contestants in underwater events, the swimming instructor of the University of Pennsylvania has devised an ingenious scheme, indicating their progress by toy balloons floating on the surface of the water. A small

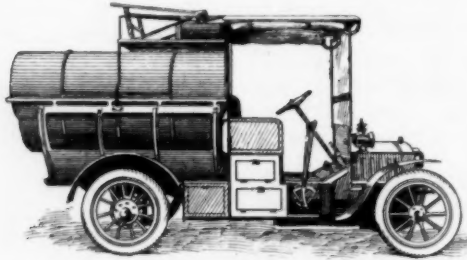
the program after the name of the contestant.

Three boys were drowned recently in a Chicago swimming tank, within a few weeks of each other. In each case the drowning was not discovered until the body rose to the surface after the boy's death. It has been suggested that had these boys been equipped with these balloons, they would have been rescued when it was noticed that the balloon did not move.

A school devoted exclusively to the study of motorboats has been started in New York.

A DISINFECTING AUTOMOBILE

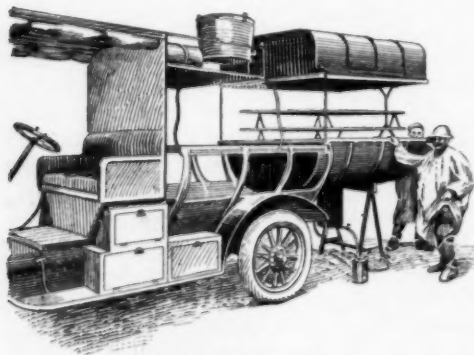
Every large city has a service connected with its board of health the purpose of which is to disinfect dwell-



Disinfecting Auto Closed

ings contaminated by disease, but small communities are very seldom provided with the required equipment. The department of public hygiene of Paris, however, has met the problem of providing a disinfecting service for the villages around Paris by designing disinfecting automobiles, one of which is shown in the accompanying illustrations.

The automobile is provided with a special cradle-like body in which rests a disinfecting stove. When the automobile is moving from place to place this stove has the appearance of a cylindrical tank, but when the place to be disinfected is reached, this is pulled out as shown in the second illustration.



Ready for Operation

The outer end rests upon a prop, and the upper part is raised as shown. The disinfecting apparatus is in the bottom, and in the cylindrical part are placed

the articles requiring thorough disinfection, such as mattresses, rags, linen, clothes, etc. The disinfectant used is formaldehyde.

In addition to this device for the disinfection of movable articles, the automobile is provided with a small portable disinfecting stove, flasks containing liquid disinfectant, fumigators, several buckets, brushes, and protecting dress for the operators.

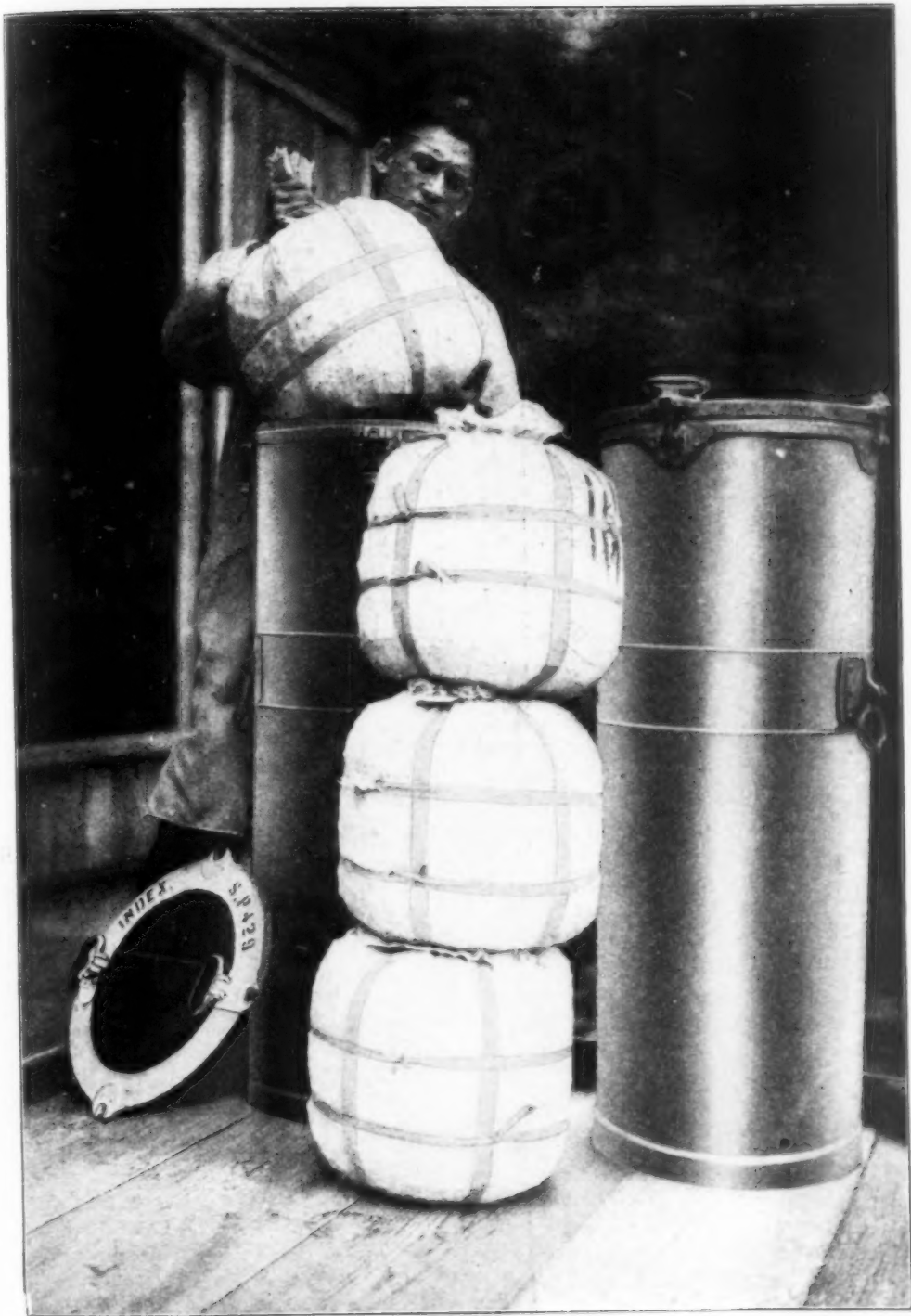
LOSS OF POWER THROUGH AUTO ENGINE SILENCER

That there is a wide scope for inventors in the production of an efficient system of silencing gasoline engines with the absorption of but a minimum of power in the operation, is well borne out by the following tests made recently. The tests were made at 1,000, 1,250 and 1,500 revolutions per minute with an engine rated at 36 hp.

First, both the exhaust pipes and silencer were removed, the engine exhausting directly into the air. Secondly, the tests were made with the exhaust pipes fitted, but no silencer, and thirdly, with the silencer fitted as well. The result proved that in the system of exhaust pipes alone, from $1\frac{1}{2}$ hp. to $3\frac{1}{2}$ hp. was absorbed, while, with the complete silencing system in operation, the loss of effective horsepower was, at 1,500 revolutions, nearly 11 hp., or close on to 30 per cent of the power developed by the engine. The engine, at 1,500 revolutions, exhausting into the air, worked out at 36 hp., which was reduced by the silencing system to 25.3 hp.

THE POWDER FOR A SINGLE SHOT

The 12-in. guns on the "North Dakota" require a smokeless powder charge of 350 lb. for a single shot. The illustration shows a powder operator handling this monster charge. The projectile and powder for a single shot cost nearly \$1,000.



The Smokeless-Powder Charge of a 12-In. Gun

LIVE SNAKE AS HEAD-DRESS

A sensational actress, or performer, appearing at the famous Moulin Rouge in Paris wears a tame boa as a head-



A Serpent Coiffure

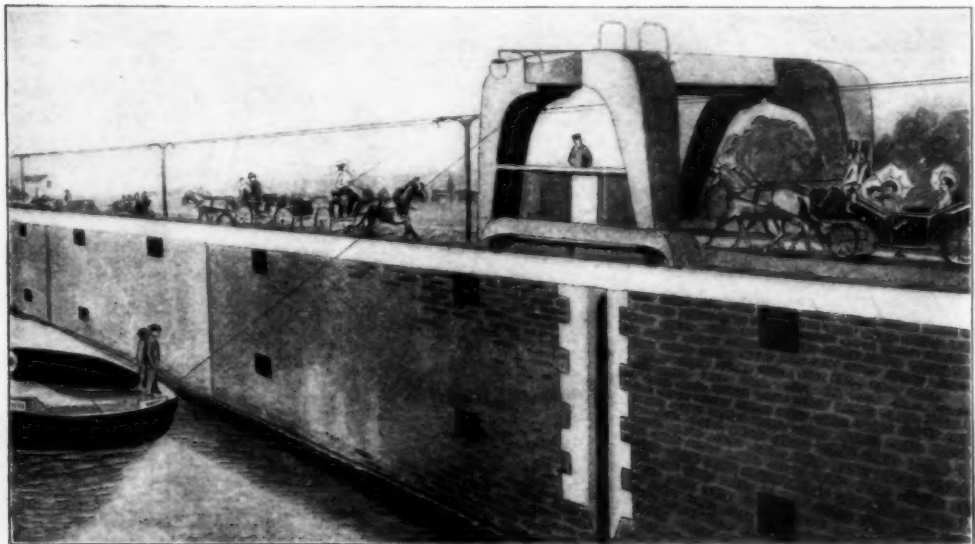
dress. The live snake is coiled around the head in the same manner as the fur coiffures illustrated in a recent is-

sue, but there is no danger of the live snake becoming as popular as the fur of a dead animal for such adornment.

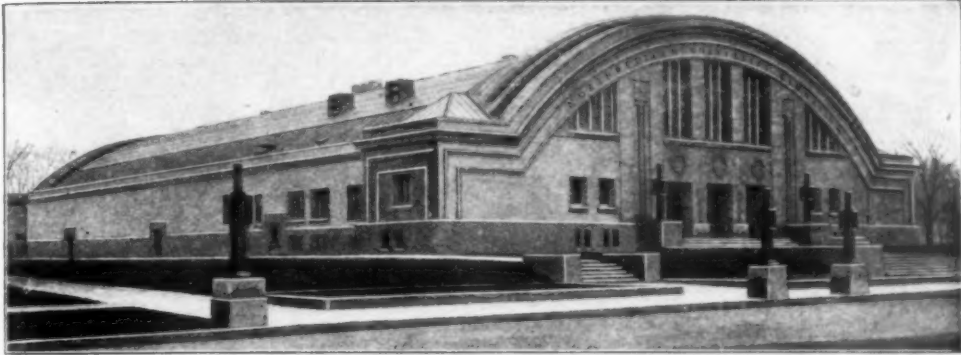
**ELECTRIC LOCOMOTIVE
STRADDLES TRAFFIC**

A unique electric locomotive, that straddles a line of moving vehicles in the same way that a farmer might straddle a row of growing vegetables in crossing a field, is a commonplace sight near Bremen, Germany. The locomotive is used for hauling canal boats, and runs on a quay that has to be kept clear for the passage of drays and other vehicles. Consequently it was built in the form of two U's, connected by a girder. One side of the locomotive runs on a track on one edge of the quay, and the other runs on a track on the opposite side, while the moving vehicles have a clear passage under it going either way.

As the width of each U-shaped base is only 28 in., the driving motor had to be placed in the upper part, where it takes its current from overhead wires. It is said to be the first locomotive ever built that could pass over a line of vehicles without wrecking itself or them.



Electric Locomotive Built Like a Bench



Exterior of Northwestern Gymnasium

WORLD'S LARGEST GYMNASIUM AT NORTHWESTERN UNIVERSITY

By FRANCIS BUZZELL

THE new gymnasium of Northwestern University at Evanston, Ill., one of the suburbs of Chicago, is not only the largest and most complete in the world, but is a building that marks a new departure in gymnasium construction as well.

When James A. Patten, the Chicago wheat and cotton speculator, doubled his first gift of \$150,000 for the construction and equipping of the gymnasium, the athletic board of the university came to the conclusion that the ordinary building designed for athletic training did not provide sufficient room to play games and exercise under the best possible conditions. Something different was demanded, and, as a result, the Evanston university has a structure that is the envy of all the universities in the country.

It is a building about 330 ft. long by 130 ft. wide, constructed of steel, stone, and brick, a great part of the interior being finished in marble. From an athletic standpoint, the main feature is the great indoor playing field and track, which takes up two-thirds of the building. It is an enclosure 215 ft. long by 130 ft. wide, with a floor composed of a mixture of black loam and clay. During the football season the teams line up against each other in practice games in the gymnasium, and

the scrimmages are as fierce as those played on the regular football gridiron. Two of the illustrations were taken while a baseball game was in progress between the 'varsity nine and an aggregation from the Wisconsin state league, which was preparing for the opening of the season. The larger view was taken from the official balcony, seen in the smaller view of the field. At the further end of the double-page illustration can be seen three net cages in which pitchers and batters practice. The regulation baseball diamond, with its 90-ft. base lines, is clearly seen in front of the cages. At the moment the photograph was taken a player was sliding to third base and another running between first and second.

Not only does the indoor field provide sufficient space for a regulation diamond, but also for a sufficiently deep left and center field. A right field is the only space requirement lacking, consequently the practice games are played without a right fielder.

An indoor field, no matter how perfect, cannot provide perfect outdoor conditions. A ball caught on a rebound from the side wall or roof girders puts the batter out. If the ball strikes the walls above a certain height and is not caught, the batter is allowed two bases.

The smaller view of the indoor field,



Photos by Burke and Atwell.

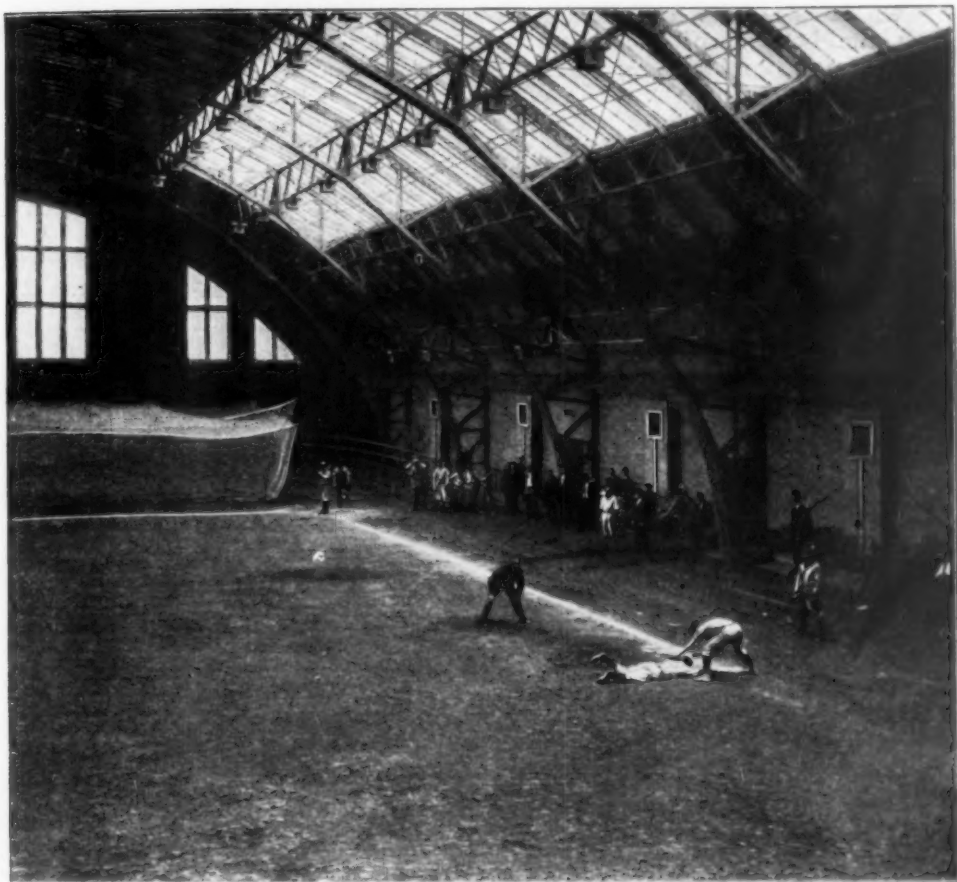
A Baseball Game in the Enclosed

gives an excellent idea of the running track which encircles the field. It is the largest permanent indoor track in the country, and measures just 10 laps to the mile. When running events are held in Madison Square Garden, New York, a track the same number of laps to the mile is temporarily built. Its outer edge rises sharply at the corners, as clearly shown in one of the illustrations.

A clearer idea of the vastness of this indoor field may be gained from Athletic Director Gillespie's statement that it can accommodate four basketball games simultaneously, or allow all the track and field games of a regular collegiate meet to be held.

The indoor, soil-floored field, however, is only one feature of the gymna-

sium. In another part is the room spoken of as the main gymnasium, because it contains all the muscle-developing apparatus, such as dumb-bells, indian clubs, weight-pulling machines, horizontal bars, overhead rings and bars, and the like. It is 102 ft. long by 70 ft. wide (a good-sized field in itself for regulation indoor events), and will be used for regular class gymnastic work. It can also be used for indoor baseball and basketball games. The hardwood floor is a masterpiece in construction, providing to all intents and purposes, a hard-surfaced cushion for the athletes to work upon. The foundation of the floor is concrete. On top of this were laid stringers, and above the stringers a couple of inches of felt. The hardwood floor was laid



Field—Runner Out on Third

on this felt, and, when a person jumps upon it, it springs under the feet.

The iron-pipe framework seen just below the roof girders are supports for the overhead exercising apparatus. The balcony running along two sides seats 1,200 people. Through the windows may be seen the big indoor field already described. On one side of the 102 by 70-ft. room, are rest rooms, showers, and a special room for the exercise and development of students suffering from different physical weaknesses. Here they go through the exercises prescribed for each individual case. In this manner they are saved embarrassment through sensitiveness, and do not interfere with class work.

On the walls of this room are large looking-glasses in which the men going

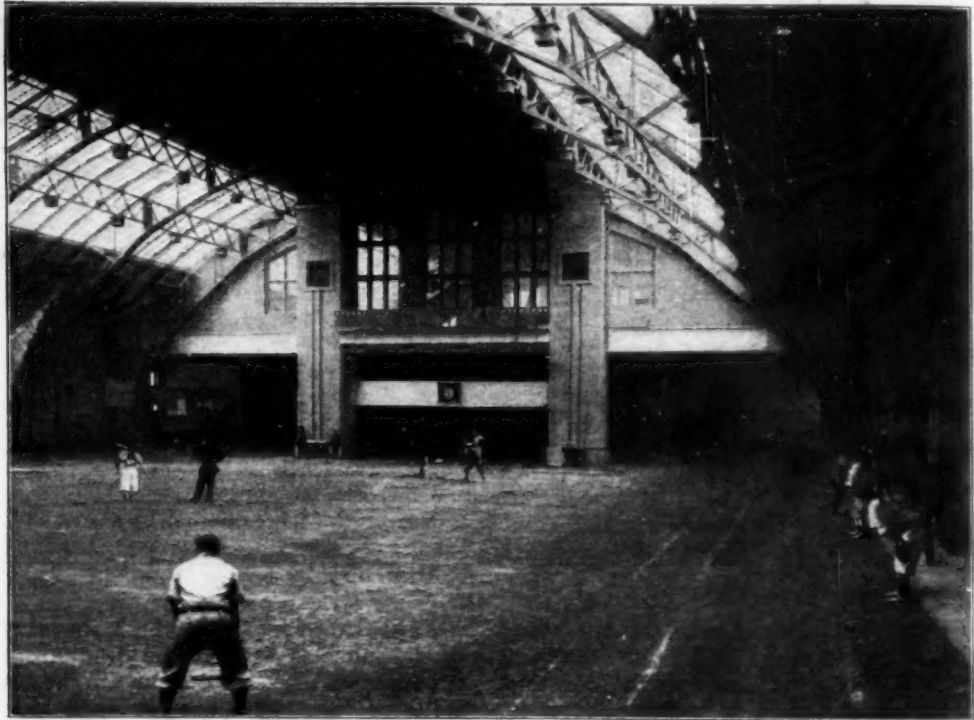
through exercises may watch the play of the muscles and see the gradual improvement. It would seem to the uninitiated that the place for such looking-glasses would be in the regular exercising room, where the well developed athletes could watch with pride the perfectly working muscles, but the installment of this feature for the benefit of the physically weak or deformed has its reason. Scientific tests made at one of the eastern universities proved to the satisfaction of the experimenters that a person, seeing the play of the muscles in exercising, developed quicker than the person only conscious of the movement of the muscles through feeling.

On the other side of the gymnastic class-room is a series of arrangements

by which the women students may have the benefits of the gymnastic class-room without coming in contact with the men students. The class-room is so arranged that when the entrances on the men's side are open, the entrances on the women's side are locked, and vice versa. On the women's side are rest rooms, shower baths, and a sun-parlor provided with a slightly-raised and leather-mattressed

the trophy room, while the other side provides a large club room, beautifully decorated and furnished, for reception and entertainment purposes, the offices of the athletic directors, and a kitchen for the preparation of refreshments. The interior of this part of the structure is finished in marble.

On still a lower floor is the main dressing room, provided with 1,200



Further End of the Field

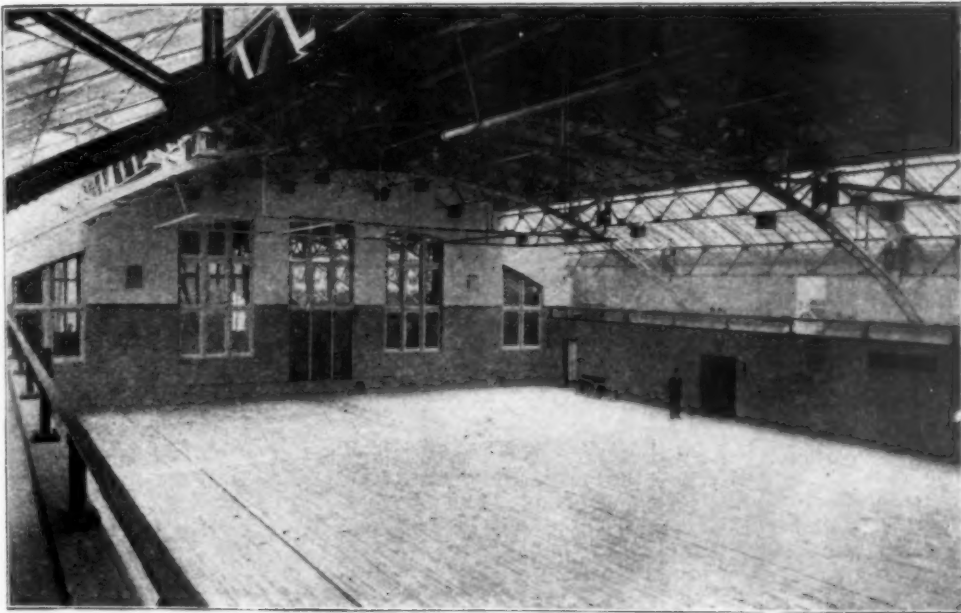
floor upon which they can recline while sun-bathing.

On one side of the floor, just beneath that containing the gymnastic room, women's quarters, and the room for those physically afflicted, is a marble and tile swimming pool, 60 ft. long. Separate entrances lead to this from the women's quarters and the main lockers of the men athletes, and an automatic locking system closes one entrance when the other is open.

The central part of this floor is the main entrance to the gymnasium and

lockers, a hot room, rubbing rooms, a drier for damp athletic clothing, and the heating and ventilation plants.

Aside from the athletic features of the gymnasium, are its lighting, heating and ventilation innovations. As can be seen by again glancing at the double-page view of the big indoor field, the window arrangement is the best possible for good light. The end windows, which look out upon Lake Michigan, are protected by a netting, while the great expanse of glass half way up on each side of the arched



Gymnastic Class Room and Basketball Floor

metal roof is protected by means of steel grating.

At night and on dark days the field is lighted by 168 clusters, a large number of which can be seen arranged along the trusses of the roof in the illustrations. Inside of each of the box-like shades are two 100-cp. tungsten lights, and on top of each are two 25-cp. tungsten lamps. The former throw the light directly downward, while the latter throw it against the roof, from which it is reflected downward. More than 40,000 candlepower may thus be used to illuminate just this one part of the gymnasium. The lighting throughout the entire building is carried out on the same scale.

The ventilation and heating of the different parts of the building is accomplished through a system of air ducts. The main supply of fresh air is drawn from the top of the building through large brick channels by two large air fans. When this air is heated it is driven by the fans through the system of air ducts under the building to the openings for its discharge into the different rooms and the inclosed field. The warm air is forced into the in-

closed field through the square openings seen between the arches on the side walls. In warm weather the system is reversed, and the fans force cool air through the building. The temperature of the playing field and exercising rooms is kept at 50 deg.

Among the many devices in the engine and boiler rooms are a filtration plant, which purifies all the water used in the building, whether for drinking, the shower baths, or the swimming pool; a hot-water plant that automatically keeps the water for the shower baths at an even temperature; an electric pump which automatically keeps the air ducts under the building free from water; and a special ventilating arrangement for the lockers. The electric pump is provided with a float arrangement which sets it pumping when the water in the underground ducts reaches a certain height.

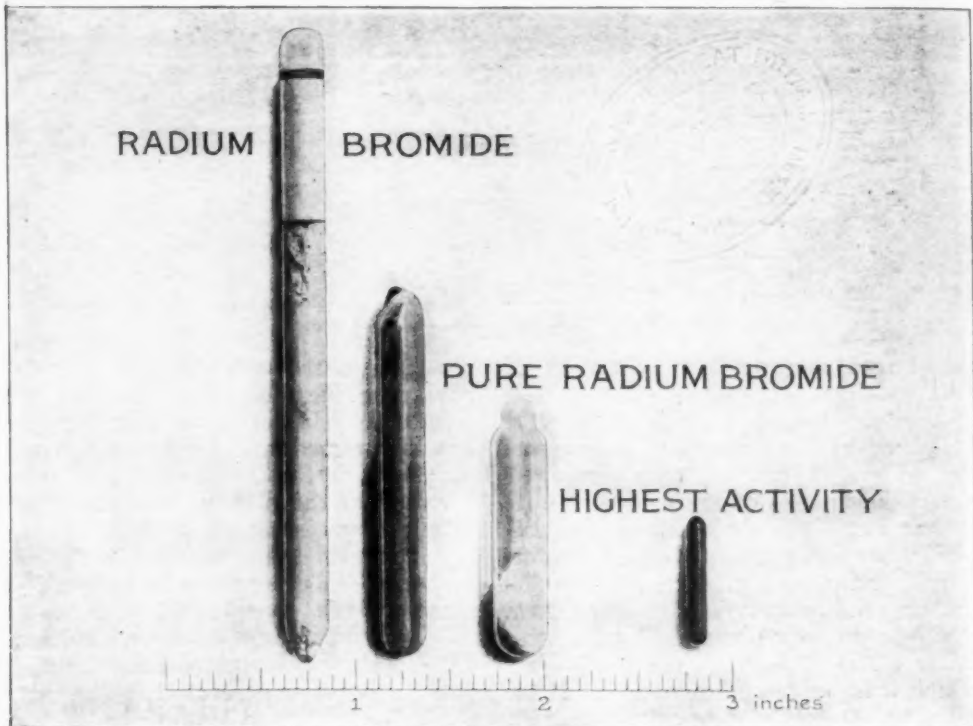
The arrangement for ventilating the lockers and keeping the contents dry is ingenious. At the back of each locker is an air tube, and at the front an opening for the air. A continual suction in the tubes running from the lockers draws the fresh air through the cloth-

ing and carries it away through the basement.

Every student at Northwestern University is justly proud of James A. Patten's gift, but the end is not yet. In the next few years it is confidently expected that a huge concrete stadium of the type which accommodated the Olympic games in England, will be erected on the land just north of the gymnasium.

among them, but the fact was not discovered until too late.

The great cost of radium caused the medical profession of England to organize the radium bank. The illustration shows the tubes which are issued to the physicians and surgeons. The amount of radium in the second tube from the left is valued at \$800. It was a tube like this which was destroyed by Dr. Finsi's attendants.



Tubes Issued by English Radium Bank

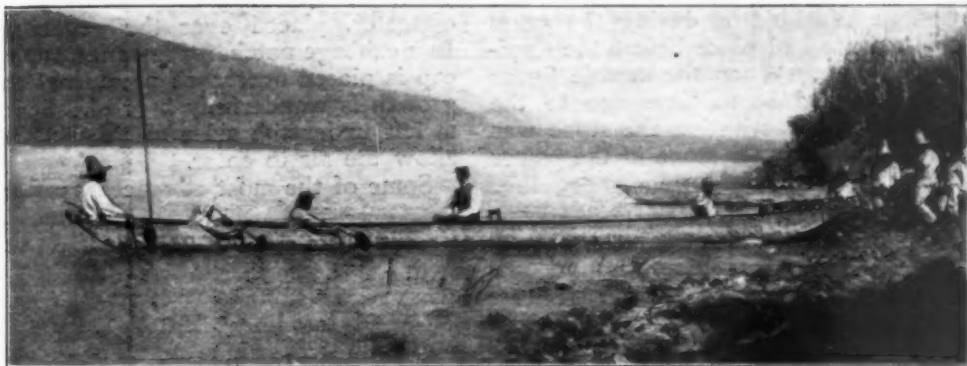
PRECIOUS TUBE OF RADIUM LOST

Consternation was caused among the officers of the "Radium Bank of Great Britain," recently, when it was learned that one of the precious tubes of radium had been lost.

The tube was in the possession of Dr. Finsi, of London, one of the most experienced users of radium in the world. After treating a case the bandages were gathered together by attendants and burned. The tube was

MEXICAN FERRY CANOES

Although Mexico has hundreds of miles of railroad and street railways with modern equipment, a large percentage of the population, especially in the more isolated districts, adhere to the old forms of travel. Numerous waterways, which for hundreds of years have furnished routes from town to town, are still popular, despite the fact that the lines of railway are within easy reach. One of the most picturesque types of boats used on these



Old Mexican Ferry Still in Use

waterways is the ferry boat of Lake Patzquaro, which is the highest navigable waterway in the republic, and next to the highest on the continent. Some of these boats, canoe-like in shape, are more than 40 ft. long, and

so narrow that it is difficult for two passengers to sit side by side at the widest portion of the craft. So dextrously are they managed that they seldom capsize. These boats are often propelled by women.

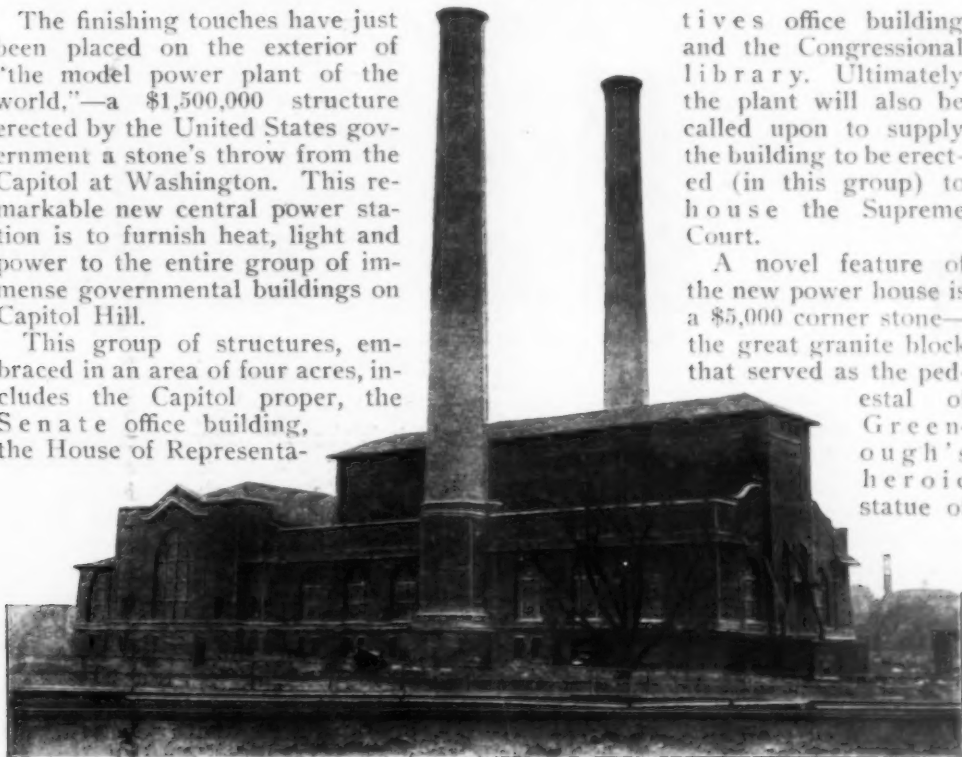
CONGRESSIONAL POWER PLANT

The finishing touches have just been placed on the exterior of "the model power plant of the world,"—a \$1,500,000 structure erected by the United States government a stone's throw from the Capitol at Washington. This remarkable new central power station is to furnish heat, light and power to the entire group of immense governmental buildings on Capitol Hill.

This group of structures, embraced in an area of four acres, includes the Capitol proper, the Senate office building, the House of Representa-

tives office building and the Congressional library. Ultimately the plant will also be called upon to supply the building to be erected (in this group) to house the Supreme Court.

A novel feature of the new power house is a \$5,000 corner stone—the great granite block that served as the pedestal of Greenough's heroic statue of

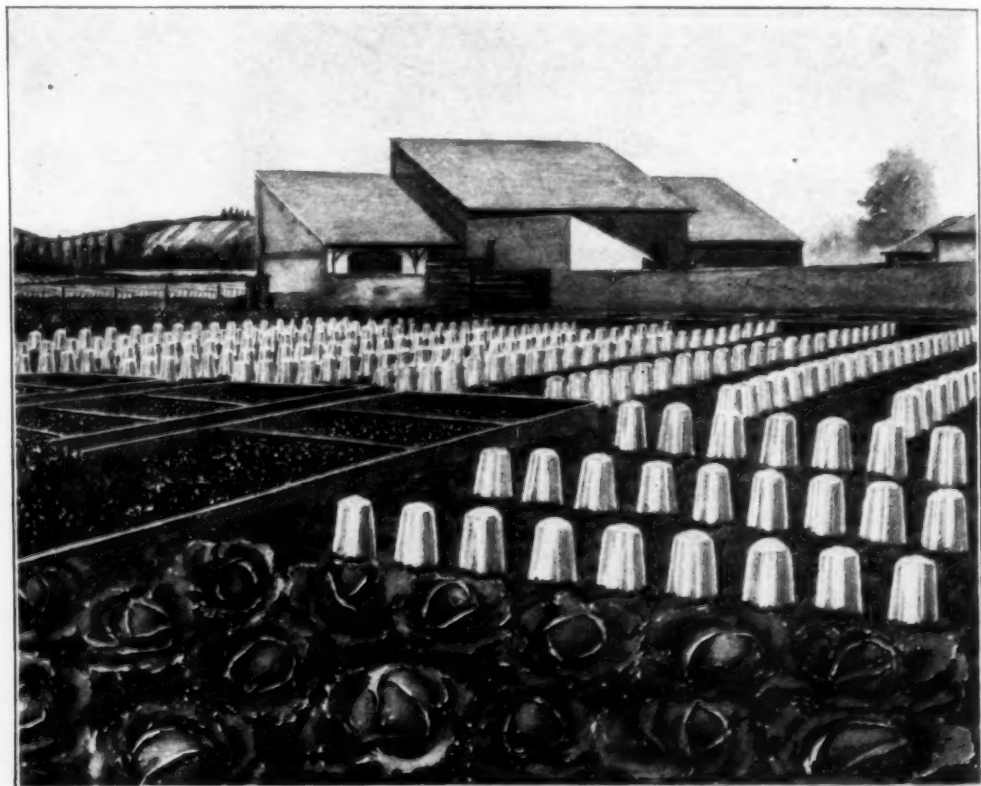


The "Model Power Plant of the World"

George Washington during the years this statute had place before the Capitol building. When the marble figure was removed some time ago to the Smithsonian Institution the stone was utilized as a corner stone in the power house.

diameter, placed over the vegetable. In a cabbage patch, for instance, such a cap is placed over each plant, and the growth is wonderfully hurried. Space is left under the sides of the bells to allow the air to enter.

Some of the most advanced growers



A Glass Bell for Every Cabbage Head

PRODUCE GARDENING UNDER GLASS BELLS

The produce growers of France have a reputation greater than that of the gardeners of any other country for the wonderful results they obtain in the artificial forcing of their little crops. Around Paris are many acres of produce gardens, any one acre of which brings in a revenue greater than many an ordinary 100 or 150-acre farm in America.

The most advanced method used by the French to force growth is a glass bell, about 2 ft. high and 1½ ft. in

are now experimenting with bells painted in various colors to determine which is the most advantageous to the plants, but the results have not become public, as each gardener keeps his discoveries quite to himself. In summer, when the heat is excessive, bells painted white are placed over the plants to protect them from the sun.

¶The Canadian government desires to build shipyards large enough to hold the heaviest ocean-going steamships. Negotiations are on with several of the large British shipbuilding firms with this end in view.

FLOATING A STEEL BRIDGE INTO POSITION

To make possible the hauling of freight into San Francisco by an all-rail route, instead of ferrying it over from Oakland, the Southern Pacific railroad recently built a line across the south end of San Francisco bay. In carrying out this project a bridge of six double-track spans, each 180 ft. long, and a draw span were required, but the water was too deep for economical erection of falsework, consequently the spans were floated into position on barges.

Piles were driven in shallow water to support the ends and centers of the spans while under erection, and trusses between the piles were used to support the intermediate panels. When the spans were completed these trusses were removed, to make room for floating the barges into position. In this manner all six spans were floated off the temporary supports and transported to the permanent sites.

The illustration shows one of the

HYDROPLANE RIDES ON AIR CUSHION

The latest development in hydroplanes is an arrangement by which the boat practically rides on air, invented by a well known boat builder of Cowes, England. The main object of the invention is to reduce the pounding which motor craft receive in rough and



choppy water, and it consists of one or more bellows fixed under the forepart of the hull. Each of the bellows is hinged, and kept extended by springs. Air is admitted to the bellows through the cowl, which rises above the forward deck.

The inventor claims that when the boat is running at full speed the air rushing into the chamber in the bow will absorb shocks, and that the compressed air escaping out under the hull at the point where the propeller shaft



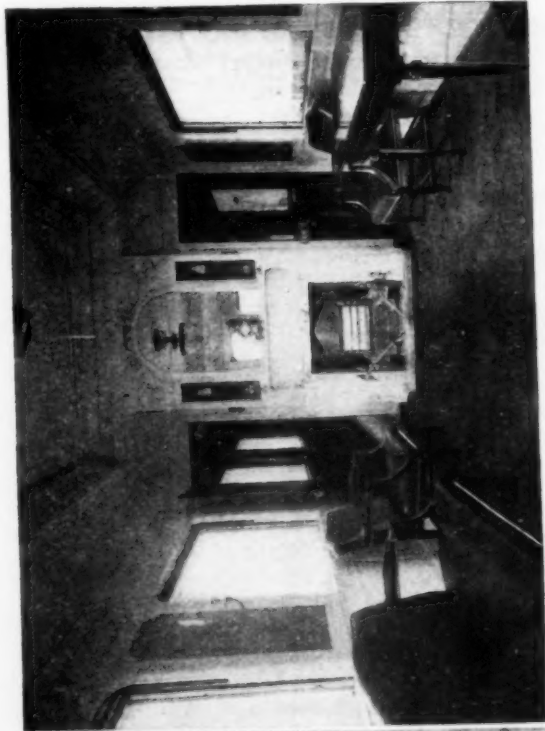
Floating Railway Span into Position

spans being lowered from its two supporting barges onto the concrete seats of its piers.

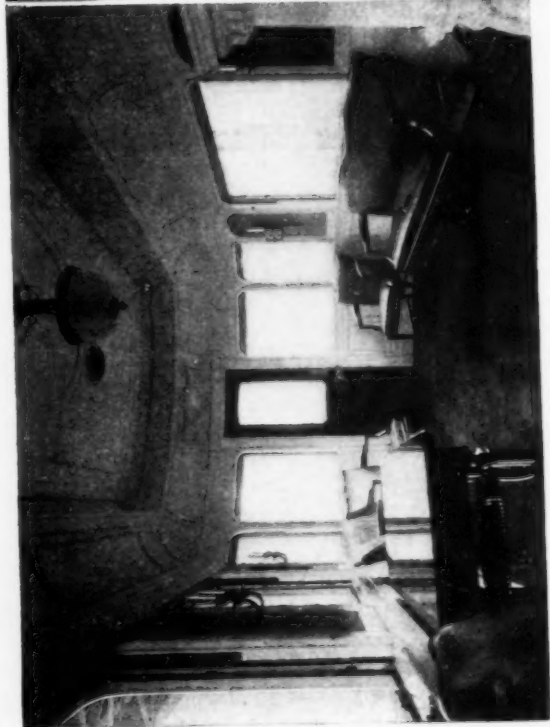
leaves the last step of the plane will form a cushion upon which the boat will ride.



Official Car of President of Argentine Republic



Day Saloon, Showing Fireplace



President's Study

MAGNIFICENT RAILROAD COACH HAS FIREPLACE

A magnificent private car, said to be the most sumptuous railroad coach ever constructed, has been sent from England to South America for the use of the president of the Argentine Republic.

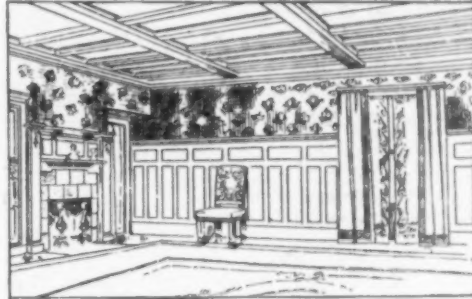
The coach is 78 ft. long, and 10½ ft. wide, and is constructed of steel. The exterior is painted in cream with gold and blue lining, the national Argentine colors. At one end is the president's day saloon, a compartment 17 ft. 3 in. long, decorated in the Louis XVI style, with green silk panels and carpet. At one end of this is a real fireplace with mirror above, and means for ventilation. The roof is tastefully carved. Adjoining this compartment is a bedroom, also fitted with green carpet and upholstery, and furnished with a bedstead finished in old gold, with the Argentine coat of arms at the foot. The bedroom has three doors, one leading to the day saloon, one to the corridor which runs along the side, and one to the bathroom. By locking any one of these doors, all become locked. The bathroom is provided with a "needle bath," and is finished in marble with silver-plated fittings. The upper panels are of enameled metal, and the floor is covered with india rubber and cork mats.

The next compartment is a study or library, finished in mahogany, with red leather chairs and a red carpet. Next to the study are two more bedrooms, upholstered with French gray silk panels, the general scheme being white, with green leather chairs and carpets. These two rooms have one bathroom. A kitchen and attendants' compartment take up the remaining space in this traveling palace.

☞The navy department has ordered a series of tests to be made over the Rockland, Provincetown and Delaware trial courses to determine whether the depth of the sea affects the speed of vessels.

VALUE OF PERPENDICULAR LINES IN HOUSE DECORATION

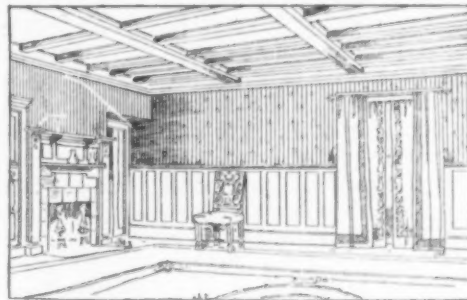
The value of perpendicular lines in overcoming awkward proportions in in-



Room Before Perpendicular-Line Treatment

teriors and giving apparent height to ceilings that otherwise would look too low, is graphically shown by the accompanying illustrations.

In the first illustration the room is shown with a wainscoting of both vertical and horizontal panels, the horizontal panels above the vertical. The wallpaper above the wainscoting has a large flower design. The second illustration shows the same room with the horizontal panels of the wainscoting removed, and a wallpaper with vertical



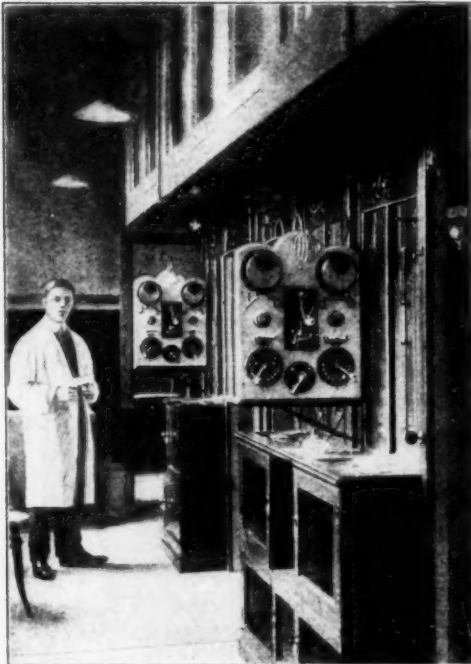
Courtesy Wallpaper News.
Effect of Perpendicular Lines on Room's Appearance

lines substituted for the large flower design. This change gives the room an apparent height that adds much to its artistic appearance.

☞Ordinary rubber tires are best for travel over ice floes, according to Lieut. Ernest Shackleton, the English Antarctic explorer.

PROTECTING OPERATORS FROM TREACHEROUS X-RAYS

The fact that the continual operation of the X-ray machine has, in several instances, proved as disastrous



X-Ray Operating Room of London Hospital

to the operators as it has been beneficial to patients suffering with certain diseases, has resulted in drastic safeguards, one of the most interesting of which is shown in this illustration. It is a safety-room for X-ray treatment, and the patient is so protected that the light can reach only the desired point, while the operator leaves the room. The X-ray tube is practically surrounded by a shield of Bohemian lead glass, which the rays cannot penetrate. The room is provided with windows of Bohemian lead glass, and the walls consist of two layers of $\frac{1}{2}$ -in. boards with sheets of lead and iron between them.

When the patient is in position for treatment the operator leaves the room, and not until then can the current be turned on. Should the operator seek to enter the room again, the mere

opening of the door cuts off the current, so that he cannot possibly come under the influence of the rays. While the patient is being treated the operator watches through the windows.

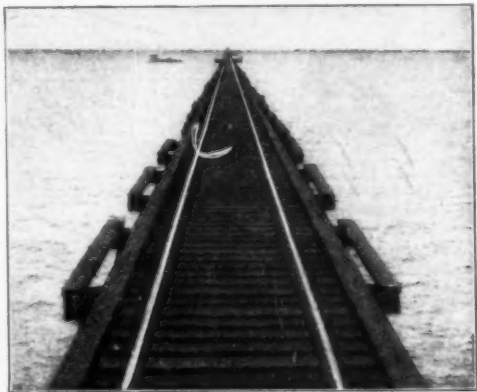
STREET CARS TO CARRY FIRST-AID FOR BROKEN WAGONS

If the chief of police of Chicago has his way, every street car running through the central part of the city will be provided with a simple but effective device by which broken-down wagons can be pushed from the tracks. Hardly a day passes but several breakdowns occur on the tracks and result in the lining up of cars for several blocks.

The device Chief of Police Steward advises is simply a piece of hardwood, slightly reinforced, equipped with an iron shoe at one end to slide along the ground as the wagon moves off, and provided with chains to make it fast. In the center of the hardwood rod should be a simple mechanism on the principle of an inverted jack-screw, with which the rod can be shortened or lengthened to the proper height for raising the wagon's axle off the ground.

RAILWAY TRESTLE 28,000 FT. LONG

The railroad trestle shown in this illustration has a length of 28,000 ft., and is said to be the longest in the



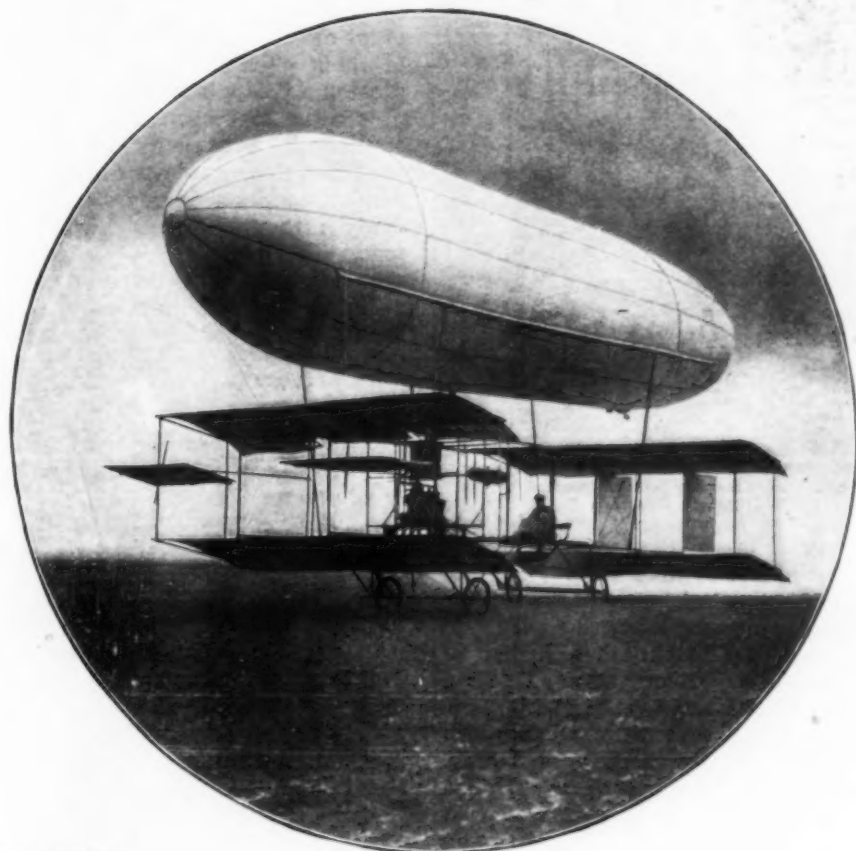
Said to be the Longest Trestle in the World

world over navigable waters. It runs over Albemarle sound from Edenton, N. C., to Mackey's Ferry, N. C., and gives passage to the Norfolk & Southern railroad's traffic, formerly ferried across.

Some 4,000,000 ft. of timber was used in the construction of the trestle,

1,000 cars of spiles, 250 cars of steel, and a train load of spikes and bolts. The spiles were all in excess of 70 ft., the longest being 95 ft. These were driven from 40 to 60 ft. into the bed of the sound. At high tide the track is about 12 ft. above the water. Two draws allow for the passage of vessels.

DIRIGIBLE AND AEROPLANE COMBINED IN ONE MACHINE



Courtesy the Sphere.

A Gas-Bag Aeroplane Airship

The latest type of aerial craft to make its appearance embodies the principles of both the aeroplane and dirigible balloon. Above a biplane is a cigar-shaped envelope filled with gas. The machine is driven by a 50-hp. engine, located just back of the first set of planes. The operator's seat is mid-

way between the two sets of planes. Experiments with the combination machine are being made at Issy-les-Moulineaux, France, and aviators are watching them with keen interest.

☞ Perfumed butter is the latest European idea for fancy breakfasts and teas.

CURIOUS CEREMONY OF BRITISH GOVERNMENT

Many of the ancient ceremonies attending the changes in governing bodies and high officials in England are still adhered to, and carried out to



Courtesy Illustrated London News.
Black Rod Knocking on the Door of the
House of Commons

the letter. One of the strangest of the old ceremonies is that incident to the formal opening of parliament.

The king having taken his place on the throne, the "Gentleman Usher of the Black Rod" is commanded to inform the Commons that it is his majesty's pleasure that they attend him immediately in the House of Lords. Advancing to the door of the House of Commons, he knocks thrice with his rod. Thereupon, an official of the lower house opens a little wicket in the door, and, on being informed of the Black Rod's mission, causes him to be admitted. Black Rod walks towards the table, bowing thrice to the Chair, and, having announced the king's commands, withdraws, still bowing, not turning his back upon the house until he has passed the bar. The speaker and members of the house

then obey the summons. On their arrival at the bar of the House of Lords, the king reads his speech.

The present Black Rod is Admiral Sir Henry Stephenson, who is shown in the illustration wearing the uniform of his rank and his decorations.

LIQUID AIR AS BLASTING EXPLOSIVE

Liquid air has a commercial value in England as a blasting explosive, and is used in many mines for the dislodgement of coal. The cartridges are made of thick phosphor-bronze, and the explosion takes place in about six minutes after loading. About 30 tons of coal can be broken by one shot.

The explosive power of liquid air depends upon its property of turning suddenly into vapor at a high temperature. The cartridge is placed in position before it is loaded with a charge of liquid air. If the vessel in which the liquid air is contained is sufficiently tight, very high expansive power is attained, and for this reason it is stored in vessels having a small opening.

Liquid air was first used as an explosive only in combination with other substances.

SPADE FOR MIXING CONCRETE



This concrete-mixing spade is designed especially for the forming of poured concrete walls. Being perforated, the concrete mass can be separated by it while in the form, the perforations allowing the finer cement to flow toward the face of the form, thus giving the face a much finer finish than could otherwise be obtained.

CYu Chi-hing, a Chinese graduate of an American school, has invented an aeroplane which will be tried out shortly at Canton, China. It is said to be 15 ft. long and 5 ft. wide.

HOW TO BUILD THE FAMOUS "DEMOISELLE" SANTOS-DUMONT'S MONOPLANE

By ARTHUR E. JOERIN AND A. CROSS, A. M.

(Paris)

FROM time to time vague descriptions of the manner of constructing aeroplanes have been given to the public. All over the United States there are thousands of persons who are intensely interested in the subject of aerial flight, but until now nothing of a tangible nature has been presented on which work could be started with a reasonable prospect of success. It is a great satisfaction therefore, to be able to present the working drawings of the wonderful monoplane invented by M. Santos-Dumont. As the authors point out, however, it would be useless for anyone not possessed of some mechanical skill, and plenty of common sense, to attempt to construct a copy of the famous flyer, even with such detailed workings and instructions.—THE EDITOR.

FOLLOWING the announcement, made some months ago by Alberto Santos-Dumont that he intended to give the plans of his latest aeroplane, the "Demoiselle," to the world in the interest of aeronautics, great interest has been centered in the wonderful monoplane. It is the lightest and smallest of all heavier-than-air machines, yet is thoroughly practical. It was with this monoplane that the renowned aviator made a flight from St. Cyr to Buc, on the 13th of September last at a speed of 56 miles an hour.

This machine is better than any other which has ever been built, for those who wish to reach results with the least possible expense and with a minimum of experimenting. The plans which accompany this article are identical with those from which the machines are now being built in France.

As it would lead us too far from the purpose of this article if we were to take up at length such questions as the strength, flexibility, and resistance and other properties of materials we shall restrict ourselves to a description of the manner of constructing the flyer. It would be well, of course, for the prospective aviator to make himself acquainted with the subject of at-

mosphere as it applies to aeronautics, to have a good general knowledge of gasoline motors, and to study the properties and qualities of the different materials which enter into the construction of the monoplane.

It is clearly impossible to go into these subjects at any great length here, but the one who is ambitious to become thoroughly conversant with the subject of aerial navigation, will not fail to consult suitable books on these subjects. Of course the possession of plans is the basis without which it would be impossible to set about building the airship, but at the same time it is necessary to possess some mechanical skill and ability, and plenty of common sense.

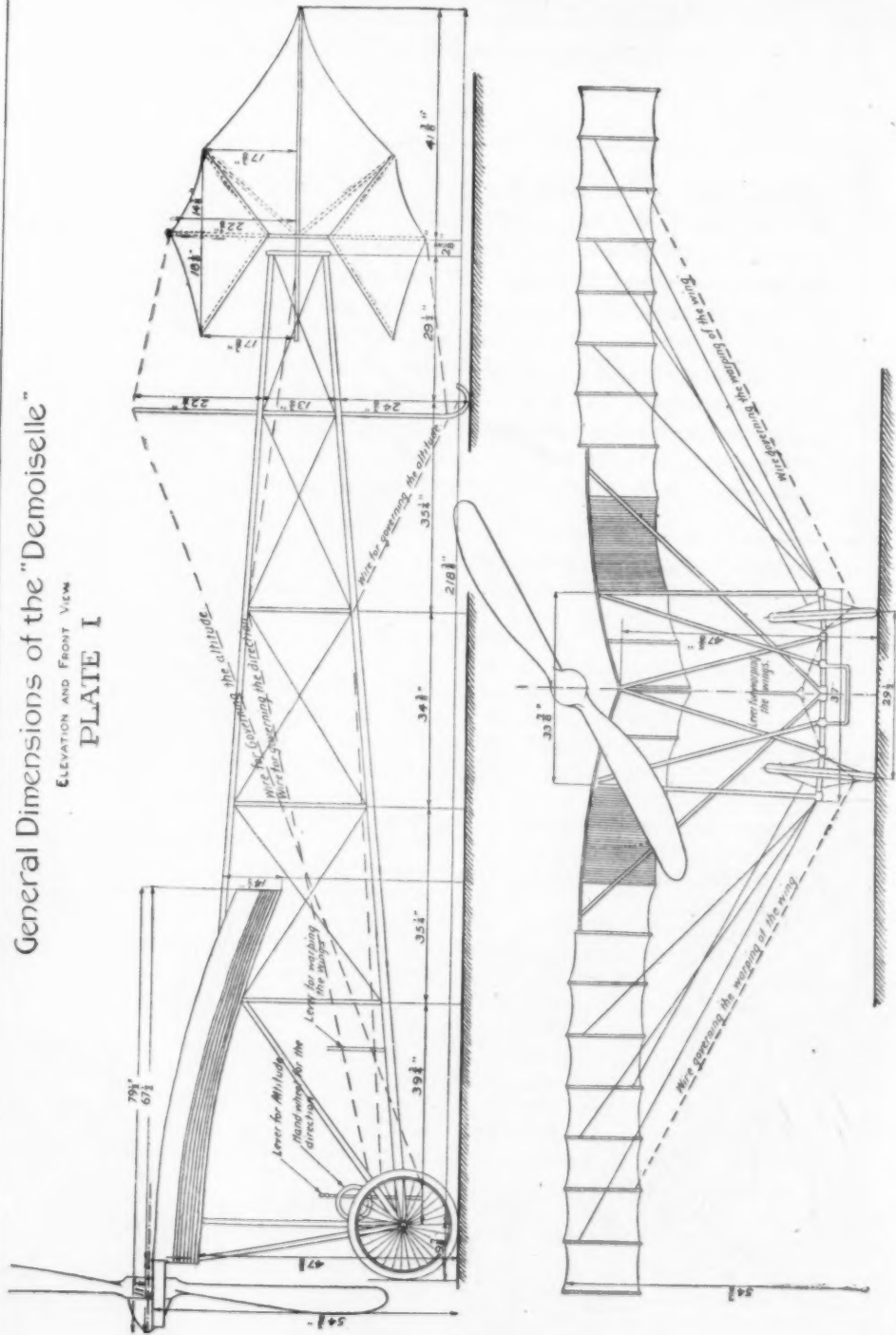
In presenting the plans through Popular Mechanics Magazine we trust that no one of our readers will start to build unless he possesses these qualities, especially the latter, without which he will never be able to accomplish anything.

That the monoplane is the superior form of heavier-than-air machine is the opinion of a majority of the aviation experts. Biplanes and even triplanes have made wonderful flights, but no flying-machine ever built has

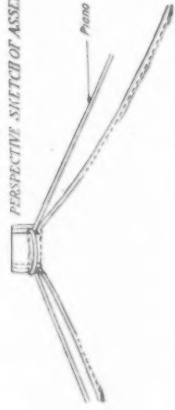
General Dimensions of the "Demoiselle"

ELEVATION AND FRONT VIEW

PLATE I



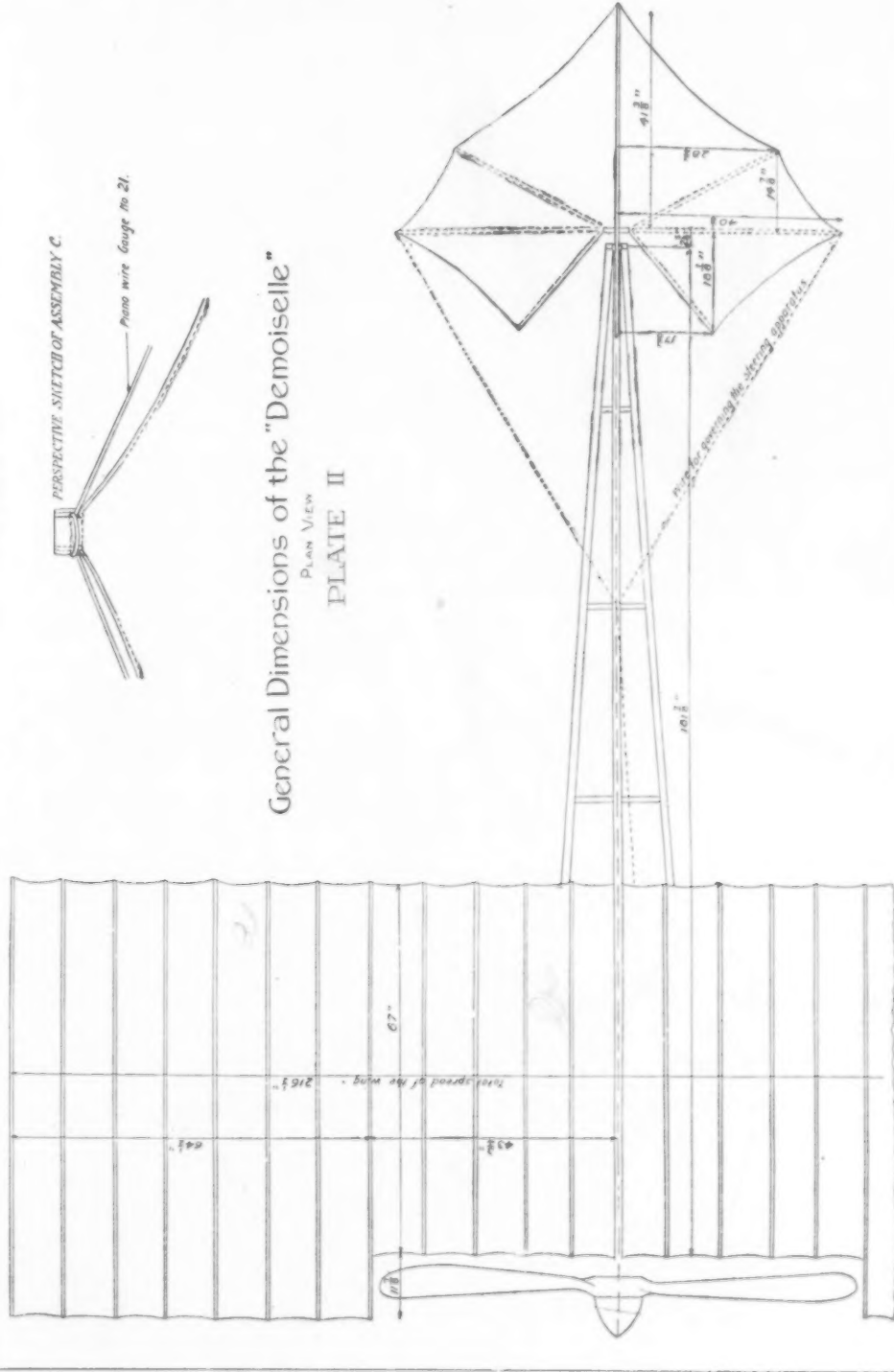
PERSPECTIVE SKETCH OF ASSEMBLY C.



General Dimensions of the "Demoiselle"

PLAN VIEW

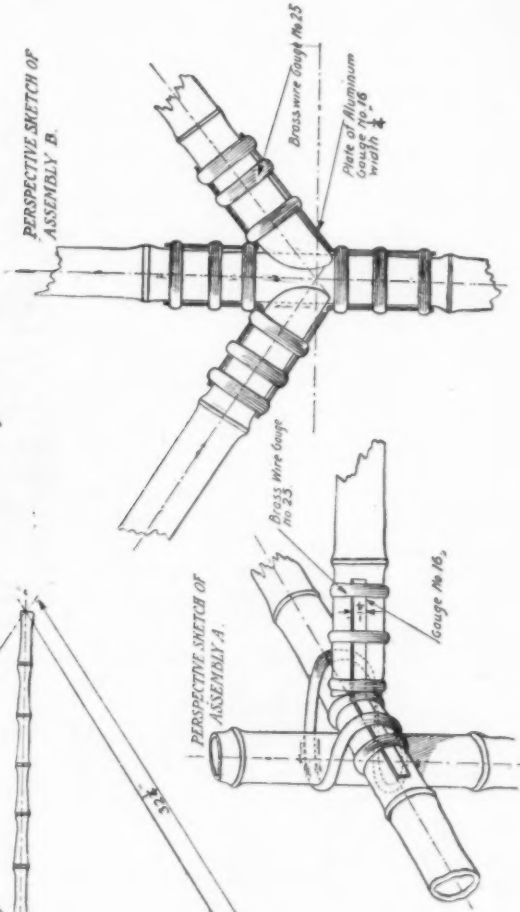
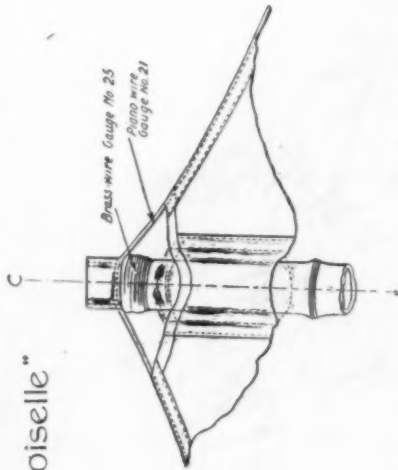
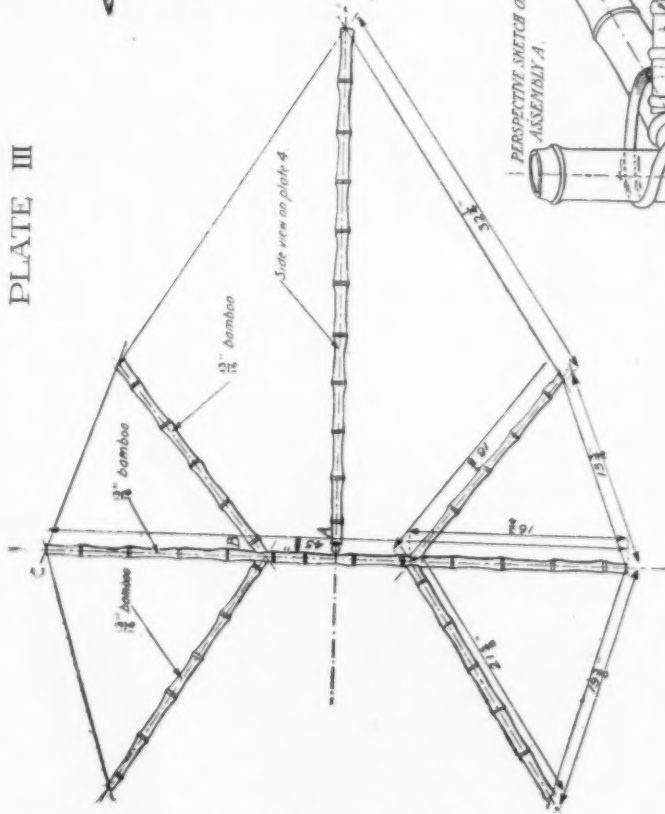
PLATE II



General Dimensions of the "Demoiselle"

VERTICAL RUDDER

PLATE III



proven so easy to balance as the monoplane. The principal objection to it up to within a short time has been the difficulty of bracing the plane. With the biplane the trussing was of great service in this connection. But with the guide wires firmly fixed from the frame to the wings there is little probability of any difficulty with the Santos-Dumont type.

At the very beginning it might be well to state that the greatest items of expense in the construction of the machine will be the motor and the propeller. Santos-Dumont used a Darraq motor of 30 hp. in his record-breaking flight, although he had previously made some fine flights with a 17-hp. motor. There are American motors which will do just as well, probably, and will undoubtedly be much cheaper, as the importation of one from France involves the expense of freight and customs duties.

The construction of the propeller is vitally important, and we would advise that this be purchased.

A good place at which to start would be the vertical rudder, Plate III. The thickness of the bamboo there given is the maximum one. The stronger and heavier portions are used for the centers where the joints are formed and the strain is heaviest. The detailed drawing C on this plate shows the manner in which the cloth is attached to the framework by gauge No. 21 piano wire. As it is done at this point so it should be done on all parts of the monoplane. After having sewn the piano wire into the outer edge of the cloth, taking care to leave open the part where the wire is to be attached to the framework, the wire should be stretched to get it to the extremity, and then dropped into the slot made for it to rest in on the outer end of the bamboo. Thus the planes of cloth are well stretched, and are held firmly in place, adding to the strength of the machine. The same end could not be accomplished nearly as well by first attaching the wire and then sewing the cloth thereon. This applies to the wings also where every

added bit of strength and firmness adds to the successful completion. Slots are made at the end of the bamboos for the



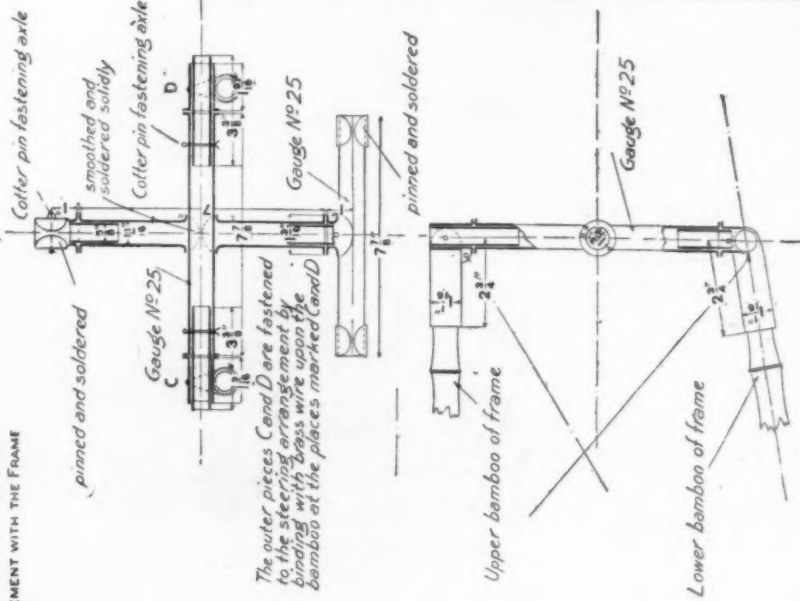
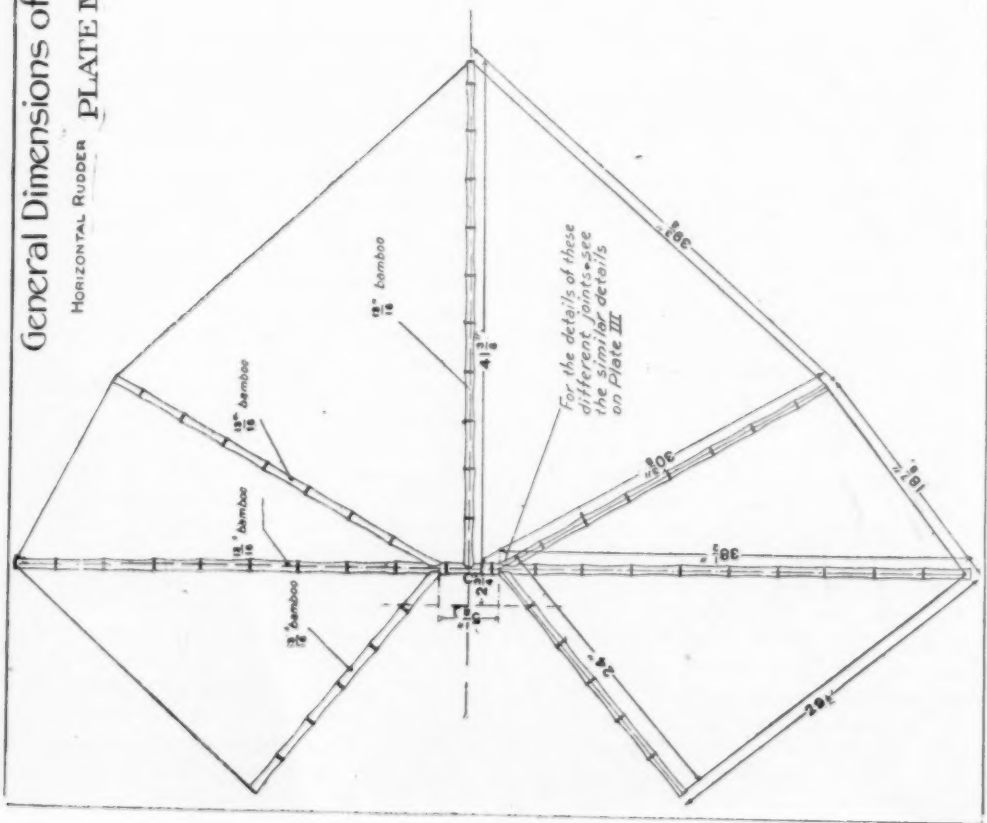
M. Santos-Dumont about to Start Flight in the "Demoiselle"

wires to slip into and be held fast. It is a good idea to put a cork into the hollow ends of the rods, and to cut the slots in both at the same time. The brass wire, gauge No. 25, should also be wound around the rod just below the end of the slot. This prevents the piano wire on which the cloth is sewn from splitting the rods. It may seem that this arrangement is crude, yet it is the way that Santos-Dumont made the ends when he flew from St. Cyr to Buc. Later on—he had a number of "Demoiselles," and small breaks happened now and then—he put a little metal cap over the ends of the rods. Slots were made in these caps to receive the wires. We have described the former because it is by far the easier way for amateur airship builders.

The cloth used by Santos-Dumont was a very finely woven silk. Silk does not rot as easily as cotton and is considerably stronger. Silk has the great objection of expense, however, and it would probably be as well to use percale or strong muslin, care being taken to secure the best grade of closely woven and unbleached goods.

General Dimensions of the "Demoiselle"

HORIZONTAL RUDDER PLATE IV CONNECTION OF THE STEERING ARRANGEMENT WITH THE FRAME



For the details of these
different joints see
the similar details
on Plate III

The method of making the joint at B is well shown in the drawing. The use of steel or aluminum plates is very important for it would be impossible to secure the necessary strength without them. The clever idea adopted by the inventor of the machine practically

the vertical rudder on both sides. If this is done properly no rods will be visible, all being covered by the cloth. The manner in which the cloth covers the rods is shown at C on Plate III.

The method of attaching the rudders



Rear View of "Demoiselle"

makes this joint in one piece, and he experienced little or no trouble at this point. The ends of the two smaller pieces are inserted for about a quarter of an inch into the vertical piece as is shown. If one wishes to finish the work particularly well, cabinetmaker's musilage or several coats of varnish may be put on at these joints. It serves to retard decay in the bamboo.

Plate IV shows the details of the horizontal rudder which governs the altitude of the machine. "Gouvenail de Profondeur" is the French term for it. It should be constructed in the same general way as the vertical rudder. At the point where the rudders join it is necessary to cut the cloth of the horizontal rudder and sew it to the cloth of

to the frame is shown on Plate IV. This is practically a universal joint, allowing the steering device to be turned in any direction by the controlling wires shown on Plate I, and also in the smaller illustration of the monoplane. These wires should be carefully selected and tested for a great deal depends upon their strength. It would be very imprudent to use ordinary piano string or wire. Santos-Dumont uses a flexible metallic wire, gauge No. 13, with a flaxen cord in the center. This wire will withstand the constant bending without danger of breaking. The joint should be made of the best steel tubing procurable as it performs a very important function. Good bicycle tubing is excellent.

*(Concluded in the July Issue of
Popular Mechanics)*

PAULHAN WINS \$50,000 PRIZE IN WORLD'S GREATEST AERIAL RACE

Louis Paulhan, the daring French aviator, broke the long-distance record for aeroplane flights on April 28th, and captured the prize of \$50,000 offered by Lord Northcliffe, the English publisher, when he flew from London to Manchester, a distance of 186 miles.

Although the prize has for some time

been awaiting the accomplishment of this trip, the fact that Graham White, an English pilot, undertook to start at about the same time, added to the event the excitement of a race. White, much less experienced than Paulhan, met difficulty in the heavy winds.

Paulhan made the trip in 12 hours and

10 minutes, the last 24 miles being covered in 24 minutes, according to an unofficial record. Both aviators used Farman biplanes.

During a part of his flight Paulhan followed the railroad line closely, and used an express train as a pace maker. At times he outdistanced the train.

It was White's intention to start about the same time as Paulhan. Both arrived at London on the 27th with their machines and began making final preparations for the flight. It was understood that they would start out on the morning of the 28th. White went to his hotel to rest, but Paulhan made an ascension during the late afternoon and headed northward toward Manchester and the \$50,000. Friends of the English aviator learned of it and im-

mediately roused him. Soon he was in pursuit of Paulhan, using every ounce of power in the motor in an effort to make up for the hour which he had lost.

For hours the rivals flew northward at a terrific pace, through the dusk and the bitter cold of the great altitude at which they flew. Paulhan made one stop at Lichfield where he spent the night. White was obliged to come to the ground at Polesworth, having covered more than half the distance between London and Manchester.

The provisions of the prize offer provided that only two stops should be made and that the trip should be made in less than 24 hours. Paulhan made only one stop and made the distance in little more than half the time allowed, including the rest at Lichfield.

FOURTH OF JULY PAGEANTS

How to Prepare for a Sane Celebration of Our National Holiday and to Make Attractive Floats and Decorations

By H. T. McCONNELL

ALL over the country, just at this time, the anticipation of the Fourth of July is felt in schools and homes as well as in business. The "sane Fourth" idea has made a deep impression in every state and in every city, and it is safe to say that pageants and parades and rational public celebrations of the day will be more general this year than ever before.

To the community which has never been able to boast of having had a pageant with floats and costumes, a floral parade, or even the time-honored "civic and military" parade, there is often a confusion of ideas as to how to go about getting up such an affair. It looks like a big undertaking to prepare for a score of floats, with brass bands, and turnouts of fraternal societies and clubs, but if the matter is taken up in a systematic manner, by a competent committee of public-spirited citizens, there should be no difficulty about arranging a demonstration that will not only distract the attention of the small

boy from the death-dealing firecracker, but will permeate the day with real patriotic sentiment and increase the general enjoyment of our national holiday.

Some suggestions which might be taken up are:

The playing of the national airs with the church chimes.

A lavish display of flags and bunting on every building.

Home reunions.

Family picnic parties.

Patriotic exercises in public places with singing of the national airs by school children.

Water fêtes.

Athletic sports.

The illumination of the city or town at night by stringing electric lights across the main streets and on the public buildings.

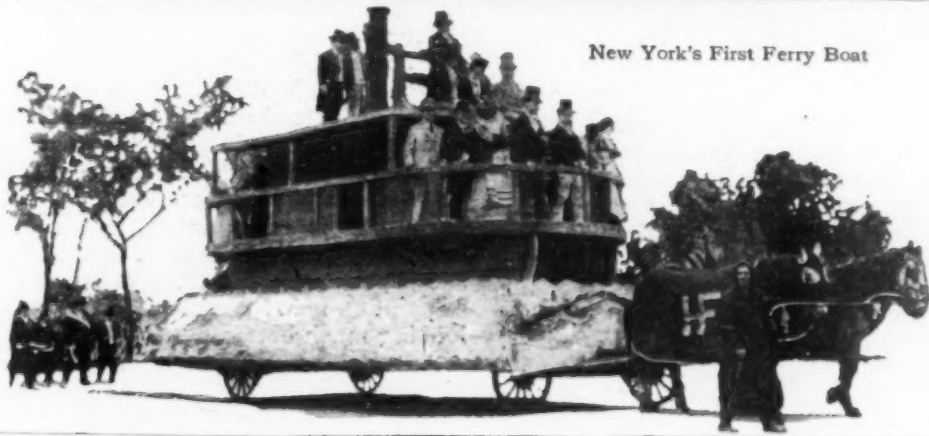
Street-car parades at night, with illuminated floats.

There is no limit to the variety of ideas for getting up floats. Every community has its traditions and its his-

Scene in Old New Amsterdam

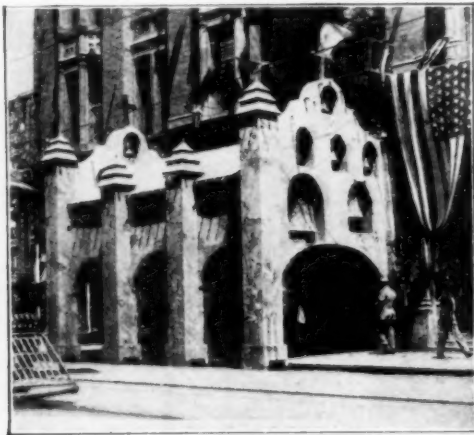


New York's First Ferry Boat



Replica of the "Half Moon"

tory, and almost all have their special industries. Every town of any size has a number of fraternal and political,



Replica of Belfry of an Old Mission—Prize Winner

civic or military organizations which could co-operate, each preparing its own float with its insignia or emblem as the central idea. Every community has schools, and the children will be delighted to take part in a street pageant dressed in the uniform of the Continental Army, or in some other costume, inexpensive and easily made.

The most important thing in any affair of this kind is a live committee with an energetic chairman. It will not do to confine the enthusiasm to certain circles or classes of the people of the community. All the people must be taken into consideration, and everybody must be made to feel that his co-operation is absolutely necessary. When the work has been assigned to different sub-committees or individuals, then the actual work of preparation must be started with an enthusiasm which will not falter at trifling obstacles.

The accompanying illustrations will give an idea of the possibilities of floats. Those of the Hudson-Fulton celebration are quite elaborate, but this does not mean that they are difficult to make. The main thing is to get the idea for the float well fixed and the details in mind before going to work. It is well, where a complicated affair is to be ar-

ranged, to have a rough sketch made before beginning the work.

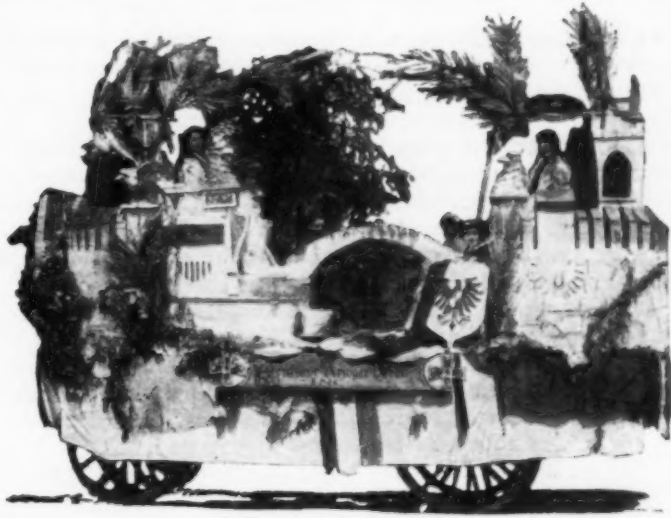
Up to within a few years wood was generally used as the framework of floats, but the practice today is to use wire, rattan or bent reeds. Where strength is necessary, as for a platform on which a number of people in costume will stand, it is imperative that wood be used, but for the average float, a wire framework is to be preferred because of the ease with which it can be fashioned. Trucks on which to place the floats should be secured without difficulty, and the material for almost any float can be obtained in a general store. White cambric and tarlatan, materials which are inexpensive and easily procurable, are used most in covering the floats. The latter, a thin, loosely woven cloth, lends itself to many uses where delicate shadings or transparent effects are desired. For the making of costumes white duck, muslin, and even silks and satins are used.

Bunting is easily made, and tissue paper has great possibilities, colored tissue paper answering the same purpose as paint on many floats, and oftentimes looking much better.

Automobiles are being used in all the big pageants now. A good float for an automobile is a gunboat, the details being worked out in wire, reinforced by wooden strips. The turrets can be formed with wire, as can the protruding guns and the mast. The sides of the boat should be formed by white or light gray cambric, dropped down to within a few inches of the ground. The judicious use of a little green paint sets off the water line.

A beautiful float, sure to draw forth expressions of admiration, can be made by a liberal use of imitation flowers—or real flowers, if enough can be secured. The very simplicity of floral designs often adds to their attractiveness.

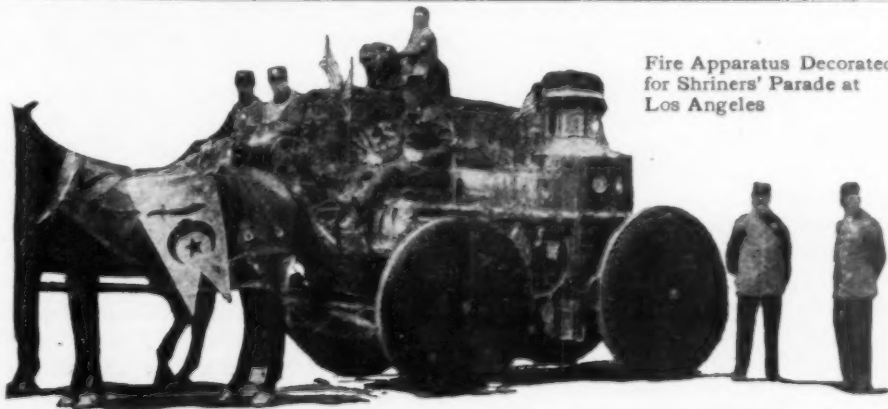
The fire engines and other apparatus are always interesting to look upon, especially for the children, and the manner in which they can be made to take part in a pageant is shown in one of the illustrations. Classes of school



A Germany Society Float



Class of School Girls in Floral Float



Fire Apparatus Decorated
for Shriners' Parade at
Los Angeles

girls can get up their own floats, the use of one flower being the decorative scheme, with the girls dressed to harmonize with the color of the flower.

Floats made to represent timely events are always sure of attracting attention. It would be a simple matter, for instance, to get up a North Pole float, with a few pieces of ice formed of wire, white cambric and a little paint, a pole with a stick of wood as a support, a man made up in Eskimo costume to represent the discoverer, and a little ingenuity. The Goddess of Liberty, with a girl as the central figure, dressed in flowing white robes, is another suggestion that might be used, and the signing of the declaration is another.

National events, romantic episodes, brave deeds, picturesque costumes, local industries, can all be worked up to good effect. It is an easy matter, for instance, to reproduce a blacksmith shop with a forge and anvil, and a smith making the anvil ring with his hammer.

A bakery can be shown in operation; in fact, almost any trade or industry can be faithfully reproduced on wheels.

Motorcycles can be used to good advantage also. Very pretty designs can be worked out for the machines with bunting and flowers, and the appearance of the riders in costume is sure to be a fine feature.

Enterprising merchants may, with a small expenditure, add to the general holiday appearance of the community by dressing up the fronts of their establishments. During a recent festival and street pageant at Los Angeles a prize was offered for the most attractive decoration. An adaptation of the famous belfry of the San Gabriel Mission, shown in the small illustration, won the first prize. The bells were merely papier maché, but they were cleverly bronzed, and a set of chimes was concealed about the edifice so that as the imitation bells were swung a most realistic effect was produced.

NEW RIVER BOAT A SUBSTITUTE FOR DEEPER WATERWAYS

By FREDERICK E. MORRIS

"When a project of a definite character for the improvement of a waterway has been developed so that the plans have been drawn, the cost estimated, and the traffic which will be accommodated is reasonably probable, I think it is the duty of Congress to undertake the project and make provision therefor in the proper appropriation bill."

This was the manner in which President Taft in his last message to congress disposed of the Lakes-to-the-Gulf boom which bloomed in the fullness of its glory last fall when a waterways party was held on the lower Mississippi, attended by some of our leading statesmen and most distinguished boomers.

And while a weak protest was made by some of the more ardent boomers at the president's position, no riots were reported in any part of the country. In spite of the well organized publicity

work on behalf of the Lakes-to-the-Gulf plan, the public seemed to feel that the president was about right. The public, like the president, was waiting to be convinced that it was worth while to spend millions of dollars for a deep channel between Lake Michigan and the Gulf of Mexico. And neither the public nor the president was quite convinced.

In the paragraph quoted above, President Taft showed in concrete form the weakness of the position held by the boomers. In the face of the reports of some of the most capable engineers of the country, including a group of army engineers who spent several years making an investigation, the deeper waterway advocates insisted that the project was feasible. Their position was not strengthened by the wild estimates which they put forward of the cost of the work, neither was it made

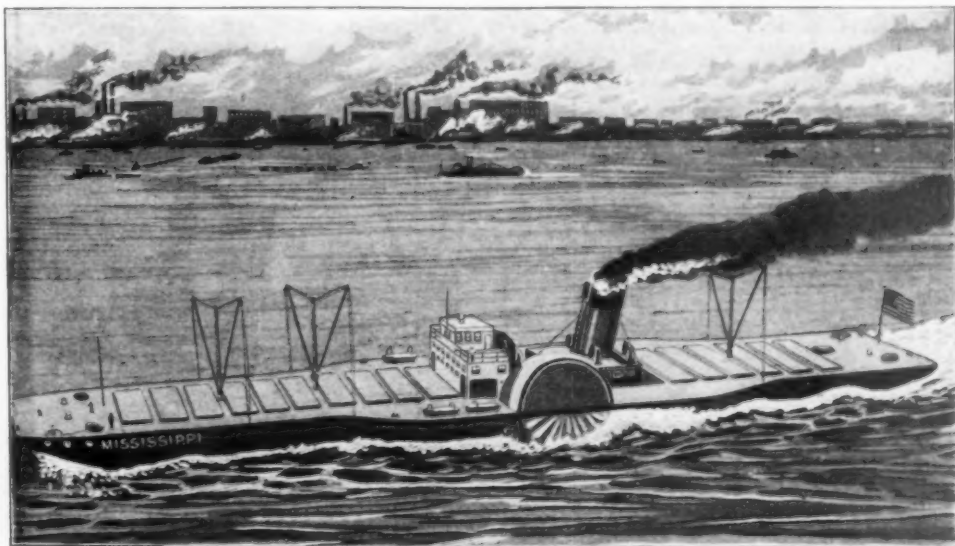
more tenable by the various channel depths advocated, all the way from 6 ft. to 24 ft. at low water.

Then there was one question which insisted on intruding into every argument—"What assurance is there that there will be any increase in inland water transportation if this hundred million or two hundred million is spent?"

The end which the men behind the Lakes-to-the-Gulf plan wish to achieve is more than a dream. Some day it may be made very plain that it is the duty of Congress to appropriate money

public that the subtle power of the railroads was blocking the work. But the railroad officials were too wise to express opposition to the plan. Indeed, James J. Hill and many other railroad kings declared in favor of it.

Taken all in all, the waterways movement was not greatly the gainer by the recent campaign. It fell flat. Congress refused to become excited, the public looked on with exasperating calmness, and, although the enthusiasts looked to the State of Illinois to start something, and Governor Deneen raged at the legislature to get busy and start



The New River Freighter

for the project. There are men who are devoting time and energy to the cause, firmly believing that it will be a greater benefit to the country than the Panama canal or any other project which the government could undertake. Such a man is Lyman E. Cooley, the Chicago engineer, who has spent years studying the problem. He is a firm believer in waterways, and his estimates and plans formed the backbone of the argument which the waterway advocates presented to Congress. It would have been a great prop for the arguments of the waterways people if they could have succeeded in convincing the

the ball a-rolling, that body closed its session very quietly without taking action.

Next year, or perhaps in five years, a sporadic boom may come along and arouse the country to action and Congress to an appropriation.

But in the meantime an attempt to solve the problem of Mississippi navigation is being made from another direction. Many inventions have been put forward for light-draft boats designed to navigate the Mississippi and meet the peculiar conditions of that river with its twistings and turnings, its shifting bottoms, its narrow chan-

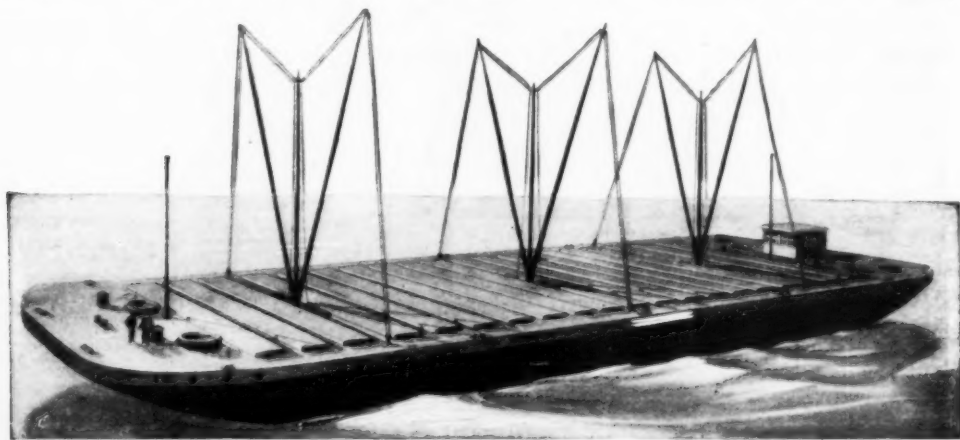
nels and its lack of landing facilities. The Mississippi has about 2,500 miles of 6-ft. channel, and the government has been spending money on the river under a fixed policy since 1870. Millions of dollars were spent on it before that time, too, yet today the Mississippi is as untamed as ever.

A new type of river craft which, according to experts, may work a revolution in river navigation, will soon be placed in operation between St. Louis and New Orleans. This new boat is designed to carry high-grade freight rapidly between terminal points. It is in some ways like the Great Lakes freighters which have been extremely

month between St. Louis and New Orleans, carrying packing-house products, dry goods and coal, and on the return trip being loaded with sugar, coffee, jute and lumber.

It is expected also that when the lock at Keokuk is enlarged the boat will be able to go to St. Paul and take on 2,000 tons of flour while drawing 3 ft. of water, then come down to Davenport and add another 1,000 tons on 4 ft. of water, and then stopping at St. Louis to take on an additional 2,000 tons, making a 6-ft. draft on which to proceed to New Orleans.

The barge is a long, broad steel craft, absolutely lacking in superstructure.



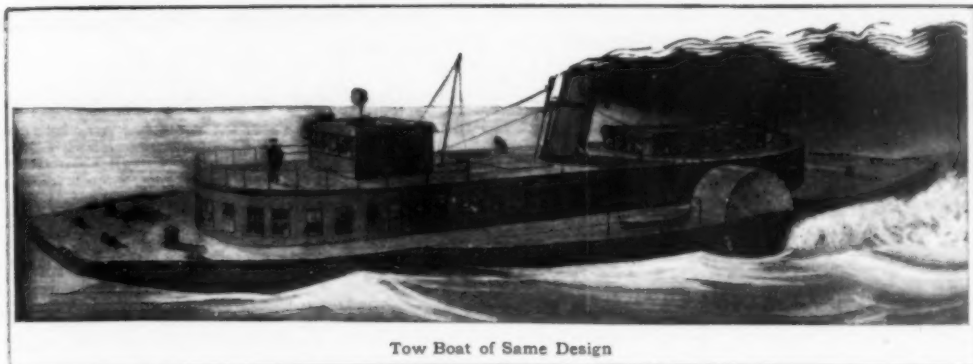
Steel Barge to Carry 1,200 Tons—With 4-Ft. Draft

successful. Three different designs will be made from adaptations of the general plan. The principal design provides for a steel craft 550 ft. long, 60 ft. wide, to draw but 12 in. of water when light. Every foot of displacement in addition to this represents 1,000 tons carrying capacity, so that she will carry 6,000 tons when loaded to 7 ft. The engines will provide 2,000 hp., which will give her a speed of 16 miles an hour when loaded. The estimated cost is \$250,000. The other boats to be built from the same design are a river tug and river barge, also constructed of steel.

The larger boat, it is thought, will be able to make two round trips a

The deck is cut by a frequent succession of hatches, through which every part of the hold can be reached. There is a small cabin at each end for the accommodation of the crew. Two steam capstans at each end work the derricks and the towlines, and aft is a steel wheel-house, for the barges will be equipped with rudders. The house will also contain an engine and steam boiler, the engine for operating the freight derricks and the boiler serving also the capstan engines. This barge is intended to carry 4,000 tons on 9 ft. of water and 1,200 tons on 4 ft.

The towboat is a sidewheeler. The hull runs out gracefully at the front, displacing the water with the least ef-



Tow Boat of Same Design

fort. The cabins, with ample accommodations for the officers and crew, rest on the main deck, and the pilot-house is placed immediately over the forward cabins. Back of this is the hatch, covering the fuel hopper, for all

the coal will be taken aboard from an overhead chute.

The engines will furnish 2,000 hp. The towboat is 150 ft. long and 33 ft. wide, and has a draft of 30 in. with fuel on board.

EDITORIAL

THE course of instruction in the United States Military Academy at West Point, provides an education of which any young man may feel proud. Few schools in the world occupy sites which compare with it in beauty, while the buildings, equipment and historical associations stimulate enthusiasm and ambition. The training of body and mind are both of the highest order. The young graduate from West Point commands attention and respect not enjoyed by those emerging from colleges and universities. His services are in demand, for he is known to be strong physically and has been taught how to do things, and do them promptly.

It is, therefore, surprising that the West Point classes are below their full quota. Not so many years ago scores of bright, ambitious boys were bending every energy to secure an appointment, and the few successful ones were the envy of hundreds. Evidently the difficulty of securing the scholarship has in these days been overestimated, or there would now be the long waiting list of a few years ago. Each state is entitled to but two scholarships each year, to which are added forty from the country at large. Appointment is by the President, usually upon recommendation of a senator or representative.

At the present time there are ninety-four vacancies which cannot be filled under the present law. These vacancies are due partly to some states having failed to furnish their quota this year and partly to students who have dropped out for one reason or another. Colonel Scott, superintendent of the academy, has recommended to the House Committee, which is considering a bill to change present conditions of admission, that where an appointee fails to enter, the man standing second in the same examination for entrance be appointed to the vacancy thus caused. The recommendation is excellent and should be adopted.

The number of graduated cadets for eleven years past has averaged 45 per year short of the number required to fill ordinary vacancies and 172 short of the number required to fill all vacancies. During the past eight years \$7,500,000 has been appropriated for additional buildings and improvements at West Point, but without providing legislation for a larger number of students. Hence, the new barracks with a capacity of 312 cadets is occupied by only 51 cadets. Major General Bell has formulated a plan whereby the number of graduates may be increased 25 per cent at an additional expenditure of only 1 per cent.

A four years' course of such training as our Government provides at West Point where not only all expenses are paid but the student is actually paid money for his attendance, surely offers

attractions which, if once known, must appeal to hundreds of our young men, and awake the old-time interest and desire to work for and secure an appointment.

* * *

A waterways demonstration is to be made that will commend itself as eminently practical. While it does not quite reach from the Lakes to the Gulf, it does extend from St. Louis to New Orleans, which is no small distance. A strictly modern river boat, with luxurious cabins for passengers and capacity for two or three thousand tons of freight, will be built.

No fourteen to twenty-four foot channel will be required for this boat, as its draught is extremely shallow, measured in inches. No expensive docks and slips need be constructed nor any other unusual expenditures made to permit the experiment. The river and wharves are taken just as they are, and the boat is built to accommodate itself to existing conditions.

The distance by river between the two cities is about 1050 miles; hence continuous day and night travel, with necessary stoppage for fuel and landing of passengers, should enable the boat to make the down trip in five days and the return trip in six days. This does not compare unfavorably with the present movement of freight by railroads other than the fast freight lines for perishable commodities, such as fruit and vegetables. Not many classes of freight can afford the high rates charged by the fast trains.

The decadence of Mississippi river traffic is understood to be due less to an insufficiency of water than the policy of the railroads to make exchange of freight between the boat lines and car lines as difficult, expensive and unsatisfactory as possible. It is said that there is a chronic car shortage where river and dock companies have freight to transfer to the railroads for transit to inland destinations, and that this has been enforced to an extent which has gradually worn out the patience of the shipper, until in desperation he "gave up the ship."

If this be so, the Interstate Commerce Commission should be able to help remove the rust from rails where it will do the most good; and in the meantime an honest, unprejudiced effort should be made to determine, at least, that freight cannot be as economically moved in shallow river boats as by train. The scheme will not commend itself to politicians, but to the rest of us has a large element of common sense and promise.

* * *

THE public is vitally interested in the character of the mail facilities afforded. At a trifling expense and with little inconvenience to themselves, the patrons of the service can give the Department substantial aid in its endeavor to reduce the annual deficit and to meet satisfactorily the rapid growth of our postal needs.

In the last analysis, all expenses incurred by the Government for this purpose, whether necessary or unnecessary, must be borne by the taxpayers. With a reasonable co-operation on the part of the people who enjoy the benefits of the postal service, the Department can save much unnecessary expense and apply the saving more effectively in raising the standard of efficiency. There are various ways in which the people may assist to this end:—If convenient mail receptacles were provided at the entrance of all dwellings and offices where delivery is made by city carriers, thus avoiding constant waiting for the answering of door-bells, the carriers could traverse their routes much more quickly. This would mean not only a prompter delivery of mail to the people concerned, but also savings to the Government that would probably aggregate several millions of dollars a year. In view of the heavy cost of city delivery as at present conducted, it is felt that the people for whose benefit the service is maintained, should be required to co-operate with the Department in the manner proposed, by providing at their doorways suitable receptacles for mail.

Each city carrier, in residence districts, making three daily deliveries, serves approximately 400 families, and on two-delivery districts in the outlying portions about 500 families. The regulation provides that mail shall not be placed under doors or thrown in entrances or hallways, consequently carriers must wait at the door in summer's heat and winter's cold, through rain or snow, holding a heavy sack of mail until some member of the family responds to his call.

With all residences provided with a mail receptacle, considerable time would be saved which could be applied to advantage in securing additional daily deliveries where necessary.

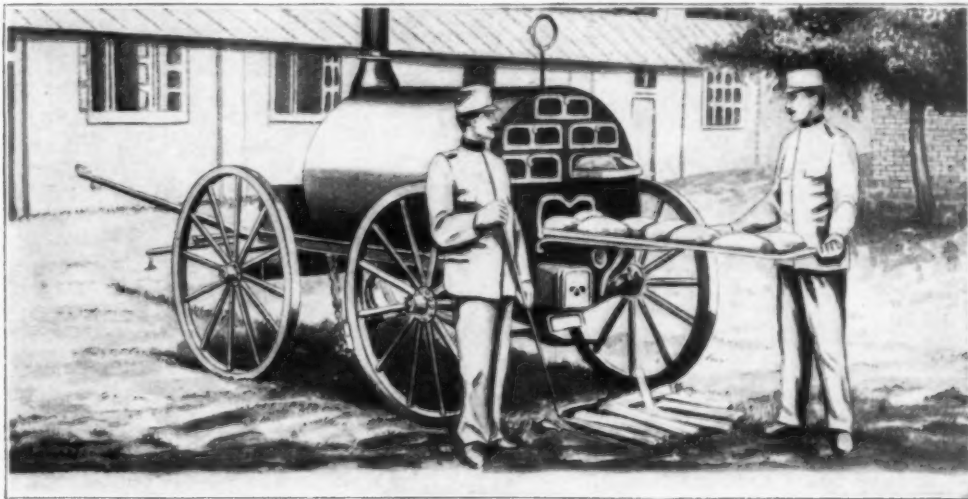
The cost of a mail box is slight, when the benefits to be derived are considered, the condition imposed is reasonable and in the interest of better service, the house box should be compulsory.

H. H. WINDSOR

TRAINING BAKERS AND COOKS IN U. S. ARMY

At Fort Riley, Kansas, the war department maintains a training school for bakers and cooks in which specially selected men from organizations of the army, who have not less than 2½ years to serve, and who have manifested a desire to learn the trade, are taught. The course extends over a term of four months, but the baking and cooking departments are distinct—that is, the soldier student is entered in one or

duties of making straight doughs, sponges, yeasts and ferments; on the machine work, fires, oven and pans and field ovens; as issue clerks and mixing room orderlies. The field experiments embrace every kind of oven, from the open trench, hole in a bank, and mud ovens, to the latest improved knock-down type. Detachments of student bakers are sent regularly to attend maneuvers, instruction camps



Courtesy U. S. Cavalry Journal.

American Built Field Oven Used by European Powers

the other in accordance with the order detailing him for duty.

A new class of bakers is started the 15th of each month. The post bakery is operated by the school and all bread issued to troops stationed at Fort Riley is baked by the student class. In addition to the regular issue bread, a higher grade of bread, called "sales bread," is baked for sale to officers and others authorized to purchase bread at Fort Riley. Rye bread, graham bread, and all sorts of rolls, buns, and doughnuts are baked in sufficient quantities for efficient instruction. Four days each month are devoted to instruction in handling the regimental field bakery and equipment. The student bakers are detailed by roster on the various

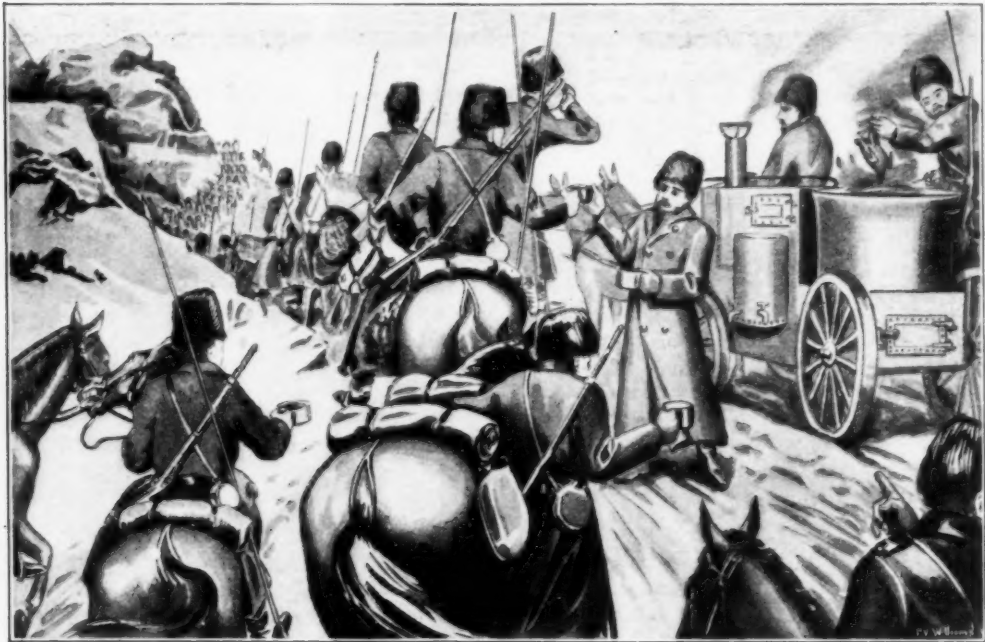
and military tournaments, for the purpose of supplying bread and giving instruction to the militia, etc.

After the student baker has become familiar with his daily work in the bakery, he is issued an authorized textbook, and required to attend daily recitations which are conducted by an officer. Upon the completion of the 4-months course, student bakers are rated as chief bakers, assistant bakers, or non-graduates, according to their ability. In determining the standing, 200 points are allowed for practical work in the post bakery, 100 points for practical work in the field bakery, 50 points for cleanliness and work as mixing room orderly, 100 points for recitations, and 150 points for exami-

nations. The total of points is 600, and 450 are required for proficiency.

One of the illustrations shows the latest type of knock-down field oven. It is fired from a trench underneath, and can be knocked down and packed immediately after baking. It will bake 270 rations of bread per hour, and can be set up for this task in 15 minutes. An older type of knock-down field oven is also shown. This is a draw fire oven and has to be fired for each batch of bread. It has a capacity of 112 rations

The department of cooking operates along the same lines as that of the baking department, but the cook not only has to understand the value of every article of the ration, how to cook it, and how to preserve it, both in the garrison and the field, but how to bake bread as well. There is, according to Lieut. Sherrard Coleman, but little theory used in the instruction. It is all a practical demonstration, and no man is graduated until he has proved his ability to take the army ration and



Russian Soldiers Feeding on March During War with Japan—Pigs, Chickens and Vegetables Thrown into Boiler by Foragers

per oven, and it generally requires three such ovens with a run of four batches of bread each to supply a regiment in the field. A remarkably ingenious field oven, sometimes used as an expedient, is the barrel oven. It is built by placing two barrels end to end and plastering them over with clay. The interior is then fired, the wood barrels burn away, and a complete clay oven is left. Such an oven has a capacity of 50 rations at each baking. Several of the European powers used a field oven on wheels, which is manufactured in Saginaw, Mich.

maintain a good company mess. Each student is tried out in the various positions from assistant cook to mess sergeant, and unless he has practically demonstrated his ability to cook and run a mess successfully, he cannot graduate better than second cook.

There are now 16 company messes and three field kitchens successfully operated by the school. Members of a new class are first assigned to duty as assistants to the first and second cooks and work with them during their hours of duty. The details for the kitchens are made out once a week

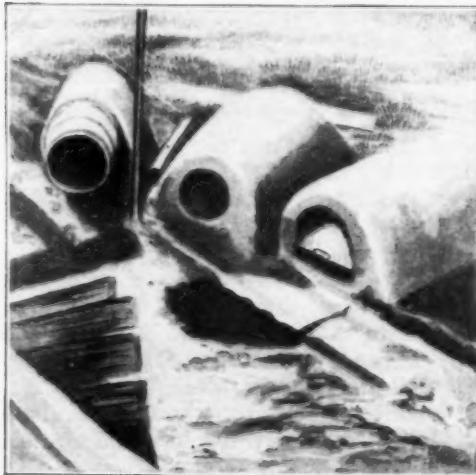


Knockdown Field Oven—Set Up in Fifteen Minutes

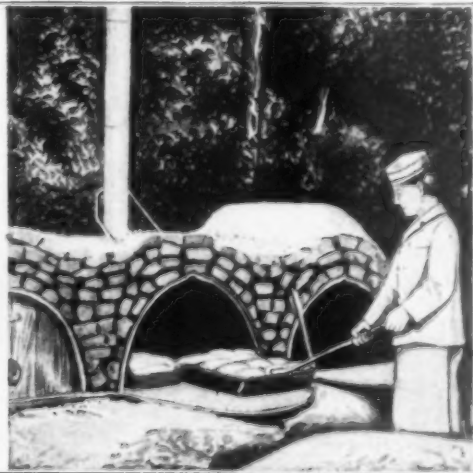
and the students are changed from kitchen to kitchen, in order that they may familiarize themselves with the different conditions.

Each kitchen has, as a rule, five men; one instructor, one first cook, one second cook, and two assistants from the third and fourth classes. Upon graduation of the first and second cooks, members of the lower classes are advanced to fill their places. The assignment to duty as first or second cook simply means that the student is being tried in that particular position, and he will graduate as such only in case his work is satisfactory.

While performing the duties of first or second cook, the student is given practical instruction in handling the ration. He must make out his own ration return, figure on his savings, and make all purchases outside of the ration come within the money saved from the ration. He must also make out the bills of fare, work into edible dishes any article left over, and keep the quality and variety up to the standard of the school. Before he can graduate, he is given thorough instruction in dressed beef inspection and the value of the different cuts of meat. "He must," says the Journal of the



Clay Oven Made Over Barrel



Old Type of Knockdown Oven

U. S. Cavalry Association, "be able, upon examination of a hind or fore quarter, to tell the quality, sex and age of the animal, and whether it comes up to the specifications of the contract; show, by demonstration, how to cut up the carcass, so as to get the best parts for roasting, steaks, boiling, etc., and give the proper name to each of the parts."

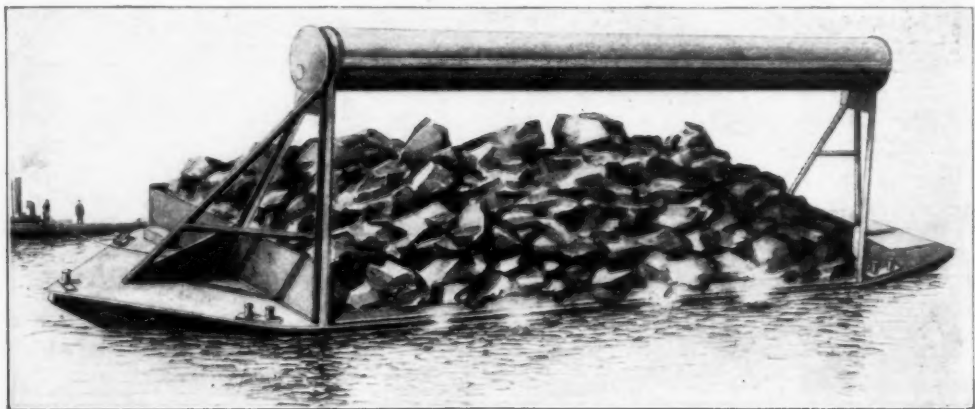
Although baking, as before stated, is in a separate class, each student cook is given instruction in the preparation and value of yeasts and baking powders, and the first or second cook makes

rolls, buns, crullers, and the like every day, as well as all sorts of pastry and cakes for deserts. From time to time the classes are sent out with the field range and are taught the use of camp expedients. Hygiene and sanitation are also important parts of the education. Instruction is given, from day to day, on the importance of keeping the person clean, the necessity of frequent changes of clothing, and presenting a neat appearance. Prizes of from \$5 to \$25 are given to students demonstrating special ability in each of the classes.

SELF-DUMPING STONE BARGE

A stone barge that partially capsizes in dumping its load is being used by the city of Stockholm, Sweden, in the work of extending its harbor and streets. The mode of dumping is new,

towing vessel. By the first pull on this line, compressed air is admitted to the water tank and this forces the water up into the cylinder above the deck. The weight of water in the cylinder

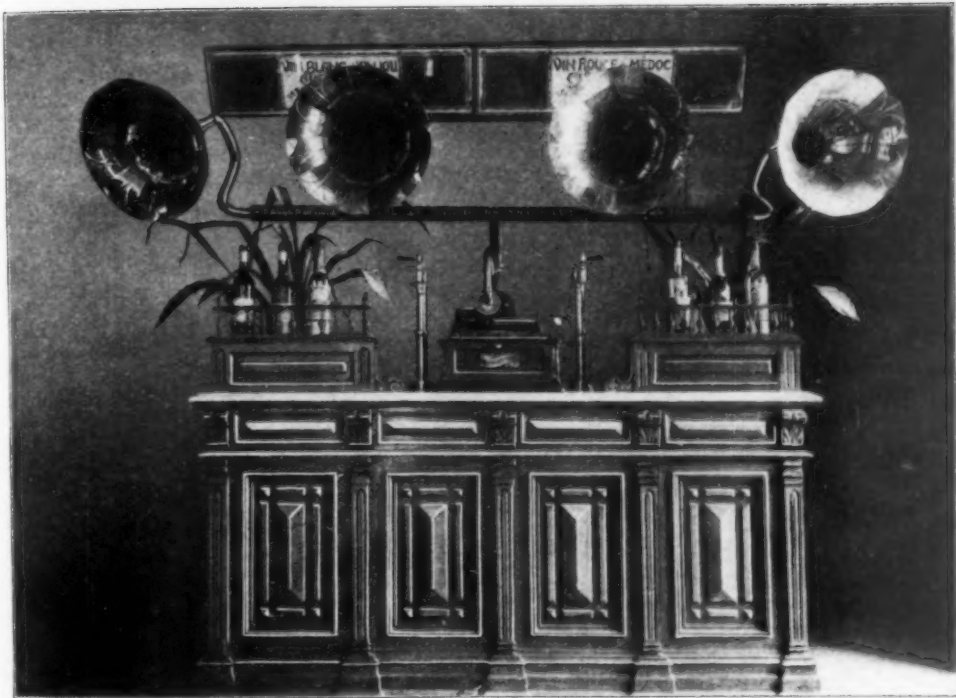


Self-Dumping Barge Turning Half Over to Dump Its Load

the long cylinder raised above one edge of the barge being filled with water and emptied in the process of tipping it over.

The load of stone is carried on the flat deck, and within the hull are three tanks. The first of these contains water, the second contains compressed air, and the third is an intermediate water tank. When the barge is being towed to the point of dumping, the long cylinder above its deck is empty, but when the destination is reached, an operating line is carried over to the

tips the barge until the rock slides off. A second pull of the line shuts off the compressed air from the water tank. If the load slides off the barge before it has tipped far enough for the raised cylinder to touch the water, then at the second pull of the line the water drains back into the water tank. If, however, the barge tips so far over that the water tank is higher than the cylinder, the water drains into the intermediate tank, which is always lower than the cylinder. The barge then rises and is soon upright, the water draining back



A Mechanical Quartette

into the water tank proper from the intermediate tank. Compressed air, of which about 70 cu. ft. is required for each dumping, is carried to the barge through a hose connection with a small compressor on the tug.

The whole operation is carried out by the pulls on the line running to the valve box, the operations of whose mechanism change the weight distribution on the barge so that it is dumped and returned to normal position as described. About six tons of water are required in the water tank for a deck load of 200 tons.

It appears that the self-dumping barge costs less to construct than the ordinary false-bottomed hopper barges, and is cheaper in maintenance. It accommodates rocks of practically any size and weight within its total capacity. Hopper barges proved unsuitable for this work.

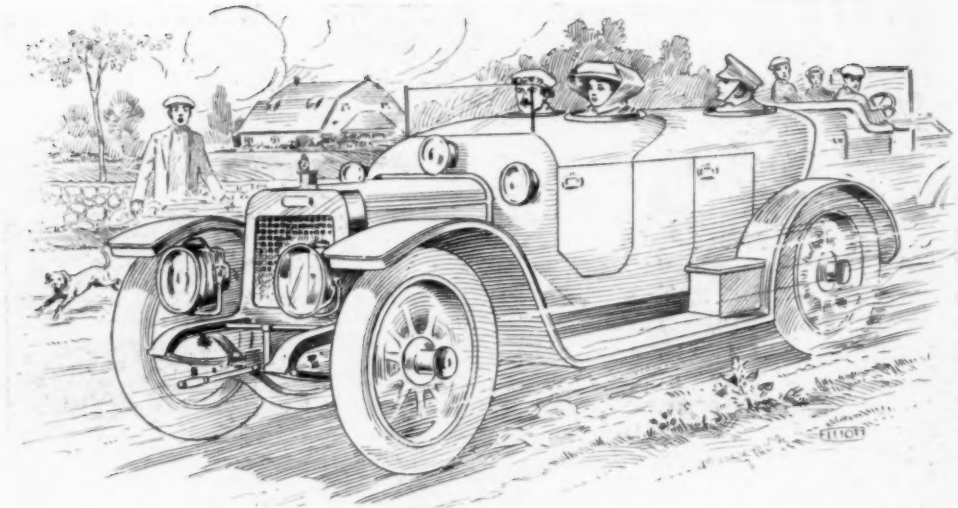
It is reported that experiments in utilizing nitrogen as a fuel for automobile motors are proving successful.

A SUCCESSFUL ORCHESTRA PHONOGRAPH

While the task of ordinary phonographs consists of replacing individual artists, or rather making accessible their performances to wider circles in a more or less perfect form, the instrument recently constructed by a French inventor is intended for producing effects of extraordinary sound intensity, which are said to equal those of a large orchestra. A feature of the apparatus is the purity of its sounds, which constitutes an undoubted advantage over the familiar mechanical piano.

As seen by the illustration, the instrument is provided with four phonograph funnels communicating with a sound range or distributor. The sounds of these four funnels are perfectly in tune with one another, so as to produce an absolutely harmonious effect.

The apparatus is actuated by a motor, operated by three substantial springs. It is perfectly suited also for the rendering of solos with reinforced intensity.



SUBMARINE TYPE OF AUTOMOBILE—The Motor, London, suggests this design as one that would attract considerable attention.

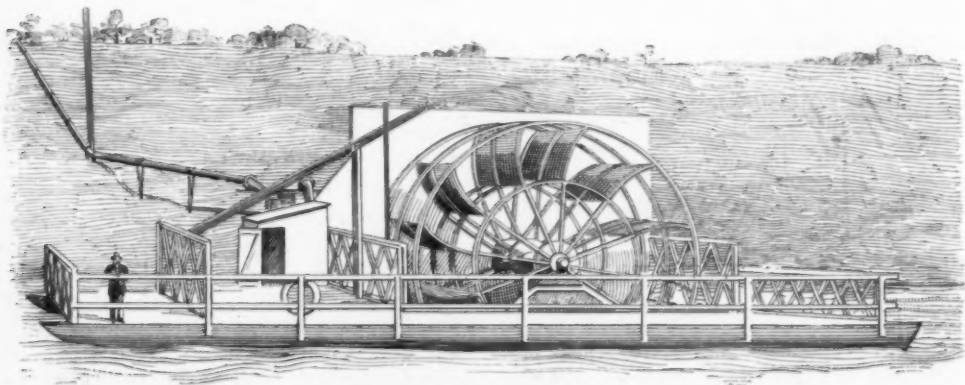
PADDLEWHEEL IN BARGE PUMPS WATER

An ingenious method of pumping water from a river is in use in a western town. The power comes from a large wheel placed in the middle of a reconstructed barge. The barge is held firmly in place both by hawsers attached to the shore and by a number of piles. The under part of the barge is so built that water can flow between the sides and under the deck direct to the wheel, the force exerted being sufficient to pump the water to a point 100 ft. above the stream in an abundant supply.

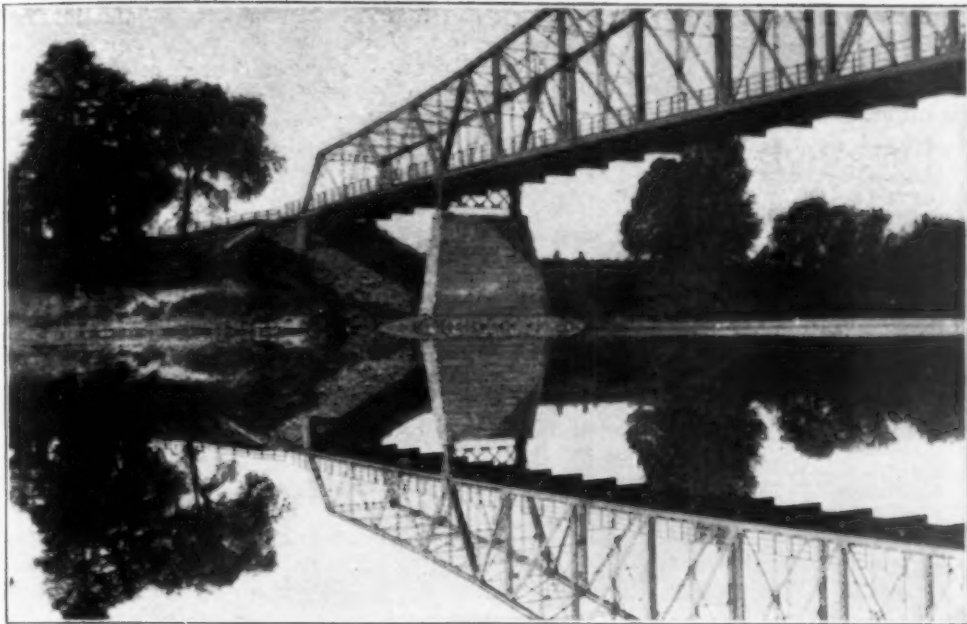
ANOTHER REFLECTION PHOTOGRAPH

A curious photograph showing a reflection of the subject in a pond of water which was so confusing that only an expert could distinguish which was the original and which was the reflection, was published in the March issue of Popular Mechanics. The article which accompanied it stated that the illustration was intentionally turned up-side-down. But through an oversight the cut was not inverted. Several readers of the magazine were sharp enough to detect the error.

A person might puzzle for hours



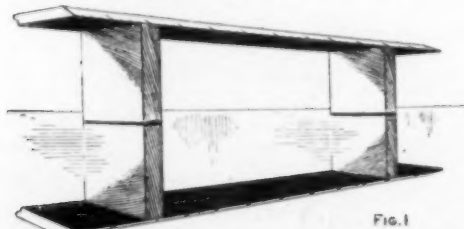
Floating Pumping Station



The Confusing Photograph

over such a photograph as is here illustrated, and even then be unable to state positively which was the original and which the reflection. This illustration shows the Northfield bridge over the Connecticut river between Mt. Hermon and Northfield, Mass.

The drawings, Figs. 1 and 2, show the manner in which the reflection may be distinguished from the subject of the photograph. To take such a photograph it is necessary that the camera be held as near the level of the water as possible. In the illustration of the bridge, the under side is the best portion on which to work. The drawings show a ruler supported by two blocks



View from Point Slightly Above Level of Mirror

on a mirror, the ruler corresponding to the bridge in the half-tone illustration.

In Fig. 1 the camera was held at a point almost on a level with the mirror. The reflection shows more of the under side of the ruler than can be seen by

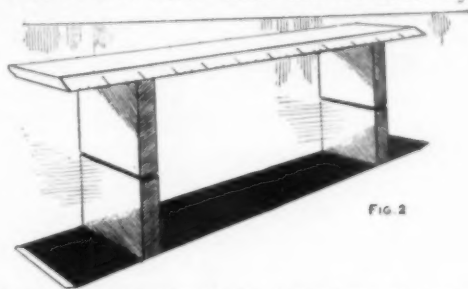


FIG 2

View from Point Considerably Above Level of Mirror looking at the ruler itself. Were the lens of the camera on a level with the mirror, the black portions would be equal. In Fig. 2, none of the under side of the ruler can be seen, but the reflection shows it even better than in Fig. 1. In this case, the camera was pointed at a sharper downward angle at the ruler. Applying this method of detection to the photograph of the bridge, the original and the reflection can be distinguished from one another. The illustration is inverted, the reflection being at the top.

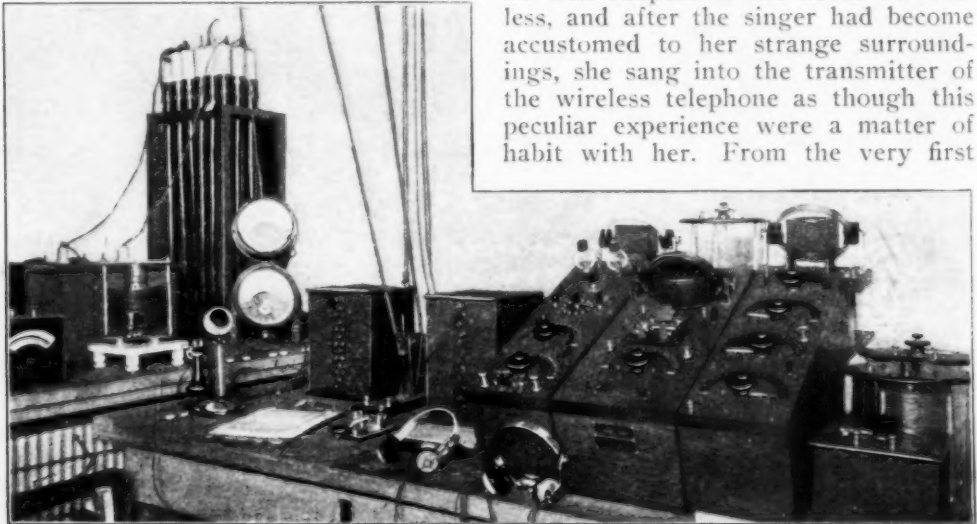
GAS WELLS SUNK IN LAKE ERIE

Gas has been struck in large quantities under the waters of Lake Erie just



Gas Well Rising Above Lake Erie

off the shore at Selkirk, Ontario. The well farthest out in the lake at present is the one shown in the illustration. It is on a bar about half a mile out, and more wells are to be sunk a still greater distance from the shore. The gas is piped to the shore and carried



Operating Room, Metropolitan Tower, Where Music Was Heard

by mains to St. Catherines and Hamilton. An extension of the pipe lines to Toronto is under consideration.

Several of the wells in the field were drilled from scows, and no difficulty has been experienced because of the water.

OPERA BY WIRELESS

The aria from "Carmen," sung by Mme. Mariette Mazarin, the famous prima donna, recently passed through the myriad jangling noises of the New York streets, and was gathered in all its original sweetness by the receivers of wireless telephones located several miles away.

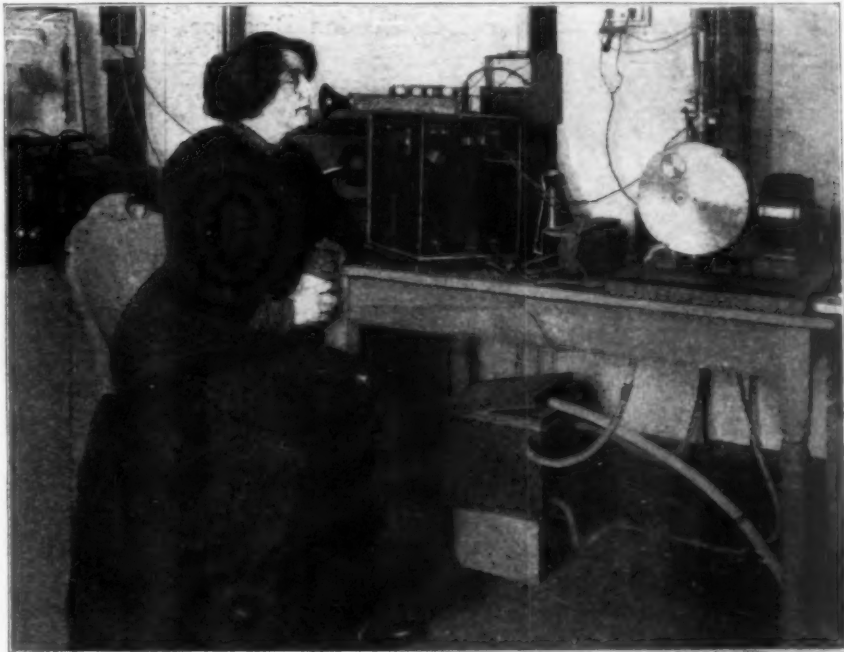
This novel exhibition took place at the DeForest laboratory, just opposite the Grand Central station, New York. The music was distinctly heard through some dozen head-phone receivers at the Metropolitan Life building, Madison Square, over a mile away, and at the inventor's Newark, N. J., wireless station, several miles further. At the Metropolitan Life tower wireless station the audience included the veteran American inventor, Prof. Hudson Maxim.

Mme. Mazarin's first song was the aria from "Carmen," which seemed to be well adapted to the needs of wireless, and after the singer had become accustomed to her strange surroundings, she sang into the transmitter of the wireless telephone as though this peculiar experience were a matter of habit with her. From the very first

notes the audience recognized the selection from "Carmen," which was heard in all its beauty on the roof of the Metropolitan Life building operating room, which is connected to the top of the 700-ft. tower by four phosphor-bronze antenna wires.

THE STORING OF DYNAMITE AT PANAMA

Three great magazines constructed of concrete block, one for each construction division, take care of the immense amount of dynamite used each



Madame Mazarin, Singing "Carmen" into Wireless Phone Transmitter

It sounded like fairy music which, while seeming to come from an immense distance and from nowhere in particular, carried clearly and perfectly every variation of the singer's voice, perhaps as though one were listening to a miniature phonograph in which all scratching or metallic vibration were absent.

When the prima donna was informed of the success of the first song, she warmed up to her task considerably and sang selections from "Elektra" which thrilled the distant hearers.

¶The "Parseval V," the smallest non-rigid passenger-carrying dirigible yet constructed—90 ft. in length—recently made an 80-mile trip in four hours in Germany.

month in the construction of the Panama canal. To insure against delay, should one of the dynamite ships be blown to pieces on its trip from the States, a full month's supply is on hand at all times, and as the average consumption of dynamite in excavating is 1,000,000 lb. per month, the supply on hand is always large.

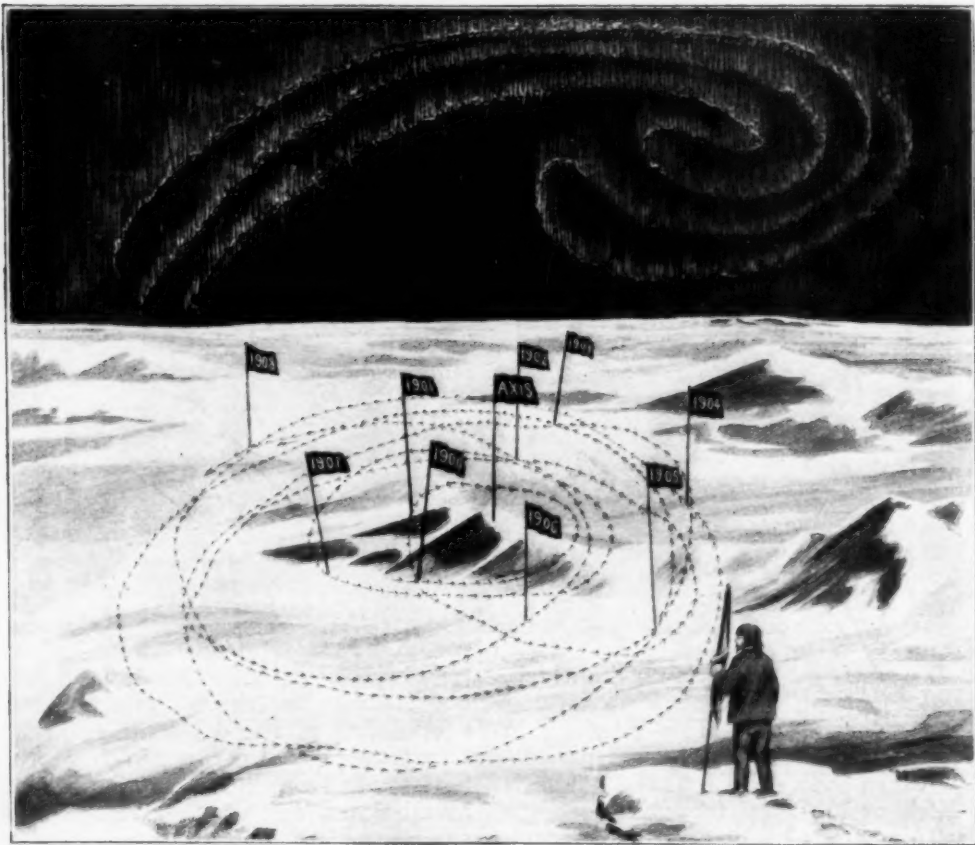
Each of the three central magazines will hold 600,000 lb. This huge amount of explosive in one building, should accident set it off, would be sufficient to destroy the canal structures were it near enough, but the magazines are well removed. The magazine on the Atlantic side is about five miles from Cristobal, surrounded by hills that form a bulwark between it and all the surrounding country.

POSITION OF NORTH POLE FROM 1900 TO 1908

That the North Pole shifts a few feet each year was proved years ago, but it was only lately that the displacements were measured with anything like accuracy at a number of stations. There is a yearly elliptical movement

MOVING PICTURES BY TELEGRAPH

Sending photographs over telephone or telegraph wires is not new and has not yet reached a thoroughly practical stage, but Edward Belin, a French inventor, according to the London Bioscope, has made an appa-



The Changing Positions of the North Pole

and also a circular movement of some feet in diameter in a period of 428 days. The distance between the point marked as "axis" in the accompanying diagram and the point where the pole was located in 1908 is about 14 ft.

It would be impossible, therefore, for an explorer to set up a staff that should, as it were, lengthen the axis of the earth, and insure that it will do so for all time.

ratus by which it may become possible to telegraph a series of photographs one after the other instantaneously, so as to give a moving-picture reproduction of an event at any distance away. Thus, a pageant in Chicago could be caught in a series of pictures, rapidly prepared for the telegraph, and be seen almost immediately on screens in Milwaukee and Detroit.

The method by which the inventor

sends the photographs over the wire is very interesting. An ordinary half-tone newspaper illustration, if examined closely, is seen to consist of innumerable dots of various sizes, which combine to form the picture with its lights and shades. Belin's sending records consist of innumerable perforations in a sheet of paper, each hole corresponding to the dots of a half-tone photograph.

The perforated paper record, or perforation photograph, is laid on a metal base and drawn along under a set of metal brushes. The wider the hole, the more contact there is between the brush and metal underneath. By this means the amount of electric current sent to the distant viewing screen is varied. The currents of various strengths are made to illuminate more or less strongly small portions of the viewing screen, each of which corresponds to a perforation in the picture transmitted.

The practicability of the idea, says the Bioscope, has been demonstrated between a suburb of Paris and a station in the city itself, but the inventor has not yet constructed a receiver capable of more than demonstrating that the idea is not a vain one.

DEEPEST COAL MINES IN EUROPE

Coal mines in Europe are much deeper than in the United States, the main reason being that the coal nearer the surface has been exhausted by long continued working. In some places, however, deep mining is carried on, because the operators are more willing to lift coal from a deep shaft at the place where it is to be used, or from which it can be most economically shipped, than to bring coal mined at less depth elsewhere to such a point.

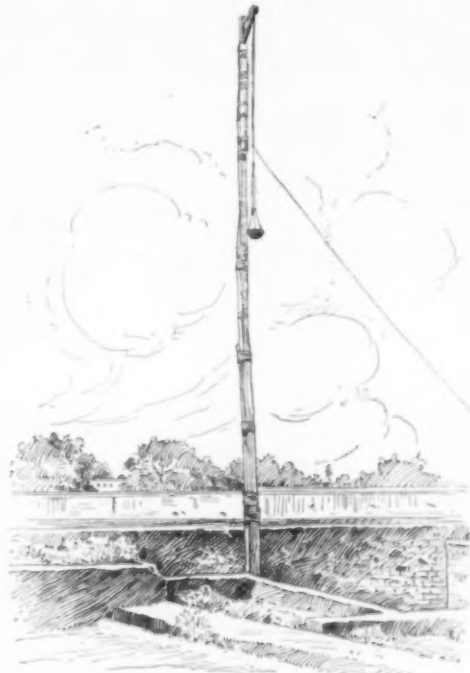
It is said that the deepest coal mines in Belgium are worked at a maximum depth of 3,937 ft., and many mines range from 2,700 to 3,000 ft. In England and Wales, where coal mining

has been carried on longer than in any other part of the world, the deepest mine attains a depth of 3,483 ft. This is the Pendleton colliery at Manchester, England. Two other mines reach a depth of 3,300 ft. The greatest depth of coal mining in Scotland is 2,700 ft., while coal mines in Germany reach a depth of 3,117 ft.

The deepest coal mining in the United States is in the Appalachian region, about 2,200 ft. below surface.

CRUDE SHOT MANUFACTORY IN MEXICO

Shot is still made in some parts of Mexico in the old, primitive way here



The Lead Falls from the Top of This Pole

illustrated. A tower, consisting of a spliced pole lashed together with rope, and having a crosspiece at the top, is first erected. Attached to the crosspiece is a pulley, used for hoisting a pot of molten lead to the top. When the lead has been hoisted, the workman climbs the pole and ladles the lead out

of the pot. It falls into a tub of water set at the base.

The shot thus produced is very irregular in form and resembles gravel



Shot is Formed in Tub of Water at Base

more than shot. No effort is made at screening or sizing the pellets.

PROJECTILE-RESISTING POWER OF CONCRETE

Several targets, made completely of reinforced concrete, have been erected at Sandy Hook for the purpose of testing the projectile-resisting power of such material with a view to learning what may be expected should heavy projectiles be hurled against the concrete work of the Panama canal. It is planned to shoot into these targets with one of the new 14-in. guns.

Already the army engineers have had an experience which, Concrete says, will give them an inkling of what to expect when a heavy projectile hits the solid concrete work of the canal. One of the 12-in. disappearing coast defense guns, mounted behind a heavy

mass of concrete, was prematurely fired. The muzzle was about 6 in. from the concrete and the shell tore through the 8-ft. thickness and continued through space with its velocity scarcely diminished. Apparently this would mean that the shell could have penetrated through many more feet of concrete, but investigation showed that it did not go straight through the concrete. Instead, it tilted upward, and had the concrete been many feet thicker, it would have come out through the top, thus minimizing the damage. No large chunks of broken concrete were left behind, nor did the concrete split, which is an important feature.

The expectation is that heavy projectiles, hitting the solid concrete walls of the locks, will do no serious damage, the projectiles not tearing straight through. A heavy projectile, however, would go directly through many points of the gates, leaving a clean hole. If a shell hit a heavy girder, or struck on a hinge, it would put the gate out of commission, but the plans not only call for extra gates, but movable dams as well, with which to check the flow of water.

RAPID TRANSIT BY SEA

All records for water transportation (bridged for just a few miles by land transit) between Pacific coast ports and New York, were broken recently by a shipment of 3,500 tons, including canned goods, fruit, etc., from Puget sound and San Francisco. The cargo was transported from these ports to Salina Cruz on the steamer "Isthmian," shipped across the Isthmus by rail to Puerto Mexico, and carried from that port to New York by the steamer "Texan."

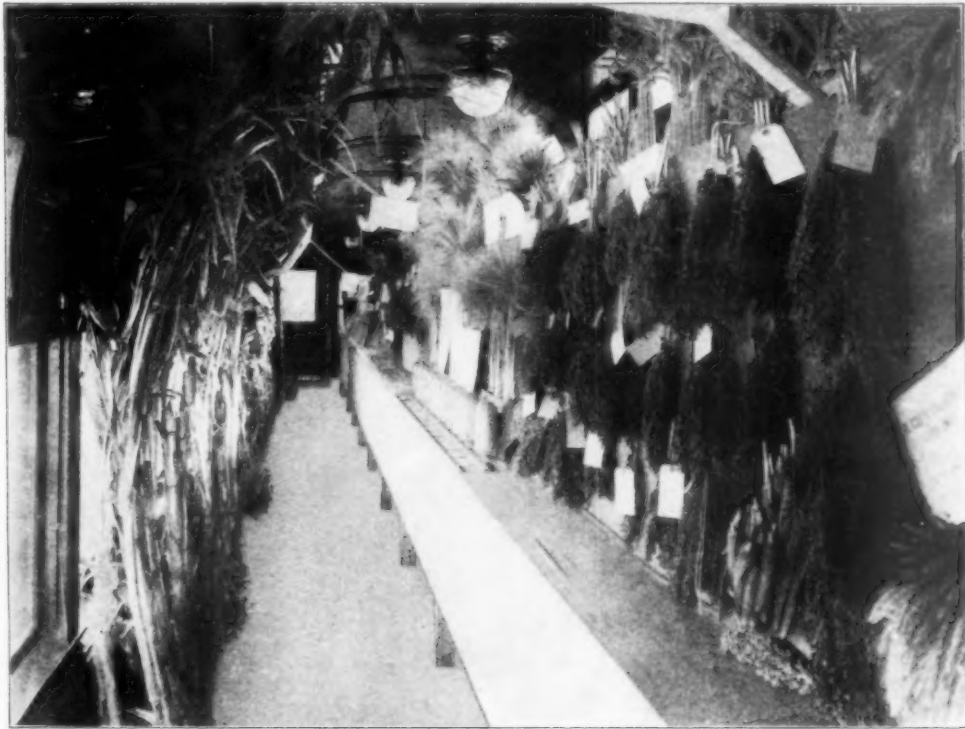
The cargo was in transit just 21 days, which is said to be shorter than the average railroad time for freight across the continent. This demonstration points to what may be accomplished by one boat, instead of two boats and a stretch of railroad, when the Panama canal is completed.

EDUCATION BY THE CARLOAD

By CHARLTON L. EDHOLM

A TRAIN of nine cars is now touring California in charge of professors from the State University at Berkeley, carrying valuable information throughout the rural districts. Five cars of this train are filled with exhibits of practical value to the farmer and the farmer's wife and the

scientific poultryman. It is complete in every detail and built on a scale of one-sixth of the full size. A few bantams were added to the exhibit to give it an appearance of the real thing. In connection with this exhibit were trap-nests, incubators, brooders, egg-weighers and testers, all of the latest model.



Interior of Grain and Corn Exhibit Car

corps of lecturers cheerfully explain every detail to the crowds which turn out at every stopping place.

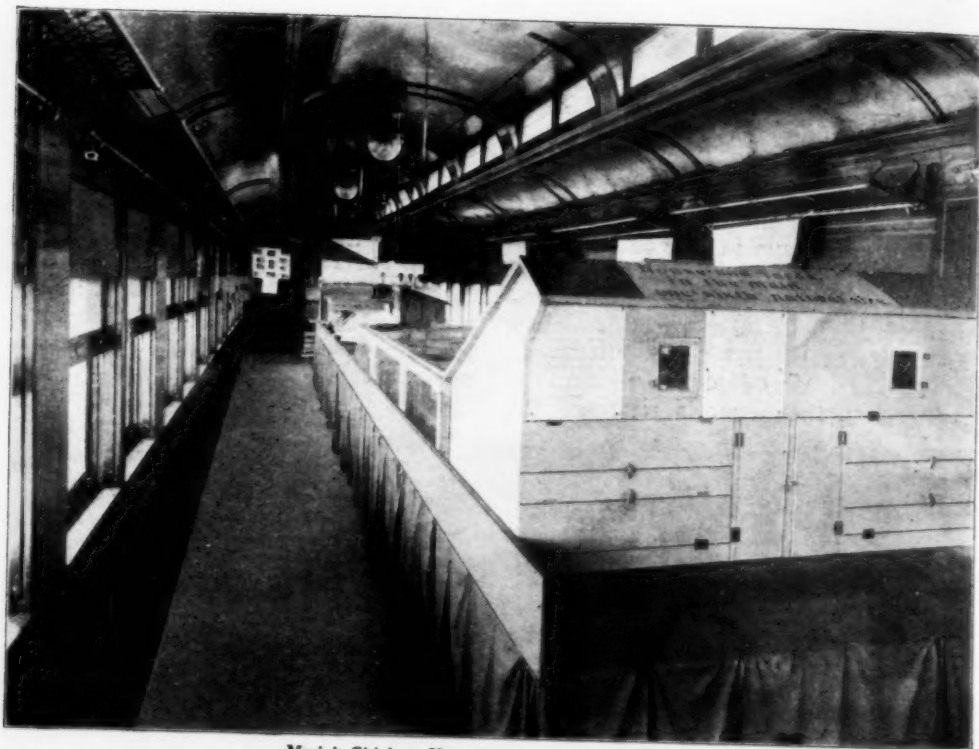
The visit of this train to a little town means practically a university course in agriculture to the ranchers who visit it, as by using striking exhibits, such as models of up-to-date farm buildings, the information can be conveyed at a glance.

One of the illustrations shows a late improvement of a chicken house for the

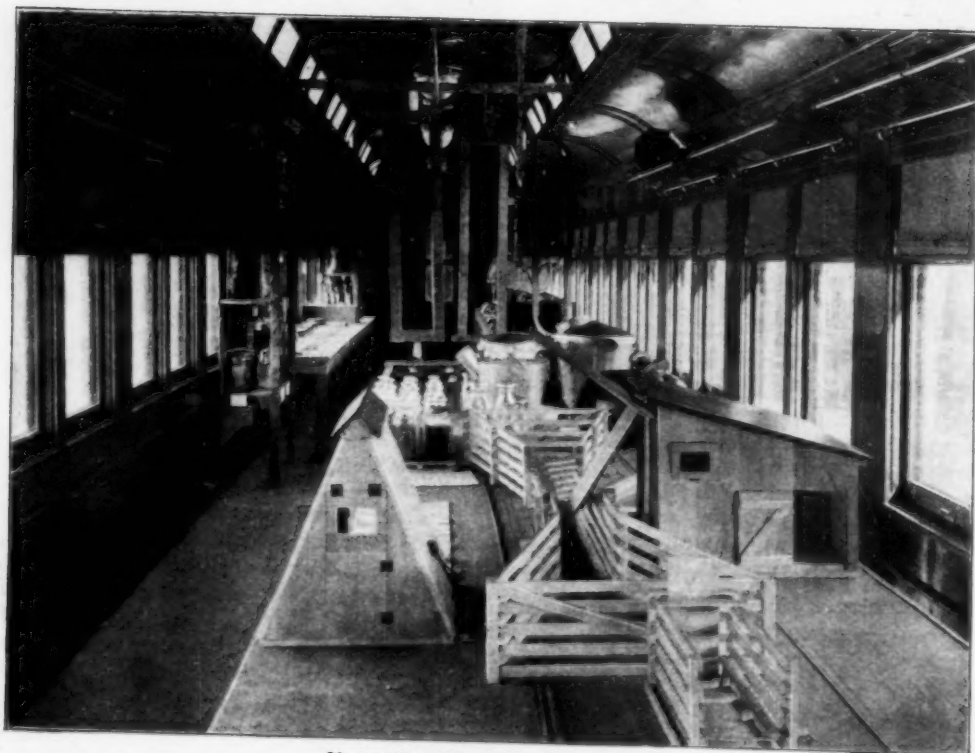
Another photograph shows a modern design for a hog house and dipping pen.

In the "animal car" are also a number of exhibits and photographs telling how to detect diseases in live stock, and giving remedies and methods of treatment.

In a car which treats the very serious menace of insect pests and fungus troubles, the fruit grower can find sections of trees attacked by the various diseases, scales and blights, while in



Model Chicken House with Live Exhibits



Model Hog House Shown in Train



Interior California University Farm Education Car

connection therewith are the sprays, fumigators, etc., which check such ravages.

The new industry of eucalyptus growing is treated extensively, a great variety of eucalyptus being represented by small growing specimens and samples of the mature timber.

Another valuable exhibit is devoted to irrigation, showing the various appliances for use in arid districts.

Of course the cereals are well represented and the great industry of grape raising receives due attention, the correct methods of pruning being fully explained.

Brief, pithy bits of advice, expressed in a way calculated to impress the reader, are printed on placards and hung in the cars. Here are a few:

"It costs California \$1,500,000 per year for smut grown on grain. It is evidence of poor farming. Kill the smut spores on the seed by using bluestone or formaldehyde."

"Does your soil dry out rapidly? It needs humus. Add this by turning under a winter grown crop of legumes."

And here is a bit of philosophy which should increase the feeling of self respect of every rural visitor who reads it:

"Agriculture must be made to yield returns in wealth, in opportunity, in contentment, in social position, sufficient to attract and hold to it a class of educated American citizens."

The train is in charge of Professor Warren T. Clarke, Superintendent University Extension of Agriculture-Horticulture Division, while each car and each important exhibit is in charge of an expert.

The expenses of the train are borne by the Southern Pacific railroad with the exception of the salaries of the demonstrators.

About 18,000 people visited the car

in its recent tour and in some places school children went through in a body, thus getting these modern ideas early in life before they should become prejudiced in favor of antiquated methods.

PURE AIR MOUTH-PIECE FOR GAS WORKERS

This respirator is a pure air mouth-cap to be worn by gas workers when entering cellars filled with gas from



Safety Apparatus for Gas Workers

leaking pipes, when tapping main pipes in awkward places where it is otherwise impossible to get away from escaping gas, and for other purposes of like nature.

A slight pressure of air is maintained within the cap by means of fresh air supplied by bellows, and gas is thereby kept from entering it. The cap is adjusted firmly, but not too tight, so that the excess air may escape around its edge.

Pea vines, long thrown away as waste by the canning factories, are now a profitable by-product. The vines are fed to stock in a fresh state, made into silage, or cured for hay.

STURGEON RELEASED AFTER THIRTY YEARS' CAPTIVITY

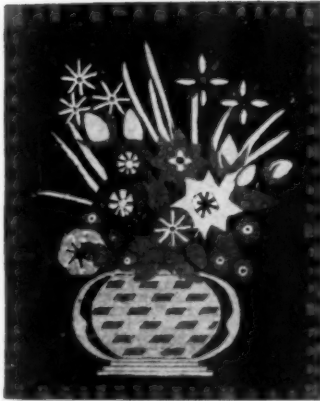
A sturgeon, nearly 6 ft. long, for more than 30 years a captive, was released in the Columbia river recently because it had outgrown its quarters. The big fish, quite small when captured in a fish wheel near Cascade Locks in 1880, was placed in a pond on Paradise Farm, Hood river, Oregon. A number of years ago the pond filled with grass and weeds, the water becoming so shallow that the back of the sturgeon was blistered by exposure to the sun. It was then placed in the basin of a fountain on the farm, and this remained its home until a few years ago.

For years it had swum around in a circle, and many people believed that when it was released it would continue to swim around in a circle by force of habit. When dropped into the Columbia river it hesitated for a moment, bewildered, then swam straight for deep water.

NEW REMEDY FOR STRONG POISONS

Experiments at the Rockefeller Institute of Medical Research are said to have developed a surgical expedient by which the effects of the most virulent poisons may be rendered relatively harmless. So long as there is the faintest heartbeat, it is possible to save anyone who has taken what has been heretofore regarded as a fatal dose of strychnine, morphine, illuminating gas, and kindred poisons.

The basis of the treatment is the forcing of a steady supply of air through the windpipe into the lungs. It differs from other artificial means of respiration in that the lungs themselves are not called upon to give aid. A small tube forced through the windpipe to the openings of the lungs conveys the fresh air, while the foul air returns by pressure through the windpipe outside the tube which may be inserted through the mouth, or an aperture cut in the windpipe.



Examples of Pasted Paper Designs

COLORED PAPER DESIGNS MADE BY CHILDREN

The industrial art school of Hamburg, Germany, an institution which strives to bring out the dormant possibilities of children, has evolved a form of developing decorative design which offers unlimited possibilities, not only for children, but for expert designers as well.

The pupils are furnished with colored papers to be cut into such forms as they might choose, and to be assembled and pasted on neutral-colored backgrounds in any original manner. The excellence of the children's work after a year of experiment is shown in the illustrations, which are reproductions of the pasted work.

The results obtained by the pupils are clean-cut contrasts of color. "Add to this the gradations of shade and the texture obtained by transferring such patterns to fabrics," says an authority on upholstery, "and one can readily see that many of the patterns evolved by the children are commercially practical and useful. The regular designer could also evolve his ideas by assem-



bling and reassembling the design suggestions that come to him, until he finally decides on his scheme."

MATCH STICKS OF GRASS

A factory at Sholapur, British India, is making match sticks of a kind of grass abundant in those regions. The grass is cut into 2-in. lengths, winnowed and screened to obtain uniform size, and then boiled in paraffin for five minutes and dried in a revolving drum. About 25 lb. of Burma paraffin is sufficient for 8,000 boxes of matches.

After drying, the match sticks are shaken through a horizontal sifter, which deposits them in layers, secured in a frame for the dipping of ends. They are dipped in a solution of chlorate of potash, sulphate of arsenic, powdered gypsum and gum arabic. About 7 lb. of this mixture is sufficient for 8,000 boxes of 80 matches each. By an ingenious contrivance, some of the closely packed stems are

forced forward in the dipping so as to avoid the sticking together of the compact mass. The materials are so cheap that the matches are sold for 26 cents per gross, which is about a cent for five boxes.

COMBINED CURRYCOMB AND BRUSH

The automobile threatens to put the horse out of business, but improve-

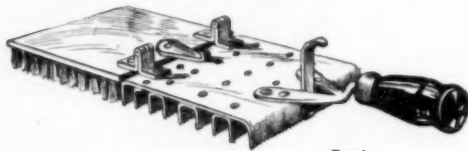


FIG 1

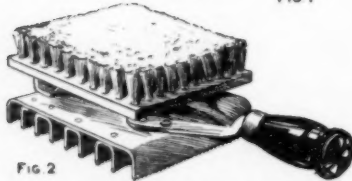


FIG 2

Currycomb Brush Opened and Folded

ments in the methods of caring for the faithful animal are still being made. The sketches show a device recently brought to the attention of the United States army. It consists of a combined currycomb and horse brush. The upper view shows it opened so that the brush may follow the comb over the horse. The lower sketch shows the brush folded back to allow the use of either currycomb or brush separately.

TIME TINTED WINDOW PANES AID TO EYES

Having been in use for more than 75 years, it was discovered recently that the window-panes of certain Philadelphia houses had been given an amethyst tint by time and the direct rays of the sun, and that lenses made from the glass were an aid to persons whose sight had been impaired by working on bright metals or under artificial light. The glass has also proved of great value to those whose eyes are exposed to danger of injury in X-ray laboratories.

MAIL RECOVERED FROM BOTTOM OF THE SEA

The procedure of the postoffice department in handling mail recovered from a sunken ship is very interesting as shown by this announcement, which was printed on an "official business" envelope of the Seattle postoffice, and contained a letter and money sent to this magazine for subscriptions by A. J. Painter, of Fairbanks, Alaska. The letter, as told by the announcement was in the mail that sank to the bottom of the sea when the steamer "Yucatan" was wrecked off Goose island, in Icy straits, Alaska, last February. The writing in the letter was perfectly clear, although the paper was stained red, blue and pink by inks that had run from stamps, post marks, etc.

When mail has been subjected to the action of water, all envelopes and wrappers held together with mucilage and paste come apart, but in the recovery of first-class mail thus damaged it is usually a simple matter to identify the letters with their envelopes.

The printing of an announcement of the cause of the damage and delay of mail on the envelopes with which the damaged ones are replaced is the usual method adopted by the postof-

THE mail in this envelope was delayed and damaged by the sinking of the steamer "Yucatan" at Goose Island, Icy Straits, Alaska, on Feb. 16, 1910. This mail reached Seattle March 16, 1910

W. J. VICKERY,
P. O. Inspector-in-Charge,
Spokane, Wash.

Wreck Announcement on Official Business Envelope

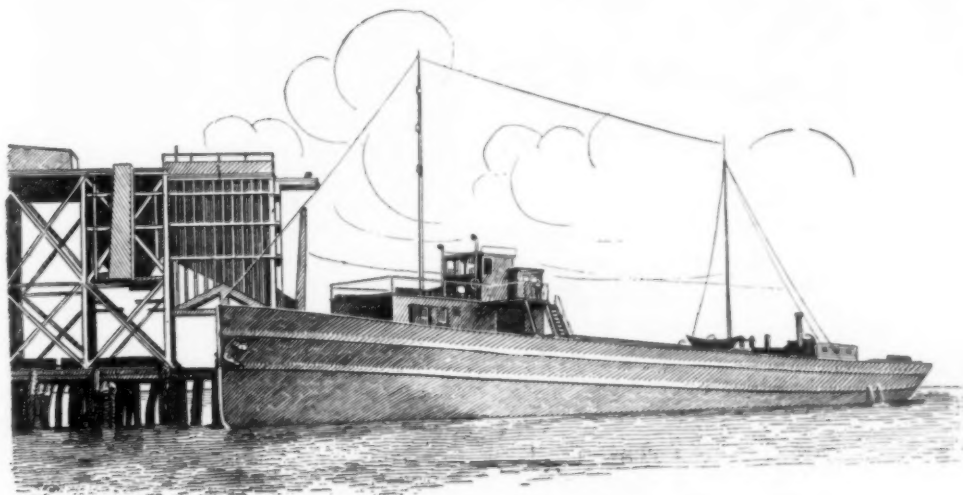
ice department when the amount of mail recovered from a wreck is sufficient to warrant the required press work. Large postoffices usually have a small printing outfit for such contingencies.

A STOMACH TELESCOPE

A stomach telescope, or gastroscope, invented by one of the staff of the London hospital, is in continual use in that institution and has proved itself of the greatest value in the diagnosis of stomach disorders. It enables the physician to actually see for himself the exact condition of the whole of the interior of the stomach, the slightest ulceration, growth, or other abnormality in the membrane being thus readily observed.

LARGEST GAS-DRIVEN CARGO VESSEL IN AMERICA

The largest gas engine-driven cargo vessel in America, if not in the world, is the "Contra Costa," a 1,580-ton oil carrier operating in San Francisco bay. The length of the vessel is 189 ft.; her beam, 37 ft., and her depth, 13 ft. 6 in. The cargo is carried in six oil tanks formed by four transverse and one longitudinal bulkhead. The total capacity of the tanks is 300,000 gal.



Twin-Screw, 189-Ft. Vessel, Driven by Gasoline Engines

That such an instrument is of very great importance can be clearly understood from the fact that a cancer of the stomach, if found at the earliest stage of its growth can sometimes be cured because of the prompt treatment.

LIFE-PRESERVER AFLOAT OVER ELEVEN YEARS

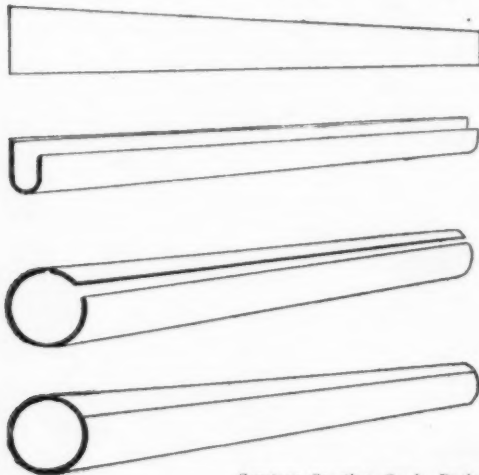
A life-preserver from the steamer "Portland," which was lost in a blizzard in November, 1898, was picked up at Pleasant Beach, near Cohasset, Mass., a month or two ago. Although tossed about by the ocean for more than 11 years it is in a fairly good state of preservation. No other instance of life preservers lasting so long is known.

The propelling equipment consists of two engines of 250 hp. each, coupled through a self-contained clutch and reverse gear to 3-bladed propellers of 6-ft. diameter. With the engines making from 240 to 260 revolutions per minute, the speed of the boat is about nine miles an hour. All power used on board for pumping oil and other purposes is generated by internal combustion engines.

In comparison with steamers of equal size, the lighter weight and smaller space required for the gasoline engines allows much more cargo to be carried. The first cost of the machinery is about 20 per cent less than in a steam vessel, the crew required is smaller by at least four men, and the cost of fuel is less.

THE STAGES IN STEEL FISHING-ROD CONSTRUCTION

The raw material for steel fishing-rods is made from cold-rolled annealed crucible steel, and comes in sheets of the many widths and gauges made nec-



Courtesy Sporting Goods Dealer

Four Stages of Steel Fishing-Rod Construction

essary by the different models of rods produced. The widths vary from about $2\frac{1}{2}$ in. to 4 in., and the thickness varies from .008 to .025 of an inch. The first operation is the cutting of the sheets into the various lengths required for the particular joints, and the lengths are then sheared down into strips like the one shown in the first drawing. Fed through a heavy press, the strips take the U-shape illustrated by the second drawing. The next step is to file the inside edges to a slight bevel, so that in the later and finishing processes the edges of the joint will come close together. This operation is very important, and is done entirely by hand.

In the next operation an accurately ground arbor is laid in the U-shaped joint and the two edges are clamped as one into the jaws of a machine somewhat resembling a lathe, which roughly shapes the steel into a circular form, as shown by the third drawing. The last process is conducted in a special rolling-mill, which rolls the joint tight upon the arbor. The face of the rolls has a groove cut on it, varying in size

from the smaller to the larger end of the joint. In these rolls lies the secret of producing a perfect joint. The arbor is withdrawn after the joint passes through the rolls, and the joint is left in the rough as shown by the fourth drawing.

During these operations the steel has not been hardened or drawn, and could have been easily bent into any shape. The soft joint is then heated up to a certain temperature and plunged into an oil bath, being hardened by the rapid cooling. It is then drawn to give it the tough, spongy temper so well known in fine steel rods. To draw the joint it is again subjected to heat, and immersed in a bath of molten lead. This operation relieves the strain and draws some of the hardness from the metal. The straight joint shown in the drawings has become warped and twisted under the heating processes, but when it cools after the immersion in lead it has lost its brittleness, is very tough, and will stand a severe bending test. The next process consists of straightening, after which several finishing operations are necessary.

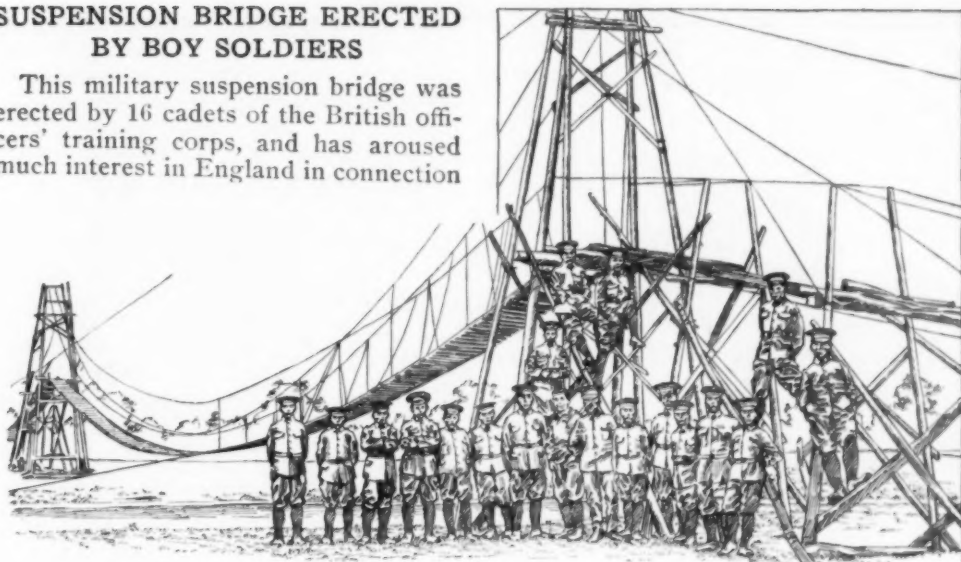
HORSE VEHICLES CAUSE MORE DEATHS THAN AUTOS

The annual report of street accidents caused by traffic in London show that the automobile, although equalling in numbers the horse vehicles, and vastly exceeding these in mileage, was responsible for a considerably less number of accidents than the older form of vehicle.

A further confirmation of the comparative safety of the automobile as concerns the general public comes from New York in the form of a report from the coroner's bureau. Of the three systems of transportation—railways, horse vehicles, and automobiles—the latter claims the least number of victims, the number of deaths attributed to each being 89 to railways, 79 to horses, and 46 to automobiles.

SUSPENSION BRIDGE ERECTED BY BOY SOLDIERS

This military suspension bridge was erected by 16 cadets of the British officers' training corps, and has aroused much interest in England in connection



Bridge Erected by British Cadets

with the cadet movement in the public schools. It was erected over the Trent river at Castle Donington, and has a length of 140 ft. from pier to pier. Much engineering and constructive skill was shown by the boys in the work.

THE FRENCH HATPIN LAW

If a person in Paris can prove that he received a scratch from a hatpin which exceeded a certain prescribed length and extended a certain number of inches beyond the brim of a hat, the wearer is liable to fine or imprisonment. As soon as the hatpin cases began to enter the courts the jewelers hastened to invent hatpin shields. These were at first small balls or enameled buttons about the size of a half dollar, but now they have grown in size until a diameter of as much as 3 in. has been reached. Many consist of framed miniatures, which correspond to the fad for Louis XV effects. Hand copies of the pictures of Boucher, Nattier, Watteau, Lebrun and other painters of court beauties, are framed in gold, set with rhinestones, and provided with means of attaching them to ends of otherwise vicious hatpins.

TAXI "FOR HIRE" SIGN ON ROOF OF MACHINE

The fact that the little "for hire" flag ordinarily carried by taxicabs does not show as prominently as could be desired has led several of the taxicab operators in London to equip their machines with a "for hire" sign, mounted as shown in the illustration. It can be seen very clearly from this van-



The New "For Hire" Signal

tage point, and, when the machine is occupied, can be dropped out of sight by pulling its standard down.

GIFT TO THE CROWN PRINCE AND PRINCESS OF GERMANY

This superb specimen of the goldsmith's art, said by German critics to



Costly German Candelabrum

have no superior anywhere, is the wedding gift of Saxony to the Crown Prince and Princess of Germany, whose marriage took place about four years ago. After more than three years of labor the beautiful candelabrum is at last completed.

About 3 ft. in height, and resting upon a heavy onyx base of about the same height, it is a harmonious combination of symbolic designs. The center of the lower part is shaped into a mountain, crowned by the castles of Burg Ranis, Falkenstein, Rudelsburg, and Merseburg. Rising above the mountain is the figure of Saxonia, in almost half life size, the figure poised upon an onyx plate, corresponding to the base. From the shoulders, a

mantle in simple, almost severe lines, falls and seems to extend protection over the land. The inner garment is of silver, incrustated with gold, in a design of rose and myrtle wreaths. The mantle is wholly of enamel, showing a lining of delicate green, and an outer side of rich violet, decorated with rose and myrtle leaves and the Hohenzollern arms. The head and arms of the figure, left bare, are strongly modeled, and the outstretched arms uphold the candelabrum proper, a massive golden circlet with places for eight candles. It is said to be the largest gold band ever constructed. The four-leaved clover, symbol of good luck, appears in the decoration.

HOT AUTO ENGINES AND ECONOMY

Recent tests in England of an auto engine, altered from water-cooled to air-cooled, show that the mileage per gallon of gasoline consumed rose from 18 to 27, an increased efficiency of about 50 per cent. This, it is claimed, bears out the contention that the higher the temperature the engine could be worked at, the greater would be its efficiency in regard to the fuel consumed.

One European automobile expert contends that the only limitation is in the matter of lubrication, and that an engine can be worked as hot as it will lubricate. The same expert says that if he could get a lubricant that would stand a heat of 1,000 degrees, he would work his engine at such temperature.

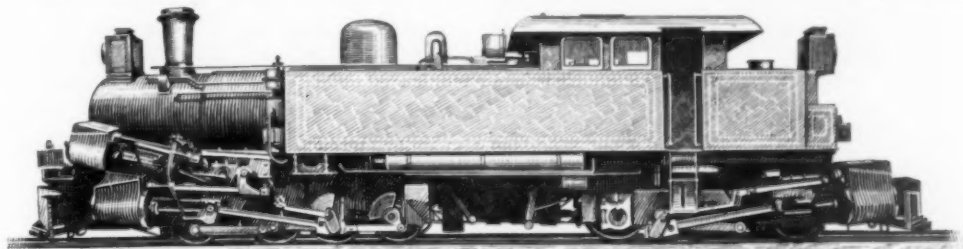
COMBINED RACK AND ADHESION LOCOMOTIVE FOR ANDES

The completion of the great tunnel through the Andes, described in a recent issue, which forms the connecting link of the railroad crossing South America from Buenos Aires on the east coast, to Valparaiso on the west coast, has necessitated the unique type of engine shown in the accompanying illus-

tration. It is an exceptionally powerful articulated, combined adhesion and rack-rail locomotive.

The rack rail of the Andes railroad,

tween the ordinary rails where the roadbed is exceptionally steep. A gear under the locomotive engages with this and forces the locomotive along. The



Locomotive for Mountain Climbing

also known as a cog rail, a fine example of which is the Pike's Peak railroad in Colorado, is a third rail running be-

locomotive illustrated has two sets of rack pinions. It has two sets of coupled wheels, all 3 ft. in diameter.

HOW TO MAKE A SMOKING STAND

When making the smoking stand shown in the accompanying photograph, use quarter-sawed oak, if possible, as this wood is the most suitable for finishing in the different mission stains. This little piece of furniture is very attractive, easy to construct, and is an article that a smoker would appreciate.

If the stock is purchased finished and sandpapered, it will save much of the hard work. The material needed is as follows:

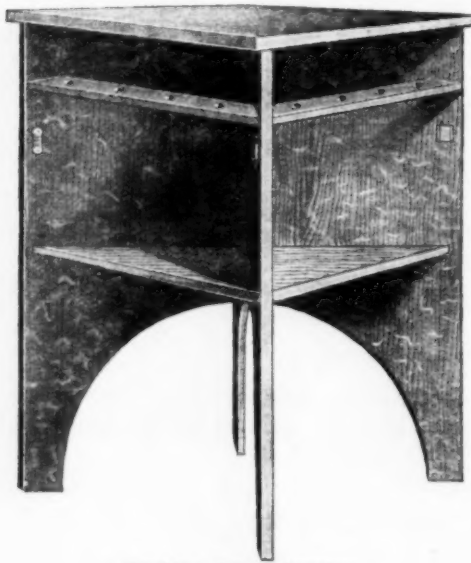
One piece, $\frac{7}{8}$ by 12 in. by 9 ft. long, for the legs.
 One piece, $\frac{7}{8}$ by 10 in. by 4 ft. long, for the top.
 One piece, $\frac{7}{8}$ by 8 in. by 4 ft. long, for the shelves.
 One piece, $\frac{1}{2}$ by 2 in. by 6 ft. long, for the pipe rack.

The legs can be made first. Cut four pieces off the 12-in. board, each exactly 25 in. long, and lay each one out with a pair of compasses as shown in the detail drawing at Fig. 1. With a circle or keyhole saw cut out the piece, then shave out the saw marks and sandpaper smooth.

Next take the 8-in. board and make the shelves. Set a bevel protractor at a 45-deg. angle, lay out the pieces as shown in Fig. 5, and cut them out with a saw. Eight pieces are cut out as shown in Fig. 4. These pieces can be cut out of the scraps left from cutting

the legs and shelves. Cut them so that the grain runs the long way. Place two of these braces on the bench with but with a piece of $\frac{7}{8}$ -in. stock between them, and the other two beveled ends resting against a straightedge. Fasten them to the bench with a couple of nails, leaving the heads sticking up so that you can pull them later with a claw hammer. Remove the straightedge and slide the piece that is between the braces along until it projects 4 or 5 in. from the side formed by the straightedge. Then place two more braces in the corners formed by this piece, put two $\frac{7}{8}$ -in. pieces between the two braces that are fastened, and the two that are loose, so that each brace will be in its proper place. Fasten the last two the same as the first pair. Then remove all the pieces from between the braces and place the tops of the legs in their stead. These should be fastened to the braces with 1-in. screws of small diameter, put in at an angle. Bore a hole in straight for about $\frac{1}{4}$ in. with a $\frac{1}{4}$ -in. bit for each screw, and then run a gimlet at an angle into the leg. After you have the legs fastened to the first set of braces, measure up from the bench 10 in. and put in another set, being careful to get

them all the same distance from the bench, as the inner corners of the



Smoking Stand Complete

shelves rest on these braces. Now pull out the nails and set the stand on its feet.

Next put in the shelves. Place the inner corner of one on one of the braces, and fasten it there with a screw put through the brace from the bottom. Now fasten a clamp on each leg at the ends of the shelf to form a support on the top side of the shelf. Then put four screws through the shelf from the bottom into the legs. Repeat the operation on each shelf, being careful to get them all the same height.

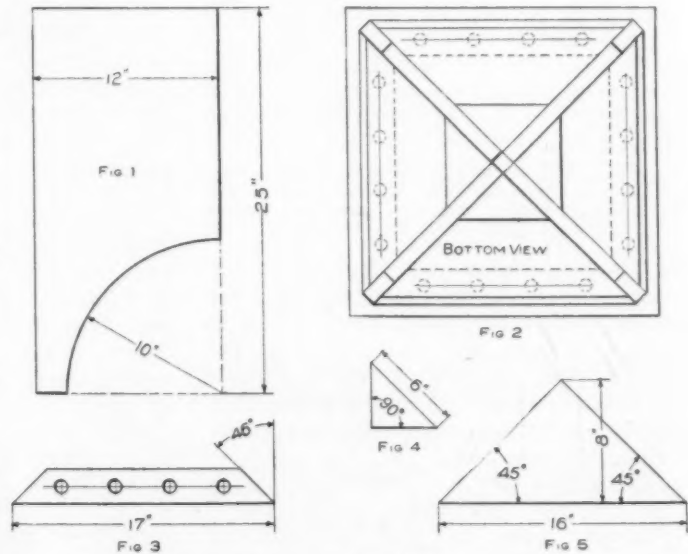
Four pieces like Fig. 3 should now be made. These pieces will have to be fitted in place as they should slant outward so that it will be easy to put articles through the holes. The holes should be about $\frac{5}{8}$ -in. diameter, al-

though they may be of various sizes, if desired.

The top can be made by cutting off two pieces from the 10-in. board, each 20 in. long, and fastening them together with dowels. Smooth the ends and be sure that the boards match evenly. It makes a better job to glue the top together, in addition to the dowels, and, if you do this, it would be better to make the top first. Then it will have time to dry before you are ready to use it. In putting on the top, care should be taken to get each of the corners an equal distance from the legs. Then a screw may be put up through each one of the braces and two or three through each leg into the top.

Now smooth all rough and uneven places with fine sandpaper and apply the finish. Secure some metal match-safes and scratchers, fasten on as shown in the photograph, and the stand is complete.—Contributed by Dewitt Tappan, Watervliet, N. Y.

☞ New Bedford is experiencing a revival of the whaling industry. Nine whalers left the port on one day last



Details of Smoking Stand Construction

month, two of them bound for the West African coast.

DEVICE LIGHTS AUTO ACETYLENE LAMPS

A device for electrically lighting acetylene lamps on automobiles by short-circuiting the regular sparking ignition system of the machine has been designed. Requiring no separate source of current and no individual spark coil, the only additional parts required are a switch, the gas-tank valve, the spark-plugs, and the wiring. The points of the spark plugs project across the jets of the acetylene burners.

The switch which is placed under the overhang of the front seat, is so connected into one of the high-tension circuits that the latter can be short-circuited across the lamp spark plugs. These have their points closer together than the cylinder spark plugs, and do not work under compression, so that the circuit offers considerably less resistance than the regular one, and the current flows through it by preference whenever the switch allows.

The valve of the gas tank is placed beside the switch. After the gas has been turned on a sufficient time to allow it to reach the burners, the switch is turned on and the spark, jumping across the jets, ignites the gas.

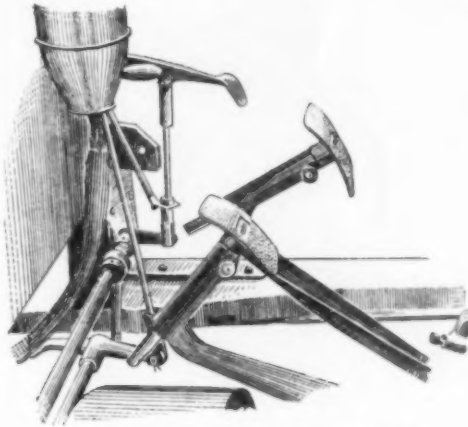
DOUBLE-POINTED NAILS FOR FENCE TOPS

An interesting novelty in nails is illustrated in the accompanying drawing. They are double-pointed affairs, and have been placed on the market by a European firm for driving into the tops of fences and gates to discourage climbing. The nail is also adapted for nailing dowels. A small collar which rests on the middle shank, is struck by a hammer in driving the nails.



ADJUSTABLE FOOT-CONTROL PEDALS

One of the new features of automobile mechanism which attracted much interest at the automobile shows during



Car Equipped with Adjustable Pedals

the first part of the year, was the adjustable foot-control pedals with which one type of car was equipped. By this adjustment the driver of the auto is able to lengthen or shorten the pedal stems to suit his own individual requirements.

FRENCH CATCHING AND PRO- JECTING RACQUET

An interesting ball game for outdoor play is possible with the curious racquet shown in this illustration. Two or more people may play, and the soft rubber ball used is just of a size to fit securely into



the cup-like receptacle on one side of the racquet. This cup is of elastic rubber. A sharp jerk dislodges the ball from it. Then the player reverses the side of the racquet and knocks the ball in the direction of one of the other players, who catches it in the rubber cup, if he can, and projects it back again.

HORRIBLE AND INGENIOUS APACHE WEAPONS

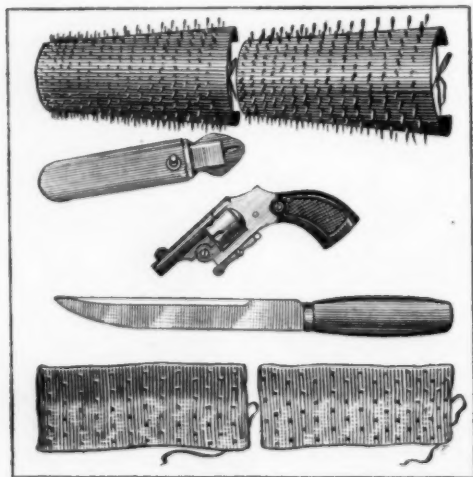
The knife and revolver shown in the illustrations are weapons with which every Apache of Paris is armed, but the



How the Vicious Arm Guards Are Worn

nail-studded arm guards are new and ingenious weapons of defense which have just been forcibly brought to the attention of the Paris police by the killing of one policeman and the wounding of three others.

How the arm guards are worn is shown by one of the illustrations, and



Weapons of an Apache

their purpose is to give the criminal a chance of escape even though laid hold

of by the officers. Hidden under the sleeve of the coat at the points where an officer invariably grasps an offender, they tear the flesh of the clutching hands, and in the moment of surprise and pain the wearer breaks away.

The arm guards shown in the illustration were found on a creature of the true Apache type named Liabeuf. Apache is the name given to the worst class of Parisian criminals. As Liabeuf was leaving a wine shop two officers clapped hands on him. Immediately there were shrieks of pain as the vicious, needle-pointed nails entered the flesh. For the moment freed, the Apache stabbed one of the officers in the breast and the other in the neck, but other officers appeared and a hard struggle followed, knives, sabres, and revolvers taking part. The officer stabbed in the chest, fought on although mortally wounded, and at last the Apache received a sabre stab which ended the fight.

GAS TAKES PLACE OF ELECTRICITY IN PRUSSIAN TRAIN LIGHTING

A few years ago the defects of gas lighting for railroad coaches induced the officials of the Prussian railroad system to make experiments and finally install electric reading lamps over the seats. The lights were supplied from electric lighting plants carried in the baggage vans, with batteries for maintenance of light when the trains were at a standstill or traveling slowly, but this caused difficulties when the coaches of other German and of foreign railways, which were not similarly equipped, were coupled to the Prussian trains.

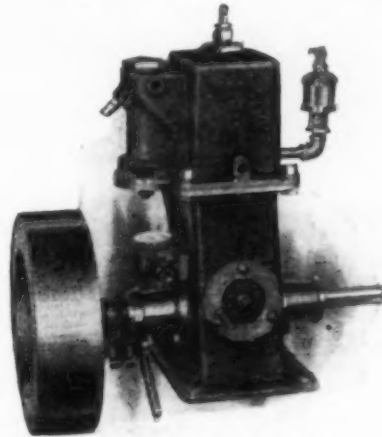
As a result, the Prussian minister of railroads ordered the removal of the electric reading lamps, and the substitution of the improved incandescent gas lamps in the ceilings of the cars. The only exceptions are the long-distance trains which are completely lighted by electricity.

A NEW INTERNAL COMBUSTION ENGINE

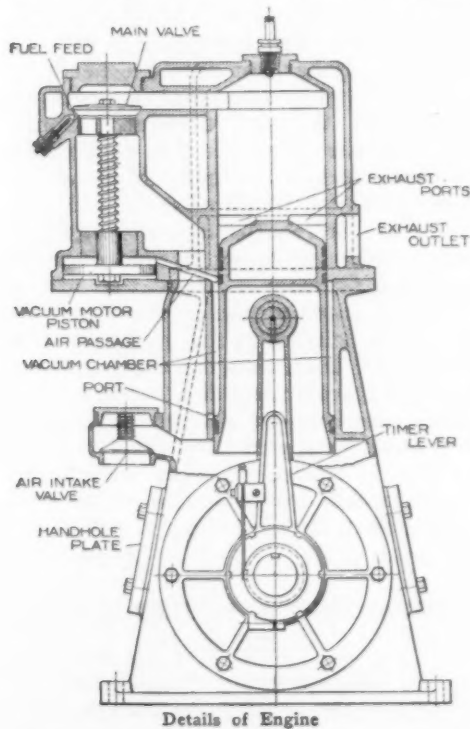
A new internal combustion engine which has a number of distinctive features that make it different from other engines of this class is being put upon the market. This engine is very simple in design and construction, and is the result of several years of careful study and experimenting.

The carburetor is eliminated in this engine, and the fuel is forced directly into the combustion chamber by air pressure, thus atmospheric changes do not affect its operation. The engine gives a power stroke every revolution, and the cylinder is completely scavenged of all burned gases after each explosion by a charge of pure air compressed in the crankcase. The main valve which controls the scavenging charge of air and the fuel feed, is operated by an air and vacuum motor. This motor is operated by the

of the vacuum is caused by the piston uncovering an air port at the proper



View of the New Engine



Details of Engine

vacuum caused by the downward stroke of the piston, and the breaking

moment, allowing air to rush in. The speed ranges from 100 to 2,000 r. p. m., and there is always complete combustion, as the main valve is automatic in its action, and governs accurately the supply of fuel and air under varying speeds and loads.

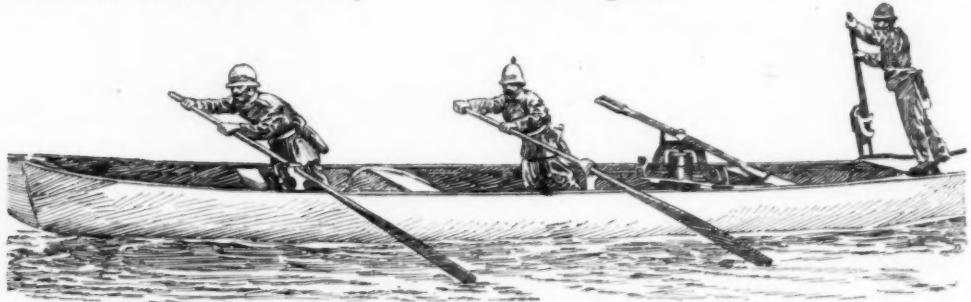
The engine has no cams, eccentrics, nor heavy valve gear. All parts are lubricated perfectly and simply from one sight feed oil cup. The oil is forced to the bearings by air pressure. This engine has been in actual service for the past three years and we understand that during this time it has given entire satisfaction under all conditions both in extreme cold and in warm weather.

CAN FAKE MEDIUMS SEE IN THE DARK?

The eyes of some persons are suited to see well in a faint light such as starlight, and can distinguish objects in a room which appears absolutely dark to others. A person possessing such eyes would make a very successful fake medium for spiritualistic seances, says a writer in the *Optical Journal*. "It seems a little strange," he continues,

"that those scientific men who make a specialty of examining cases of this character do not have the medium's eyes tested by an oculist under a cyclopeglic. The skiascope would be of service in this regard, and the ophthalmometer would also be a help."

simple matter to rod and draw a three conductor cable of moderate size through a clay duct 1,200 ft. in length, and, as the block signals of a railroad are usually about one mile apart, only four splices would be necessary between signals.



Responding to Fire Alarm in Venice

UNDERGROUND TRANSMISSION FOR RAILROAD SIGNALING

The exposure of overhead wires to wind, snow, and sleet storms, causes so much loss in property damage and delay in train service, both passenger and freight, that an underground system of railway signaling transmission is being strongly advocated by signal engineers in reconstruction and new work.

An underground system that has been suggested and approved by engineers of standing consists of a line of vitrified clay conduits, laid in a trench excavated midway between tracks. Either single or multiple conduits can be used, depending upon the number of ducts required. By the use of clay



Transmission Ducts Under Tracks

conduits, it is said that less concrete for mechanical protection is required, and the use of manholes is also eliminated. It has been demonstrated that it is a

A GONDOLA FIRE ENGINE

It is obvious that, as the public thoroughfares of Venice are canals instead of streets, motor-driven or horse-drawn fire apparatus have no place, and as yet the government of that Italian city has not seen the necessity for such up-to-date apparatus as the American type of fireboat. Consequently the Venetian fire department is composed in the main of gondolas, provided with hand pumps. The gondolas are driven through the water by means of long oars or sweeps, operated by the firemen. When the fire is reached, two of the crew work the pump, which draws the water up from under the boat, and the third member holds the nozzle and directs the stream. The water can be thrown as high as the second story of a building.

Fires in Venice, however, are few and far between, owing to the stone construction of the buildings.

DRAGGING A HOUSE OVER HILL

The accompanying illustration depicts a house moving in Alberta, Canada, in which a 4-room frame cottage, 25 ft. square was transferred from its old site to another 15 miles away. The

floor of the porch was detached and the roof securely propped.

The first 10 miles of the journey was over the ice of the Bow river, and the going was comparatively easy with 12



House-Moving in Alberta

horses pulling. The remaining five miles was overland, and the first stage of this was up a hill with a 25 per cent grade. The 12 horses made the river part of the journey in three hours, and also pulled the house part way up the steep hill, but could not keep it moving. Four more horses were added and the destination was finally reached. The house was dragged on two skids, 1 ft. square and 30 ft. long. When the journey was completed these skids were found to have worn down about 4 in. in front.

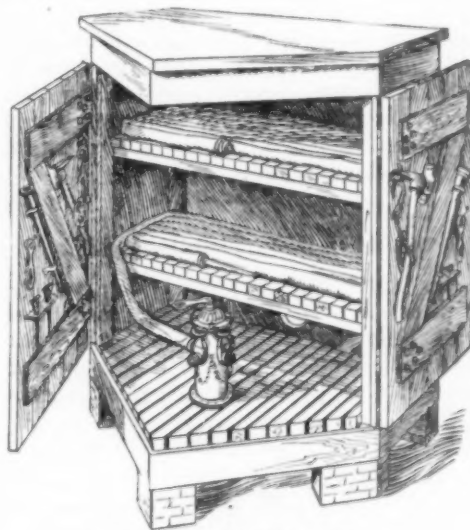
The photograph was taken just as the horses were about to start up the hill. A 12 by 25-ft. kitchen and a couple of ranch buildings were moved in the same way, the whole operation taking about eight days.

SMALL HOSE HOUSES FOR PRIVATE INTERESTS

The importance of the private fire hydrant and hydrant house as a protection for factories and yards is recognized to such an extent that the underwriters' association of New York state has prepared drawings for such an equipment, one of which is shown in the illustration.

The house is completely inclosed, with rectangular sides and back, and a front brought forward to a point. It is so erected that the hydrant comes up through the triangular portion, leaving the rear or rectangular portion for shelves and racks upon which hose and other equipment can be stored. Two

hinged doors at the front give access to the house, and when thrown open the hydrant is in position for handy operation from the ground. The house should rest on concrete or brick piers to give an open space of at least 8 in. under the floor, this being required for the proper circulation of air and the drying of the hose.



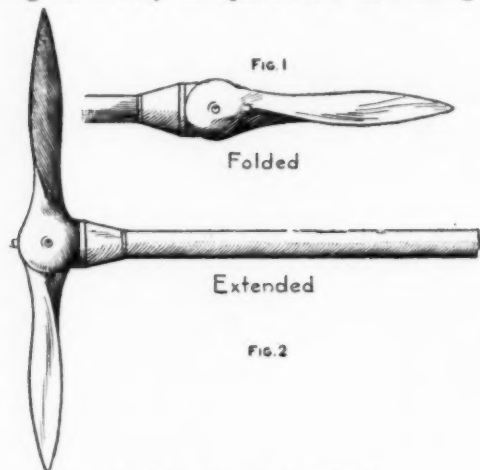
Approved Type of Hydrant House

Sufficient hose is carried for three streams, and racks on the backs of the doors hold nozzles, axes, fire hooks and other hand tools.

¶The largest clay-pipe factory in the world is located in Appomattox county, Va. The clay found in that section is specially adapted to this use.

FOLDING PROPELLER FOR AUXILIARY CRAFT

The propeller shown in these drawings is a very compact form of folding

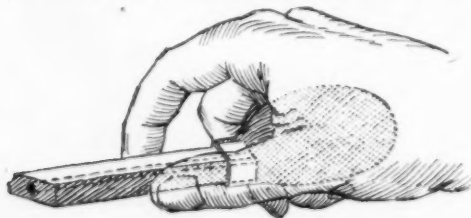


Folded and Ready for Work

propeller for sail yachts provided with gasoline auxiliary power. When the two blades are folded back they offer but little resistance to the progress of a craft under sail. The folding and spreading of the blades is accomplished by means of a lever arrangement within the boat.

A PNEUMATIC ERASER

A court stenographer has just invented an ingenious desk tool that not only performs the work of the ordinary eraser, but blows away the particles of paper and the dust, clean-



Cleans as Well as Erases

ing the surface of the paper. At one end of the eraser proper is a small egg-shaped bulb, the neck of which is clasped over the eraser. Through the eraser runs a 1/16-in. bore or air pas-

sage. In use the bulb lies easily in the palm of the hand, with the fingers clasping the eraser in the customary way. In making an erasure one proceeds as usual, after which, by compressing the bulb, a jet of air is directed at the rubbing point.

DENTAL MIRROR FOR AUTO INSPECTION

The mirror shown in this illustration is of the type used by dentists in examining the teeth of a patient, and as such is vividly associated with dental offices, yet an automobile owner has found one of them of the greatest service in inspecting small and almost hidden parts of his power mechanism. On the majority of cars the magneto is fitted in such manner that it is a matter of great difficulty to adjust or inspect it while running. With this mirror which has a glass 1 1/2 in. in di-



Dental Mirror for Magneto Inspection

ameter and a handle 6 in. long, the action of make and break, etc., can be easily watched during working, and the adjustment simplified. The glass is pivoted to the handle.

A MECHANICAL FINDER OF MEN

A device, known as the autocall and installed in many factories, sounds a call through every department or room of an industrial plant for the person it is searching for. It is an automatically operated signal system, with its operating center in the main office of the plant. When the superintendent or any other party is wanted a signal is automatically sent from the central station. The code used for calling is similar to the Morse code, but not so complicated. Each official has an individual signal.

ELECTRICAL RECORD OF PATIENT'S TEMPERATURE

The desirability of the physician being kept informed of the varying temperature of a patient suffering with a fever has led a German firm to devise an electrical apparatus by which the temperature of the blood is recorded every minute of the night and day.

The apparatus is based on the alteration in the electrical resistance of platinum wire caused by variations in temperature. The platinum coil is attached to the body. A double conductor of low resistance connects the coil with a Wheatstone bridge and the self-recording millivoltmeter, which records any variations in the resistance



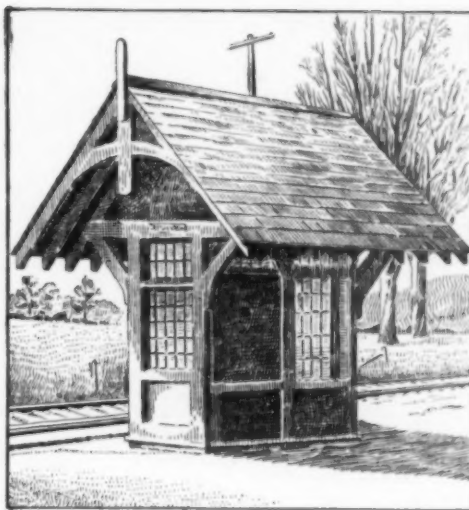
Electric Temperature Recorder Affixed to Patient

of the platinum wire, and accordingly the temperature of the body. The current required for the apparatus is supplied by a small storage battery.

SHELTER HOUSES ON SYRACUSE RAILWAY

Probably no system of electric interurban railways in the country has devoted more attention and investment to highway station shelters than the system running out of Syracuse, New York. More than 100 shelters of the type shown in the illustration have been placed at the more important highway crossings.

The shelters are 10 ft. square and 14 ft. high, erected on one corner of a

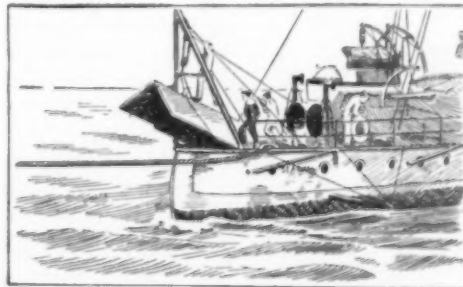


Shelter House for Electric Railway

yellow pine platform, 16 by 20 ft. The inner edge of the platform is located 30 in. from the rail to provide clearance for snow-plows. The shelter building proper contains no less than 660 pieces of wood and costs \$400.

TACKLE FOR SUBMARINE MINE FISHING

The curious apparatus erected over the stern of the H. M. S. "Seagull" is for the purpose of sweeping the sea of submarine mines. It is presumed to catch the mines in such a way as to render them incapable of causing danger for the vessel thus clearing

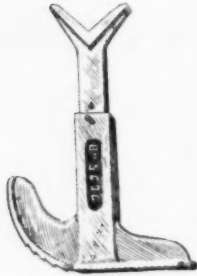


Apparatus Destroys Submarine Mines

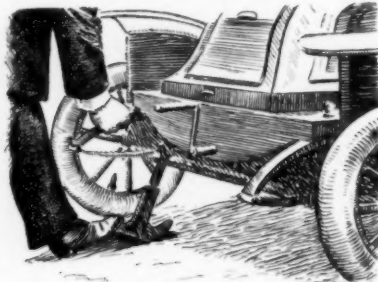
the entrance to a mine-protected harbor. Just how it works is not divulged by the British naval office.

DOCTORING ORIENTAL RUGS

The soft appearance and peculiar sheen of the expensive oriental rug is not always due to age and superior quality, as pointed out by many rug



Tilting Jack



How It Lifts the Automobile

dealers, but is the result of doctoring, which invariably weakens and sometimes destroys the materials. Bright colored rugs, according to one authority, are often washed with a solution of chloride of lime, a treatment which partly bleaches the colors and imparts the soft appearance and sheen. Turkish rugs, having this soft appearance and sheen because of their good quality, are more valuable than the brightly colored rugs, but when doctored to get this effect the wool and cotton in them becomes brittle, thus weakening the warp.

SAFETY STIRRUP



at the bottom keeping them in position.

The inventor claims that this stirrup will prevent a rider from being dragged should he fall from the horse—that is, that his foot will not catch in the stirrup. The side bars are hinged at top and bottom, the small spring

FOOT-OPERATED TILTING JACK

A jack that is simple to operate, yet effective in raising medium-sized automobiles, has been introduced recently and received with much favor. The base of the jack consists of a broad, flat foot, as well as a semi-circular portion with transverse notches. The jack is placed under the car for lifting, with the curved, forward portion on the ground, and the stem, of course, inclined. The foot of the operator is then placed on the flat portion of the base, pressure is applied, and at the same time

the car is pulled slowly toward the operator. This brings the jack into a vertical position and the car is raised from the ground. Owing to the broad base and V-shaped head, there is no danger of the car upsetting the jack on the forward pull.

The stem of the jack is adjustable. The operation of raising a vehicle with such a jack is much quicker than with the gear-operated type, but heavily built touring cars would require too much exertion in drawing them forward onto the jack.

PRIZES FOR SMALL AND EASILY MANAGED AEROPLANES

The practical utilization of the aeroplane depends upon the ease with which it can be launched and landed, and also to a great extent upon the smallness of size that can be attained. To this end the French national aerial league has offered prizes of several hundred dollars to the first aviator who shall succeed in starting from a selected road, bordered with trees, and land on the same road after a flight of a mile or more, and for the aviator who flies a circuit of one mile with the smallest aeroplane.



Huge Rug Loaded on Truck

LARGEST ONE-PIECE RUG EVER MADE

This monster rug is the largest ever made in one piece, and was ordered from a concern in Austria for the grand lodge room of the new Masonic temple in New York. The size of the rug is 53 by 60 ft., and the room in which it is placed measures 72 by 81 ft. and will seat, 1,200 people comfortably.

An idea of the unusual size of the rug and the difficulties of its transportation may be gained by glancing at the illustration which shows it stretched over a truck like a huge sea-serpent, while the other illustration shows its size laid on a floor. The weaving of the rug in one piece is considered an extraordinary achievement. It contains more than 7,000,000 hand-tied knots, and it was delivered in New

York in less than two months after the order was received in Austria.

ALBERTA, CANADA, MAY HAVE RICH OIL FIELDS

About 400 miles northeast of Edmonton, in Alberta, Canada, is an oil field which it is hoped will prove sufficiently productive for operation. The Canadian government has already expended about \$30,000 in investigating the prospects, and a company, capitalized at \$5,000,000, has been organized in Winnipeg to exploit it.

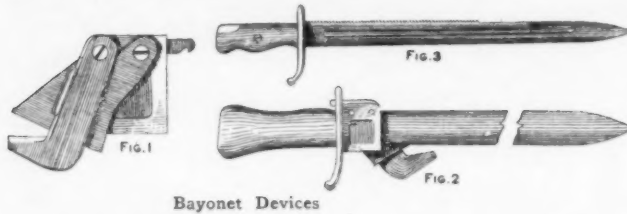
About 15 wells have already been sunk by an independent prospector, and eight of them produce oil in small quantities.



Rug Spread Out on Floor

OIL PRODUCTION EXCEEDS GOLD IN CALIFORNIA

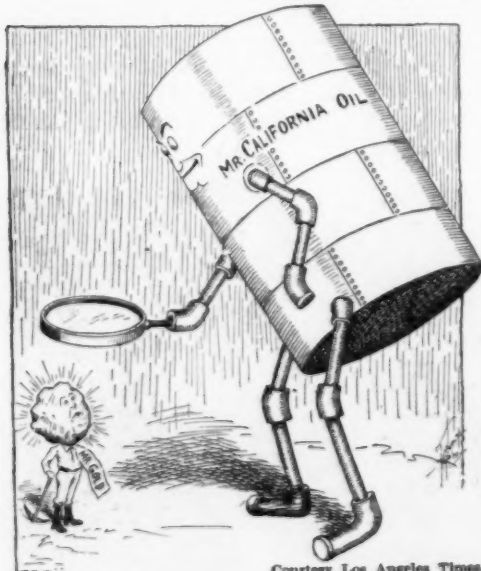
In the past two years, California, called the Golden State, and the scene of more gold excitement than any other state in the union, has produced greater value in oil than in gold. The value of oil to the producers themselves last



Bayonet Devices

year was about \$43,000,000, although positive figures are not yet available, while the production of gold was in the neighborhood of \$21,000,000 or less than half.

This great advance in oil value over gold is, it must be understood, in no way aided by a falling off in the production of gold. The gold output, through the use of dredges in the river channels, has increased year by year at the rate of two or three million dollars. In 1907 oil slightly surpassed



Courtesy Los Angeles Times

Oil Production in California Worth Twice That of Gold

gold, the figures being \$16,783,943 for oil, and \$16,727,928 for gold.

NEW GERMAN BAYONETS

Two new bayonet devices have recently been adopted by the German army. One of them is a wire cutter, the invention of an American. The Russian-Japanese war demonstrated the effectiveness of barbed wire as a barrier to the rapid advancement of infantry or cavalry, and the new bayonet device will enable soldiers to cut the wires as they proceed.

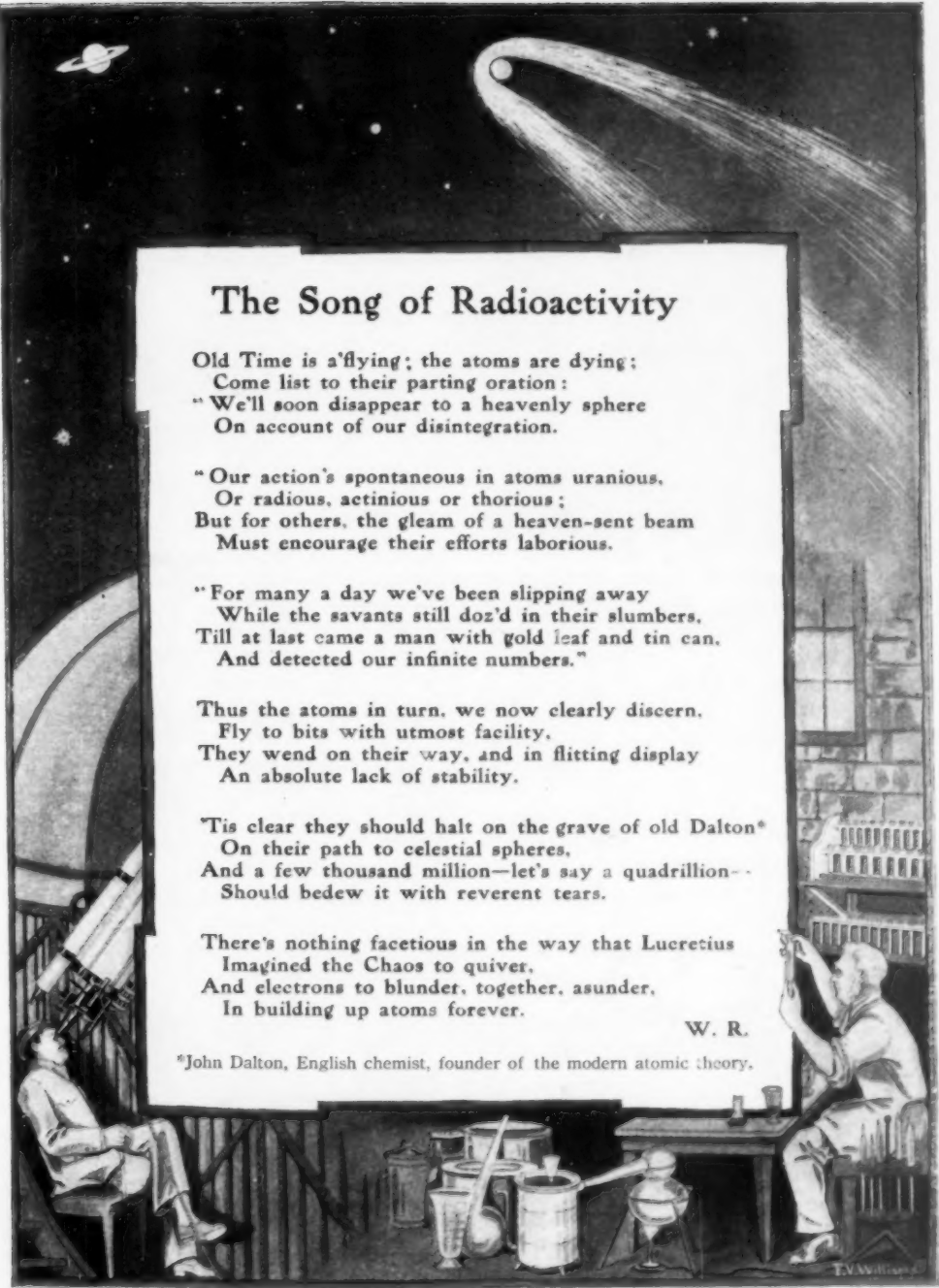
It is simple and compact, and not only does the work of the ordinary wire cutters, but does it much more rapidly and easily. It may be placed on the bayonet and used with the hand, or the bayonet may be fixed on the rifle and the soldier may grasp the stock of the rifle while using the cutter, thus protecting himself against a shock while cutting a charged wire. Using the cutter in this manner also allows the soldier to have his rifle ready for instant use. The weight of this wire cutter is less than $\frac{1}{4}$ lb.

Another advantage this tool has over others is that it allows a soldier to cut the wires of a fence several feet high while lying on the ground, as having the cutter at the end of the rifle enables him to reach to a considerable height.

Figure 1 shows a side view of the device in cutting position, and Fig. 2 shows it in position on the bayonet.

It is only necessary to lay the back edge of the bayonet on the wire, and then push the bayonet forward until the wire enters the cutting jaws, which move backward under the pressure and cut the wire quickly and easily.

The bayonet shown in Fig. 3 combines the features of a sword, bayonet and saw. The bayonet is of the straight knife pattern, but of unusual length. A portion of the back edge is made into a saw.



The Song of Radioactivity

Old Time is a'flying; the atoms are dying;
Come list to their parting oration;
"We'll soon disappear to a heavenly sphere
On account of our disintegration.

"Our action's spontaneous in atoms uranious,
Or radious, actinious or thorious;
But for others, the gleam of a heaven-sent beam
Must encourage their efforts laborious.

"For many a day we've been slipping away
While the savants still doz'd in their slumbers,
Till at last came a man with gold leaf and tin can,
And detected our infinite numbers."

Thus the atoms in turn, we now clearly discern,
Fly to bits with utmost facility,
They wend on their way, and in fitting display
An absolute lack of stability.

'Tis clear they should halt on the grave of old Dalton*
On their path to celestial spheres,
And a few thousand million—let's say a quadrillion—
Should bedew it with reverent tears.

There's nothing facetious in the way that Lucretius
Imagined the Chaos to quiver,
And electrons to blunder, together, asunder,
In building up atoms forever.

W. R.

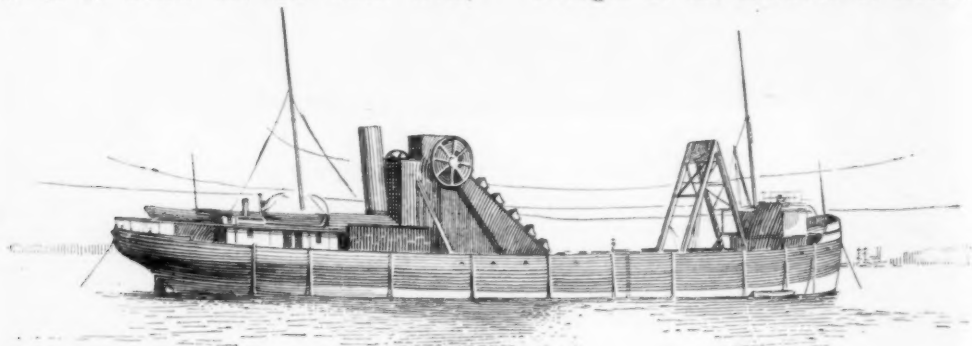
*John Dalton, English chemist, founder of the modern atomic theory.

LAKE FREIGHTER CONVERTED INTO ELEVATOR DREDGE

The dredging work at the entrance of Boston harbor includes an area in which excavation is required to a depth of 35 ft. below the low water level,

riods. The discharge of the buckets is carried by a chute into the hoppers of scows, made fast alongside. The chain of buckets, of course, goes down through the hull of the vessel, scoops up the load, and brings it to the top.

Dredges at the entrance of Boston



Ocean-Going Elevator Dredge

which means that the dredging must be done at a depth of about 50 ft. when the tide is high. To fulfill this requirement the contracting firm purchased the "Denver," a heavily built wooden cargo steamer, originally in service on the Great Lakes and equipped it with dredging machinery. The form of the elevator is shown in the accompanying illustration, which gives an idea of the size of the buckets. The capacity of each bucket is $1\frac{1}{4}$ cu. yd., and the bucket chain is ordinarily driven at a speed of 15 buckets

per hour. The dredges at the entrance of harbor are often exposed to rough weather, but the "Denver" makes a seaworthy craft that could cross the ocean, if necessary.

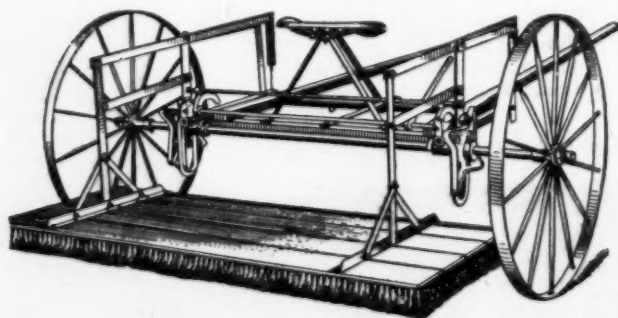
MECHANICAL BUMBLEBEE

The implement here illustrated is a mechanical substitute for a bumblebee, and its purpose is to cross-pollinize clover.

The machine consists of a platform, the under side of which is covered with a myriad of minute fibrous fingers arranged like the bristles of a brush. The end of each fiber is covered with a rubber-like substance to which the pollen of the clover will cling.

When driven across a field, the platform, or frame, moves up and down, the little fingers reaching down into the heads of the clover. All that is required of the operator of the machine is to know when the pollen is in the proper state to be carried from one blossom to another by the machine.

The clover pollen, unlike that of



Mechanical Substitute for the Bumblebee

per minute, which gives the dredge a capacity of 1,100 cu. yd. per hour with full buckets. This capacity has been exceeded by 30 per cent for short pe-

most plants, is heavy and has a tendency to adhere to the heart of the blossom. The period in which the pollen can be carried from one blossom to another lasts not longer than two or three weeks. Consequently, it would take a vast army of bumblebees to carry the pollen from every head of clover to some other head, even in a small field. The pollen cannot be carried by the wind, and the bumblebees are disappearing, therefore, a machine to do the bumblebee's work is necessary.

THE POLICE PATROL GONDOLAS OF VENICE

Along with gondola fire apparatus, gondola cabs, and gondola trucks, Venice also is provided with gondola police patrols, used for the same purposes as the police patrol wagons and automobiles.

The illustrations are photographs taken during the trial of Countess Tarnovska, M. Prilukoff, and M. Naumoff, the three persons who incited, planned and carried out the sensational murder of Count Kamarovski. One illustration shows the woman arriving at the



Naumoff Entering Barred Gondola from Prison

court of criminal assize from the prison of San Marco, and the other shows Naumoff just stepping into a police gondola from the door of the prison. In both illustrations the barred windows and doors of the gondolas can be plainly seen.



Titled Prisoner Leaving Police Gondola

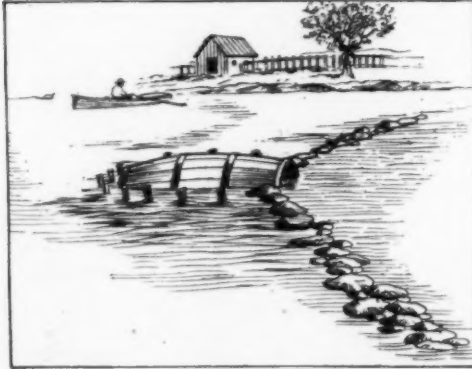
A DEWDROP WAS THE FIRST LENS

It has been said that a convex lens made of rock crystal was once found in ancient ruins in Asia, and others insist that the first was the famous glass of Nero. The first contention is not accepted because the lens is not to be found in any museum, and the second is claimed to have been simply a jewel through which Nero looked to fill his idle moments, just as a child looks through a colored glass.

The controversy is brushed aside, however, by the Optical Journal with the statement that the first lens was a dewdrop on the grass. A dewdrop is a good magnifier, and the person who looks at a small object through such a lens will receive an excellent lesson in natural science.

TRAPPING EELS IN PENNSYLVANIA

At many points along the rivers and smaller streams of Pennsylvania, fish



Pennsylvania Fish Basket with Wing Walls

traps, licensed by the state, may be seen. The game laws of the state permit the trapping of eels with these traps or baskets between the hours of four o'clock in the afternoon and eight o'clock the next morning, from Sept. 15 to Nov. 13.

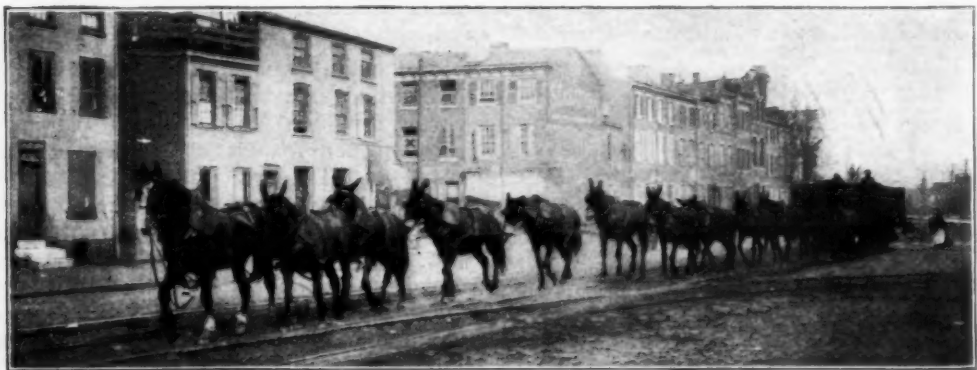
The license for catching eels in this manner costs one dollar, and the person securing it must construct the trap according to the directions given by the state fish commission. The baskets cannot be placed within a quarter of a mile of any fishway, chute, or opening in a dam, through which fish pass when water is running, raceways and mills excepted. The regulations made by the fish commission give a good idea

of the manner in which the traps are built:

"No fish basket shall be placed in a stream known as a trout stream. The wing-walls of any two baskets shall not be within 20 ft. of each other at the upper end, when side by side, nor extend beyond each other at the upper end, nor extend over more than three-fourths of the width of a stream, nor be constructed of any material other than loose stones. The bottoms of the basket must be made of well-rounded wooden slats, not more than 2 in. wide, so set or placed that they shall not be less than $\frac{3}{8}$ in. apart when swollen by water. These bottoms must also be in part removable, so that it will not be possible for the baskets to catch fish from eight o'clock in the morning until four o'clock in the afternoon."

CAR-HAULING MULES LED BY HORSES

Mules are such peculiar animals that where large mule teams are used it is sometimes necessary to hitch a horse in front of the team to lead the way. The mules often take it into their heads to stand still when the driver wishes them to start, and at such times the most expedient means of getting the team into motion is to hitch a horse at the head of the mules. Left to themselves the mules stand stupidly ignoring the crack of the driver's whip, but when the horse pulls on the traces they



Horse as Leader of Team of Mules

all start. Army mules, while generally better trained, sometimes exhibit this same characteristic. This might prove disastrous in battle when it might be necessary to take a field gun out of the way, but the drivers always make sure there is a horse around that can be pressed into service as captain of the mules.

The animals shown in the illustration are used to drag freight cars along a stretch of railroad siding in a city street.

AUTO AMBULANCE FOR BRAZILIAN NAVY

This automobile ambulance, built for the Brazilian navy department by an American concern, embodies many new and improved features, not the least of which is the top, patterned somewhat on the same lines as the tops of railway coaches. The four ventilating windows on the sides and the two in front and back thus formed, provide plenty of fresh air.



Photo by Paul Thompson, N. Y.

Improved Type of Auto Ambulance

HEATING WITH ACETYLENE GAS

Acetylene gas stoves are not an absolutely new innovation, several types having been placed on the market from time to time in the last couple of years, but all of them proved impracticable because of "lighting back," due to the faulty construction of the burners and the density of acetylene gas.

By means of a certain type of burner and a patent gas cock, however, an English concern has just introduced an acetylene heating stove with which there is said to be no possibility of back lighting. Also, by means of an ingenious device, it is possible to obtain a number of gradations in heat.

The interior of the machine is finished in mahogany and is very roomy. There is every conceivable contrivance for the comfort of the patients, including four beds, with springs and curled-hair mattresses. These beds are arranged on slides and rollers, so that they can easily be taken out of the wagon, and a locking device is provided to hold them firmly in position when the machine is traveling. In addition to the beds, the equipment includes four stretchers of rubber cloth and four pillows, two folding seats for the nurses and surgeons, and two medicine and instrument chests.

The ambulance will be used in connection with the naval hospital in Rio de Janeiro.

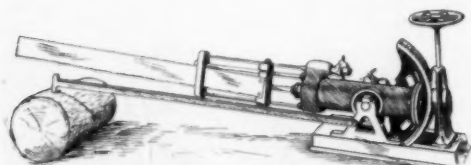


Alpine Fire Brigade

INGENIOUS POWER SAW FELLS TREES AND CROSS-CUTS LOGS

An ingenious power saw for felling trees and cross-cutting logs has recently been produced. The illustration shows it arranged for cross-cutting. It operates upon its standard in somewhat the same manner that a big gun is elevated or lowered to get the range. The saw is directed through the log by hand-wheel and quadrant rack. The operator keeps turning the wheel as the sawing progresses, and this drives the saw deeper and deeper into the log. For tree-felling, the mechanism and saw are placed in a horizontal position.

The steam cylinder driving the saw in its reciprocating motion receives its



Combined Log-Cutting and Tree-Felling Saw

steam from a portable boiler mounted on four wheels, with platform for carrying the sawing mechanism.

A FIRE BRIGADE ON SKEES

One of the most novel fire brigades in Europe is the little corps of fire-fighters shown in this illustration. They belong to one of the communities in the Alps and rush to fires on skees. Modern fire-fighting equipment is lacking, and would be of but little use if provided. Four of the firemen carry bugles for sounding the call of fire.

AUTO HORN GIVES BUGLE CALL

An automobile horn recently placed on the market, has a sound like a bugle and is pleasant and distinctive. In operation it is like an ordinary bulb horn. Each time the bulb is pressed a piston arrangement moves out and gives a turn to a ratchet wheel at the base of a four-tone group. The turn of the ratchet wheel revolves a valve, which directs the air into the various tubes in turn. By changing this device any combination of sounds or calls can be produced. Thus, repeated pressure on the bulb will give four-toned calls that are said to give pleasure instead of nerves to people in the vicinity.

HEAT

PART V—High Temperatures and the Rare Metals

By J. Gordon Ogden, Ph. D., Professor of Physics, Fifth Ave. High School, Pittsburgh

[This is the fifth article of a series by Dr. Ogden, in which well known subjects will be discussed from the standpoint of their relation to modern mechanics. In the February number "The Nature of Heat and How It Is Measured" was discussed; the March article told "How Low Temperatures Are Produced;" in the April number "Some Effects of Low Temperature Upon Matter," were described, and the May number treated of "The Production and Uses of High Temperature." Succeeding articles will include Steam, Boilers, Ice, Radiation, etc.]

FOR thousands of years the world jogged along with only four metals—copper, tin, gold and silver. Today we have 59, and are still adding to the list. Even iron, the metal which forms the basis of our modern civilization, was unknown for scores of centuries, and was impressed into the service of man 1,000 or 1,500 years before the Christian era. Lead and mercury were next added to the list, and then the world, tired out with its metallurgical exertions, rested comfortably for many centuries with these seven metals. During the middle ages, antimony, bismuth, zinc and arsenic were discovered, more by accident than by systematic research. This inactivity was partly due to the lack of facilities on the part of the few earnest seekers after scientific truth, and partly to the charlatanism and jugglery of fakirs and frauds of the time, who were seeking such impossibilities as the elixir of life, and the philosopher's stone—which would transmute the so-called base metals, like copper or lead, into gold.

Within the last two hundred years about 50 metals have been discovered. Most of them, it is true, have been looked upon by the world as curiosities, and they have been relegated to the dusty shelves of chemical museums in tiny little vials, as concrete samples of the wonderful achievements of modern chemical research. Occasionally they would be referred to by some writer gifted with a vivid imagination, who would call to mind their extreme rarity and their fabulous value—but only as chemical curiosities and never as substances that would be of use to man-

kind. Then the little vials would be put back on the shelves, out of sight, out of mind, until the public again wished to hear the dreams of gallium, aluminum, germanium, and tungsten, and to estimate what it would cost to make a pound of these rarities.

With the advent of the electric furnace and the use of temperatures hitherto unheard of, these little vials have been taken down from the dusty shelves. One by one the rare metallic oxides have been introduced to the fearful heat of the flaming arc, and reduced to the form of pure metals; and these rare metals, now rare no longer on account of the cheapness of reduction and the abundance of ore, are taking their places in the sphere of industrial activity. The little, dust-covered vials are looming up, and keen, hard-headed scientists are studying them with a view to their possibilities and the best means as to their utilization.

Take aluminum for example. In 1888, aluminum first appeared on the market and sold for five dollars a pound. It was still a curiosity, and here and there, some one would get hold of an ounce or two and muse over its extreme lightness, its beautiful color, and its oxygen resisting qualities. But still a rarity on account of its prohibitive price. Then comes the electric furnace with its extraordinary high temperatures. Aluminum immediately drops from five dollars a pound to less than 35 cents a pound, and the world sits up very straight and takes notice. A metal more useful than gold or silver—possibly than iron, has joined the great procession of modern business opportunities, and immediately the business man seeks the man of science, and talks about "output and possibilities."

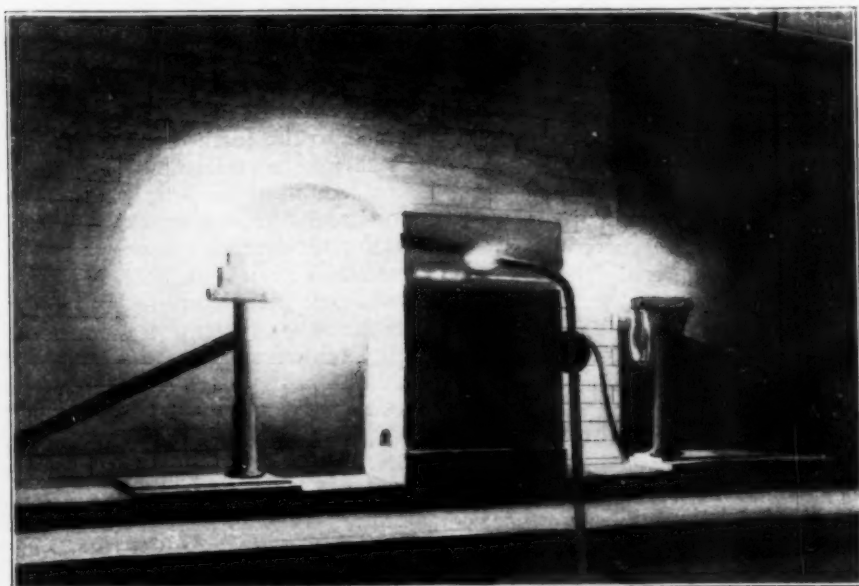
Aluminum has had a remarkable

growth, commercially, but the next few decades will show its real value and use. It is popularly supposed that iron is the most abundant of all the metals, but analyses of the earth's crust show that aluminum is the king of all the metals so far as quantity is concerned. There is just a little more than eight per cent of aluminum in the crust of the earth, or almost twice as much as there is of iron, and more than 80 times as much aluminum as there is of copper.

Sometime aluminum will be made for a few cents a pound, and it will even-

economically. Then every clay bank will be a mine of high-grade ore, clay containing a high percentage of aluminum; every bit of slate will yield to the magic caress of high temperature its precious prisoner of pure aluminum, which it has so jealously guarded for untold ages. Iron, with its rusting, its crystallization, and its odd eccentricities, as shown in the form of steel, will be displaced by its peerless young rival, aluminum.

Ever since Edison, over 25 years ago, discovered the incandescent electric lamp, there has been an eager search



Electric Furnace for Reduction of Rare Metals

tually displace iron in many places where iron is now considered to be indispensable. It is about one-third the weight of iron, is about as strong in tensile strength as cast iron, and just as soon as the proper alloy of aluminum can be found, it will be steel's strongest rival. At present metallurgists are handicapped by the fact that aluminum can be made from only one ore, bauxite, and this ore is found in but few places, and is rapidly being exhausted. There is no doubt, however, that in a short time we shall know how to extract the aluminum from ordinary clay,

for a substance that would take the place of the tiny thread of carbon which forms the filament of the lamp. Almost every substance under the sun from bamboo to silk has been tried for this purpose, but the same objection applied to all. Every one would rapidly deteriorate, or blacken the bulb, and the longer they were used the more electricity they would convert into useless heat, and the less light they would give. In fact, 98 per cent of the total electric energy was wasted in heat, while only two per cent was available as light. There is even more waste energy in

the ordinary carbon-filament electric lamp than there is in the ordinary steam engine. Numerous attempts to substitute metal filaments for the carbon were made, but it was impossible to find a metal which would not melt far below the temperature at which the light vibrations were available. With the coming of the electric furnace the difficulty was solved. The rare element, tantalum, so-called from tantalus as it was so elusive and hard to get hold of in its purity, was conquered by the high temperature of the modern electric furnace, and has found extensive use as a substitute for carbon in the manufacture of filaments. Tantalum, owing to its high melting point, between 5200° F. and 5300° F., is a very satisfactory substitute for carbon. It gives much more light and uses only two watts per candlepower, while the carbon filament uses three and one-half watts. Another use for tantalum depends upon the fact that it is very hard. Various attempts have been made to drill through a sheet of this metal; a diamond drill running at the rate of 5,000 revolutions per minute resulted in a penetration of only a small fraction of an inch, although the boring was kept up continuously for three days, and the sheet of tantalum was only a third of an inch in thickness. No doubt this highly refractory metal will eventually be used for bearings and dies and drills, or for any other purpose where extreme hardness is desired. Fortunately we have abundant supplies of this valuable substance in South Dakota and North Carolina.

It is a curious fact that the candlepower of an incandescent electric lamp increases out of all proportion to the increase, slight though it may be, in the temperature of the filament. Taking advantage of this fact, tungsten, another product of high temperatures, is now used quite extensively in the manufacture of filaments. Tungsten has a melting point of 5500° F., only a few hundred degrees higher than tantalum, and yet this comparatively slight increase is sufficient to double the can-

dlepower, and at the same time to lessen the expenditure of electrical energy. A tungsten lamp uses only one-third the energy necessary for a carbon filament, and gives far greater candlepower. It is true that the first cost of a tungsten lamp is almost prohibitive, but that is now. Wait until the magic work of the high temperature furnace is completed, and we are able to obtain the element cheaply. Then a carbon filament lamp will be found only on the before mentioned dusty shelves of museums as a curiosity.

Large quantities of tungsten ore have been found in Montana and California, and there is no lack of raw material for the future development of this industry. This important metal has other possibilities than the one indicated and is employed in fire-proofing cloth for curtains, and is invaluable in its use in dyeing, being a powerful mordant. A mordant is a substance that forms an insoluble compound with a coloring matter and holds it within the tissue of the fabric.

Cerium and thorium are rare metals and were until recently regarded as curiosities of little practical value. Now they are looked upon literally in an entirely new light as they form the basis of the chemicals used in impregnating the meshes of the ordinary gas mantle, so common now as an illuminant in our homes. And these rare metals have been the saving of the coal gas industry, as their radiant, powerful, and cheap light enables gas to compete with electricity as a means of illumination.

Chromium, whose melting point is beyond that of platinum, is another rare metal that has done marvellous things in the way of bettering steel. By the addition of a slight percentage of chromium, steel is wonderfully improved.

Molybdenum and uranium are also of high value for the betterment of steel and the future alone can reveal the possibilities that lie in this direction.

And now comes vanadium, the most

wonderful of the rare metals and the latest gift of high temperatures to man. Vanadium, known to the world for about 80 years, was little more than a chemical curiosity until quite recently. Then some wise experimenter added a mite of it to steel, and found that its effect was almost marvellous, wonderfully improving the quality of the steel. It increases the tensile strength of the steel about twofold, and at the same time acts as a scavenger and rids it of the deleterious nitrogen and certain obscure oxides. Vanadium is not only statically stronger, but dynamically stronger than ordinary steel. In other words, it will not only carry greater loads, but will also withstand harder shocks.

A bar of steel of high tensile strength would make a poor axle for an automobile if it could be fractured by a sudden stress produced by a jar against a cobblestone. The steel made with vanadium and chromium seems to be less liable to what is commonly known as "crystallization," or more properly speaking, the molecular disintegration which in some mysterious way changes fine steel into a substance but little better than cheap pot-metal. It has been recently reported that vanadium steel

has been made in the form of wire possessing the unheard-of tensile strength of 400,000 lb. to the square inch! Another remarkable quality possessed by vanadium is that of self-lubrication—an immense advantage in the case of high-speed tools. Enormous deposits of vanadium have been located in this country, and in many other countries of the globe, and nature has again demonstrated her wonderful power of always providing for our needs, when those needs arise.

Owing to the fact that vanadium has the remarkable power of eliminating nitrogen, and also the power of oxidizing carbon, it has been used as a medicinal agent both in this country and Europe as a specific in the treatment of pneumonia and other diseases requiring free oxygen.

As yet we are in the infancy of high temperature developments. There are many other little vials on the dust-laden shelves, and one by one each shall be taken down and made to reveal its secret to the busy, inquisitive chemist and physicist; and within the next twenty-five years, no doubt, marvels more stupendous than those of the past score of years will add to the comfort and wealth of mankind.

STEAMBOAT STRANDED IN CORN FIELD

One of the most extraordinary on the Ohio river is shown in this illustration. The "Virginia," a steam-



Ohio Steamboat Which Graces a Corn Field

boat operating between Pittsburg and Cincinnati, ran aground while the river was high during the early part of March, and, when the water receded a short time later, was left high and dry in a corn field near Willow Grove, a few miles below Ravenswood, W. Va. The grounding occurred at night while the packet was attempting to make a landing at Willow Grove.

A curious feature of the wreck is the way not only her hull but her upper works were warped out of shape and curved to fit the uneven surface of the corn field. The boat cost about \$60,000.

ROTARY HOOF-PARER FOR HORSESHOERS

An inventor of Reno, Nevada, has patented a power-driven rotary hoof-parer to take the place of the horse-shoer's tongs, knife, and rasp. By pressing a spring the cutter is exposed and regulated to cut any depth with the precision of a plane.

ENGLISH HAVE MOTOR BANKS AND AUTO HEARSE

Although in the United States the automobile is being put to service in many fields, in England, at the present time there exists what may be called

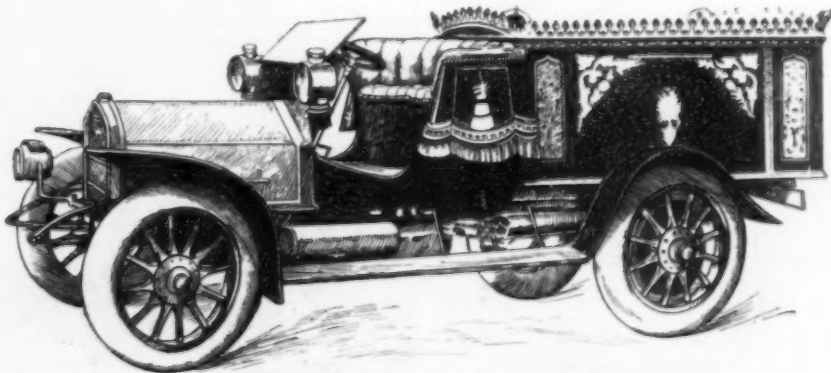
the largest club in the city, and it is erecting a home which will rival the



The New Motor Bank—Depositing the First Shilling

million-dollar building of the Automobile Club of America in New York.

One of the latest uses for the automobile there is as a traveling bank which goes from house to house secur-



A Fashionable English Motor Hearse

a motor epidemic, according to an English automobile paper. The Royal Automobile Club of London ranks as

ing deposits. It is becoming quite ultra fashionable, it is said, to be carried to the grave in a motor hearse.



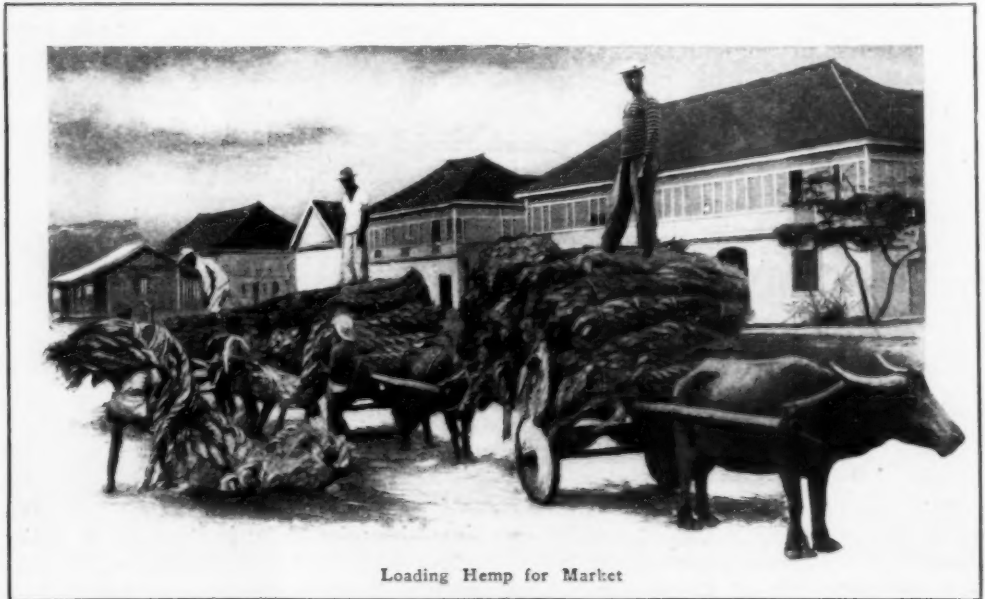
Extracting Coconut Meat

FILIPINO INDUSTRY

Two scenes of Filipino industry are pictured in the accompanying illustrations, one of which shows newly harvested hemp twisted into bundles for shipment to market, while the other is a view of a copra factory in which workmen are extracting the meat of the cocoanut preparatory to drying. Copra

is the dried meat of the cocoanut from which cocoanut oil has been extracted.

The bundles of hemp look more like old rope in the illustration than the crude material for rope yet to be made. Some of the bundles of hemp are as large around as the natives who are handling them.



Loading Hemp for Market

AIRSHIP INVENTORS OFFERED TO CARRY MAIL SIXTY YEARS AGO

The present day aviators who suggest the carrying of mails by aerial craft are over 60 years behind two American aviators who made similar proposals to the government in 1845. One of the letters, which has just been unearthed in the files of the postoffice department, was from B. O. Davidson, of Mobile, Ala., to Cave Johnson, of Tennessee, then postmaster-general.

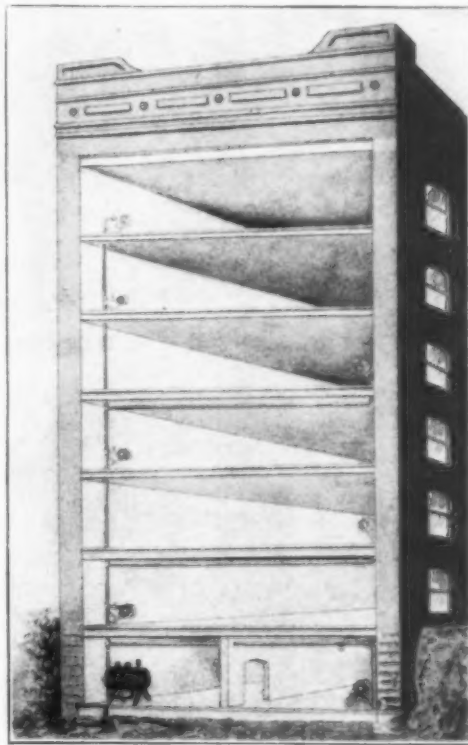
"If the postoffice department will furnish me with \$2,000," said Davidson's letter, "to be expended under the supervision of its own agent, in constructing a machine upon a plan which I have fully matured, for traversing the air like a bird, then I will obligate myself to transport mails to and from places mentioned in said advertisement, at the rate of 50 miles per hour, for one year, from May 1, 1846, for an amount of money equal to what it will cost to construct any one of the largest vessels which are contemplated as suitable for the service mentioned. This may appear to you a strange and visionary project, but I trust it will not be treated lightly or disregarded. We live in a wonderful era. So great an accomplishment or undertaking is worthy of a little effort."

Richard Clooney, of Cincinnati, about five years later, made similar proposals in the following letter:

"I take the liberty of addressing you on the subject of a means of transportation of mails through all America at the rate of from 150 to 200 miles an hour. The power which I propose has been tried, approved, and I now take the liberty through you of asking to have it submitted to any scientific man that you may be pleased to appoint. The outfit would be very cheap, the maintenance nominal, it will work with certainty in all seasons, and preclude the possibility of mail robbery during transmission. Letters and parcels will be perfectly safe, and the rate of postage will naturally be reduced."

CHEMICAL INSTALLATION AS FIRE PROTECTION

An excellent arrangement by which dwelling houses, public buildings, factories, and schools may be protected



Stationary Chemical Apparatus

from fire by chemical apparatus is shown in this illustration. A tank of from 100 to 500-gal. capacity is installed in the basement, and compressed air drives the fluid through the standpipe to the different floors. Each floor has a hose station, equipped with quick-opening valves and hose lines, the latter held by a reel. The standpipe and hose arrangement is similar to that often placed in buildings to supply water for fighting a fire.

CPepsin in small quantities is being used in a new process of bread-making in England. It renders the loaf more digestible, and does not affect its appearance or flavor.

ADORNED WITH 11 SERVICE STRIPES

The sailor shown in the accompanying illustration is still doing active duty on the U. S. revenue cutter "Perry,"



A Stripe for Every Three Years

stationed on the Pacific coast. His name is John Hall, and the 11 stripes on his left arm show that he has been in the service 33 years, each stripe designating three years. In July of this year the stripes will have reached an even dozen. A little more than 33 years of his nearly 36 years of service were passed on the revenue cutter "Grant." His right thumb was lost while making sail.

A garment known as the "shadow coat," made of chantilly lace, and valued at \$300, which could be folded up and put in a large pill box, was one of the seekers for favor at a recent Chicago fashion show.

CONVEYING CONCRETE THROUGH PIPES BY AIR PRESSURE

An apparatus has been patented which conveys concrete through pipes by air pressure to the point where it is to be used. The device consists of a horizontal tank, provided with an air-tight gate at the top, a pipe entrance for the compressed air at the side, and an exit pipe for the concrete in the conical bottom of the tank. Concrete is mixed on a board above the tank and then poured into the tank through the air-tight gate, which is then battered down. Valves on the intake air pipe and the outlet concrete pipe are opened and the compressed air forces the concrete out of the tank into a 4-in. pipe.

In tests, the 4-in. pipe used to carry the concrete was about 400 ft. long, and contained several 90-degree bends. Under a 50-lb. pressure the concrete was forced out of the end of this pipe in a well-mixed mass, but at a velocity too great for practical work. A plank box with a curved upper cover is used to reduce the velocity where the concrete leaves the pipe. This diverts the rapidly moving stream and drops it into the molds.

ALUMINUM MONEY OF FRANCE

Aluminum as a metal for the coining of money of small denominations in France has proved itself of sufficient durability in tests to warrant its general adoption. The illustration shows the size of the 25-centime, 10-centime, and 5-centime aluminum coins. Five



French Aluminum Coins

centimes is equal to one cent in American money, consequently the 25-centime piece is of the same monetary value as the American 5-cent piece.

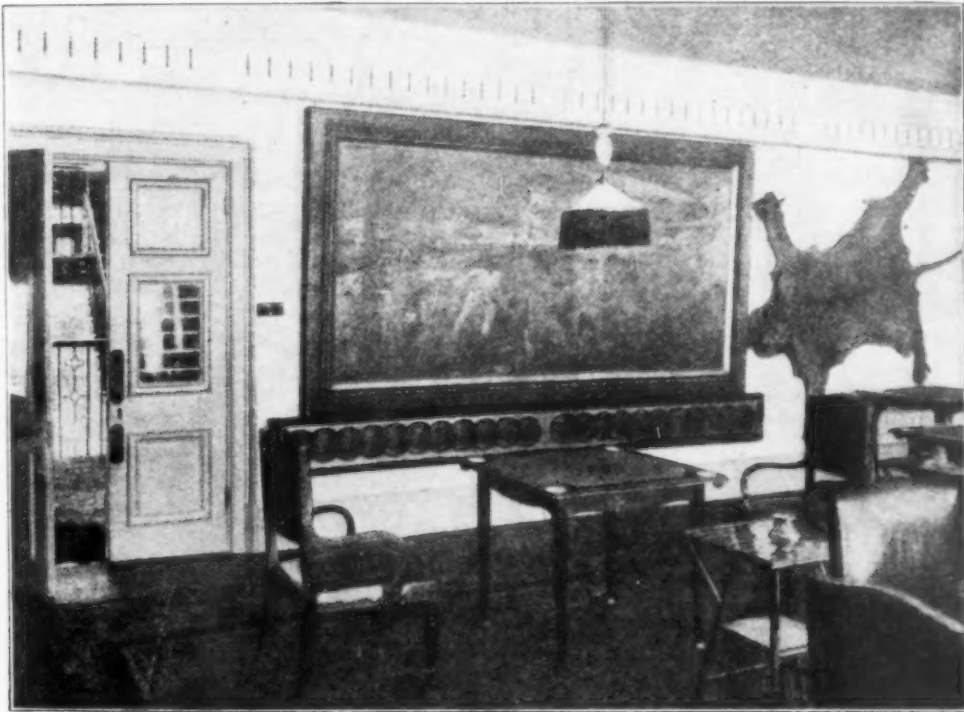
NOVEL SYSTEM OF VENTILATION

In their desire to secure a system of ventilation and heating as near perfect as possible, the architects of the Bath Club, of London, England, resorted to the use of electric radiators. The air is drawn through a duct by an electric fan, and passes over a series of the radiators, by which it is warmed without being dried or given any offensive odor.

ELEVATOR INSTALLED IN ST. PETER'S CATHEDRAL

An electric elevator, carrying 10 persons, has been installed in the wonderful cathedral of St. Peter's in Rome, for lifting people up into the dome. The elevator, which was blessed and inaugurated by Cardinal Rampolla in March, has at its entrance the Latin inscription "electricum anabathrum."

St. Peter's, which is the cathedral of



Room in Bath Club, London

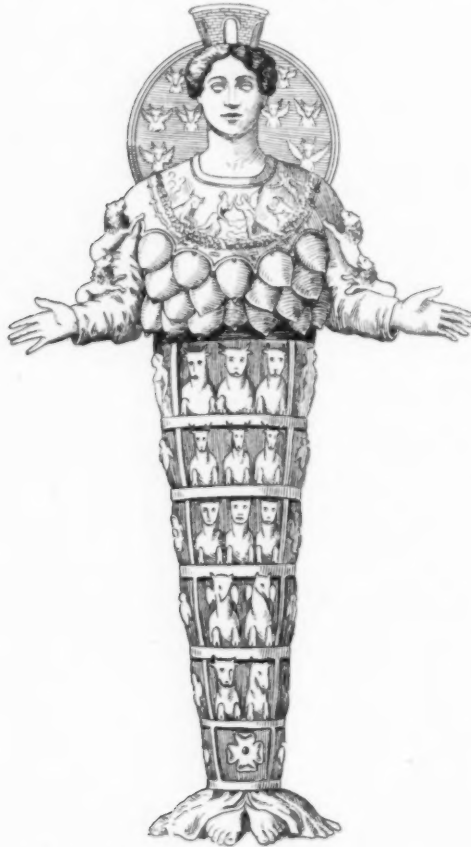
The warm air is passed into the rooms through the series of vertical slots seen in the frieze near the ceiling. These openings, collectively, give a large surface, and do not introduce any unsightly fixtures. Ventilation is secured without draughts, the velocity of the incoming warm air not exceeding one foot per second.

CA French company has been organized to construct an underground freight railway to connect all the railroad terminals of Paris.

Rome, is the largest and one of the most magnificent churches in the world. It is a cruciform building in the Italian style, surmounted by a lofty dome, built on the legendary site of St. Peter's martyrdom. The cathedral was started in 1506, and dedicated in 1628, when practically completed. The extensive colonnade which surrounds the piazza and forms a magnificent approach to the church was begun in 1667, and the sacristy was not erected until 1780. The floor of the edifice covers nearly five acres.

WOODEN STATUE PRESERVED 1,300 YEARS

This wooden statue of Diana of Ephesus, said to have been carved about 400 B. C., has been preserved al-



Preserved 1,300 Years by Superficial Treatment

most perfect ever since that long distant time by superficial treatment with antiseptic oils. It is generally conceded that most rot is caused by bacteria or fungi, entering wood from the outside, therefore one of the first things to consider in the preservation of timber is the protection of the outside. What is known as superficial treatment in the preservation of wood should, according to some authorities, consist of allowing the timber to absorb as much oil as it will take up without extracting the sap or moisture, or without the addition of pressure.

SIMPLE PASTEURIZATION OF MILK AT HOME

Milk delivered in the cities during the summer months frequently contains bacteria in such large numbers that it is not safe food for children, especially for infants who depend upon it entirely for nourishment. Under such circumstances it is advisable to pasteurize all milk consumed by small children, and this may be accomplished in the home by means of this simple improvised outfit, recommended by the department of agriculture.

"Milk is most conveniently pasteurized in the bottles in which it is delivered," says L. A. Rogers, bacteriologist of the dairy division. "To do this, use a small pail with a perforated false bottom. An inverted pie tin with a few holes punched in it will answer this purpose. This will raise the bottles from the bottom of the pail, thus allowing a free circulation of water and preventing bumping of the bottles. Punch a hole through the cap of one of the bottles and insert a thermometer. The ordinary floating type of thermometer is likely to be inaccurate, and if possible a good thermometer with the scale etched on the glass should be used. Set the bottles of milk in the pail and fill the pail with water nearly to the level of the milk. Put the pail on the stove or over a gas flame and heat it until the thermometer in the milk shows not less than 150 degrees nor more than 155 degrees F. The bottles should then be removed from the water and allowed to stand from 20 to 30 minutes. The temperature will fall slowly, but may be held more uniformly by covering the bottles with a towel. The punctured cap should be replaced with a new one, or the bottle should be covered with an inverted cap.

"After the milk has been held as directed, it should be cooled as quickly and as much as possible by setting in water. To avoid danger of breaking the bottle by too sudden change of temperature, this water should be warm at

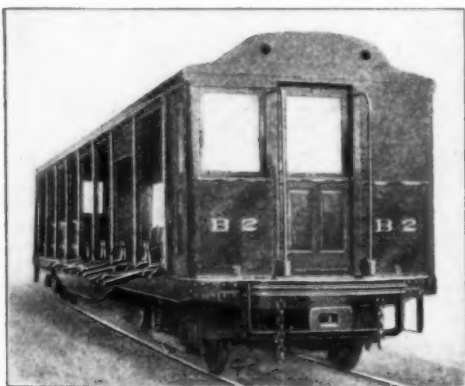
first. Replace the warm water slowly with cold water.

"This method may be employed to retard the souring of milk or cream for ordinary uses, but it should be remembered that the pasteurizing does not destroy all bacteria in milk, and that after pasteurizing it should be kept cool and used as soon as possible."

CARS THAT TRANSPORT BAGGAGE ON TRUCKS

The Hudson & Manhattan tunnel system has placed in commission two all-steel baggage cars especially constructed to carry baggage trucks as well as baggage. The plan is to use these cars between the several steam railroad terminals served by the Hudson tunnel lines. The fact that the baggage is carried on trucks eliminates all extra handling and trucking.

Each car is arranged to receive at one time eight loaded trucks. The sides of the cars are apportioned off into eight openings, each of which is provided with a steel curtain, which, when pushed up, leaves the sides completely open. In each opening is a folding apron, provided with a runway or guide for the truck wheels. Depressions in the steel floor of the car form a track for the trucks when



Truck-Receiving Baggage Car

they are pushed on board. The aprons take the place of the loose steel plates, frequently used by freight and baggage handlers, and bridge the gap be-



Aprons on Left Side Down for Loading

tween the car and the loading platform. The aprons are also part of the locking device for holding the baggage trucks on the car, and are so designed that the air brakes are kept set until they are raised. All eight trucks can be pushed onto or drawn from one of these cars at the same time, so that but a few moments is required in either operation.

A RIVAL OF STOVAINE

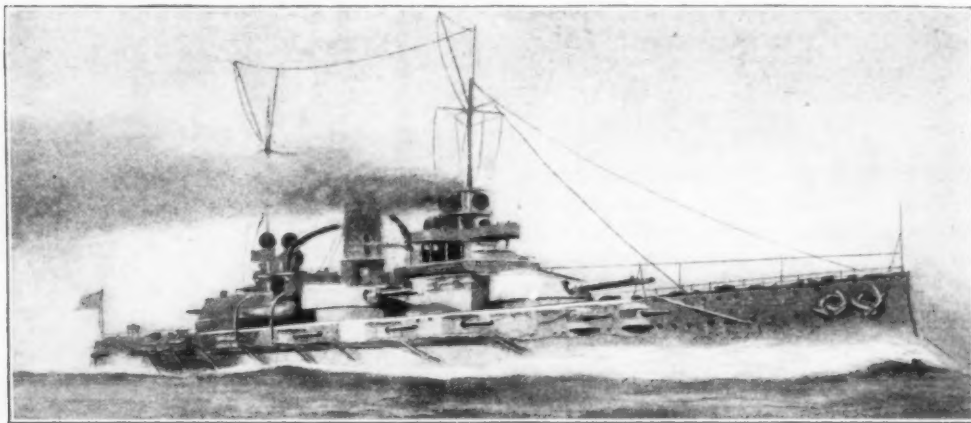
A Boston surgeon, Dr. John J. Hurley, has announced a new anesthetic which permits operations on the brain, eye, or ear while the patient is conscious. It is an injection of a solution of cocaine, adrenalin, and a salt solution, beneath the membrane of fibrous connective tissue around all bones except at the articular surfaces. The operation under this anesthetic is said to be bloodless as well as painless, and the patient may be given a full meal just before the operation.

Operations at the Massachusetts Eye and Ear Infirmary are said to have proved the great value of the discovery. One woman, on whom a delicate operation on the ear was being performed, started laughing, and it became necessary to suspend work until she calmed down.

GERMAN DREADNOUGHT WHICH PUZZLED BRITAIN'S EXPERTS

One of the causes of the recent "navy scare" which swept over England was the secrecy surrounding the design of the German battleship "Nassau." The

masts and the placing of the fore-funnel right up against the mast. Each of the new ships cost approximately \$9,000,000.



The "Nassau," the Ship That Had the English Admiralty Guessing

naval experts could not secure the least information concerning the design of the huge battleships which the Kaiser was building. Portentous rumors were whispered about in the admiralty, until it was feared that the new German sea fighters would render the British navy obsolete.

Two of these ships the "Nassau" and the "Westfalen," are about to be placed in commission and two others, the "Posen" and the "Rheinland," will soon be ready. It was a supposed revolutionary design in the arrangement of the heavy gun firing system that the English experts feared would make their own leviathans seem like gunboats in comparison to the German ships. When the details leaked out recently, it was learned that instead of some novel design, the Germans had adopted a design which experts declare gives a limited all-round bearing for 12 guns, a very commonplace idea. The admiralty heaved a great sigh of relief.

There are many novelties in the minor details of the new ships, however, especially in the design of the superstructures. The most notable is the discarding of the ordinary form of

TRAVELING HOSPITALS TREAT EYE DISEASES IN EGYPT

Egypt, being an agricultural country, has an enormous population in districts remote from hospitals or medical treatment, and the curse of the country is blindness. To make possible proper treatment of affected eyes, Sir Ernest Cassel gave \$200,000 a few years ago for the development of some practicable scheme of carrying treatment where most required. With this money a trust fund was established, and a traveling eye hospital was recommended.

The first traveling hospital organized consisted of an encampment of twelve tents, with an operating staff of English eye surgeons and several Egyptian doctors being trained in the work. The outfit was first pitched at Menuf, a populous town in the Egyptian Delta, and the people in the surrounding country were invited to attend for treatment. As many as three to four hundred cases were always under treatment, and there were often as many as 200 new cases to be examined. Each patient treated was given a lead-

en disc bearing a number corresponding to that on a card bearing clinical notes and kept at the hospital. At each visit the patients presented their disc.

At the end of six months the hospital moved to another location. The work thus accomplished among the poor soon proved so beneficial that a second traveling hospital was organized through Sir Ernest Cassel's liberality, and the improvement is continuing with such fine results that the English government is now establishing eye hospitals in localities where the traveling surgeons have paved the way. The localities so far visited are around Menuf, Calioub, Zagazig, Damietta, Damanhour, Beni-Suef, Fayoun, and Assiout.

The blindness of Egypt changes active and happy lives into existences of helplessness. Glaring sunshine and dust are in some measure to blame for the curse, but the chief cause is the uncleanly habits of the people, especially in the custom enjoined by that phase of their religion which forbids babies being washed until after they are a year old. To many appeals made to parents to discard some filthy charm and use hygienic remedies instead, the only answer is: "It is the will of Allah." Many little children are horribly disfigured with sore eyes on which the flies swarm.

DANCING ON BOTH FLOOR AND CEILING

A student of the Tyrol and Tyrolese people describes a remarkable dance in which the male dancers beat time on the ceiling with their feet. "In Brandenburg, and one or two other Tyrolese valleys which boast of a particularly muscular fair sex," says the writer, "the girl at the conclusion of her swain's fantastical jumps catches hold of him by his braces and hoists him up in the air. He, of course, helps, by jerking himself upward when she lifts, and then, balancing with his hands on her shoulders, he treads the



A Strenuous Dance

ceiling of the low room to the tune of the music, and she continues to dance around on the floor of the room. Such dances are rapidly falling into disuse, and it is almost impossible for the ordinary tourist to witness one nowadays."

MOTORCYCLE SIREN WHISTLE

A powerful siren whistle, designed for attachment to the front fork of a motorcycle, just above the rim of the wheel, has been placed on the market. Attached in this way the bell of the whistle points in the exact direction that the front wheel of the machine is taking.



Ten million cigars were shipped to the United States from Manila during the month of December, 1909.

WORKING A MINE BY DAY-LIGHT

The mining now being carried on in a zinc mine at Webb City, Mo., is done by daylight. It was formerly a closed



Daylight Mine in Missouri

mine, the workings extending through a hill, but the work approached too near the surface, and a cave-in was the result. The opening shown in the illustration is about 300 ft. in diameter.

THE HOAXING OF THE "DREADNOUGHT'S" OFFICERS

England has been laughing for several weeks over the hoax played on the officers of the "Dreadnought," and its amazing and amusing success will probably cause a laugh whenever mentioned in British naval circles for years to come.

One morning the commanding officer of the ship received a telegram

stating that five Abyssinian princes, an interpreter, and a representative of the British foreign office would arrive during the afternoon to inspect the ship. They were received and accorded high honors, the officers not discovering the joke until the visit was over.

The party was headed by "Prince Makalin," and one of the princes in his suite was a woman in disguise. The local color and costumes were supplied by a famous English costumer, and the make-up was striking. At every fresh sight the party murmured in chorus, "Bunga, bunga!" which being interpreted, meant "Wonderful, wonderful," besides other expressions learned beforehand. Tea awaited them after the inspection of the ship, but they declined this hospitality, since the hoax might have been brought to an untimely end by the false lips becoming detached.

The hoax was one more added to the list of many by which English officials have been fooled to the keen delight of the British press and people. One of the most famous of the past was the Sultan of Zanzibar hoax, in which the Mayor of Cambridge suffered.

There is seldom a time when there is not one or more African or Asiatic



The Group That Perpetrated the Hoax

princes visiting England, consequently the officers of the "Dreadnought" did not think such a visit unusual.

Rattlesnakes Met by Government Explorers

By Guy Elliott Mitchell

The United States geological survey topographers carry their level-lines from low swamp to high mountain-top, traversing all kinds and conditions of country. Since much of their work is exploratory they not only penetrate many remote and wild regions where other men seldom if ever go, but they meet with all the kinds of wild things which are to be found within the borders of the United States.

The experiences of the members of the field force of the survey with respect to serpents alone would make a fair-sized snake volume, and, not without its exciting incidents, although there is no recorded case of a surveyor ever having been seriously poisoned by snakebite.

Throughout the entire plains region the medium sized rattler abounds and there is not a field party in the west that does not run across these universally disliked reminders of the original cause of sin. The men in fact think but little of killing western rattlers, or in some instances keeping them about camp as pets, after, of course, extracting their fangs. This is not a difficult operation on a small and medium sized snake, but with a 7 to 9-ft. diamond back of the lower Mississippi valley or the Florida swamps, it would be a somewhat fearsome job, and probably has not yet been undertaken for the fun of the thing. One of the photographs shows a couple of pet rattlers upon which a dental operation had been performed by Robert H. Chapman, of the geological survey at one of his bivouacs in the foothills of the Lake McDonald region, Montana. These fellows, which had skins just about big enough to make ladies' belts, were later deprived of the possibility of growing new fangs.

Unlike the copperhead, which has no good traits, the rattlesnake is a gentleman. He minds his own business and prefers to be let alone. Moreover he always gives a timely and unmistakable warning as he throws himself into



Pet Prairie Rattlesnakes from Which Fangs Have Been Extracted, and Buffalo Skull

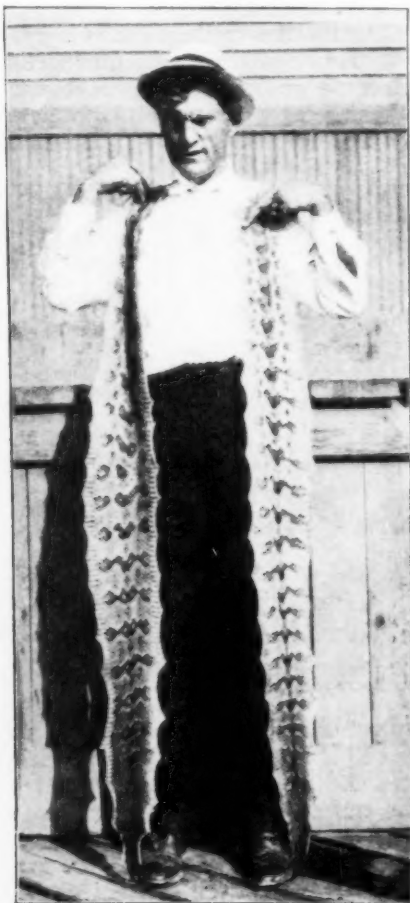
a coil of defense. If given half a show to save his face or perhaps to dispel his alarm, he will cautiously uncoil and glide quietly away, leaving his disturber in possession of the field.

The vibrant buzz-zz-zz of the rattlesnake seems to strike instinctive terror to the hearts of all animals, whether they are snake-wise or not. Young animals which have never seen a snake, at the sound of the menacing note, tremble with fear—all except, perhaps, the hog, which will proceed to eat any snake, poisonous or harmless.

It is a curious thing, as noticed frequently by the writer, that this general fear on the part of other animals of the warning rattle of the rattlesnake, is instinctively taken advantage of by many harmless snakes. In Florida and Mississippi I have been made most uncomfortable for brief periods by the rapid tattoo on dead leaves of the tails of black snakes and several kinds of harm-

less garter snakes, in their imitation of the look-out signal of the rattler.

Strychnine is probably the only positive antidote for a big injection of rat-



Rattlers from Yazoo Delta Swamps, Miss., Killed by Government Topographers

tle snake toxin—a bite or rather stroke such as a four-foot snake would inflict on a fleshy part of the body, as the calf or thigh. For such a bite, carrying as it does a half teaspoon or more of venom deep into the flesh, all ordinary cures are unavailing. Hypodermically injected, however, in sufficient quantities to surely kill the patient were he not suffering from the snake poison, strychnine is a certain counteractant. The greatest danger is said to be in administering too little strychnine.

As a matter of fact but few, even of skilled physicians, have enough knowl-

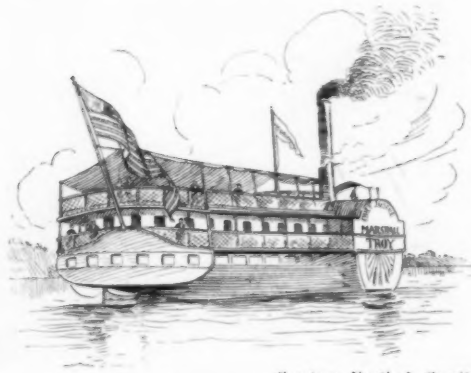
edge of the subject to be able to act with any assurance, in administering strychnine in such cases. That rattlesnake poison and strychnine are exact opposites has been shown by experiments in which animals dying of strychnine inoculations have been cured by injections of the snake venom.

MAGNIFICENT STEAMBOAT OF 1825

The first steamboat to be built expressly for service between New York and Troy, at the head of navigation on the Hudson river, was the "Chief Justice Marshall;" named in honor of the jurist of the Supreme Court at Washington, who decided against the steam navigation monopoly of Fulton and Livingston.

The vessel was about 140 ft. in length and had a beam of 26 ft. 6 in. She was a mastless vessel and had a stern shaped like that of the sailing vessels of the eighteenth century. When she made her first trips she was referred to by the New York and Troy newspapers as superb and magnificent.

"The model of this boat is a fine specimen of naval architecture," said the Troy Sentinel, at the time of the launching, "happily combining the desirable objects of buoyancy and stability, and the workmanship is of a style of excellence rarely equalled.



Courtesy Nautical Gazette
Superb Steamship of the Past

Her accommodations are spacious, airy and neat; and among the various im-

provements is a large reading room on the upper deck, where the principal newspapers of the Union will be filed. Below is a very convenient 'washing room' where water is let in from the river. The strong net-work around the upper and lower decks is another improvement happily suggested for the safety of the passenger. She is a superb vessel, with movements powerful and rapid, and the style and variety of her accommodations are such as will do credit to the projectors of the work."

The vessel made the trip between New York and Troy, with intermediate stops, in about 14½ hours.

PROTECTION FROM DISEASE-BEARING MOSQUITOES

The engineers building the Madeira-Mamore railroad, in the jungles of South America, are compelled to wear net head-dresses to protect the face, neck and head from the stings of disease-bearing mosquitoes. The feet and



Mosquito-Proof from Head to Foot

hands are tightly covered with boots and gloves, so that no part of the body is exposed.

WIRELESS ON THE ENGLISH "DREADNOUGHTS"

The English "Dreadnoughts" are being equipped with improved wire-



Cage of Death on H. M. S. "Dreadnought"

less outfits that will enable them to receive and send messages long distances even under unfavorable conditions. The new plant, a result of many experiments in the past year, is said to be the finest in the world. The operating room, located near the main bridge of the powerful fighters, has sound-proof walls.

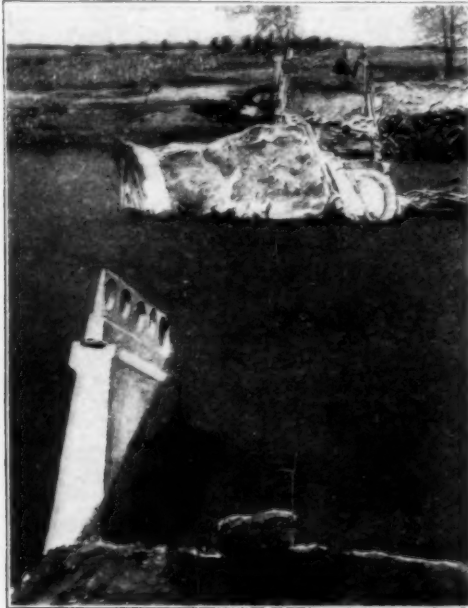
The illustration shows what is known as the "cage of death." It surrounds the live wires leading to the masthead, and its purpose is to protect the wireless operators and members of the crew from danger.

¶The French government claims to have secured an invention which will stop leakages in submarines automatically, and has ordered all submarines fitted with the device.

¶The result of tests made by a large engineering firm recently to test the effect of sea water on cement-sand mortar showed that the water reduces its tensile strength.

COLLAPSE OF CONCRETE ARCH BRIDGE IN INDIANA

A three-arch reinforced concrete highway bridge across the Flat Rock



End View of Wrecked Indiana Bridge

river about seven miles from Edinburg, Ind., collapsed recently during a high flood. The central span was 90 ft. long, and the two side spans 75 ft.

The collapse and fall of the bridge appear to have been due to the undermining of one of the piers by the flood, and do not indicate any defect or disadvantage inherent in concrete arch structures.

"The collapse of the bridge does, however, indicate three things," says the *Engineering News*. "First, the danger of having changes in the designer's plans ordered by those who are in authority but not qualified to pass upon such matters; secondly, the necessity of careful design for bridge piers in soft or loose material; thirdly, the importance of providing ample waterway at flood level."

The original plans for the collapsed bridge called for pile foundations under the piers and abutments. The piers were to reach to a depth of 2½ ft. be-

low the river bed, and each was to rest on 28 piles. The contract price for the piling was 60 cents per foot, and it is said that the county commissioners concluded to save money by omitting them altogether. To offset this they ordered the concrete piers carried about 4 ft. deeper than originally intended.

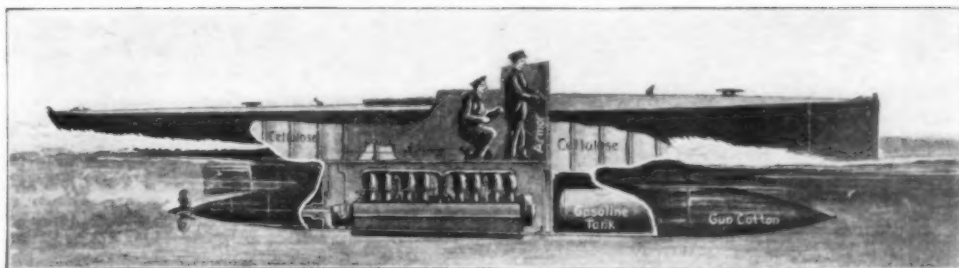
WIRELESS PENETRATES ISOLATED POINTS OF THE ORIENT

No great invention has been more quickly adopted by the people of the Orient than the wireless. One after another the isolated parts of Asia are being connected with the outer world by its aid, and the wireless has already ceased to be a novelty in Japan, China and India. The former, of course, was the first to make use of it, but we have long since ceased to consider Japan in connection with the remainder of the big continent when modernisms are concerned.

The viceroy of Kwangtung was recently ordered by the Chinese government officials at Peking to install a wireless station in his province. Fuki Promontory has been selected as a site for the establishment of a wireless station by the Formosan government, and the construction will begin at once. Wireless communication has just been successfully established between the Audaman Islands and the mainland of India on either side of the Bay of Bengal. And stations will be added at Madras and Karachi as well as Colombo in the near future.

Great strides are being made with the wireless on the Pacific, and while the attempts made to connect Japan and Honolulu have not met with success, it is considered but a matter of a short time before messages will be winging their way through the air between the two points.

India saw its first aeroplane flight recently. A native mechanic constructed a flying-machine which made a flight of about 50 yd.



Showing Relative Positions of Engine, Conning Tower and Powder Charge

NEW TORPEDO BOAT TERROR HURLS ITSELF BODILY AGAINST HOSTILE SHIPS

THE United States is now in possession of a torpedo boat of a radically new design which threatens to revolutionize torpedo boat construction. It is known as a subsurface boat, somewhat in the nature of a compromise between the ordinary torpedo boat and the submarine. This boat, with a torpedo-boat destroyer built along the same lines, was authorized by the naval appropriation act of 1909.

It is estimated that it will cost no more to build 50 of these than to construct two or three submarines, and should half a hundred of these boats

set about to send a huge battleship to the bottom, naval experts declare that flight would be the best move on the part of the battleship.

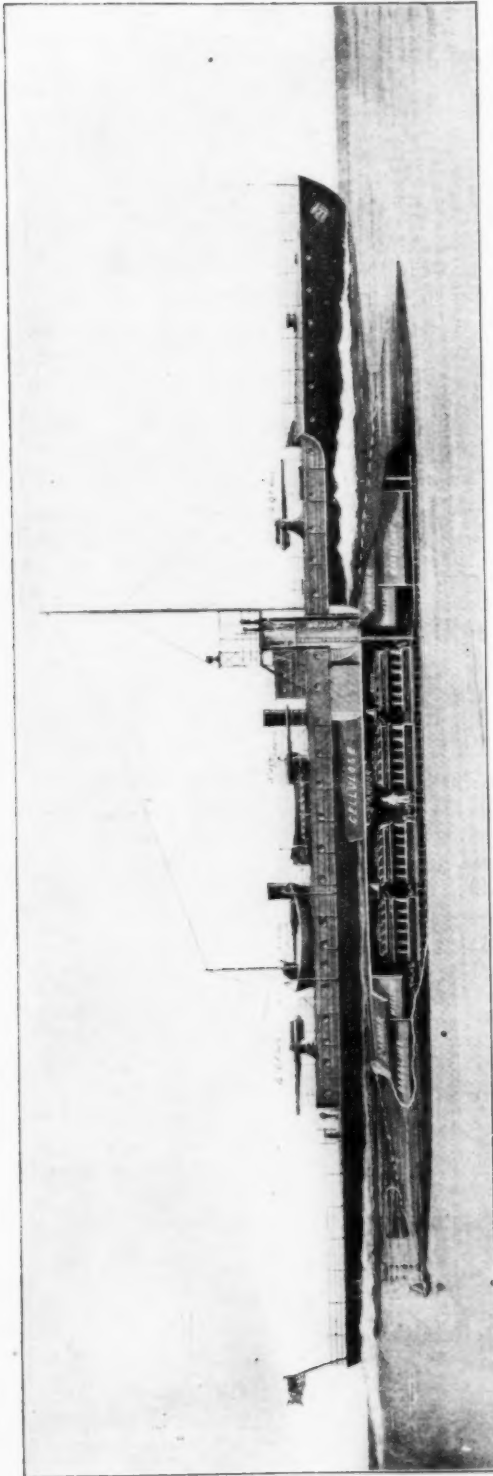
In short the new craft is a torpedo suspended from an unsinkable surface hull, divided into compartments all packed with cellulose.

The front end of the subsurface portion of the boat contains all the machinery in addition to the powder charge. So that if the entire upper part, with the exception of the conning tower should be shot away, the two men who comprise the crew, could



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Latest War Terror at Full Speed

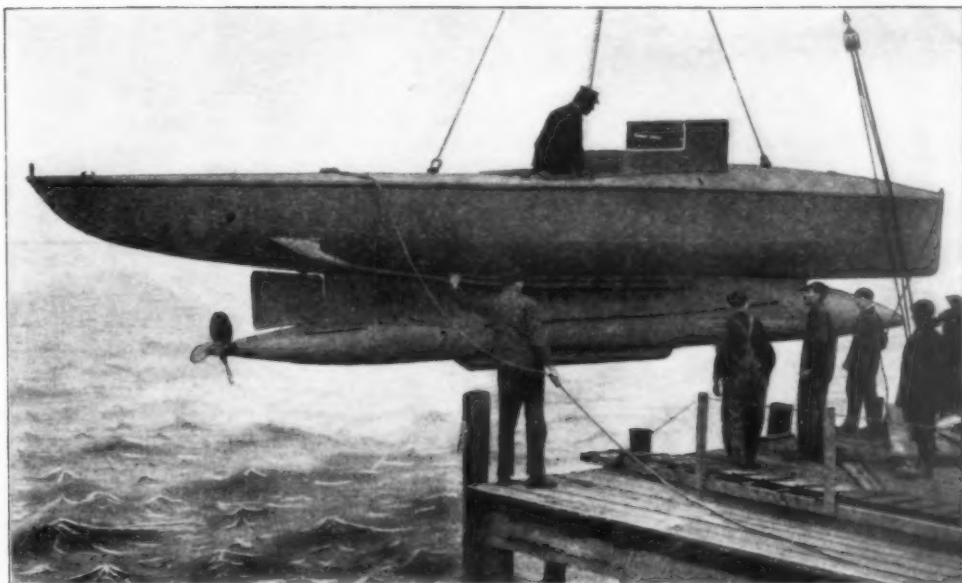


still operate it. The powder charge in the forward end of the submerged portion contains 1,000 lb. of guncotton.

In operation the crew is to navigate the boat to within what may be considered sure striking distance of the hostile battleship. The helm is then locked, with the prow pointed at the mark, and the engine is set at full speed ahead. The crew is expected to abandon the boat at this juncture in small boats or life buoys. If they are lucky, they may be rescued later. If unlucky, well—the fortunes of war. It has been suggested that an alternative design may be adopted fitted with a submerged bow torpedo tube for discharging an ordinary 18-in. torpedo.

The length of the submerged, or torpedo hull, is about 30 ft. as compared with the 16-ft. length of the ordinary 18-in. torpedo. It carries about eight times the explosive charge carried by the large Whitehead torpedo. An eight-cylinder gasoline engine is located in the midships portion of the submerged hull. It is capable of developing 150 hp. The engine and rudder are controlled from the conning tower directly above in the surface hull, which communicates through a hatchway with the engine compartment. The rudder is located in the V-shaped space between the sterns of the two hulls.

The conning tower is protected by heavy armor which is also extended over the floor as additional protection to the power plant below. The surface hull itself is 45 ft., 9 in. long with a beam of 5 ft., 4 in. The weight of the entire vessel is given as 6 tons. The surface hull is protected with the cellulose packed within its double walls. This, it is claimed makes the boat unsinkable and practically immune from serious injury by the comparatively small guns ordinarily relied upon for defence against torpedo attacks. The estimated speed is 18 knots an hour. Its cruising radius is about 200 miles, which practically confines its work to coast defence, although it would be possible for warships to carry a num-



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Lowering the Semi-Submarine into the Water, Giving a View of Entire Boat

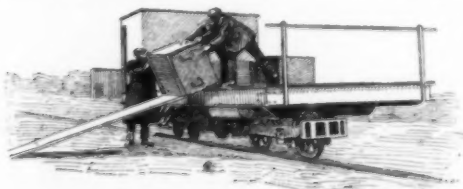
ber of them on deck, launching them over the side when necessary.

Clarence L. Burger, of New York City, a patent lawyer, is the inventor of the new boat.

The subsurface destroyer, shown in the column illustration, will be equipped with two 4-in. quick firing guns, two 3-in. semi-automatic guns, and four 18-in. torpedoes, to be discharged through twin submerged bow torpedo tubes. It will be 235 ft. long and will have a beam of 24 ft., drawing 11 ft., 9 in. of water. The required speed is 22 knots, to be produced by four 6-cylinder gasoline engines.

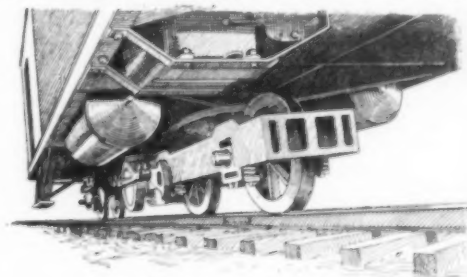
TRICKS WITH GYROSCOPE CAR

To see the Brennan monorail car rushing around curves on its single



Unloading Freight from Gyroscope Car

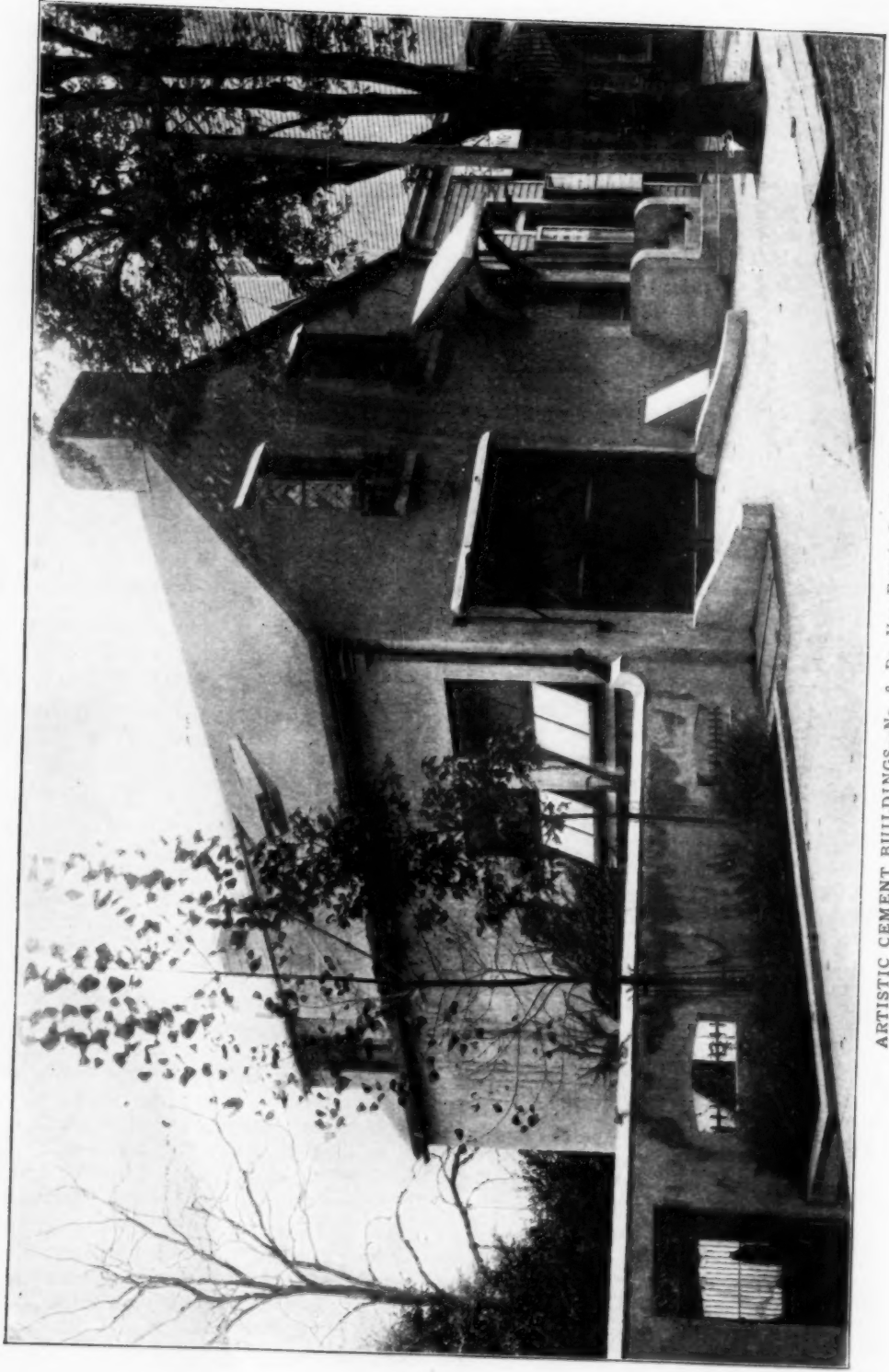
track strikes the spectator as supernatural, and adds immensely to his respect for the wonderful gyroscopes that keep



View of the Car from Underneath

it upright, but his wonder is doubly increased by witnessing some of the tricks played with the car. One illustration shows the gyroscope car made to lean over to one side, that freight might be unloaded, yet it remains on its rail as if securely propped in the leaning position. The other illustration shows the under side of the car.

ⒸThe production of copper in 1908 broke all previous records. Of the output of 1,667,098,000 lb., the United States contributed 942,570,721 lb., more than half.



ARTISTIC CEMENT BUILDINGS—No. 8, Dr. Van Eitten's Stable, Bronx, N. Y.

GERMAN PEDAL-PROPELLED AEROPLANE

Baron Fredericks, a European inventor of aeroplanes, has constructed a machine which he expects to propel by working the pedals of the bicycle

indicating that the marriage has been annulled and the ring divided. Still another ring for the divorcee has two opposing half-moons, and looks very much like an ordinary signet ring. The ring for widows has a half-covered full moon.



Bicycle Fitted with Flying Planes

forming its carriage. The power is conveyed from the sprocket wheel of the bicycle by chain to a gear attached to the propeller, which is forward. Connection is also made with the rear wheel of the bicycle, so that he may drive the machine along the ground in making the start.

The idea of pedal propulsion has been tried before, but not since the aeroplane attained its present successful form.

MARRIAGE RINGS FOR DIVORCEES AND WIDOWS

The latest jewelry novelty in Germany is a special type of ring for divorced and widowed persons. The claim set forth for these curious innovations in rings are that they save the wearers, especially the feminine sex, from embarrassing or painful explanations, and delicately inform other interested persons of their circumstances.

The designs are but slightly different from the ordinary ring, and the difference is not so marked but that they can be displayed or concealed at will. The divorcee's ring is of gold with a broad strip of platinum or silver set in, so that the ring shows a white stripe,

DOLL-COSY KEEPS COFFEE AND TEA WARM

The ordinary cosy is usually made of figured satin, padded with cotton, and is placed over a tea or coffee pot to keep the contents warm. This curious cosy, is of a new design, and its purpose is to keep the coffee or tea warm after it has been placed in the cup. It is made in the form of a doll, and the



Doll Cosy Over Cup

body of the doll acts as a handle, while the skirt, with its interior padding, envelops the cup. When placed over a cup, the skirt has the appearance of the large hooped affairs worn about the time of the Civil war.

FALLING WEIGHT OPERATES FOG BELL ON CANADIAN COAST

This fog bell, located on the Atlantic coast of Canada is operated by a heavy



Unusual Type of Fog Bell

iron weight which drops inch by inch, causing the hammer to strike the bell with considerable force. The bell is rung about 16 times a minute and can be heard for many miles. The weight can be seen hanging just below the bell platform.

THE QUESTION OF FRONT- WHEEL BRAKES

The advisability of using brakes on the front wheels of automobiles is a question which is engaging the serious attention of English motor car manufacturers, and a number of inventions provide means for the adaptation of

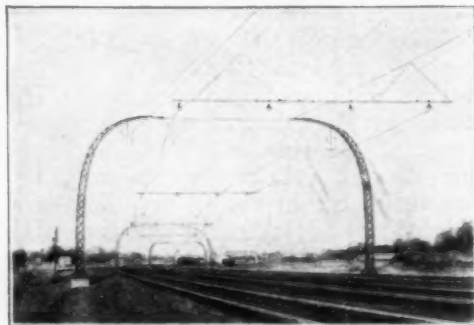
brakes to act on the front wheels. None of the American manufacturers, however, have given the subject serious attention. One reason for this is, undoubtedly, the general reluctance to adopt features which will add to the cost of production.

The desirability of attaching brakes to the front wheels is fairly well admitted. They have strong claims to consideration, among the leading points in their favor being the immunity they provide from sideslip, and the fact that they take the suddenly reversed strains away from the driving mechanism, while they also tend to equalize the wear on the tires, the rear ones doing the driving, the front ones the stopping.

Some experts point out that upon a down grade the weight of the car is thrown forward on the front wheels, and that in this case the efficiency of brakes on those wheels is likely to exceed those of brakes fitted on the rear wheels.

NEW METHOD OF SUPPORTING TROLLEY WIRES

Experiments are being made with a new type of trolley support on an electric line between Glenbrook and Stamford, Conn. The poles are curiously shaped lattice-work affairs, and have been erected along a two-mile stretch



Something New in Trolley Wire Supports

of track. From the overhanging ends cables are strung, and from these cables, supported by long cross-arms, are hung the trolley wires.

Confessions of a "Handcuff King"

By Victor Alexander

FREQUENTERS of the vaudeville theaters and music halls of America and Europe have many times been entertained and mystified by an act that has come to be widely known as the "great handcuff release and prison cell escape mystery."

The curtain rises and the "handcuff king" is announced. In the course of his introductory remarks to the audience, he states that he is but an ordinary human being, but possesses the

have sometimes acquired the impression that the "handcuff king," so-called, possesses powers supernatural. Having been favored with the royal appellation myself, after appearing nearly all over the globe in this act, I have thought that it might prove interesting to disclose for the first time the secret of this trick, or rather series of tricks, which have aroused so much comment wherever witnessed.

I was one of the first to be known as



The "Handcuff King" on the Stage

power to release himself from any manacle that any member of the audience wishes to put on him, and that furthermore, in most cases, he can escape in a shorter time than it takes to bind him.

His challenge is forthwith accepted, and a small delegation of citizens or police officials, chosen from the audience proceeds to lock and secure him in such a manner that it seems manifestly impossible for him to free himself. Yet after disappearing into his cabinet for a few seconds, he reappears as entirely free from his manacles as though they had never been locked on him.

This is so mystifying a performance that the public together with the police

a "jail breaker," and during my professional travels I have come across many appliances by which prisoners were secured, both at the present day and in past generations.

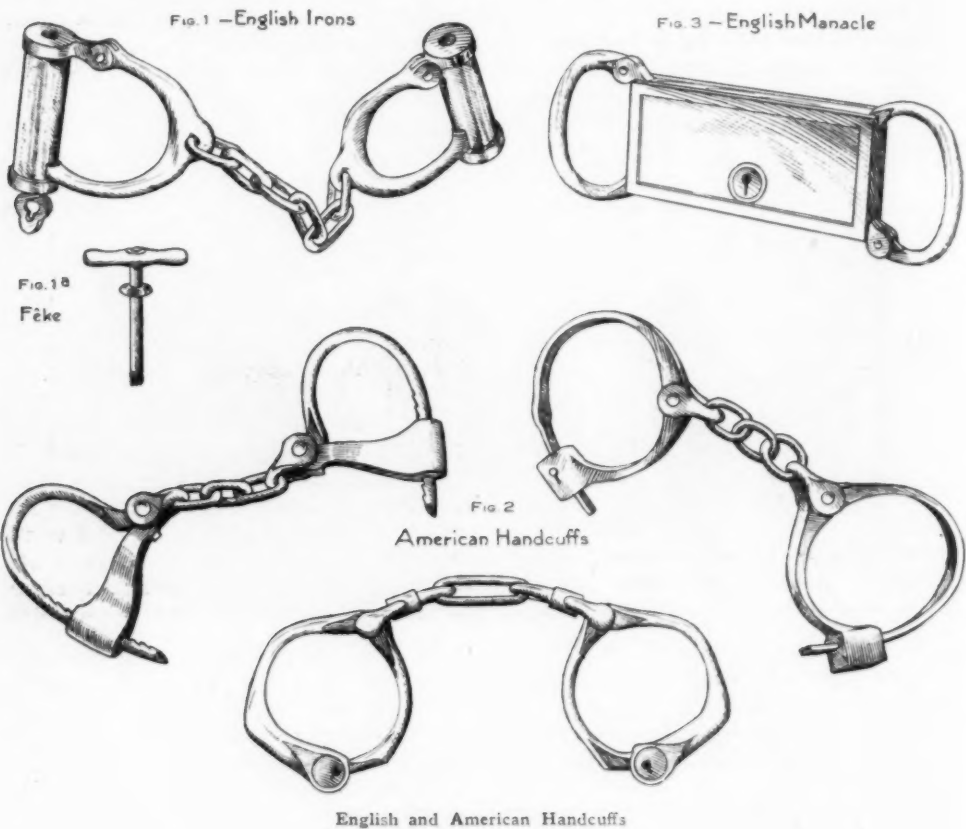
From my earliest days I have had a passion for studying locks in their various forms, especially the most prominent makes, such as Yales, Towers, Chubbs, etc., to find out their mechanism. In addition I had always been a fair athlete, so when I entered upon the life of a vaudeville performer, and issued my challenge, I found that I had naturally a good deal to my advantage in the way of being able to tackle any manacle handed me on the stage. I made my debut and issued my first challenge in England, where I immedi-

ately found that many people had been lying in wait for me, thinking me a boaster who carried through my act only with the aid of confederates. However, I accepted all kinds of challenges throughout England and Scotland, France, Germany and Russia, and always proved the winner.

To carry out successfully this rather sensational trick, it is necessary that the performer should have a flexible

handcuff monarch), you may easily create a sensation that will set the average man to wondering whether he is not a victim of hallucinations.

Now, in the first place it must be remembered that handcuffs used by the police are constructed with spring locks which are fastened or released by means of a key, or some article which answers the same purpose which pulls back the spring.



and muscular body, an unlimited supply of nerve, that he be a good talker, and most important of all, that he possess an adequate supply of handcuffs, leg-irons and special manacles of his own, together with a retiring cabinet, and a complete assortment of specially designed skeleton fêkes, picks and keys. Given these requisites and a good mixed audience (which, I have found is nearly always sympathetic to the

Without the aid of such an appliance, it is, I can say without fear of contradiction, absolutely impossible for any human being to free himself from the ordinary handcuffs employed by the police.

The most embarrassing contingency I found myself obliged to solve was how to conceal these keys so as to be able to get at them in whatever position I happened to be handcuffed. The

favorite place of concealment was the cabinet in which I always retired to effect my release. This was constructed of iron piping, and many of the pieces which appeared to be essential portions of the framework were in reality only intended to hold my keys. Other keys I disposed about my person in sundry small pockets and I had them so arranged that I was able to place my hands upon some of them in whatever position I might be. The best places for pockets I found to be under the knees, to permit me to reach the keys when in a crouching attitude. The next best place was about six inches up, inside the leg of trousers, if they were worn. When pinioned with my arms behind my back, a small pocket inside the neckband of my waistcoat made my complement of pockets complete. A piece of violin string made into a loop was kept inside the cabinet for emergencies. Thus, when it was impossible to draw the key and force the lock spring with the fingers, the loop was draped over the key, the heel of the boot was placed in the other end of the loop and the lock was easily sprung.

When I have accepted challenges in a nude condition, it has naturally excited greater attention. This is the way I have had to work it. First I must explain that when I undergo this test in the hands of the police authorities I hold a vastly different position to a prisoner in the hands of the law. The very nature of my visit enables me to make conditions favorable to myself, of course. I state what I require, and it is while listening to my instructions that the police as well as the public audience are deceived. When they take me down to a cell which is fitted with a spring lock, all I have to do in the course of my conditional examination of the locks, etc., is to fill up the bolt hole with a wedge of hard wood. As the door shuts the bolt "pinches on" this wedge and remains shut, but pressure opens it and to conceal my methods I afterwards secretly remove my wedge.

I generally work on this method in



Victor Alexander as He Was Bound by English Police—Escaped in Two and a Half Minutes

ordinary cases, but once in Clermond-Ferrand they would not let me have the conditional examination. However, I shall tell later on how I finally succeeded in outwitting them.

In cases of escaping from a cell nude, I generally have my keys (which all fit into a tiny silver tube) stuck under my armpits by means of shoemakers' wax. I have also concealed my keys in my hair, which I keep particularly long for that purpose. The fêke key I use to open the English regulation handcuff (Fig. 1) is a round piece of steel about 2 in. long, with a handle at one end (which can be folded up) and with the opposite end drilled out and screwed with a 1/4-in. top as shown in

Fig. 1^a. It will open all regulation English key irons. These, as all locksmiths know, are opened by a key lifting a screwed pin, and thus releasing a spring catch. This catch must always be lifted. There is a shoulder on the ordinary key which prevents it from entering the keyhole beyond a certain point, and when that point is reached the key begins to lift the pin inside the lock. This shoulder is not necessary on a fêke or trick key, as once it has reached and secured a hold on the pin, the latter may be raised as required with a reasonably strong pull. The reason the fêke must be split is so as to fit any size screw pin and this fêke expands if the screw pin is stout. All of these pins vary in thickness, otherwise any ordinary shoulder key would spring them.

I have opened many English irons by giving them a sharp rap at the hinge near the keyhole, on the other iron, or on the heel of my boot (if I could reach it) as the sudden recoil of the spring usually makes it fly open.

As regards American handcuffs (Fig. 2), I could also manage generally without a fêke, though I sometimes use a very thin piece of clock spring, and when I am handcuffed, I take care that the person who locks them on me does not squeeze them on up to the last notch on my wrist. Then when I get into my cabinet all I have to do is to get the piece of clock-spring and place it flat over this notch that is left. I then squeeze the 'cuff as though on to the next tighter notch, which naturally goes on to my piece of flat spring, and the cuff catch of course fails to fit into the notch. All I then have to do is to slide the 'cuff carefully open, pushing at the same time the clockspring over all the 'cuff notches with it, so as not to allow the 'cuff spring to wedge itself into one of them again.

When my hands were fixed behind my back I could always bring them to the front by squeezing my legs and entire body through my arms, and this of course required considerable muscular flexibility on the part of the performer. Another position that looks

harder than it really is: If the right hand is fixed over the right shoulder to the left hand behind the back, one appears to be helpless; but it will always be found possible to pass the right arm over the head, which brings both arms to the front.

It was in Clermond-Ferrand that the police decided that I certainly should not escape from their cells. They would not let me have any conditional examination beforehand, so, being absolutely unable to wedge the door I had to resort to my wits. They locked me in. After a few seconds I called out: "Open the door!" They opened it. "Well," I said, "are you satisfied now?" The policeman that opened the door replied: "Didn't you tell me to open the door?" I replied, looking very fierce for the occasion: "Who said the door was locked?" Needless to say I so confused the poor policeman about his simply pulling it open and I having already unlocked it, that this ruse worked. My ad stood good for the night's show, as I certainly escaped from the cell, and the theater was packed.

While performing at Barnard's Palace, Chatham, England, two sailors secured a very old torture handcuff, which they were anxious for me to tackle. Luckily I got to know of this, so when the usual number of challengers stepped upon the stage I examined all, but carelessly rejected the sailors' cuffs, saying that "owing to time" I was quite unable to give more than two or three tests.

During my appearance in Wilmington, Delaware, when one man came upon the stage, I could see his 'cuffs were going to give me trouble; so I said to him: "Put them in your pocket. I want to see you after the show." Luckily he did so without a word, thinking probably I would offer him money to keep quiet. During my interview with him after the show it was arranged that he should post a challenge of \$25.00 to fix me in strait-jackets, insane belts, etc., but instead of paying the \$25.00 he was to receive it for his trouble. He replied that it was

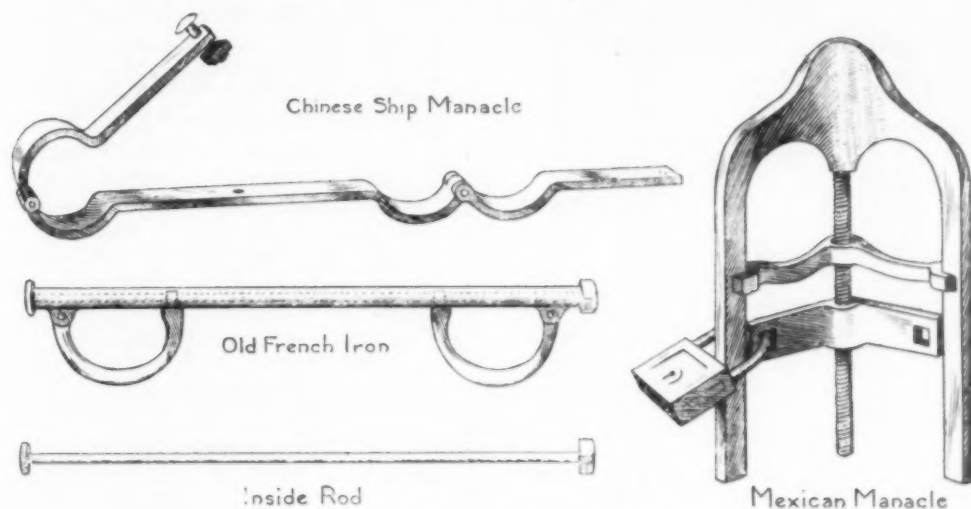
impossible to do as I suggested, as he did not possess the necessary manacles.

"Well!" I laughed, "that's all right. I have a trunkful you can use."

I recall how on one occasion I might have had a very rough time of it had it not been for the fact of my being in the theater manager's office at the time.

I was at the Theatre Royal, Wool-

the inventor had his treasure restored to him again. This manacle was similar to Fig. 3, so not forgetting what the manager had told me about his being so anxious to get the key-hole nearest the body, I was in readiness for him. We met face to face upon the stage, and I accepted his iron after a lot of sham reluctance. I got over the



Some Queer Forms of Manacles

wich, London, and the man who was going to challenge me was employed at the well known Woolwich Arsenal. He was one of the chief mechanics. He passed the theater in the morning and wished to show the manager the irons which he had invented and with which he was going to challenge me that night. He said he was certain I would stand no chance whatever. He also remarked that he was going to place those irons on me with my hands in front, but with the key-hole nearest the body, to make my escape doubly hard.

The manager expressed surprise at the ingenuity of their construction and begged to be allowed to show them to a press representative who happened to be in his office. The poor inventor unsuspectingly did so. Needless to add, I was the press representative and I quickly made the key impression on wax, cut my key and in a few moments

key-hole difficulty by turning the irons about quickly in my hands so that my challenger could not well follow the key-hole; then, putting one hand entirely in and the other only partly, I thrust my hands out toward him quickly and remarked: "I don't think they'll go round my wrists. Just try them." He naturally snapped them on forthwith, thinking it was only a trial, but I immediately disappeared in my cabinet, having the key-hole in front, as I wished it. I reappeared almost immediately with the irons open, thanks to the fact that I had made a duplicate key to fit the irons.

In order to open the irons when the key-hole is placed next the body, simply push the key into the end of a match box, it being pinched between the cover and the box. If the box is now taken between the knees the key will project sufficiently to enable it to be passed

into the lock. Once in the lock it may be turned enough to release the spring catch by the action of rubbing it against either knee.

The accompanying photograph was taken at the time that I accepted a challenge to escape from the Hampstead police. I succeeded in baffling all their attempts to secure me and escaped from the manacles and binding shown in the photograph in two and a half minutes. The binding consisted of:

- Steel throat squeeze cable.
- Neck lock and clamps.
- Ropes bound round neck going into four diverse corners of cell.
- Armllets padlocked to shoulder straps.
- Indian torture thongs.
- Neck clamps.
- Waist straps, chain and girdle.
- Four handcuffs (English police).
- Four spiked handcuffs (torture).
- Heavy weights (each 25 lb.).
- Waist chains 'cuffed to leg-irons.
- Chain from back of neck meeting front 'cuffs.
- Two pairs leg-irons.
- Fifteen yards of bound rope (cable).
- Chinese steel knee bands (holding knees stiff).
- Back locked to weighted manacle.
- Chain gird locked back and front and joining waist.
- Also—
- Double locked cell doors,—bolts and bars.

With the explanations it is quite possible for any reader to do this same act. I concealed (on my conditional examination) several picks in the corners of this dark cell. I had several fêkes in my hair, and also worked this ruse which helped me a great deal: Noticing the stone floor, I requested the police to at least let me wear my shoes, as I might catch cold running from the cell when free to the top of the passage (where I always made the challengers stay). They readily assented, so I placed my shoes inside the cell ready to put on when I was free. Well, naturally, it was not the cold stone I minded, but both of those shoe heels were false, opened half way and contained one of my finest collections of picks; otherwise it might have proved rather more difficult to have escaped in such quick time.

President Taft is to have a private wire for his use between the White House and the home of his brother, Charles P. Taft, in Cincinnati, O.

HOW TO MAKE A WRITING DESK

For the writing desk shown in the accompanying picture the following stock will be needed. The thicknesses of all the pieces are specified. On the legs the widths, too, are specified. Quarter-sawed white oak is the best wood to use, and it should be well seasoned and clear of shakes and other imperfections.

STOCK BILL

- 2 front posts, 1½ by 1½ by 34 in., S-4-S., oak.
- 2 back posts, 1½ by 1½ by 42 in., S-4-S., oak.
- 2 lower side rails, ¾ by 3¼ by 15 in., S-2-S., oak.
- 1 lower back rail, ¾ by 3¼ by 27 in., S-2-S., oak.
- 2 sides, ¾ by 9 by 14 in., S-2-S., oak.
- 2 sides, ¾ by 10½ by 14 in., S-2-S., oak.
- 1 back, ¾ by 9 by 26 in., S-2-S., oak.
- 1 back, ¾ by 10½ by 26 in., S-2-S., oak.
- 1 top, ¾ by 6 by 30 in., S-2-S., oak.
- 1 lid, ¾ by 15 by 28 in., S-2-S., oak.
- 2 side shelves, ¾ by 5 by 16 in., S-2-S., oak.
- 4 braces, ¾ by 1¼ by 9 in., S-2-S., oak.
- 1 bottom of case, ¾ by 16 by 28 in., S-2-S., oak.

INTERIOR

- 1 piece, ¾ by 16 by 27 in., S-2-S., oak.
- 4 drawer and case bottom supports, ¾ by 2½ by 28 in., S-2-S., oak.
- 6 drawer and case bottom supports, ¾ by 2½ by 16 in., S-2-S., oak.
- 4 drawer guides, ¾ by ¾ by 16 in., S-2-S., oak.

DRAWERS

- 2 front pieces, ¾ by 7½ by 13 in., S-2-S., oak.
- 4 side pieces, ¾ by 7½ by 16 in., S-2-S., poplar.
- 2 back pieces, ¾ by 7 by 12 in., S-2-S., poplar.
- 2 bottom pieces, ¾ by 16 by 12 in., S-2-S., poplar.

PIGEON HOLES

- 1 bottom, 3/16 by 7¼ by 27 in., S-2-S., poplar.
- 1 top, 3/16 by 4½ by 27 in., S-2-S., poplar.
- 4 verticals, 3/16 by 7¼ by 10 in., S-2-S., poplar.
- 1 vertical, 3/16 by 4½ by 4 in., S-2-S., poplar.
- 5 horizontals, 3/16 by 7¼ by 9 in., S-2-S., poplar.
- 2 horizontals, 4½ by 9 in., S-2-S., poplar.

DRAWERS IN PIGEON HOLES

- 2 front, ¾ by 2¼ by 9 in., S-2-S., poplar.
- 4 sides, 3/16 by 2¼ by 7¼, S-2-S., poplar.
- 2 backs, 3/16 by 2¼ by 9 in., S-2-S., poplar.
- 2 bottoms, 3/16 by 7¼ by 9 in., S-2-S., poplar.

Begin work by cutting the posts to length and shape. Having done this, lay out the tenons on the lower rails so as to have the required distances between the shoulders, and then cut them. Now cut the parts to be worked into the frames that support the drawer and bottom of the case, and glue them

properly. While this is drying, the other parts of the case may be laid out and shaped. It is intended that the sides of the case shall splice on the edge of the bottom of the pigeon hole case. In this manner the side shelves will cover the joint on either end. The back may be made up into one solid piece. Make the side pieces of the case long enough to be housed into the posts about $\frac{3}{8}$ in. at each end.

The shelves at the ends of the desk should be fastened after the frame is put together and before the bottom of the case for the pigeon holes is fitted and fastened. In so doing the shelves may be fastened from the inside of the case. The angles of the braces are 30-60 deg. It will be noted that the edges of the lid are rabbeted. Another way is to have the lid large enough to fit entirely over the sides of the case and change the slope to correspond.

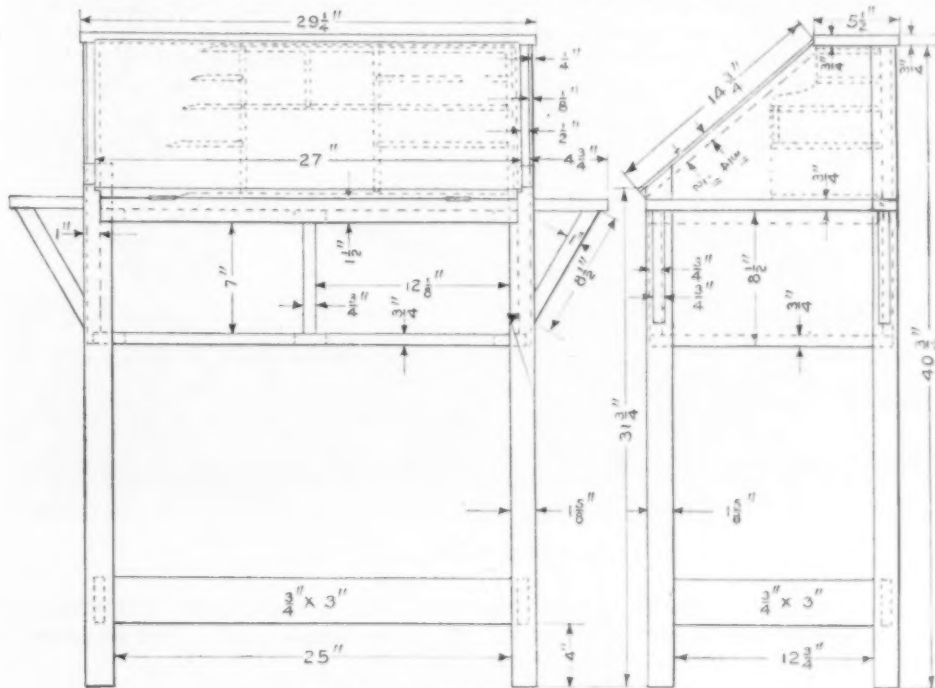
The drawers may be made next.

amination of an ordinary drawer will show the manner of construction.



Writing Desk Complete

Make the frame of the pigeon holes of $\frac{3}{16}$ -in. yellow poplar. The drawing



Details of Writing Desk Construction

The fronts should be of oak but the other parts of yellow poplar. An ex-

shows an arrangement entirely independent of the sides of the desk so that

the frame can be made and slipped in place after the finish has been put on. Two drawers are shown. These are faced front and back alike so as to secure as much room in the drawer as possible.

In the finishing, the poplar wood should be finished with white shellac in the natural light color of the wood. For the oak parts the following is appropriate for this design: Apply one coat of green Flemish water stain. When this has dried, sandpaper lightly until the raised grain has been removed, and apply another coat of stain

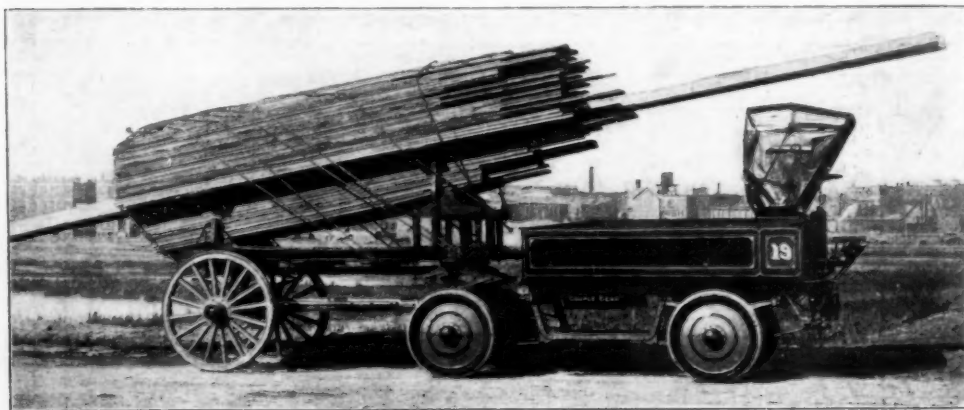
diluted one-half with water. When dry, sand lightly and apply a very thin coat of shellac. Sand lightly and apply a coat of dark filler, natural filler colored with lampblack, according to the somberness of the finish desired. Upon this put a coat of orange shellac. After this, put on two coats of a good rubbing varnish. Rub the first coats with curled hair or hair cloth and the last with pulverized pumice stone and raw linseed oil or crude oil. This is called a green Flemish finish and the general effect is black with highlights of greenish gray.

MOTOR-WHEELED AUTO TRUCK IS LAND "TOW-BOAT"

A lumber company in Cambridge, Mass., is using a couple-gear electric motor truck for lumber hauling. It is in reality a towing truck to take the place of horses, and, like the electric motor truck described in the May number, has a motor in each of its four wheels. By a curious frame arrangement the rear set of motor-contained wheels are back of the box of the truck

the king bolt dropped into a socket made for it on the motor truck.

Each of the four driving wheels contains a 3-hp. motor, and both pairs of wheels are shifted in steering. With the truck part of the vehicle swinging on its kingpin, the whole can be turned around in not much more than its own length, and it is able to navigate without difficulty the alleyways in the lum-



Trailer Truck with Motors in Four Wheels

proper, and in such position that the forward end of the trailer rests upon them. The trailer and truck therefore form a 6-wheeled vehicle. The forward part of the truck can also be coupled to an ordinary wagon, the front wheels of the latter being removed, and

ber yard. A speed of $5\frac{1}{2}$ miles an hour is attainable when loaded to the full capacity.

☐The cities of Bombay, Lucknow, and Allahabad, India, have ordered motor fire engines.

A THREE MILLION-DOLLAR SALVAGE FIND

The Gans line steamship "Erika," running between Boston and German ports, made one of the richest salvage finds on record recently when she picked up the disabled steamship "Varzin" in mid-ocean, and, after a remarkable towing feat, brought her safely into port in the face of a series of severe storms.

Not until port was reached was it learned by the captain of the "Erika" that the steamship he had saved contained a cargo worth \$2,500,000. The vessel itself was valued at nearly half a million. In the hold of the "Varzin," were 17,080 bales of the finest Australian wool, and other merchandise of great value.

The tail-shaft broke a few days after leaving port, and the steamship was tumbled about by the high seas for two days before she fell in with her rescuer. After eight days of towing, during which the towlines parted twice in the gale, they reached Boston harbor.

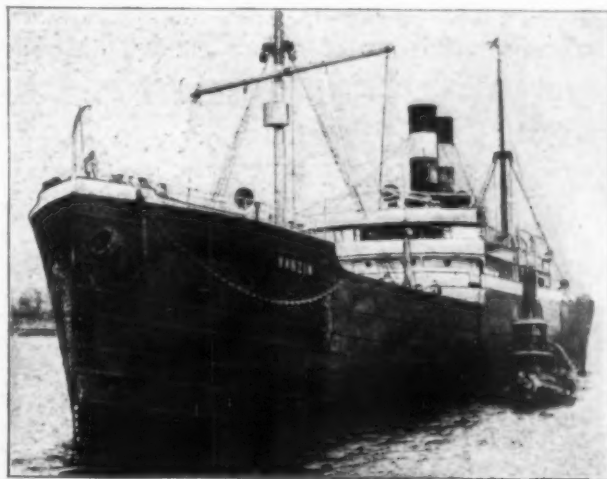
As both steamships fly the German flag, the question of the amount of salvage will probably be settled in the German courts. It is expected, however, that it will be at least \$100,000, of which every member of the crew will come in for a share. The captain's share would be about \$15,000.

It is claimed that this is by far the richest find it has been the luck of a sea captain to make in recent years.

THE MAGNITUDE OF EARTH- QUAKE WAVES

Earthquakes cause pulsations which extend for thousands of miles in all directions, and are often likened to the

long, low swells that sweep across the ocean. Recently an attempt was made to measure the height and length of the waves of an earthquake. Apparatus was arranged and the pulsations of an earthquake that occurred in Greece were received with the aid of



The "Varzin," a Veritable Treasure Ship to the Crew That Rescued Her

a specially constructed pendulum at Birmingham, England.

The pulsations, or waves, passed through the rocky crust of the earth with a velocity of about two miles a second, and each of the largest of them, according to the scientist in charge of the experiment, must have been about 28 miles long, but only half an inch in height.

CORKSCREW WITH PULLING LEVER

An English inventor has patented a corkscrew with a lever attachment by which the tightest cork may be pulled with but little exertion. It is screwed into the cork like any ordinary corkscrew, and then a lever is pressed down and the cork comes out readily.



THE COLORING OF MOVING-PICTURE FILMS

Realizing that a properly colored moving-picture film is far in advance of the uncolored film, a great French film concern has devised means by which the tinting can be done successfully. The illustration shows one part of a loft in which 400 girls are at work coloring. The row of girls standing

strip and touching the surface of the film.

After the films colored by the machine are retouched by hand the result is so nearly identical with the best of natural color photography that the average observer cannot distinguish the difference.



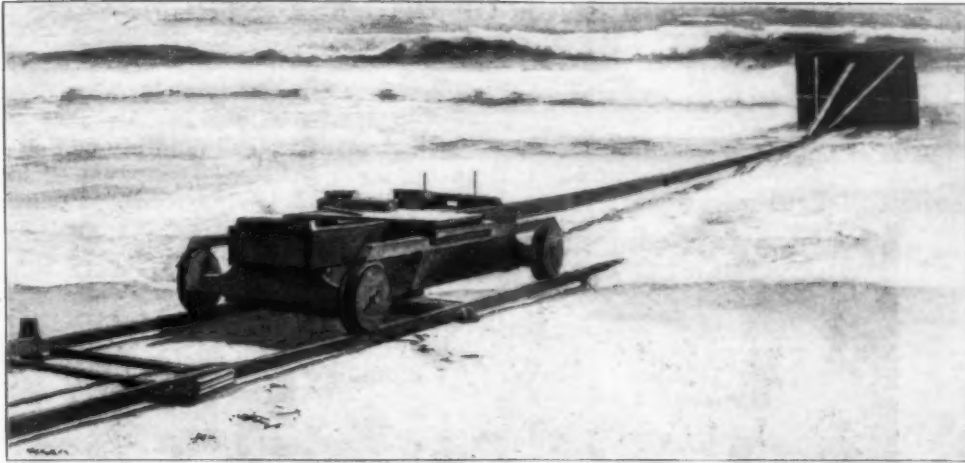
Where Moving-Picture Films Are Colored

up are coloring the films by machinery, and the others are doing the work of retouching by hand.

The coloring machines are ingenious affairs provided with a number of stencil strips as long as the strip of picture film. Holes cut in the stencil strips correspond to the parts of each of the little pictures which are to receive the coloring of ink or dye each strip is expected to give the film. The stencil strips are run through the machine on top of the picture film, one at a time, until all the colors have been put on. The stencil strip and film strip, of course, run through the machine as if one solid layer. The coloring matter is put on the film by a short endless band of velvet, which acts as an ink brush, the soft brushlike surface passing through the holes of the stencil

PUSH-TRUCK WAVE MOTOR

A Californian inventor who is interesting himself in the production of a wave motor that will successfully harness the force of the ocean waves, has been testing the curious apparatus shown in this illustration at Santa Monica. His idea is to catch the power of a wave on its shoreward journey, and this is done by means of a small truck with a broad dashboard tail. The wave pushes against this tail and sends the car along its track up the incline of the beach. The car in turn pushes a piston, which has connection with compressed air tank on the shore. The force of the inbound wave being spent, the force of gravity carries the car back down its track into the surf until it is caught



A New Idea in Wave Motors

by the next wave, and so on indefinitely.

When too heavy a sea is rolling for the safety of the apparatus, the car can be uncoupled from the piston rod and pulled up on the beach where it is out of harm's way.

FOOT-WARMER HEATED BY AUTO ENGINE

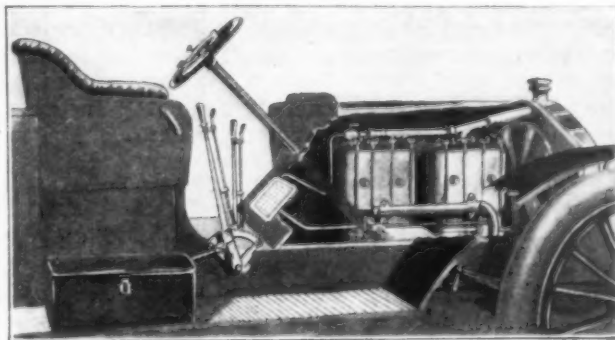
An automobile foot-warmer, which receives its heat by the circulation of the hot water from the cylinder jacket of the engine, is one of the latest and most ingenious motor accessories brought out in England. The warmer itself, which is set into the footboard, is composed of several copper plates so fastened together by rivets that there is a slight space between each plate. The hot water from the cylinder jacket is carried to the warmer by one pipe, circulates through it, and is returned to the engine pump through another pipe.

CA one dollar bill recently subjected to a microscopical examination by government experts contained 92,000,000 germs.

THE EXPENSE OF THE BRITISH NAVY

The total estimated cost for the upkeep of the British navy and the building of new ships for the year ending March, 1911, is a little more than \$193,000,000, which is about \$22,000,000 more than for the year ending March, 1910.

Of the above enormous figure, new construction is responsible for about \$60,000,000, which is the largest amount on record. This provides for



Hot-Water Foot-Warmer for Autos

hulls, machinery, armor, and gun-mountings, but not guns, ammunition, nor stores.

The British estimate for the year is about \$90,000,000 more than that of the United States navy.

THE EXCELLENCE OF CHINESE STREET-CAR OPERATORS

The street car system of Shanghai, China, which has been in operation nearly two years, consists of 26 miles of track with an equipment of 65 cars, operated by 500 men who are as pro-

simple. There are two classes of tickets to handle with four divisions in each class, as well as monthly and coupon season tickets. The payment for a ride consists of ten coins, of which



Training Chinese Motormen

ficient as any body of street car employes in America or Europe, and probably more careful as a whole. The men are of various nationalities, mostly Chinese, but up to June, 1909, when the line had been in operation a year, not one fatal accident had occurred. The percentage of accidents has been very small, and native trouble has been entirely absent from the start.

Very great care is taken in selecting and training men for the cars. The medical examination, which is handled by Chinese doctors with European training, includes sight and hearing tests. After a thorough schooling in the training-rooms the applicants for positions begin their actual work under experienced men, and only those who on final examination prove efficient, are engaged.

The conductors' work is far from

it takes about three to equal an American cent in value. Consequently the conductors have to turn in each day several times the number of coins received by conductors in America and Europe.

A FIREBUG'S INGENUITY

One of the most striking cases on record of perverted mechanical ingenuity is charged against a ranchman in Southern California. Some time ago he was denied the privilege of grazing his cattle on the forest reserve near Los Angeles, and he considered himself injured to such an extent that he determined to have revenge. He planned to set fire to the forest.

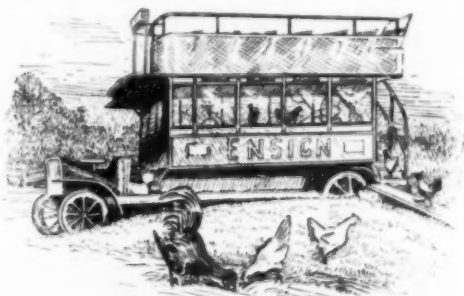
In order to avert suspicion, he constructed a device which would start the

fire at a time when he could prove an alibi. A burning-glass was attached to a piece of twisted wire and set in a clearing where the sun would strike it. Under the glass was placed a bunch of matches, and leaves and twigs were arranged so that when the sun's rays, focused by the glass, should ignite the matches, the leaves would be set afire.

This infernal machine was successful, so it is alleged, and a large tract of forest was destroyed, but the rancher's actions were so suspicious, when he was pressed into service as a fire-fighter, that the foresters were led to investigate. The remains of the device were found in the ashes and circumstantial evidence was so strong that the rancher has been brought to trial.

DERELICT MOTOR-BUSES MAKE HEN COOPS

When an electric street railway system was constructed in Hastings, England, the motor-buses operating there were withdrawn from service. An attempt was made to run them back to London, but Silver hill, a steep incline between Hastings and Battle, proved too much for the worn-out engines,



Abandoned Motor-Buses

and so they were towed to their last resting place in a farmyard beside the road, where they are now surrounded by refuse and used as hen coops.

Milwaukee public schools are being supplied with paper towels. They cost one cent a dozen, and, being used but once, are more sanitary than the cloth towels.

THE MONUMENT OF AN AUTOIST

Over the grave of Leon Thery in the cemetery of Pierre La Chase, one



Memorial to Leon Thery

of the great burial places of Paris, has been erected a memorial stone, the upper part of which is the sculptured likeness of the famous automobile driver with his hands on a steering wheel.

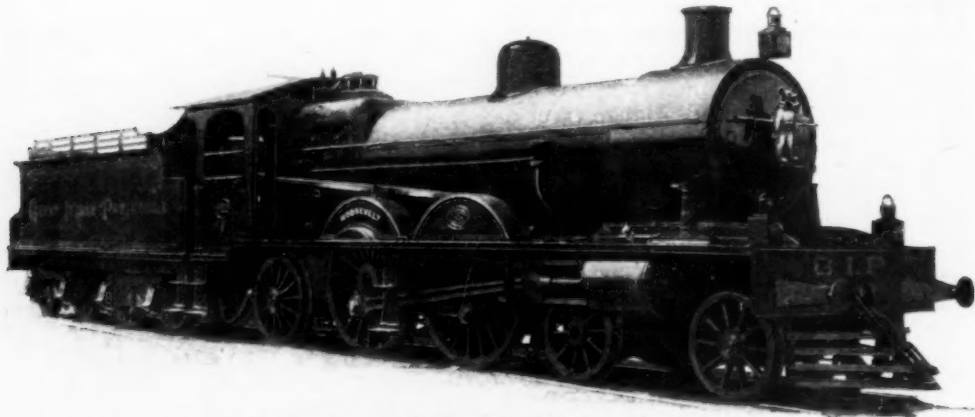
ALCOHOL STILLS ON GERMAN FARMS

An authority on alcohol stills says that there are 20,000 farm stills in operation on as many farms in Germany. The German government permits the farmer to produce a certain amount of grain or potato alcohol, the amount depending upon the size and location of the farm and the annual demand for the product, upon the payment of a reduced revenue tax. Alcohol distilled in excess of the quantity allowed is subject to the higher rate of taxation. Denatured alcohol, however, is not subject to any tax.

SELF-CLEANING GARDEN RAKE "ROOSEVELT" ENGINE DRAWS TOURISTS OVER INDIA

The rake shown in the illustration is composed of an inner fork that works on a hinge connected to the main fork. A perforated angle bar connected to

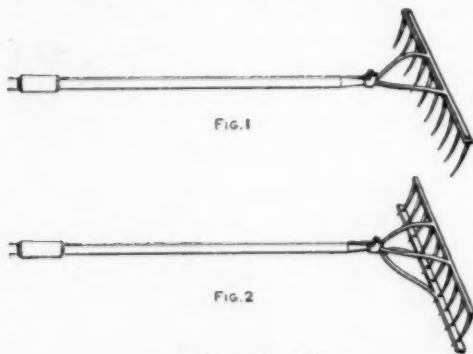
One of the largest parties of tourists to visit India in the past two years was a party of nearly 700 Americans,



Locomotive of India Railways, Named "Roosevelt"

the inner fork rests on the rake bar and slides on the teeth of the rake. This is operated by a rod and lever attached to the rake handle.

In operating this rake the movements are mechanical. One hand grasps the end of the handle while the other hand, sliding in a downward and backward movement, comes in contact with a lever which slides forward and pushes



Self-Cleaning Rake

a rod that turns the inner fork downward over the rake teeth, thus cleaning them at every stroke of the rake.

CA street-railway garbage car is to be used by a Chicago company.

who arrived at Bombay on the S. S. "Cleveland" a few months ago, and started out to visit the chief cities of that British possession. Some doubt of the ability of the railroads of India to transport them in a first-class European or American manner was expressed at first, but when the party arrived two perfectly equipped express trains were in readiness. The trains were made up of sleeping cars of the Pullman pattern, and dining cars that would accommodate 40 persons at one sitting. Over 20 tons of provisions, water and ice were taken on each train, and the serving staffs of each consisted of 22 waiters, 8 cooks, and 10 berth attendants. Even telephone service was found installed throughout the cars.

The locomotives drawing the trains, one of which is shown in the illustration, were selected from the stock used for pulling the royal mail trains, and, as a compliment to the nationality of the tourists, were renamed "President Taft" and "Roosevelt." A Teddy bear was attached to the front of each locomotive to act as a mascot during the runs through the long stretches of country. This engine decoration created interest at every stop.

FREEZING THE SOIL TO MAKE TUNNELING POSSIBLE

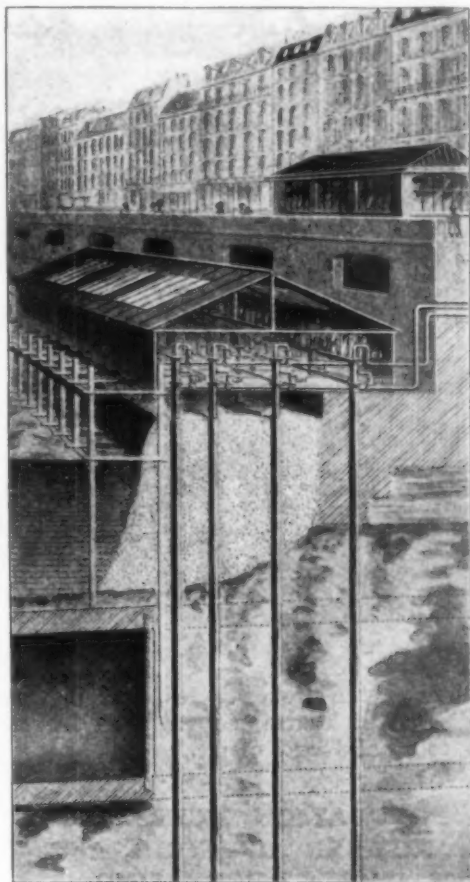
Freezing the soil under a river to make it solid enough for railway tubes to be built through it was the remarkable means utilized by the engineers of the Paris metropolitan railways in running the line under the Seine river. This section, 5,500 ft. long, passes under two arms of the river, under the city barracks, and under two working railway lines. It includes two stations which are situated below the level of the water. The junction of the caissons in the middle of the Seine, therefore, necessitated the use of a special process.

The ground which was frozen consisted of mud, sand, marl and limestone, and a large part of it was under the bed of the river. The freezing of such a mass of earth necessitated the installation of a powerful plant. A double pipe service carried the refrigerating liquid into a coil of boring pipes sunk into the earth, where it circulated and froze the soil adjoining the pipes by radiation, and then returned to the plant.

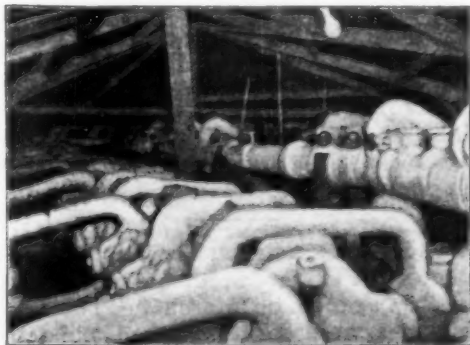
Each tube had a radius of action of about 4 ft., and froze the soil by degrees, until it became compact and dry. On the conduits and pipes in the open air the coating of ice attained a considerable thickness, thus forming an excellent insulator for the tubing.

About three months after the beginning of the freezing a sudden in-

undation of the works caused the engineers much uneasiness, but it only

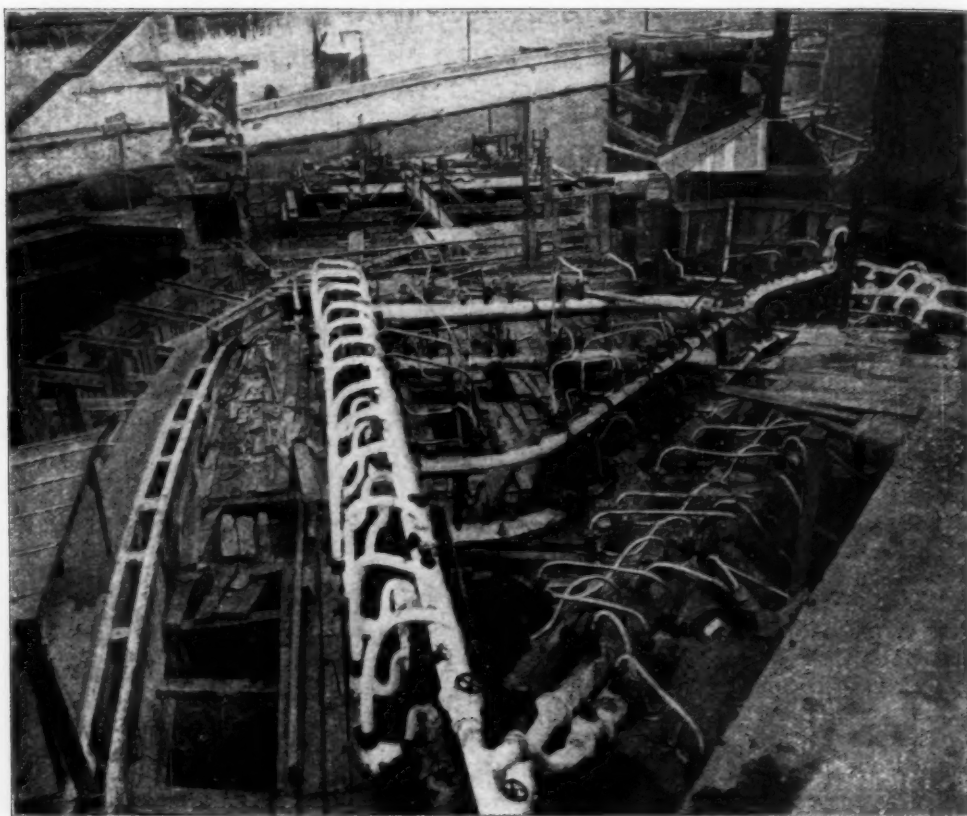


The System of Soil Refrigeration



Ice-Covered Pipes Entering the Ground

proved the wonderful success of the system. A stream of water, passing under the upper part of the quay and across the foundations of the Orleans station, passed around the frozen mass, burst into the subterranean part which was being pierced, and completely filled it. A cofferdam, about 200 ft. long, had to be constructed along the whole length of quay to cut off the water. During the four days required in draining the underground it was feared that the water would have



Refrigerating Pipes in Main Plant

thawed the frozen mass, but it was discovered that the water had frozen into a solid wall of ice.

POPULATION INCREASING— NUMBER OF FOOD ANI- MALS DECREASING

That the supply of meat in the United States is not keeping up with the growing demand is made clear by reports of the department of agriculture, the bureau of statistics of the department of commerce and labor, and the census estimates of population.

According to these figures the number of food animals in the United States has decreased 5,000,000 since 1901, and the number of consumers has increased 12,000,000. Food animals include cattle, sheep, and swine, and consumers include all the population as estimated by

the census. The number of cattle in the United States in 1901 is placed at 63,200,000, as compared with 69,000,000 in 1910; sheep, 59,750,000 as compared with 57,250,000 in 1910, and swine 57,000,000 as compared to 45,750,000. While cattle have gained nearly 6,000,000, sheep and swine have lost about 11,000,000.

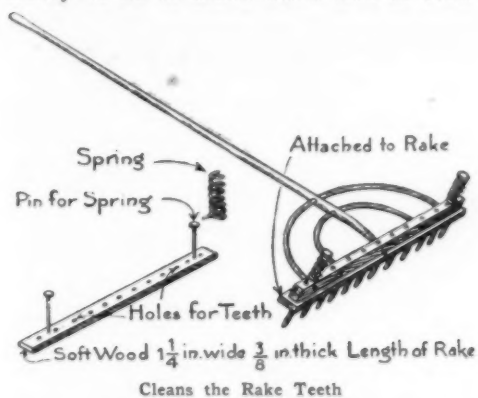
In the meantime the total value of the food animals has increased, despite the reduction in number. The department of agriculture estimates the value in 1901 at \$1,943,000,000, and in 1910 at \$2,368,000,000, which is an increase in the aggregate value of 22 per cent.

☞The first collision between aeroplanes in flight occurred at Mourmelon, France, on March 7. The two biplanes were badly smashed and fell, but neither aviator was hurt.

SHOP NOTES

Self-Cleaning Lawn Rake

When cleaning a lawn of dead grass, leaves, etc., with a garden rake much time is lost in removing the trash clogged between the teeth. I was using a wood back rake for this purpose and decided to make an attachment for self-cleaning. I procured a soft and light piece of wood, $\frac{3}{8}$ in. thick, $1\frac{1}{4}$ in. wide, and as long as the rake bar, and bored holes in it to match the teeth of the rake. Attached to this piece of wood were two pins which passed through the back of the rake. Two compression springs placed on these pins between their heads and the rake back kept the strip of wood at the base of the rake teeth. If the grass or leaves would stick to the rake teeth after each drawing of the rake, all that was necessary to do to clean them was to turn

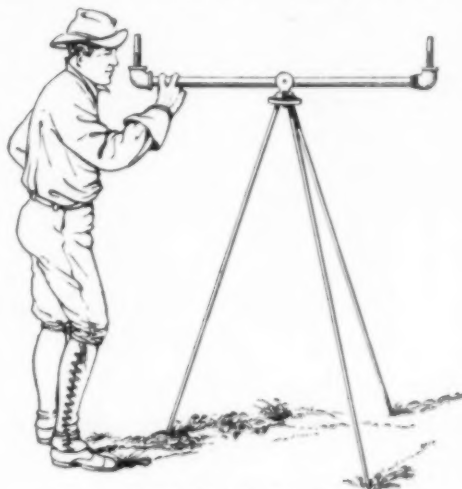


the rake over and strike the heads of the pins on the ground. The teeth would be cleaned instantly.—Contributed by John Blake, Franklin, Mass.

A Home-Made Surveying Level

A good practical level for use in surveying the ground when laying drain tile can be made from a piece of $\frac{1}{2}$ -in. gas pipe and two ells, each fitted with a piece of water gauge glass. The pipe

should be about 4 ft. long, to the middle of which is attached a socket



Level Made of Gas Pipe

for the tripod or support. When the level is set up the pipe is filled with water so the water level will be about one-half way in each glass. The surveying is done by sighting over the two water surfaces.—Contributed by Thos. L. Parker, Olaf, Iowa.

Velvet Grip for a Thumb Tack

A small piece of rubber cut from a rubber band about $\frac{3}{8}$ in. wide and used as a washer on a thumb tack as illustrated will be found advantageous in many cases. In mechanical drawing it affords a firm grip on the paper and allows a slight space between the head of the tack and the paper which is most convenient in removing the tack. For tacking drawings, pictures, etc., to the wall, this rubber attachment will be found invaluable.—Contributed by C. W. Neiman, New York City.



A FORGE FOR PROSPECTORS

The experienced prospector, of course, knows that he needs a reliable forge, and after several years' trial I

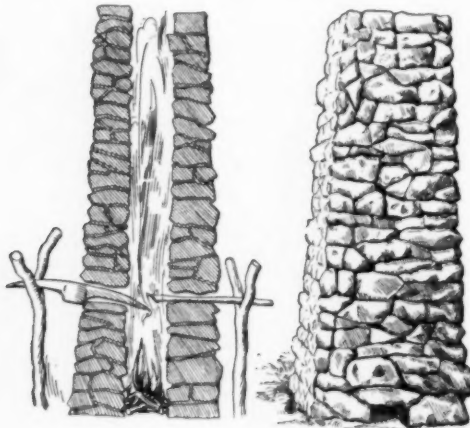


FIG 1

FIG 2

Forge Made of Rock

find the one illustrated and described herein to be the most satisfactory. All forges are too clumsy or too complicated and heavy to carry around. I once carried one on my burro for months without having any chance to use it, yet when one is needed it must be had immediately.

The one illustrated can be made on the spot out of stones, using mud for mortar, while a large granite cooking spoon makes an excellent trowel. This forge is simply a small chimney about 4 ft. high. The flue is 6 in. in diameter. At the bottom is left an opening through which to rake out the ashes; also to start the fire and give it a draft. A flat stone will serve as a door and to regulate the draft. If it does not fit snug enough, the edges may be sealed with mud. About 1 ft. from the bottom, four small holes are made just large enough to insert the drill and pick points. The forge is fed from the top, using wood broken into chunky pieces, charcoal or pieces of bark for the fuel, which must be well packed in the flue until it is about one-third full.

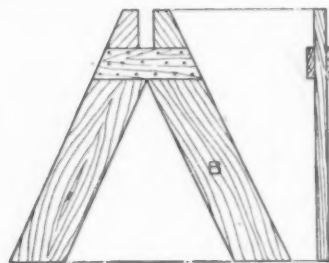
A piece of light railroad iron about 4 in. long serves well for an anvil. The

best way to temper drills and picks after repointing them is to heat the metal to a cherry red, then dip $\frac{1}{2}$ in. of the point into cold water, and hold it there for three or four seconds. Remove and place the point or cutting edge against a piece of newly broken green bark or green wood, and keep it there until it smokes. Then plunge the entire tool into water and let it remain until cold. Straw color is the best temper for drills to be used in ordinary rock.—Contributed by W. A. Lane, El Paso, Texas.

A Knockdown Shop Horse

A new design of a shop horse or trestle that can be taken apart for storing away or moving is shown in the accompanying sketch. If it is well made, it will be quite stiff and suitable for most any kind of work.

The top bar, A, is provided with grooves near each end formed by nailing strips of wood, C, on each side as shown. Each pair of legs has a space at the top which is a close fit over the top bar and the strips on the top bar are a close fit on the upper end of the legs. This horse is very handy for carpenters on account of its knock-down feature, for it is certain that the



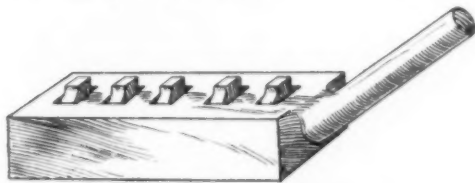
The Parts Can be Separated

old style of horse is very unhandy to stow away when not in use.—Contributed by J. R. Weaner, Plainfield, N. J.

A Stencil Block

In boiler shops and plate mills where it is necessary to stamp numbers on steel plates a device for holding stencils in a convenient manner has long been wanted. Plates for government work and marine boilers must all be stamped with a number representing the tensile strength of the material. In the mills where the plates are rolled every plate is stamped with the number of the heat from which the metal was poured. Quite often it is necessary to stamp the same number fifty or one hundred times. If this number contains four or five figures it means a great deal of work if the stencil man stamps the figures one by one.

The block shown in the sketch can be held by the operator while he strikes the stencils consecutively with a hammer. The holes in the block are large enough to allow the stencils to fit loosely. The bottom of the holes



Block for Holding Steel Stencils

taper to a small size to prevent the stencils from falling through.—Contributed by J. J. O'Brien, Buffalo, New York.

Folding Window Screen

The accompanying illustration shows a window screen frame that may be set in the stile where the ordinary sash raises. The frame is built up the same as the ordinary kind, with the length equal to the width of the window sash, as shown in Fig. 1. The frame is then cut in the middle and hinges are put on as shown in Figs. 2 and 3. This makes it possible to set the frame in under the raised window sash. The brace B is put in to keep the sash from sagging. A screw hook

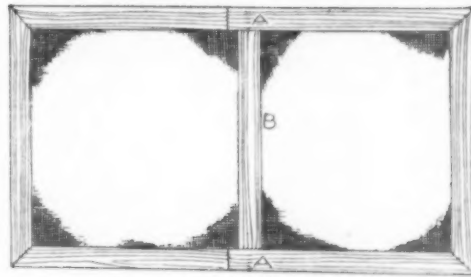


Fig 1

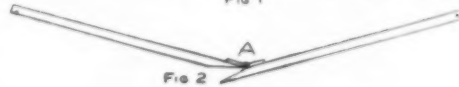


Fig 2

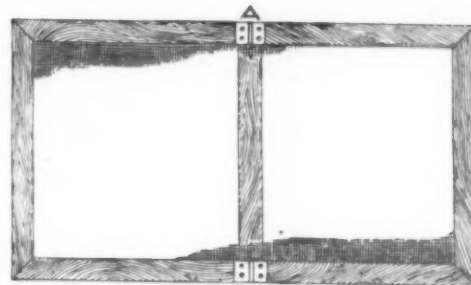


Fig 3

Frame Hinged in the Middle

and eye is put on the opposite side of each hinge to hold the frame rigid when it is in place. The outside of the frame is shown in Fig. 3.—Contributed by J. Long, Portland, Ore.

A Garden Weeder

Take a piece of wire cable having five or more strands of wire and untwist one end for about 3 in. Spread the strands out and bend the end of each one at right angles, making the bend about $\frac{1}{2}$ in. long. Bend the untwisted end of the cable so it will be double for 6 in. of its length, and tie them together. Also tie around the



Made of Wire Cable

cable at the base of the hooked strands. The illustration needs no further description.—Contributed by R. H. Workman, Loudonville, O.

Double-Acting Gate Latch

The illustration shows a latch for a large driveway or farm gate which

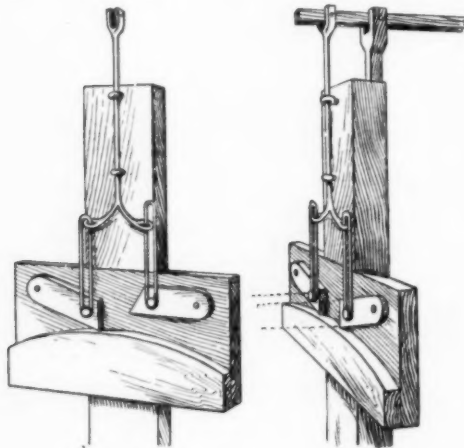


FIG. 1
FIG. 2
Latches Raised Singly or Together

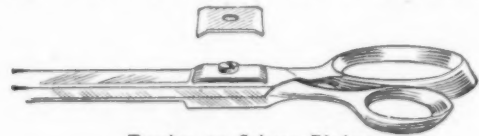
combines the best qualities of different models of gate latches, and has an attachment by means of which it can be easily opened by a person on a horse or on foot. It is made by taking a board about 6 by 12 in. in size and nailing it to the gate post. A strip beveled off each way, Fig. 1, is then nailed on the lower end of the board and two catches of either wood or iron are bolted on above the strip, so it will move up and down easily. Attach a tongue on the gate that will extend out far enough to engage in the catches, as shown by the dotted lines in Fig. 2. This illustration also shows how the attachment for opening the latch is applied. The two catches are attached to the rod leading to the handle of this device by wire loops in such a manner as to permit each catch to operate independently of the other when the gate is swung shut from either side.

The latch can be adapted to a gate which swings only one way by making but one movable catch instead of two, and having a stationary catch or block in the place of the second catch. In this case the rod or device

for lifting the catch may be attached directly to the catch without using the wire loops. It is best when making the latch to mortise the latch board into the gate post so that the gate will close up without leaving a large space between it and the post.—Contributed by J. G. Allehouse, Avomere, Pennsylvania.

Keeping Scissor Blades Tight

Remove the pivot screw from the scissors by filing down the riveted end of the screw. Secure a piece of clock spring about 1½ in. long, punch or drill a hole in the center for the pivot screw and bend the ends as shown. Procure a screw and nut the same size as the one removed. Assemble the parts with the spring on the screw. Tighten the screw until the proper tension is secured and rivet the end of the screw over the nut to keep it from turning loose. The spring keeps

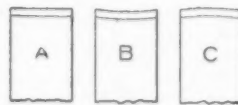


Tension on Scissor Blades

the blades at the proper tension without binding and consequently the edges remain sharp much longer.—Contributed by John Sedelmaier, La Salle, Ill.

How to Grind a Chisel

The experienced blacksmith upon receiving a chisel to be redressed always judges the user by the shape of the cutting end and gives it a temper accordingly. A

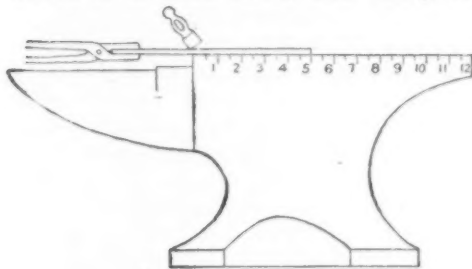


chisel ground straight across or concave as shown at A and B, is ground incorrectly and the blacksmith receiving it will give it a slightly softer temper than he would the one ground convex as shown at C, which is the correct way to grind a chisel. When ground as shown at A and B, the points

do most of the work, and the smith must temper them somewhat softer so they will turn over slightly and not break off at the first blow of the hammer. A convex end makes the center the strongest part and as it is less liable to break, the chisel can be given a harder temper.—Contributed by D. A. Hampson, Middletown, N. Y.

Anvil Scale

A very convenient scale for blacksmiths can be made on the anvil as shown in the sketch. The lines are cut with a chisel, making the inch division marks 1 in. long and the $\frac{1}{2}$ -in. marks just one-half as long. The numbers can be put on with steel numbering punches. This will make the scale just where it is used most, and being on



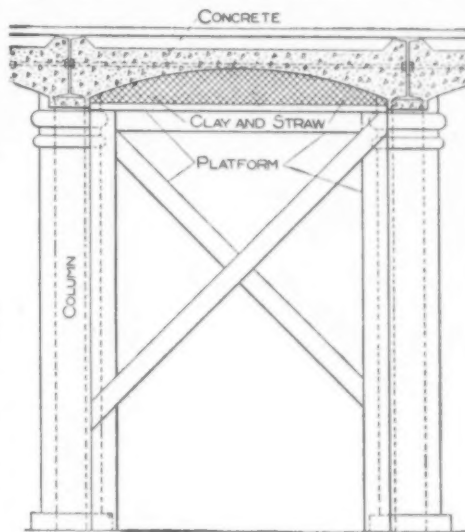
Scale Cut on the Anvil

the anvil, both hands can be used for holding the tongs and hammer.—Contributed by J. W. Plemons, Circleville, Ohio.

Clay Forms for Making Concrete Arches

Wood forms for making cement vaulted ceilings are very expensive as the material for constructing them is so cut up that it cannot be used for other purposes. This caused contractors who had a series of vaulted ceilings to make to try out using a clay and straw mixture on which to place the cement. The idea proved a success and they made flat platforms on which the clay and straw were rounded up to shape the vaulted ceiling. The cement was mixed and placed on the clay forms. The accompanying sketch

shows a section through the center of one arch. When the cement had set



Clay and Straw on Platform

and the forms had been removed, the clinging clay was washed away with water from a hose.

Such forms could be used in many places where wood forms, on account of cost, are prohibitive.—Contributed by Walter A. Weldon, Rochester, New York.

Stop for a Workbench

Where only thick lumber is planed on a bench, a good stop can be made from an ordinary railroad spike. The overhanging head of the spike should be filed sharp and straight, and then saw-tooth notches filed in this sharp edge as shown in Fig. 1. The spike is

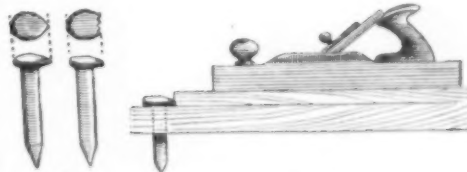


FIG. 1

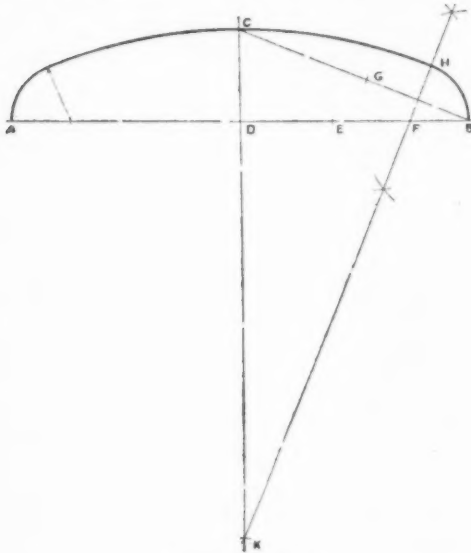
FIG. 2

Railroad Spike Stop

then driven through a hole bored in the top of the bench as shown in Fig. 2. The height can be adjusted as desired.

Laying Out an Elliptic Arch

A simple method of laying out an elliptic arch is shown in the accompanying sketch. This will prove use-



Layout for Arches

ful to carpenters and others who have occasion to make supports for window heads, doors, and concrete arches.

In the sketch, AB is the width and CD the height of the arch. Lay off DE equal to CD. Draw line CB and from the point C lay off CG equal to EB. Now draw a line perpendicular to and bisecting the line GB and intersecting the center line at K and the line AB at F. Then KC will be the radius of the large arc and FB the radius of the small one with K and F their centers. Draw the arcs and the elliptic arch will be completed.

Arches can easily be duplicated by laying off a rod KFH and driving nails at the points K, F and H and using K as a center describing the arc CH and with F as a center describing the arc HB. If a board is to be bent by saw kerfs this is also handy as two centers are given and one can proceed as if making two segments with H as the intersecting point.—Contributed by Alfred Atherton, Philadelphia, Pa.

Weighing Stone on Barges and Scows

The following is a description of the methods employed to ascertain the weight of stone shipped on barges and scows from the quarries. The fleet consisted of several old schooners that were converted into stone carriers, common deck scows and steel derrick scows. As it was not practical to weigh all cargoes on the scales the following methods were used: Usually the boats were "weighed in" once each season, sometimes oftener. The stone was actually weighed on scales and then placed aboard the boat. The water displacement was closely watched at various times during the loading. Markings were made fore and aft on the outside of the boat at the water line, making lines for different weights. As this method of markings did not prove satisfactory another way of gauging the displacement was adopted. This plan was to bore a hole in the bottom of the boat. In this hole was fitted tightly a 3-in. pipe having sufficient length to extend almost to the deck. The water had free access to the inside of the pipe. Two holes were made in the side of the pipe and short pipes fitted with a throttle. A glass tube was inserted in these two pipes and when the throttle was opened the water showed in this gauge similar to a water gauge on a boiler. A rod was fastened firmly near this pipe and cross lines 0.01 ft. apart were drawn on it. The feet were marked in large red numerals and tenths of a foot in smaller black numerals. The gauges were read before any cargo was placed on board. Then 50 to 100 tons, according to the size of boat which had been weighed on the scales was placed aboard and the gauges again read and the displacement noted. This reading of the gauges was repeated at various times during the loading of the barge, the displacement always being noted. The displacement for any amount of tons was found from the various gauges, two to six, according to the size of the boat, being read and their average found. Before any cargo was placed aboard

the reading was called the light gauge reading. Then after a part or all of the cargo was aboard the gauges were again read and their average taken. From this last average the first was taken, the difference being the displacement. The gauges were placed fore and aft only, in the smaller boats, near bow and stern, and as near the keel as possible. In larger boats there would be one gauge fore, one midship, and one aft, and in the largest boats there was a gauge at the fore, one midship, and one aft, all on starboard side, and one opposite each of these gauges on port side, or six in all.

After the weighing in of a boat was satisfactorily completed, tables were compiled from the various gauge readings and their corresponding tonnages and these tables were used for computing the future loads of this boat. These tables were computed for every 0.005 ft. displacement from the lowest probable loading to the highest. After a boat had been satisfactorily weighed in, all that was necessary to ascertain tonnage of a load was to read gauges before loading, then place entire cargo and read gauges again, deduct former from latter and refer to table.

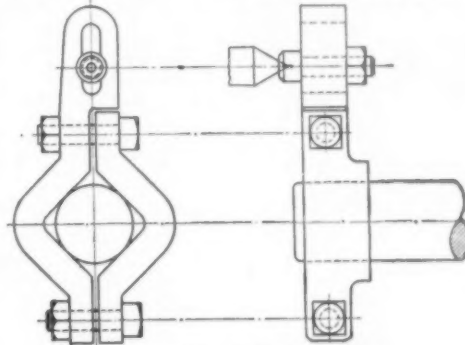
Vacuum Cleaner Driven by an Automobile

Many times automobiles have lent themselves to various purposes besides traveling the roads as a pleasure car. In one instance a light car was used to drive a home-made vacuum-cleaning outfit at a country home where no electric power was available. The air pump was purchased and attached to a dust tank made from an old water tank. One rear wheel of the automobile was raised from the ground and a belt placed on over the pneumatic tire to drive the pump. The complete outfit cost considerable less

than a factory made outfit and performed just as effective work.—Contributed by L. H. Jacks, Albany, Oregon.

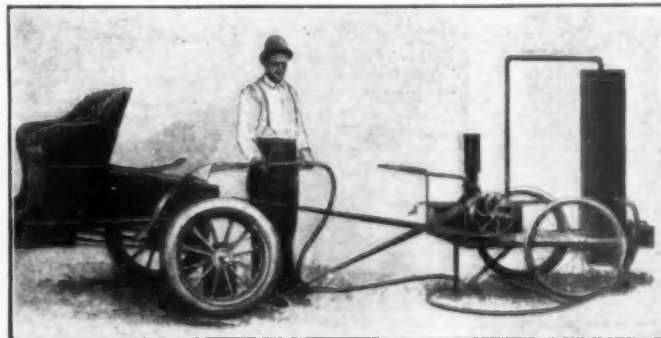
Jig for Turning Crankshafts

Almost every machine shop of any size has some sort of a jig for turning crankshafts. Some are good and some



For Turning Solid Crankshafts

are not, but the one shown in the accompanying sketch has been in use for some time and has given good satisfaction. It is very simple and easy to make and has the advantage of being adjustable so that cranks of different throws may be turned on it. All the parts are made of steel and the center should be hardened. The castings should be proportioned according to the size of crankshafts they are to be used in turning. Two sets of castings will be required, one for each end of the

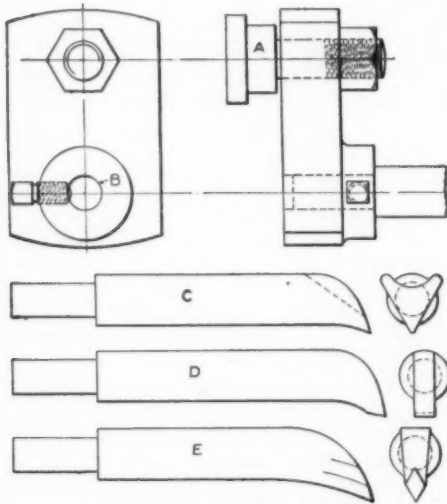


Automobile Driving the Vacuum Pump

crankshaft.—Contributed by R. T. Traylor, Suffolk, Va.

A Tool Holder for the Shaper

A tool holder for the shaper, which is very useful on die work and all internal shaper work, is shown in the accompanying sketch.



Tool Holder and Tools

The body is made of cast iron and the lock bolt of steel. The lock bolt should be made to fit the tool post hole in the shaper head block. The width of the body piece should be a little less than the width of the block and it should be about 2 in. longer. The tools fit into the hole B and are held by a setscrew. They are made of drill rod and can be of any desired shape or length as shown by C, D and E. They should be turned down at the end to prevent them from slipping through the hole B.—Contributed by M. S. Fehman, Arlington Heights, Ill.

Moving Storage Boxes Easily

Parts of machinery, supplies, castings and such things, usually kept in boxes or sets of drawers on the floor and under a workbench or table, make a heavy load to move about when some part is wanted. These bins or boxes can be easily moved if a $\frac{3}{8}$ -in. pipe or a $\frac{1}{2}$ -in. iron rod is placed under each one near the front. They can then be drawn out almost as if on wheels.

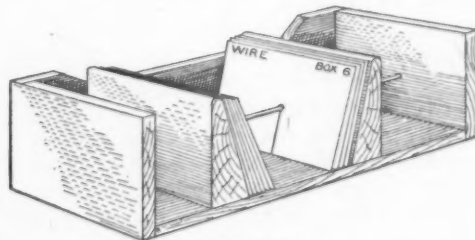
Card Index for the Shop

A card index system can be used to advantage for the shop just as well as in an office. Most shops are strewn from one end to the other with all kinds of working material and parts. These can be taken care of in the same way as papers are filed in an office, using a card system as shown in the accompanying sketch. This system will give the workman a means of locating each piece of material quickly.

A sufficient number of boxes, drawers with divisions or bins, are provided, each giving ample room for the part or parts, and numbered 1, 2, 3, etc. These numbers can be cut from an old calendar and pasted on the front end or edge of the box.

The filing case is made up of a hundred or more blank cards about $2\frac{1}{2}$ by 4 in. in size. Take each part you wish to file away and write its name or description in the upper left hand corner of a card. Place the part in one of the numbered compartments and put its number on the upper right hand corner of the card. When all the cards have been filled out properly, punch a small hole $\frac{1}{2}$ in. from the bottom edge and in the center of the card. Cut a slit from the edge of the card to the hole. This makes it possible to insert new cards in the case and remove the old ones for corrections, etc.

Make a wood tray to hold them a little larger than the cards. The tray should be 8 or 10 in. long and pro-



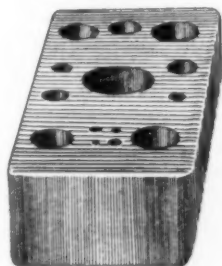
Card Tray

vided with a wire $\frac{1}{2}$ in. from the bottom and in its center. Two tapered blocks are provided and put on the wire before it is fastened to the tray

ends. The tray as illustrated has one side removed so the parts may be clearly shown. When placing the cards on the wire be sure to put them in alphabetical order.—Contributed by C. A. Kotterman, Washington, D. C.

A Bench Block

One of the most useful tools I have on my workbench is the bench block shown in the accompanying sketch. It is made from tool steel, 1 in. square, with the corners rounded slightly, for appearance. A $\frac{3}{8}$ -in. hole is bored through the center and at the four corners are drilled respectively $\frac{1}{8}$ -in., $\frac{9}{32}$ -in., $\frac{1}{4}$ -in. and $\frac{7}{32}$ -in. holes. Between these holes are spaced six other holes from $\frac{3}{16}$ -in. to $\frac{1}{2}$ -in. The block is hardened,



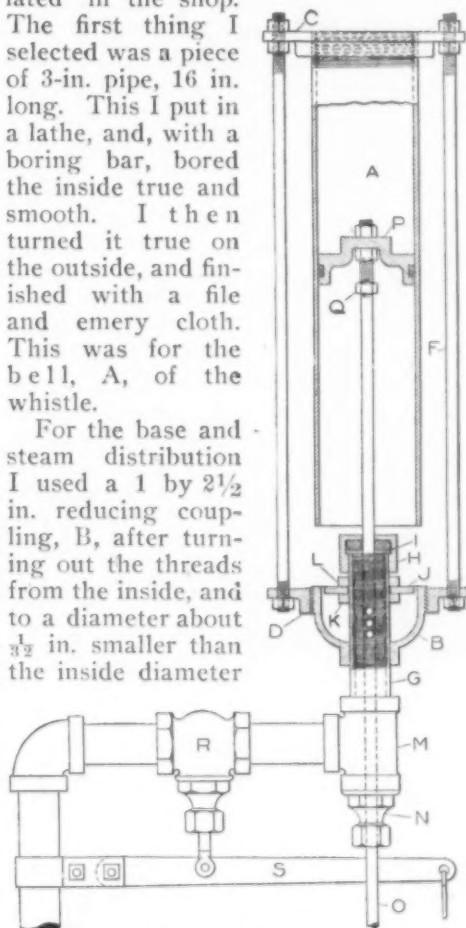
tempered to a straw color and ground all over.

Some of the uses of this block are as follows: It serves as a good block through which to drive out pins, rivets and dowels. If the pins or rivets are long, it can be placed over the open jaws of a vise when used. The holes being of standard sizes it makes an excellent drill gauge. Another use is to punch holes through sheet metal up to $\frac{1}{16}$ in. thick. I have several round punches that correspond to the holes in the block. Locating the part to be punched over the proper sized hole, take the right sized punch and strike a light blow on the metal as near over the hole in the block as possible. If correctly located, in which case the metal will sink slightly into the hole, the punch can be easily driven through. If incorrectly set, the punch may be relocated and driven through. A little practice will save going to the drill press many times.—Contributed by Chester L. Lucas, E. Saugus, Mass.

How to Make a Mocking Bird Steam Whistle

While on a construction job I made at odd times, a steam whistle from old pieces of junk which accumulated in the shop. The first thing I selected was a piece of 3-in. pipe, 16 in. long. This I put in a lathe, and, with a boring bar, bored the inside true and smooth. I then turned it true on the outside, and finished with a file and emery cloth. This was for the bell, A, of the whistle.

For the base and steam distribution I used a 1 by $2\frac{1}{2}$ in. reducing coupling, B, after turning out the threads from the inside, and to a diameter about $\frac{3}{32}$ in. smaller than the inside diameter



Detail of the Whistle

of the bell, A. On the outside of this coupling I cut threads 8 to the inch. Two old pipe flanges were turned up in the lathe to make them as light as possible, one pipe flange, C, threaded to fit the top end of the bell and the other, D, to fit the threads cut on the outside of the coupling. As the 3-in. pipe had threads on one end these did not have to be cut.

The flanges were connected with three $\frac{1}{2}$ -in. bolts having sufficient

length to raise the bell from $1\frac{1}{2}$ to $2\frac{1}{2}$ in. from the diaphragm. These bolts were threaded long on one end for the purpose of adjusting the height of the bell. The drawing only shows two bolts, but three are necessary for correct adjustment.

The steam connection at the lower part is a 1-in. pipe, G, with a thread on one end long enough to reach entirely through the coupling, and have end enough to accommodate a lock-nut and a small stuffing-gland, H, which was made from the stuffing-nut of an old brass valve. The top of the pipe was covered with a washer, I, having a hole large enough to allow a $\frac{3}{8}$ -in. rod to pass through easily. The long threaded pipe was perforated, making the holes $\frac{1}{4}$ and $\frac{1}{8}$ -in. in diameter inside of the coupling as shown. I then turned up a diaphragm, J, from thin metal, to a diameter of about $\frac{3}{64}$ in. less than the inside diameter in the coupling B, and made a hole in it that the 1-in. pipe would pass through tightly. The 1-in. pipe was then screwed in position in the coupling, a lock-nut, K, turned on, and the diaphragm placed and set in position. Then another lock-nut, L, was turned on to hold them all tightly in place. Then the stuffing

gland, H, was placed on top to complete this part of the whistle.

The steam pipe, G, was turned into a tee, M, which was fitted with a stuffing gland arrangement, N, made from an old brass globe valve, machined and fitted as shown. This prevents steam leakage around the rod O, which was made from $\frac{3}{8}$ -in. round iron and smoothed with emery cloth. The piston, P, was made from an old 3-in. pipe plug which was turned up and grooved for a cast-iron snap ring. The piston was fastened to the end of the rod O with two nuts as shown. The nut Q was placed on to prevent the piston from being drawn out of the bell by striking on the stuffing-gland. The top end of the bell A was hammered in slightly to keep the piston from going out at the top.

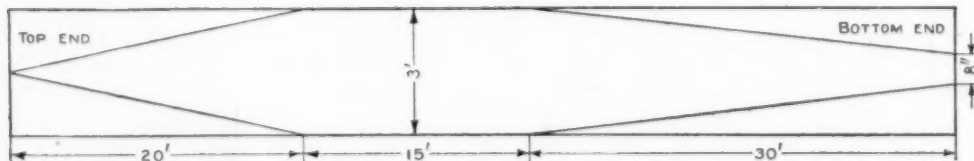
The steam valve R was made from an ordinary 1-in. disk valve by turning off the threads on the stem so it could be operated by the lever S as shown. The change of tone is caused by the piston moving up and down in the bell. The piston is operated by the rod O. This whistle has a range of three octaves and has a clear and beautiful tone which equals very expensive ones.—Contributed by Jack Campbell, Denver, Colo.

Aeronaut's Hot-Air Balloon—Part I

How to Make a Balloon

In November of the year 1782 Joseph M. and Jacques E. Montgolfier, sons of a paper maker of Annonay, France, conceived the idea of filling a light envelope with smoke to make it rise in the air. They lighted a fire,

came joint inventors of the hot-air balloon, and in June, 1783, they made a public demonstration of their great discovery. The hot-air balloon is also called a montgolfier, in honor of the brothers. As aeronautics is a constant



Each Section of Cloth Is Cut by This Pattern

placed a large paper bag over it to collect the smoke, and were delighted to see the bag ascend. The brothers be-

and ever prevailing topic, its latest developments being watched with increasing interest, the making and op-

eration of the old-time hot-air balloon may prove to be of great help to many as an experiment.

The description and illustrations are for a balloon 42 ft. in diameter and 65 ft. high. This size balloon will carry a person weighing 170 lb. or less, also the weight of a parachute. The balloon complete and ready for filling will weigh less than 200 lb.

There will be needed 42 pieces of unbleached muslin, 3 ft. wide and 65 ft. long, or 910 yd. of cloth, 1 yd. wide, to make the main part of the balloon. A regular balloon maker would utilize the gores cut from the cloth for the top and bottom, but the full lengths are given as it is best for those not expert in balloon construction. Lay the pieces of cloth on top of each other carefully until there are six layers. Cut one of the pieces for a pattern, using the dimensions given in the diagram. This design is simple and will suit all purposes just as well as a more complicated diagram. The top part of the piece is cut to a point and the bottom left 8 in. wide so that an opening will be left for inflation after the pieces are all sewed together.

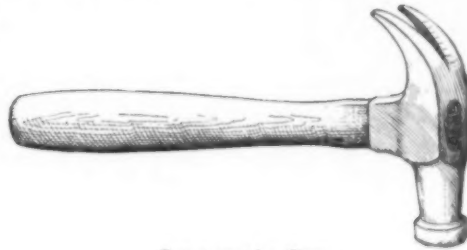
After the sections are cut, join them together by taking about $\frac{1}{2}$ in. of the edge of each piece, laying them double and sewing on a machine with a strong thread, making a double fell. After all of the edges are joined together, double or turn the top ends through a strong ring that has a diameter of about 3 in. This ring is used for hanging the balloon while inflating. Turn up the bottom edge of the cloth and sew a $\frac{1}{2}$ -in. rope tightly inside of a hem. Fasten four ropes, each 12 ft. long, at equal distances apart on the rope ring. These ropes are used for carrying the basket, turning bar or parachute.

The balloon is strengthened with four bands of cloth, each one 3 in. wide, sewed around at equal distances apart. A double band with a small cord placed inside is sewed only on one edge about 5 ft. from the bottom opening. This is for holding the cloth out from the chimney when the balloon is nearly inflated. While it is not necessary, it is

best to double the cloth for about 6 ft. around the top ring. Three light ropes about 65 ft. long are fastened to the top ring, and are used to steady the balloon during inflation.

Wire Gauge on a Hammer

A lineman will find it handy to have the claw of his hammer marked off as a wire gauge. This combination will

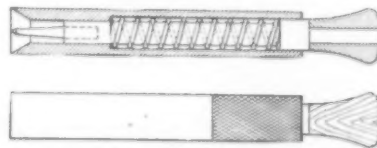


Gauge on the Claw

provide him with two necessary tools in one. The marks can be made by testing wires with a regular gauge and using them in the claw to mark the graduations. These can be numbered with steel numbering punches or etched with acid.—Contributed by F. D. Heiser, Biddeford, Maine.

A Centering Tool

A new tool which is used for accurately centering shafts is shown in the accompanying sketch. It can be made in various sizes to suit different kinds of work. Watch-makers will find it very handy in centering shafts that are to be drilled for new pivots. Machinists can use it to center shafting, hubs, or any round piece of work where the center must be accurate. The sketch

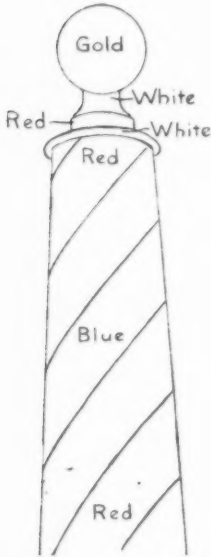


Watch-Makers' Centering Punch

shows its construction clearly and needs no explanation.—Contributed by F. W. Wieman, Lawrence, Kan.

How to Paint a Barber Pole

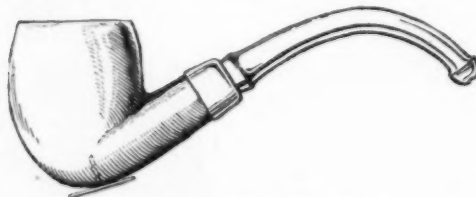
First paint the whole pole a good solid white. Then secure some long strips of paper such as wall paper, as wide as the desired stripe. Make some good flour paste and paste the strips of paper on the pole, beginning at an angle of about 45 deg. Wind one of them around in a spiral until you reach the bottom. Start the second strip exactly opposite the first at the top of the pole. Paste this strip on in a spiral the same as the first one taking care to get the



paper on even and to make the spaces the same. Give the paste time to dry. Then paint one open space red and the other blue, using the strips of paper in the same manner as a stencil. When the paint is thoroughly dry, dampen the paper and remove it. This will space the colored stripes correctly in a spiral.—Contributed by E. H. Tane, Oshawa, Ontario.

A Non-Upsetting Pipe

The smoker who wishes to lay his pipe down for a moment is frequently



Tack in the Bowl of a Pipe

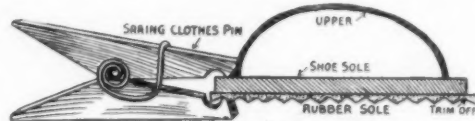
annoyed by having it upset and spill ashes and fire. Poker pipes with a flat bottom to the bowl overcome this

trouble but the man who has a round-bottomed pipe generally likes it with all its faults and is averse to introducing a stranger to his mouth. A pipe may be made into a poker pipe by sticking into the bottom of the bowl a large flat headed thumb tack. The illustration shows a pipe thus equipped. If the right kind of a tack is not available, soldering a round piece of copper to a common tack is the work of a moment.—Contributed by C. W. Neiman, New York City.

Attaching Rubber Soles to Shoes

Many floors in new factories are now made of cement. While such floors are durable and smooth for rolling trucks, barrels, etc., they are not so good for a human being to stand on during the working hours of a day. They put old age into a person's lower limbs rapidly.

This cement floor stiffness can be removed by attaching rubber soles to



Clamping Rubber to the Shoe Sole

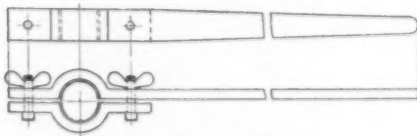
the regular leather shoe soles. Secure a piece of rubber, such as used for matting in an automobile, large enough to make two complete soles, a small bottle of rubber cement and a few spring clothespins. Clean the soles of the leather shoes, also the piece of rubber with a little benzine or turpentine. Apply the rubber cement to the piece of rubber and put them on the leather soles of the shoes. Press out as much of the cement as possible and clamp the spring clothespins on around the edge as shown in the illustration. Allow the cement about 24 hours' time to set, and then trim the edges.—Contributed by M. E. Duggan, Kenosha, Wis.

Unnecessary noise and wear of a chain will be prevented if it is kept clean and oiled.

A Tool for Grinding in Crank Pins

In overhauling and repairing automobile or marine gas engines, the crank pins are often found to be badly cut or worn, due to lack of proper lubrication and the subsequent overheating. In most repair shops all sizes and kinds of engines are met with and it would be considerable trouble to rig up a lathe with arms for centering cranks of different throws in each case to properly remove the scored marks by a machine tool.

The little device, shown in the accompanying sketch, for grinding or lapping in the crank pins has been used with good results. Take a piece of wrought iron, $\frac{5}{16}$ by $1\frac{1}{4}$ by 20 in. long, and bend it as shown in sketch, likewise a piece for the under side. Drill two holes in them for bolts with thumb nuts for clamping them together. Caliper the crank pin to be lapped and then turn up a pin $\frac{1}{8}$ in. less in diameter. Set the pin in a central position between the two bars and pour melted lead about it as you would to form a bushing. Split the lead so that the device can be clamped over the crank pin. By applying oil and emery dust to the inside and moving the handle laterally while the crank is revolved in a lathe, the pin will soon be ground smooth and true all over. Pressure should be kept on the pin by means of the two thumb nuts. Use coarse emery at first and fine for finish-



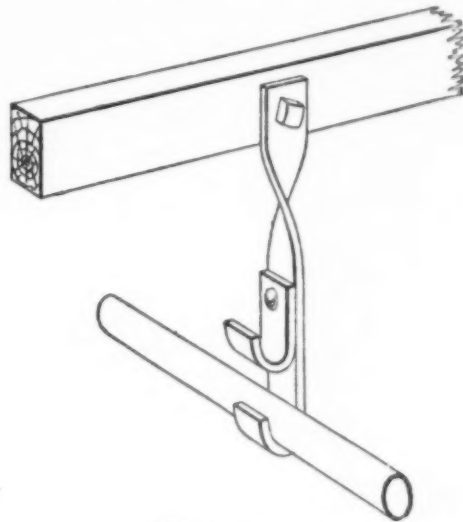
Lapping Tool

ing. When through grinding, care should be taken to clean all the emery dust from the crank.—Contributed by W. F. Quackenbush, New York City.

☞When your automobile is at rest, occasionally glance beneath it while the engine is stopped and the gasoline turned on. This caution may prove profitable.

A Simple Pipe Hanger

The hanger shown in the sketch consists of two or more small hangers, riveted together in such a manner as to



Made of Strap Iron

form hooks at the required distance from each other, says the American Miller. The hangers are made of wrought iron, about $\frac{1}{2}$ -in. thick and 2 in. wide. The iron can be heated first and bent around a pipe of the same diameter as that which is to be used. This will prevent the pipe from vibrating after it is hung. If the pipes are to run in opposite directions, or to the beams above them, the iron can be heated and twisted to the right angle. The upper end is drilled to receive a $\frac{1}{2}$ -in. lag screw, by which the hanger is fastened to the beam.

Paste for Hanging Burlap on Walls

The paste should consist of 1 lb. of good glue dissolved in 2 gal. of water, into which put enough paste powder to make it stiff, then add to the still warm paste 2 tablespoonfuls of turpentine or Canada balsam, and stir well. The paste powder consists of 84 parts of wheat flour or starch, 8 parts of caustic soda and 8 parts of sulphate of ammonia. All parts must be weighed.

A Combination Ladder

A handy and inexpensive ladder for use on a farm, around buildings, or on construction work is shown in the accompanying sketch.

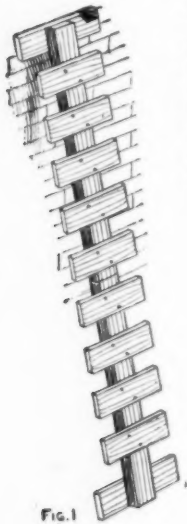


FIG. 1

The main part is made of 2 by 4-in. material having a suitable length, sawed in two, and provided with one or two heavy strap hinges. A crosspiece, 1 in. thick, 4 in. wide

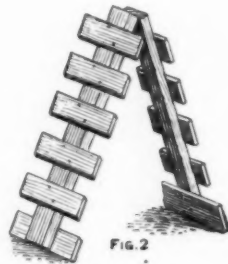


FIG. 2

Ladder and Stepladder

and 3 ft. long, is nailed to the under side of the 2 by 4-in. piece on each end. The steps, which are of 1 by 4-in. material, are nailed on the upper side as shown. The full length ladder may be used as shown in Fig. 1, or made into a stepladder as in Fig. 2.

Clothesline Tightener

A device for tightening clotheslines is shown in the accompanying sketch. One end of the clothesline is passed

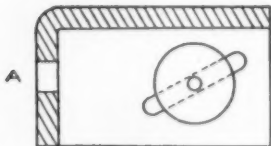


FIG. 1

Pulley in Slot Holds Line



FIG. 2

through the hole at A, Fig. 1, and a knot tied on the end so the line will not pull through. The other end passes over the pulley. The axle of the pulley runs in an inclined groove in each

side of the casing. When the line is tightened, the effort of pulling will draw the pulley down to the bottom of the groove. When it has been sufficiently drawn up a slight outward throw will make the pulley run up the groove and join the rope between the wheel and the casing. A hitch over the taut line will hold the rope in any kind of a gale. Figure 2 shows the end view.—Contributed by J. H. Crawford, Schenectady, N. Y.

Lubricating an Automobile Engine After a Run

When a car comes in from a run the engine is very free and can be started easily, but after standing for three or four days some difficulty will be experienced in cranking because the oil has thickened around the rings and the engine is so stiff that the shaft cannot be turned fast enough to get a good suction from the carburetor. Kerosene is the best oil to loosen piston rings and a little injected into each cylinder at the time the engine is stopped from a run will greatly assist in starting the next time, whether it is a day or a week from the time the car was last used.

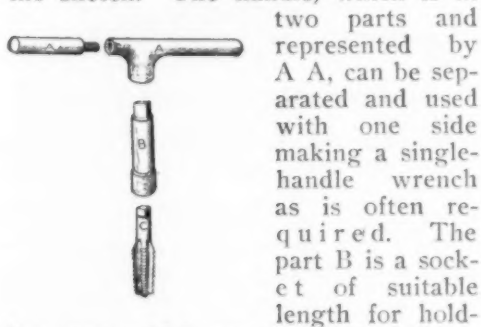
The kerosene should be injected into the engine while it is running, and the only way to do this is to introduce the oil where the suction of the engine will take it into the cylinders. The best place to have the oil enter the suction pipe is at some point near the engine and for this purpose much the most convenient way is to fit a small pet cock with a cup attached to the manifold, through which the liquid can be introduced into the cylinders while the engine is running. For an ordinary four-cylinder engine one-half a teacupful will be sufficient. When the proper amount of oil has been supplied the pet cock should be closed and the throttle opened and the engine run at top speed for a few seconds till the kerosene is cleared out of the cylinders. This will be evident because the car will smoke violently for a brief period after the throttle is opened and the

speed increased, when the smoke has disappeared one can consider the cylinders cleared.

With this treatment the engine will stand for a week or more and be as free and easy to turn as when it is nicely warmed up after an hour's running. It not only makes starting easier, but the motor operates much better at the beginning of a drive than is the case when the piston and rings are more or less gummed with oil. It does not seem to matter how good an oil may be, it always "sets" a little on the rings and cylinder walls after a long rest. This precaution also has the effect of reducing carbon deposits in the cylinders and tends to keep the interior clean if regularly done at the completion of all long runs.

An Offset Tap Wrench

A single or double-handle offset tap wrench with socket is shown in the sketch. The handle, which is in

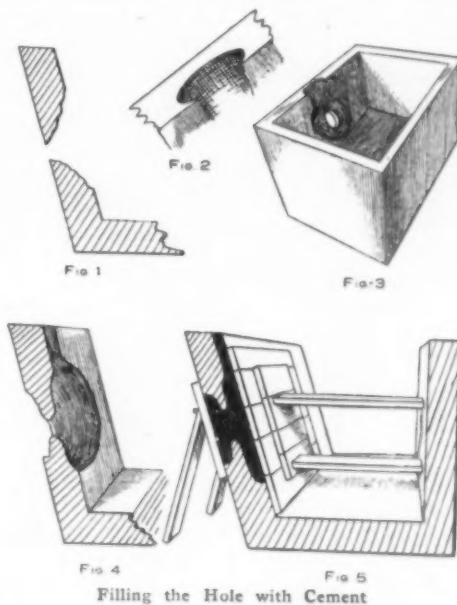


two parts and represented by A A, can be separated and used with one side making a single-handle wrench as is often required. The part B is a socket of suitable length for holding taps which are required for special work. This socket is fitted tightly in the handle and may be made in several sizes convenient for different taps. The tap is represented by C.—Contributed by C. Purdy, Ghent, O.

Cementing a Rotted Hole in a Wooden Tank

Cement is not usually considered the best material for repairing wood tanks, but I have used it in one instance to repair a tank which had rotted through, and was in such water-soaked condition that white lead and wood were

out of the question for repair materials. As it was in almost constant use, little time could be allowed for any-



Filling the Hole with Cement

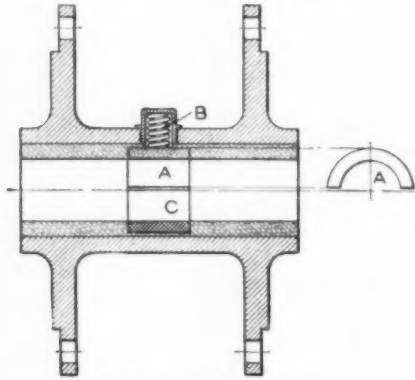
thing to dry, so cement was used as an experiment.

The tub was made of 2-in. white pine, and the rotted space of 18 in. in diameter had been eaten through one of the sides. (See Fig. 1.) This space was first deepened and a groove guttered all the way around inside of it so as to make a surface for holding the cement. The hole was then enlarged and gouged out on the outside in the form of a screw head, and a channel cut for pouring the cement. The pouring channel is shown in Figs. 2 and 3, and the shape gouged out for the cement on both sides of the board is shown in Fig. 4. Boards were then placed against the tub inside and outside and braced, and the cement mixture poured in (Fig. 5). The cement hardened properly, so that when the confining boards were removed, the job was perfectly watertight, and remained so.—Contributed by James M. Kane, Doylestown, Pa.

Apply pumice to the surface of greasy belts to prevent their slipping.

Stopping Gas Leakage Through Bearings of a Gas Engine

The accompanying sketch shows a simple method of stopping gas leakage

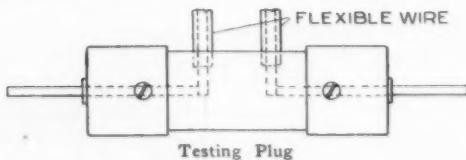


Division Between Cases

through the crankcase bearings of gas engines of the two-cycle type. Many remarkable results have been obtained by this method, usually increasing the speed of the engine from 30 to 50 r. p. m. A groove, $\frac{3}{16}$ in. deep and about 1 in. wide, is cut in the bushing as shown in the sketch. A half bushing, A, is then made that will just fit this groove and also fit a spring, B, to hold it down on the shaft. The lower half of the groove C should be filled with babbitt. As the wear of the crankshaft is downward, the bushing A follows it, thus making an airtight bearing.—Contributed by John Murrie, La Crosse, Wis.

A Handy Series Attachment Plug

I had occasion recently to take some quick ammeter readings of our lights and motors. To do this I devised a set

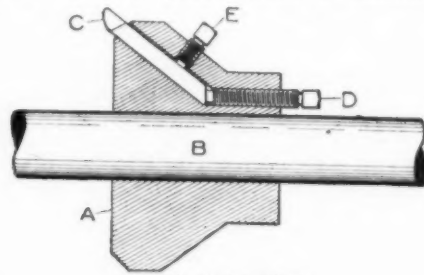


of handy series attachment plugs, one of which is shown in the accompanying sketch. The plugs were made of burned out inclosed fuses in sizes ac-

ording to the current carried. After taking them apart and removing the burned fuse and insulating powder I soldered a piece of flexible wire to each of the end terminals and put the plug together, bringing the wire out through holes in the fiber tube, and connecting them to the ammeter shunt. To take a reading it was only necessary to remove one fuse from the cutout, which could be done while the load was on by putting a jumper around it, and inserting the plug. The plug can be used for other series work as well, in the same manner.—Contributed by E. F. Brough, Tweed, Ont., Canada.

Boring Bar Cutter Head with Adjustable Tool

The usual form of a boring bar provides no way to set the cutter only to drive it into place with a hammer.



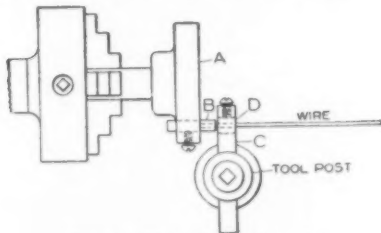
Detail of the Head

While this method must be used in boring holes of small diameter, a cutter head with screw adjustment for the tool can be made for boring engine cylinders and holes having larger diameters. In the accompanying sketch, A illustrates the cutter head and B the boring bar. The cutting tool, C, is adjusted by the screw D and held by the screw E. The cutter head, A, is fastened to the boring bar with either a set screw or key.—Contributed by Chas. Hattenberger, Buffalo, N. Y.

Wagon wheel spokes may be made to fit tight by splitting the tenon with a chisel and driving a wedge in the split. Saw the wedge off close to the felloe. This work may be done when resetting tires.

A Speedy Wire Cutter

In the manufacture of novelties a great many short pieces of wire are needed for rivets and other purposes, and it is sometimes quite a task to cut them up into the proper lengths. The accompanying sketch shows a device that was arranged for this purpose. The disk A is placed on a short shaft which is held in the lathe chuck. The tool B is held in the disk by means of a set screw and should extend out from the face of the disk the length the rivets are to be cut. A piece of steel, C, is held in the tool post and holds a hardened bushing, D. The hole in the bushing should be the same size as the wire to be cut. To operate, let the tool B extend from the face of the disk the length you wish to cut the wire, then



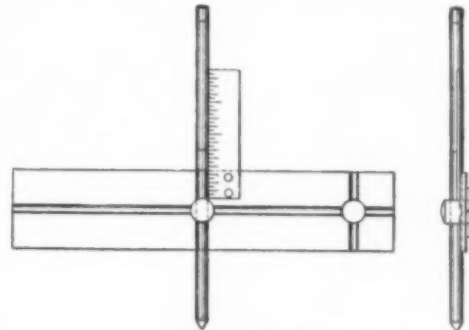
Cutting Short Wire Lengths

place the piece, C, with the bushing, D, so that the tool, B, will just pass it without touching. Revolve the disk and the wire will be cut into the proper lengths as fast as it can be fed in.—Contributed by A. J. DeLille, Elgin, Illinois.

A Sensitive Depth Gauge

A light, sensitive depth gauge that will compare favorably with those now on the market is shown in the accompanying sketch. Any machinist can easily make it without much trouble or expense. Secure a flat piece of steel of suitable size and plane grooves in it on one side as shown. These grooves serve as guides for a rod or finger which can be any length. Point and harden the rod at the lower end. A flat headed pin, as shown, holds the rod in place. A spring washer should

be placed under the head so that the pin will hold the rod firmly, yet allow it to slide for adjustment. Attach a

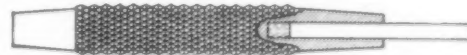


Depth Gauge

small scale to the blade with a couple of rivets as shown. Make division marks on the rod equal to the length of the scale, and as the rod or finger is pushed down the depth can be read off on the scale. The rod can be placed in several different positions as the grooves on the blade indicate.—Contributed by L. H. Kresge, Scranton, Pa.

An Improved Pin Punch

In assembling small machines, says a correspondent of the American Machinist, it is often necessary to have a variety of pin punches. The usual one-piece punch bends or breaks, and has to be scrapped. The accompanying cut shows a simple pin punch which can be made in several sizes to suit. Both ends of the punch holder are hardened, while the punch itself is made from long pieces of tempered drill rod. When a punch breaks or bends, the workman grinds off another piece of the rod to replace the broken one. A drop of oil in the holder is

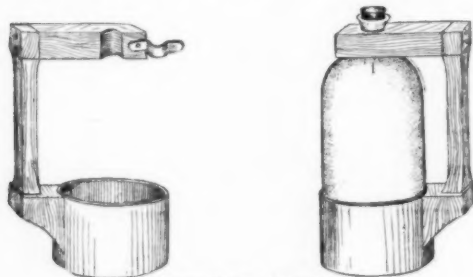


Removable Punch Ends

sufficient to hold the punch in place, and by heating the holder the oil boils and forces the punch out. Punches of this sort are stiffer and better than those turned from solid tool steel.

Detachable Bottle Handle

A great many households use water, bought in gallon bottles, for drinking purposes. These bottles are usu-



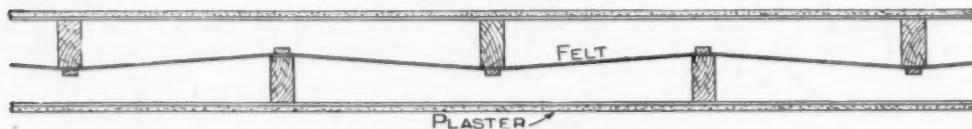
Home-Made Handle

ually kept in the ice box and when a glass of water is wanted it is poured from the bottle. The accompanying sketch shows the construction of a handle made for the purpose of attaching to the bottle to make it easy to pour the water. This handle also provides a means of carrying the bottle.

The bottom part of the handle is made from a large tin can cut in two and attached with wood screws to the wood handle piece. The top of the handle is fitted with a horizontal piece of wood on which a half circle notch is cut to fit the bottle neck. A metal clip, fastened with one screw, holds the bottle in place.—Contributed by W. A. Jaquith, Richmond, Calif.

How to Deafen Center Walls and Floors

A very good way to deafen a center wall in a double house is to set a double row of studs, as shown in the accompanying sketch, says a correspondent of the American Carpenter



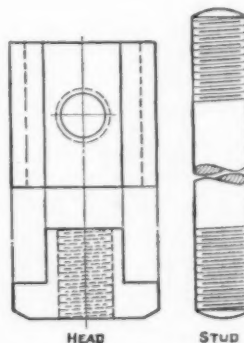
The Sound Cannot Penetrate the Three Walls

and Builder. The studs are of 2 by 4-in. stuff, set in the usual way, but staggered so that the face lines will

be 6 in. apart. This will leave a space of 2 in. between the studs and the plastering. Then on the inner edges of the studs, heavy felt paper or hair insulator quilt should be stretched and made secure by nailing a lath over the stud, as shown in the sketch. Two by 6-in. plate can be used at the top and bottom. The floors should be deafened, also, and this can be done very satisfactorily by putting down a rough floor of shiplap, and after all rough work is done, covering this with felt or hair cloth, and then laying the finished floor.

A New T-Bolt for Planer Beds

A bolt head and stud for use in the T-slots of planers, milling machines, shapers and the faceplates of lathes is shown in the accompanying sketch. It is better than a machine bolt as it will not turn when tightening the nut, nor will the head pull off, as is often the



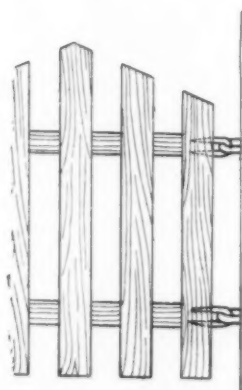
case with a carriage bolt. The studs are threaded alike on both ends to a length equal to the depth of the head. In constructing the heads a bar of steel is milled to the desired size and the stud holes drilled and tapped all the way through before the piece is cut into the proper lengths. For a $\frac{3}{4}$ -in. bolt the heads are made $1\frac{1}{2}$ in. deep and 2 in. long, this being of ample size to protect the T-slots in the machine

from crumbling and to insure long life to the head itself. In service the studs are ordinarily screwed in the full depth

of the head or until tight and their length in the clear is determined and rated in this position and a supply progressing in length by inches should be kept in stock. Should it be desired to put an additional clamp on work already set, the stud is easily loosened with a pipe wrench and replaced in the head, which meanwhile has been slipped through the slot to the required location, or when the cross rail is so close to the work that there is no room for a bolt to project above a nut and a fractional length of bolt is needed, the stud may be partially unscrewed, the remaining thread still being sufficiently strong. The heads are practically indestructible but the threads may wear off on the one end in time and in that case the stud can be cut off to the next smaller size.—Contributed by Donald A. Hampson, Middletown, N. Y.

Staples Used for Gate Hinges

Two of my ranch buildings were built with a small space between them, and this space I had occasion to close



up with a gate. I had no hinges at hand and knowing that those made of leather always sag, I set about to make up something that would answer the purpose. I secured four large staples and drove two of them into one of the buildings so the points of each staple were in a horizontal position, allowing a small portion of each to project. Into these I placed the other staples and drove them into the gate with their points in a vertical position. The illustration shows the position of the staples. This made a good hinge for the light gate I used.—Contributed by Frank Robert, Lauder, Wyo.

Handle for Upending Barrels

The ordinary way of upending barrels is to take hold of the edge at the



Upending a Barrel

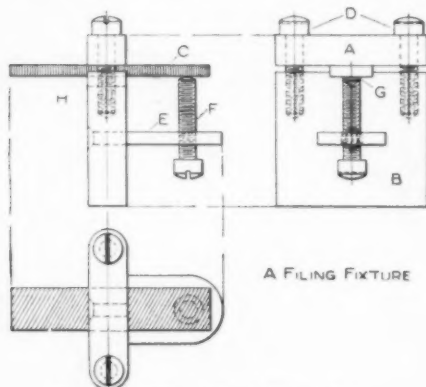
floor or ground and lift, which is quite hard on the back as well as the hand that grasps the barrel rim. If you have many barrels to handle, the device shown in Fig. 1 will be of great assistance. The construction of the device is simple and it can be made in a few minutes' time. The handle is about 3 ft. long, on the lower end of which is fastened a block having one side hollowed out to fit the curvature of the barrel. An iron hook is fastened in the wood 6 or 8 in. below the hand grip. The handle is used as shown in Fig. 2.—Contributed by Don C. Higbee, S. Omaha, Nebr.

How to Make a Good Imitation Ground Glass

Procure a quart of elastic varnish (of a good quality) and mix with it 2 lb. of finely ground pumice stone. By flowing a coat of the above on a glass it will give a very good imitation of ground glass. It can very easily be removed with a paint remover.—Contributed by A. B. Mukay, Augusta, Ga.

A Filing Fixture

A tool which is used for filing the edges square on thin pieces of metal is shown in the accompanying illustration. While the device is not new to



Used for Filing Metal Edges Square

jig or gauge makers, it is rarely seen in the "kit" of the average machinist.

In the fixture, C represents a short piece of a narrow file, secured between the members A and B by two small screws, D. By holding a square at H against the piece B, and adjusting the screw F, the file can be brought to a right angle to B. The screw maintains this angle while the tool is held, by that end of the file and the part E, in the right hand. In operation the tool is held firmly against the flat surface of the work and used as a draw file, and in this manner a square edge is insured with very little effort on the part of the workman. A beveled edge can be obtained in the same manner if the angle is not too great. If a hole is to be worked out, the flat file is removed and a round one substituted in the V-slot at G. If a little care is used in roughing down, this little tool will be found a very useful article and well worth a place in every machinist's tool-chest.—Contributed by Robt. O'Neal, Baltimore, Md.

How to Sharpen a Lawn Mower

Take the driving wheels off, remove the ratchets, and change them, placing the left ratchet on the right and the

right ratchet on the left side of the machine. This will cause the revolving blades to strike backwards on the cutting bar. Put some heavy machine oil in the groove on the cutting bar and place some emery dust in the oil. Turn the mower upside-down and push it around, keeping the cutting bar in close contact with the revolving blades. As soon as the blades are sharp, wipe off the oil and emery carefully, and change the ratchets. This will sharpen the blades more evenly than can be done with a file.—Contributed by Ernest Boyce, Winter-set, Iowa.

A Quick Repair for a Cracked Water Jacket

A short time ago I was called upon to repair a crack in the water jacket of a gasoline engine that was caused by freezing. The crack was about 8 in. long and had spread open about $\frac{1}{8}$ in. as the water was still frozen solid when I arrived upon the scene. I was somewhat puzzled to know what to do until I saw a can of putty standing nearby which gave me an idea. I scraped a piece of asbestos into fine particles and mixed it with the putty, about two parts of asbestos to one of putty, and then filled the crack with this mixture with the aid of a small packing tool. I then thawed out the engine and it has been running ever since and has never leaked a drop.—Contributed by Walter E. Roberts, Macdoel, Cal.

Ordinary sheet brass or that in the form of wire, as free as possible from lead, is better than brazing solder (half copper and half spelter) for brazing iron or steel, according to the Brass World, as it is tougher and the joint is less apt to break. Its melting point is only slightly higher than the half-and-half solder, and not enough to interfere with the brazing operation in any way. Ordinary high brass wire is often sold as "spelter wire" for brazing iron or steel.

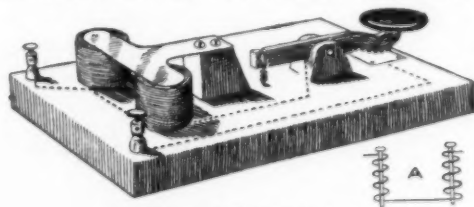
AMATEUR MECHANICS

Home-Made Telegraph Key

A piece of wood, $\frac{1}{2}$ in. thick, 2 in. wide and 5 in. long, is used for the base of this instrument. Two wire nails, each 1 in. long, are used for the cores of the magnets. Each nail is wound with three or four layers of fine insulated magnet wire about No. 25, similar to that used in electric bells, leaving about $\frac{1}{4}$ in. of the end bare so that they may be driven into the wood base. The connections for the coils are shown in the sketch at A.

About 1 in. behind the coils is fastened a small block of wood, the top of which is just even with the top of the nails in the coils. A piece of tin cut in the shape of the letter T is fastened with two screws to the top of this block, and the end bent slightly so as to clear the top of the nails about $\frac{3}{8}$ in.

The key lever is cut from a thin piece of wood in the shape shown in the sketch and pivoted in a slotted block which is used as a base for the key. A piece of bare copper wire is fastened along the under side of the key as shown by the dotted lines. A rubber band, passing over the end of the key and attached to the base with a tack, acts as a spring to keep the key open. A small piece of tin is fastened to the base under the knob

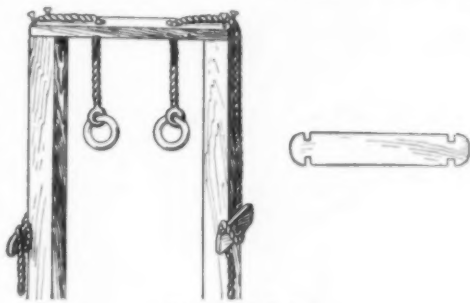


Key and Connections

of the key. This is for making the contact between the copper on the key and the wires from the coils, when the key is pushed down.—Contributed by W. H. Lynas.

Combined Turning Rings and Swing

This trapeze, with rings for the large boys and a swing for the smaller ones, can be made on the same standards.



Rings and Swing

Instead of the usual two short ropes, tied and bolted through the top cross timber, bore two holes large enough for the ropes to pass through easily. Pass the rope along the crosspiece and down the post and tie it to cleats nailed at a height that can be easily reached.

At the ends of the crosspiece drive two nails, allowing them to project 1 or 2 in. This will keep the rope from slipping off when the rings and swing are raised and lowered. All sharp edges should be sandpapered to prevent the rope from being cut. A board with notches cut in the ends will make a good swing board which can be removed instantly.—Contributed by W. A. Jaquythe, Richmond, Cal.

A Traveler's Shaving Mug

Take an ordinary collapsible drinking cup and place a cake of shaving soap in the bottom ring. This will provide a shaving mug always ready for the traveler and one that will occupy very little space in the grip.

☞ Grease a hard running saw with kerosene. This oil will not stain the wood.

Imitation Arms and Armor—Part VII

The helmets, breastplates and gauntlets described in parts V and VI can be used in making up a complete model

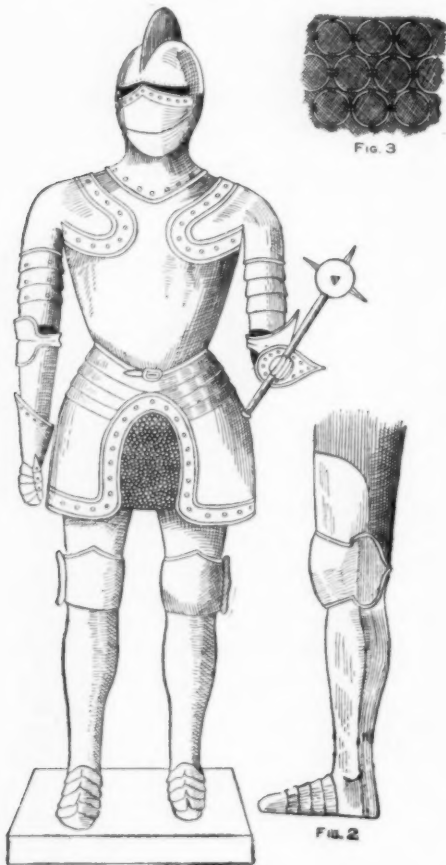


FIG. 1
Full Suit of Armor

for a full suit of armor of any size, as shown in Fig. 1. All of the parts for the armor have been described, except that for the legs. Figure 2 shows how the armor is modeled on the side of the left leg. The clay is modeled as described in previous chapters, the paper covering put on, and the tinfoil applied in imitation of steel. The chain mail seen between and behind the tassets is made by sewing small steel rings on a piece of cloth as shown in Fig. 3. These rings may be purchased at a hardware store or harness shop.

The whole figure when completed

is placed on a square box covered with red or green baize. The armor should be supported by a light frame of wood built up on the inside, says the English Mechanic, London. Two vertical pieces are firmly attached to the box so they will extend up inside the legs, and at the top of them is attached a crosspiece on which is placed a vertical stick high enough to carry the helmet. The two lower pieces must be built up and padded out with straw, then covered with red cloth or baize to represent the legs.

In making up the various pieces for a full model it will be found very convenient to use rope, a stout cord or strings in making up the patterns on the parts. Instead of using brass-headed nails, brass paper fasteners will be found useful. These can be purchased at a stationery store. Secure the kind having a round brass head from which hang two brass tongues. These are pushed through a hole and spread out flat on the opposite side. Other materials can be used in the place of tinfoil to represent steel. Silver paper will do very well, but if either the tinfoil or silver paper are found difficult to manipulate, go over the armor with a coat of silver paint put on with a brush. When dry give the surface a coat of varnish.

A Home-Made Tripod Holder

An inexpensive tripod holder, one that will prevent the tripod from slipping on a smooth floor, and prevent the points from doing damage to the polished surface or puncturing an expensive rug or carpet, can be made in a few minutes' time, says Camera Craft.

Secure two strips of wood, or ordinary plaster laths will do, and plane them down to a thickness of $\frac{3}{16}$ in., for the sake of lightness. Cut them to a length of 40 in. and round off the ends to improve their appearance. Take the piece shown in Fig. 1 and

drill a 1/4-in. hole in the center, and eight small holes, 1 in. apart, at each end. In one end of the piece, Fig. 2, make the same series of eight small holes and, in the other end, drill six 1/4-in. holes, 3 in. apart. A 1/4-in. flat-headed carriage bolt, about 1 in. long, completes the equipment.

The two pieces are bolted together, not too tight, and the points of the tripod legs inserted in their respective small holes. So set up, there is absolutely no danger of one of the legs slipping out of position. By moving the position of the bolt from one to another of the larger holes in the strip, Fig. 2, almost any desired inclination of the camera can be secured.

The same sort of simple apparatus built slightly stronger, and with a

small caster under each of the three series of small holes, makes an excel-

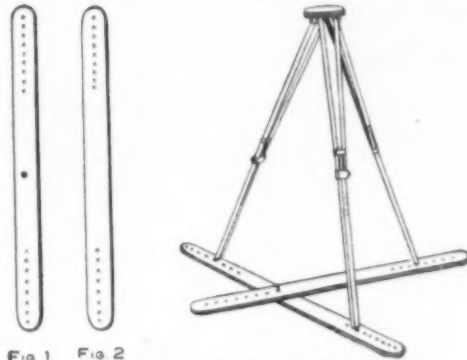


Fig. 1 Fig. 2 The Tripod Cannot Slip

lent tripod clamp for use when the camera has to be shifted about, as in portraiture and the like.

How to Weave a Shoestring Watch Fob

Having procured a pair of ordinary shoestrings, take both ends of one of them and force the ends through the middle of the other, leaving a loop 1 1/2 in. long, as shown in Fig. 2. In this sketch, A is the first string and B is the second, doubled and run through the web of A. Take hold of the loop and turn it as shown in Fig. 2, allowing the four ends to hang in four directions. Start with one end, the one marked A, in Fig. 1, for instance, and lay it over the one to the right. Then take B and lay it over A, and the one beneath C; lay C over B and the one under D, and then lay D over C and stick the end under A. Then draw all four ends up snugly. Commence the next layer by laying the end A back over B and D; D over A and C; C over D and B, then B over C and the end stuck under A. Proceed in the same manner and keep on until about 1 1/2 in. of the ends remain unwoven. Four pins stuck through each corner and into the layers will hold the ends from coming apart. The ends of the strings are raveled out so as to make a tassel. This will make a square fob

which will appear as shown in Fig. 4.

A round fob is made in a similar way, taking the same start as for the square fob, but instead of reversing



Fig. 4 Fig. 5 Fobs Made from Shoestrings

the ends of each alternate layer, always lap one string, as at A in Fig. 3, over the one to its right, as B, slipping

the last end of the four strings under and tightening all, as in making the square fob. Fasten the ends with pins and ravel out for a tassel. The round fob is shown in Fig. 5.

A fob in the shape of a horseshoe can be made by taking four shoestrings and tying a small string around the middle of them, then weaving the layers both ways from the point where the strings are tied. A loop, $1\frac{1}{2}$ in. long, is left out at the center before

starting on one side. The loop is for attaching the fob to the watch. After the weaving is complete and the tassel ends made, a small stiff wire is forced through the center to form the shape of a horseshoe.

Other designs can be made in the same manner. Strings of different colors will make up a very pretty fob, especially if silk strings are used.—Contributed by John P. Rupp, Monroeville, Ohio.

Wood-Working for Beginners

By Ira S. Griffith

CHAPTER III Hand Saws

Hand saws are of two kinds—rip and crosscut. The first is for sawing

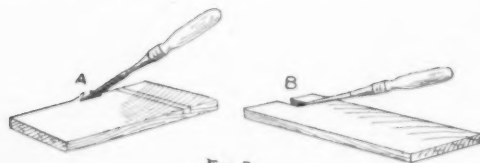
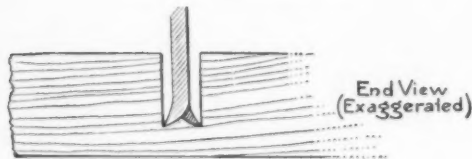


FIG. 7
The Way Saw Teeth Cut



Crosscut Saw

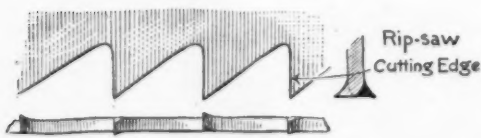


FIG. 8
Setting Saws

along the grain, the direction in which wood splits easiest, the other for sawing across the grain. The necessity for having a saw for each direction of cutting with reference to the grain is clearly shown in Fig. 7. The rip-saw is really nothing more than a lot of little narrow chisels so arranged that they cut, one after the other, in rapid succession, the cutting edge, like that of the chisel, being on the front of the tooth. To cut across the grain with a rip-saw would be to split the wood as in A, Fig. 7. Cutting with the grain is shown in B. The teeth of the crosscut saw are so sharpened, that the cutting edges are on the sides of the teeth instead of in front. Fig. 8 shows the shape of both rip and crosscut saw teeth.

Both of these saws are sharpened with exactly the same tools, the differences in the teeth being due to the difference in angle at which the file is held in the process.

Sharpening a saw is considered a difficult thing to learn, so difficult that it is not necessary to go into a lengthy description for beginners. It may be worth while, however, to state the steps that are taken in putting a saw in order. The beginner ought to know how the tools are sharpened even if he must attain more experience before attempting to sharpen them. First, the teeth are jointed. This is done by running a flat file along the length of the saw so as to cut down any teeth that

project farther than others (Fig. 9). Second, the teeth are filed, a three cornered file being used, and the kind of saw determining the angle or angles at which it is held with reference to the side of the saw. The rip saw is filed straight across (Fig. 10). The cross-cut is filed as in Fig. 11. After the filing, the teeth are side jointed. This is done by running an oil stone over the sides of the saw and teeth as in Fig. 12. This will make the sides of the teeth cut a smooth kerf.

If the saw, before filing, had a tendency to stick in the wood, it should have its teeth set before the top jointing. Figure 13 shows a modern sawset. These sets are adjustable so that the teeth may be bent much or little, as the condition of the wood necessitates. No more set than is necessary

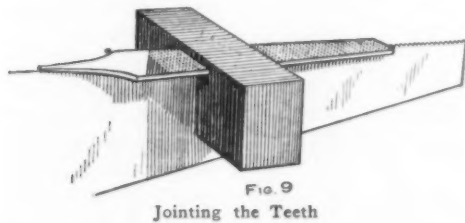


FIG. 9
Jointing the Teeth



FIG. 10
Filing a Rip saw

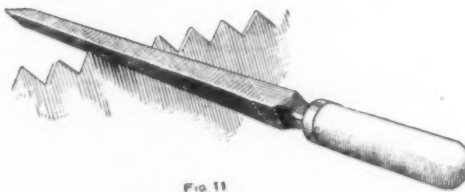


FIG. 11
Filing a Crosscut Saw



FIG. 12
Jointing the Sides of the Teeth

is a good rule. Moving the handles together shoves the plunger forward. This bends the tooth outward from the

side of the saw. Every other tooth is set, the saw is then reversed and the

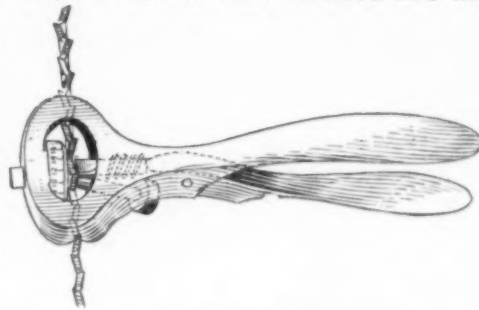


FIG. 13—Sawset

remaining teeth are set from the second side.

(To be continued.)

Mounting Photographs in Plaster Plaques

Purchase a few pounds of plaster of paris from your local druggist and select a dish of the desired shape in which to make your cast. The size of the dish will depend on the size of the print to be mounted. Select the print you wish to mount, those on matte paper will work best, and after wetting place it face down in the dish, press into place and remove all drops of water with a soft cloth. Be sure and have the print in the center of the dish. Earthen dishes will be found more convenient, although tin ones can be used with good success, says Photographic Times.

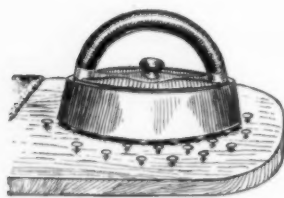
Mix some of the plaster in clear water so it will be a little thick. Enough plaster should be mixed to cover the bottom of the dish about $\frac{1}{2}$ in. thick. Pour the plaster into the dish over the print and allow to stand until it becomes quite hard. The cast can then be removed and the print should be fast to it. If the print or plaster is inclined to stick, take a knife and gently pry around the edges and it can be removed without breaking.

Prints of any size may be used by having the mold or dish large enough to leave a good margin. This is a very important point as it is the margin that adds richness to all prints. Platinum or blueprint papers work well, but any

kind that will not stick may be used. After the plaster has thoroughly dried, any tint may be worked on the margin by the use of water colors; if blueprints are used, it is best to leave a plain white margin.

Iron Rest for an Ironing Board

A flatiron rest can be made on an ironing-board by driving a number of large tacks into one end of the board.

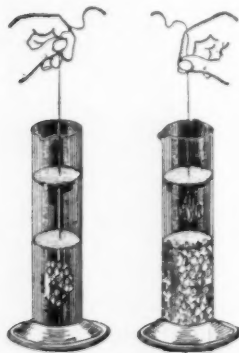


The tacks should be about 1 in. apart and driven in only part way, leaving

about $\frac{1}{4}$ in. remaining above the surface of the board. The hot iron will not burn the wood and it cannot slip off the tacks. This iron rest is always with the board and ready when wanted.—Contributed by Beatrice Oliver, New York, N. Y.

Instantaneous Crystallization

Dissolve 150 parts of hyposulphite of soda in 15 parts of water and pour the solution slowly into a test tube which has been warmed in boiling water, filling the same about one-half full. Dissolve in another glass 100 parts of acetate of soda in 15 parts of boiling water. Pour this solution slowly on top of the first in such a way that it forms an upper layer, without mixing the solutions. The two solutions are then covered over with a thin layer of boiling water and allowed to cool.



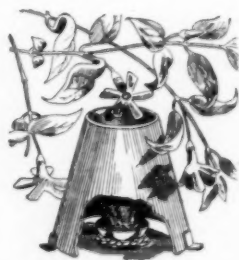
Lower into the test tube a wire, at

the extremity of which is fixed a small crystal of hyposulphite of soda. The crystal traverses the solution of acetate without causing trouble, but crystallization will immediately set in as soon as it touches the lower hyposulphite of soda solution, as shown at the left in the sketch.

When the hyposulphite of soda solution becomes crystallized, lower in the upper solution a crystal of acetate of soda suspended by another wire, as shown in the right of the sketch, and this will crystallize the same as the other solution.

Decoloration of Flowers by Fumes of Sulphur

Dissolve some sulphur in a small dish which will inflame by contact with air thus forming sulphuric acid fumes. Cover the dish with a conical chimney made of tin and expose to the upper opening the flowers that are to be decolorized. The action is very rapid and in a short time myrtle, violets, bell flowers, roses, etc., will be rendered perfectly white.



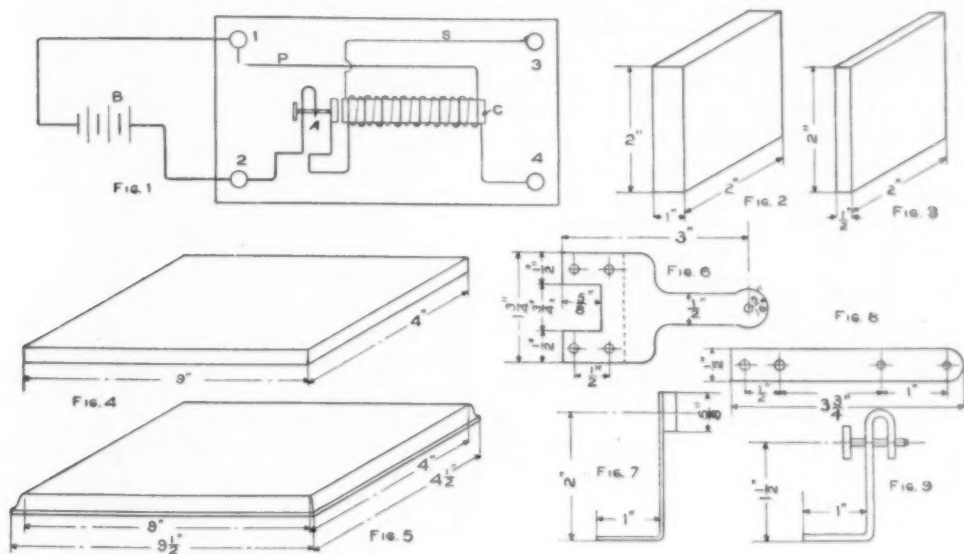
How to Preserve Egg Shells

Many naturalists experience difficulty in preserving valuable egg shells. One of the most effective ways of preserving them is as follows: After the egg is blown, melt common beeswax and force it into the shell with a discarded fountain pen filler. Set in a cool place until the wax hardens. The most delicate shells treated in this manner can be handled without fear of breaking, and the transparency of the wax will not alter the color, shading, or delicate tints of the egg.—Contributed by L. L. Shabino, Millstown, South Dakota.

How to Make an Electric Shocking Coil

The amateur experimenter will find that more pleasure can be derived from a simple induction coil, or "shocking coil" as it is often termed, and a few dry cells than from many a costly toy. The construction and operation of such a coil will be quite instructive; and he will have an opportunity to become acquainted with some of the fundamental principles of the electric circuit.

The core of the coil can be constructed as follows: Wind a piece of good strong paper, $5\frac{1}{2}$ in. wide, around a $\frac{5}{8}$ -in. round stick, forming a tube whose wall is about $\frac{1}{16}$ in. in thickness. In winding this tube shellac each layer, and do not wind it too tight on the stick, as you will be unable to move it when the tube is complete. Now cut from some No. 20 gauge iron wire a sufficient number of pieces $5\frac{5}{8}$ in.



Details of the Shocking Coil

Before taking up the actual construction of the coil it might be well to become acquainted with the various parts of it by reference to Fig. 1. The coil proper consists of two windings of wire on an iron core, C. One of these windings, called the primary, P, consists of a few turns of rather large copper wire, and it is connected in series with a make-and-break device, A, to some source of energy such as a few dry cells, B. The other winding called the secondary, S, consists of a larger number of turns of a smaller wire, and it is from this coil that the high voltage current is obtained by connecting to the terminals 3 and 4.

long to completely fill the opening in the tube. Allow these wires to project $\frac{1}{8}$ in. at one end and make this end of the iron core perfectly even. Next secure a piece of thin brass tubing, 5 in. long and just large enough to slip over the paper tube easily. Wind outside of this tube one or two layers of paper and glue them to the tube. Then wind a piece of paper, 1 in. wide, very tightly around the first paper tube, at the end with the projecting core, until a ring is formed whose outer diameter corresponds to the outer diameter of the paper-covered brass tube. Now slip the brass tube on the core and wind on the whole a piece of heavy

paper, $5\frac{1}{2}$ in. wide, until a second paper tube is formed with walls $\frac{1}{8}$ in. in thickness. Be very careful not to wind this paper or shellac it in such a way that you will be unable to remove the tube. When the outer tube is complete remove the brass tube and scrape off the two layers of paper, which will allow the brass tube to move easily on and off of the iron core. The purpose of this tube is to increase or decrease the shocking effect of the coil by changing the effect of the primary current on the iron core. The maximum shock will be obtained when the tube is entirely withdrawn. A handle may be attached to the end of this tube which will aid you in moving it and at the same time add to its appearance.

Cut from some hard wood two pieces whose dimensions correspond to those of Figs. 2 and 3. The holes in these pieces should be such that they will fit tightly on the ends of the outside paper tube. Fasten them in place by means of shellac, placing the thicker one on the end with the projecting core, and allow them to dry thoroughly before proceeding.

Now wind on the spool just formed two layers of No. 20 gauge double-cotton-covered wire and shellac with best quality shellac you can obtain. The ends of the winding can be carried out through holes drilled in the thick end block. It might be well to make these terminals of stranded wire such as lamp cord, which will reduce the likelihood of the conductor being broken. Solder the joints and thoroughly tape them, the joint being inside the coil. These ends should be 7 or 8 in. long.

Outside of the primary winding wind two or three layers of good quality paper and shellac. Then wind on 1 lb. of No. 36 gauge double-cotton-covered copper wire, forming the terminals as suggested in the case of the primary winding. The insulation of this winding can be increased by placing a layer of paper between every layer of wire and shellac. The coil can now

be covered with some kind of insulating cloth or paper that will add to its appearance and serve as a protection to the winding.

You will need two pieces of hard wood whose dimensions correspond to those of Figs. 4 and 5, to form the base of the coil. The various parts of the coil should be first mounted on the thick piece, all the screws being countersunk, and the wires placed in grooves cut in the under side of the board. After all the various parts are in place this piece can then be mounted on the other board by means of several round-headed brass screws.

The interrupter or "make-and-break" device can be made as follows: Cut from $\frac{1}{16}$ -in. spring brass a piece whose dimensions correspond to Fig. 6, and bend it to the form shown in Fig. 7. Mount on the narrow end of this brass strip a small piece of soft iron, and then fasten the whole to the wooden base with several screws, so that the iron block is about $\frac{3}{8}$ in. from the end of the iron core.

The adjusting screw should be mounted on a piece of $\frac{1}{8}$ in. brass, the dimensions of which correspond to those of Fig. 8, and bent as shown in Fig. 9. This piece is then mounted on the base by means of two round-headed brass screws. The point of the adjusting screw should be platinum tipped, and a piece of platinum placed on the spring where the point of the screw makes contact.

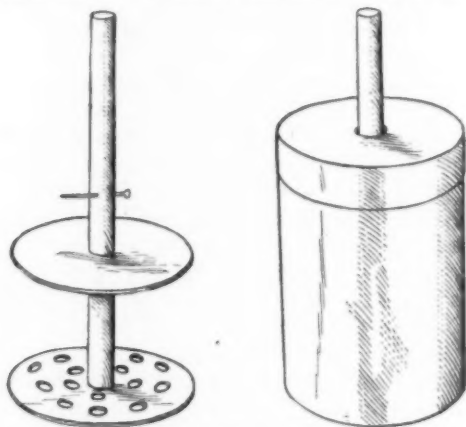
Four binding-posts can be mounted on the base that will serve as terminals of the primary and secondary circuits. Connect one terminal of primary winding to the interrupter spring and the other terminal to one of the binding-posts; while the support for the adjusting screw is connected to the other binding-post. The secondary windings are connected direct to the two binding-posts 3 and 4, Fig. 1.

A battery of three or four dry cells should be sufficient to operate the coil. You may find the interrupter spring is too stiff. If so, reduce its thickness by filing away some of the metal.

Handles can be made by soldering 3 or 4 ft. of lamp cord to some small pieces of brass tubing.

How to Make an Egg-Beater

There is no reason why any cook or housewife should be without this egg-beater, as it can be made quickly in any size. All that is needed is an ordinary can with a tight-fitting cover—a baking-powder can will do. Cut a round piece of wood 3 in. longer than the length of the can. Cut a neat hole in the cover of the can to allow the stick to pass through, and at one end of the stick fasten, by means of a flat-headed tack, a piece of tin, cut round, through which several holes have been punched. Secure another piece of



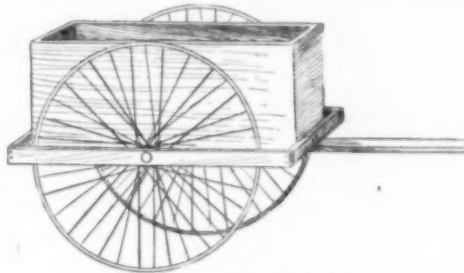
Made Like a Churn

heavier tin of the same size, and make a hole in the center to pass the stick through. Put a small nail 2 in. above the end of the dasher, which allows the second tin to pass up and down in the opposite direction to the dasher. This beater will do the work in less time than the regular kitchen utensil.—Contributed by W. A. Jaquythe, Richmond, Cal.

Cart Without an Axle

The boy who has a couple of cart wheels is not always lucky enough to have an axle of the proper length to fit the wheels. In such a case the cart

can be constructed as shown in the illustration. This cart has no axle, each wheel being attached, with a short pin



Wheels Fastened to the Box

for an axle, on the side and at the lower edge of the box. The outer end of the pin is carried on a piece of wood extending the full length of the box and supported by crosspieces nailed to the ends, as shown.—Contributed by Thos. De Loof, Grand Rapids, Mich.

An Illuminated Target

My youthful nephews sometime ago were presented with an air rifle and it worked so well that it became necessary for me to construct a target that would allow the fun to be carried on at night.

I reversed a door gong, screwed it on the inside of a store box, and fitted two candles on the inside to illuminate the bullseye. The candles, of course, were below the level of the bullseye. The position of the candles and gong are

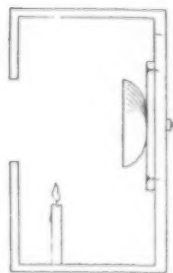


FIG 1

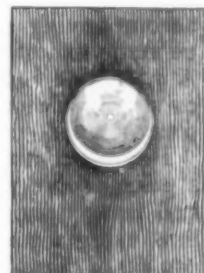


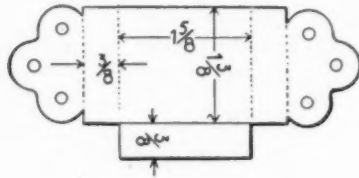
FIG 2

Target for Night Shooting

shown in Fig. 1. At night the illuminated interior of the bell could be plainly seen as shown in Fig. 2.—Contributed by James M. Kane, Doylestown, Pa.

How to Make a Match Holder of Wood and Metal

A very simple piece of art craft work is easily made, as follows: Secure a piece of paper and upon it draw the outline and design, as indicated in the



Match Holder

accompanying sketch. The size may be made to suit the taste of the worker. A good size is 5 in. wide by 6 in. long over all. The metal holder should be proportioned to this size, as shown.

Having completed the drawing, take a piece of thin wood, $\frac{3}{8}$ or $\frac{1}{4}$ in. thick, and trace upon it the design and outline, using a piece of carbon paper. A couple of thumb tacks should be used to fasten the paper and design in place. Put the tacks in the lines of the design so that the holes will not show in the finished piece. Any kind of wood will do. Basswood or butternut, or even pine, will do as well as the more expensive woods.

Next prepare the metal holder. This may be made of brass or copper and need not be of very heavy gauge—No. 22 is plenty heavy enough. The easiest way to get the shape of the metal is to make a paper pattern of the development. The illustration shows how this will look and the size of the parts for the back dimensioned above. Trace this shape on the metal with the carbon paper and cut it out by means of metal shears. Polish the metal, using powdered pumice and lye, then with a nail, punch the holes, through which small round-head brass screws are to be placed to hold the metal to the wood back. Carefully bend the metal to shape by placing it on the edge of a board and putting another board on top and over the lower edge so as to keep the bending true.

The wood back may be treated in quite a variety of ways. If soft wood, such as basswood or pine was used, it may be treated by burning with the pyrography outfit. If no outfit is at hand a very satisfactory way is to take a knife and cut a very small V-shaped groove around the design and border so as to keep the colors from "running." Next stain the leaves of the conventional plant with a little green wood dye and with another dye stain the petals of the flower red. Malachite and mahogany are the colors to use. Rub a coat of weathered oil stain over the whole back and wipe dry with a cloth. The green and red are barbarously brilliant when first put on, but by covering them at the same time the background is colored brown, they are "greyed" in a most pleasing manner. When it has dried over night, put a coat or two of wax and polish over the wood as the directions on the can suggest.

The metal holder may next be fastened in place.

If one has some insight in carving, the background might be lowered and the plant modeled, the whole being finished in linseed oil. If carving is contemplated, hard woods such as cherry or mahogany should be used.

RECENT PATENTS, PRACTICAL OR UNIQUE

SHOULDER RACK FOR HAIR DRYING—

The drying of the hair is the most difficult part of the washing process, and this fact has led to the designing of many devices to aid in its accomplishment. Figure 1 is one of the latest ideas, consisting of a wire rack which rests upon and extends backward from the shoulder. The wet hair is spread out around this rack.



FIG. 1

INSECT CATCHER—Figure 2 is a unique arrangement for catching and destroying insects, patented by a resident of Canby, Oregon. It is composed of articles ordinarily found around a house, and includes a barrel, dishpan, lantern, and three sticks for a tripod. The upper section of the barrel is cut out and the lower part contains fruit or other odorous materials. The pan contains liquid.

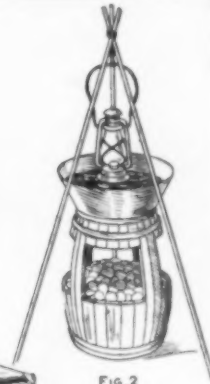


FIG. 2

SLIDING LEGS FOR TRUNKS—A trunk provided with legs that can be slid up along its sides, out of the way, when the trunk is being moved from place to place, is shown in Fig. 3. The legs are adapted to slide in guides, and a set of springs holds them in extended and withdrawn positions. When the legs are in use the trunk is lifted high enough above the floor to do away with the necessity of bending over to handle its contents.



FIG. 3

FOOT-BRACE FOR HORSES—The device shown in Fig. 4 is designed to remedy weak ankles of horses. A boot envelops the limb above the ankle joint, and to this is attached a spring arrangement. The lower end of the spring metal, which is about 2 in. above the bottom of the hoof, is attached to the steel shoe by means of a strap. The strap is shortened or lengthened to add to or detract from the pulling pressure of the spring. The pull of the spring counteracts the tendency of the weak ankle to bend outward with the horse's weight.

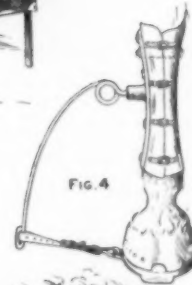


FIG. 4

TRUNK SHAPED LIKE A DRUM—This circular trunk (Fig. 5) provides a receptacle for traveling purposes that is simple to handle. Its drum-like surface makes it possible to roll it from room to room, or place to place, with but little of the exertion required to handle an ordinary trunk.



FIG. 5

CANVAS NET ARRANGEMENT FOR GATHERING FRUIT—The fruit gatherer illustrated in Fig. 6 takes some time to set up around a tree, but it is said to make possible the obtaining of fruit from the most inaccessible branches. The canvas floor of the net slopes from the tree trunk to the outer edges, so that the fruit, dropping onto it, rolls to the edges, where it is out of danger of being struck and bruised.

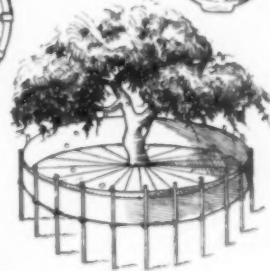


FIG. 6

STEAM FACE-BATH—A simple steam face-bath is shown in Fig. 7. An alcohol burner is arranged in the base, and above this is a pan containing water. A hood fits over the top of the device, and this is passed around the head of the person taking the bath. The steam, filling the hood, envelops the face.

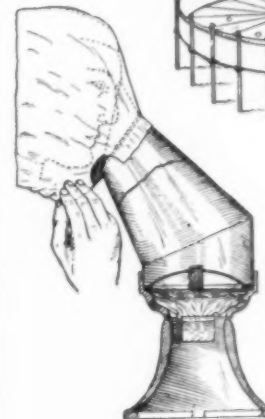


FIG. 7

SPRING CLAMP FOR BOXES—It is often desirable to securely fasten a top on a box without the trouble of nailing it down and then withdrawing the nails when access to the contents is desired. The device shown in Fig. 8 makes such a procedure possible. It consists of two sets of clamps, each set being connected by a spring.

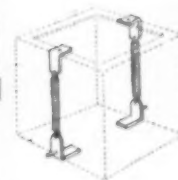


FIG. 8

RAKE FOR ROTARY LAWN-CLEANERS—The porcupine-like device shown in Fig. 9 is a rake for rotary lawn-cleaners. It picks up leaves, paper and other material as the machine is drawn across the lawn. An arrangement on the carriage, which is like that of a lawn-mower, cleans the teeth at each revolution.

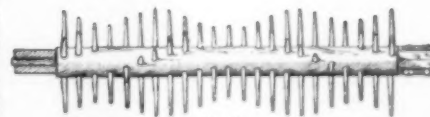


FIG. 9

"WATT-HOUR you doing there?" asked the boss.

"Eatin' currents," replied the apprentice, shamefacedly. "Anode you'd catch me at it."

"Wire you insulate this morning, anyway?" demanded the boss.

"Leyden bed."

"Wouldn't that jar you! Can't your relay-shunts get you up mornings?"

"Amperently not."

"Fuse going to do that every day you can take your hat and go ohm," replied the boss, and the circuit was broken right there.

◆ ◆ ◆

Two telephone girls were talking over the wire one afternoon. The subject of the conversation was a lawn party, which was to take place the next day. Both were discussing what they should wear, and after five minutes had come to no decision. In the midst of this important conversation a masculine voice interrupted, asking humbly what number he had. The lack of reply did not squelch the inquirer, for he asked again for the number.

One of the girls became indignant, and scornfully asked:

"What line do you think you are on, anyhow?"

"Well," said the man, "I am not sure, but judging from what I have heard I should say I was on the clothesline."

◆ ◆ ◆

"How often does your road kill a man?" asked a facetious traveling salesman of a Central Branch conductor the other day.

"Just once," replied the conductor, sourly.—Kansas City Journal.

◆ ◆ ◆

"Now they have perfected a mechanical contrivance for setting up tenpins."

"Well, well! What next?"

"Oh, I suppose a device for knocking them down."—Courier-Journal.

◆ ◆ ◆

Egyptologist—"Here is a papyrus on which the characters are so badly traced that they are indecipherable. How shall you class it?"

Keeper of Museum—"Oh, I shall just call it a doctor's prescription in the time of Pharaoh."

◆ ◆ ◆

"How did they manage to get such a fine thumbprint of the burglar?"

"The house had been painted that day and he just couldn't resist the temptation to feel of the paint to see if it was dry."—Houston Post.

◆ ◆ ◆

Ferroid—I can't get any speed out of that motor car you sold me. You told me you had been arrested six times in it.

Hobart—So I was, old chap; for obstructing the highway.—Exchange.

◆ ◆ ◆

"You've missed that target every time!" said an officer. "What on earth is the matter?"

"Well, sir," answered the new man, "the only reason I can think of is that, the person who set up my target hasn't placed it in a straight line from here."

◆ ◆ ◆

"Yes, your honor, I'll admit I chased the complainant for a mile or more."

"You meant to do him bodily injury?"

"Yes, indeed, your honor."

"Why?"

"Because he handed me a pamphlet entitled 'How to Live Well on Seven Cents a Day.'"

"Discharged."—Cleveland Plain-Dealer.

◆ ◆ ◆

The Lady—What would you expect me to give you if you'd split that wood for me?

The Hobo—Some new kind of anaesthetic, mum—and yer'd hafta give it before I started.—Cleveland Leader.

"Why is Maude so angry with the photographer?"

"She found a label on the back of her picture saying, 'the original of this photograph is carefully preserved.'"

—Boston Transcript.

◆ ◆ ◆

Teacher—"Jimmy, you look very pale this morning. Are you ill?"

Jimmy—"No ma'am. Ma washed my face this morning herself."

◆ ◆ ◆

"Mike," said Plodding Pete, "dere's wuss t'ings dan gold bricks."

"What's happened?"

"De lady up de road said dat if I'd chop an armful of wood she'd gimme a cake."

"Didn't she keep her word?"

"Yep. She handed me a cake of soap."—Washington Star.

◆ ◆ ◆

"Here is an aeroplane catalogue."

"Good enough. I'll supply it with dialogue and have the first aviation novel."

◆ ◆ ◆

"I thought you didn't care for him. What won you?"

"His language. He told me that his love for me burned like gasoline, and begged me to honk-honk through life with him."—Louisville Courier-Journal.

◆ ◆ ◆

Barber—"Have anything on your face when I get through, sir?"

Victim—"Some skin and a nose, I hope."—Boston Transcript.

◆ ◆ ◆

"She is very liberal in her charities," said one woman.

"Yes," answered the other, "liberal, but not always practical. For instance, she wanted to send alarm clocks to Africa to aid sufferers from the sleeping sickness?"

◆ ◆ ◆

"Bill, what share did you get of your grandfather's estate?"

"I got what was left after every other feller had been provided fur."

"Then you are the residuary legatee."

"I ain't nothin' of the sort, blame ye! I'm an honest hard workin' coppersmith!"

◆ ◆ ◆

Little Boy (studying his lessons for the next morning)—Papa, how many make a million?

Father—About one in a million, my dear boy. Now, don't ask me any more questions.—New York Times.

◆ ◆ ◆

The diminutive office boy had worked hard on a "salary" of \$2 a week. He was a subdued little chap, faithful and quiet. Finally, however, he plucked up his courage enough to ask for an increase.

"How much more would you like?" inquired his employer.

"Well," answered the lad, "I don't think that 50 cents more a week would be too much."

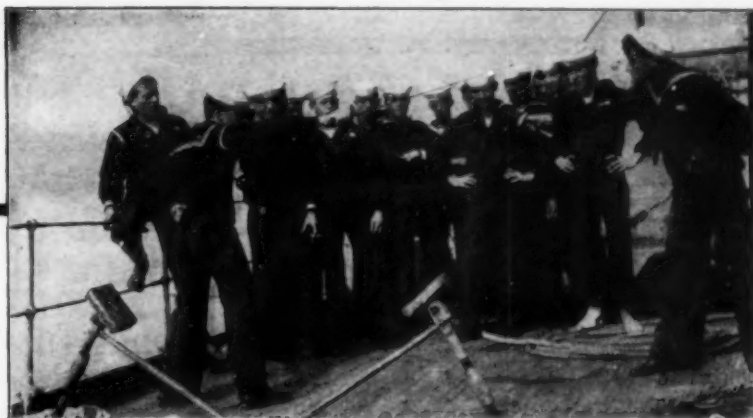
"You are rather a small boy to be earning \$2.50 a week."

"I know I am small," he replied, "but to tell the truth, since I've worked here I've been too busy to grow."

◆ ◆ ◆

Old Lady—"I want you to take back that parrot you sold me. I find that it swears very badly."

Bird Dealer—"Well, madam, it's a young bird. It'll learn to swear better when it's a bit older."—San Francisco Star.



Bluejackets Fencing

If You Are Ambitious

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¶ You probably think—if you have thought about it at all—that you would not like a job in the Navy. That is because you've never looked into the matter. And your parents may think the Navy would be the ruin of you. That is because they don't understand what life in the Navy is, and don't know the kind of young men there are in the Navy.

¶ The story of what the Navy offers, what it can do for a young man, the character of the men who compose it—is too long to tell on this page; but it is told in simple language, profusely illustrated by pictures of actual Navy scenes, in a Booklet which will be sent you **free**. Send for copy of it, and read it. You will learn more about the Navy Service than you ever knew before, and it will be a valuable education to you, even if you don't decide to join the Navy. Have your parents read it, too.

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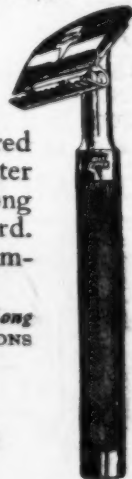
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POPULAR MECHANICS

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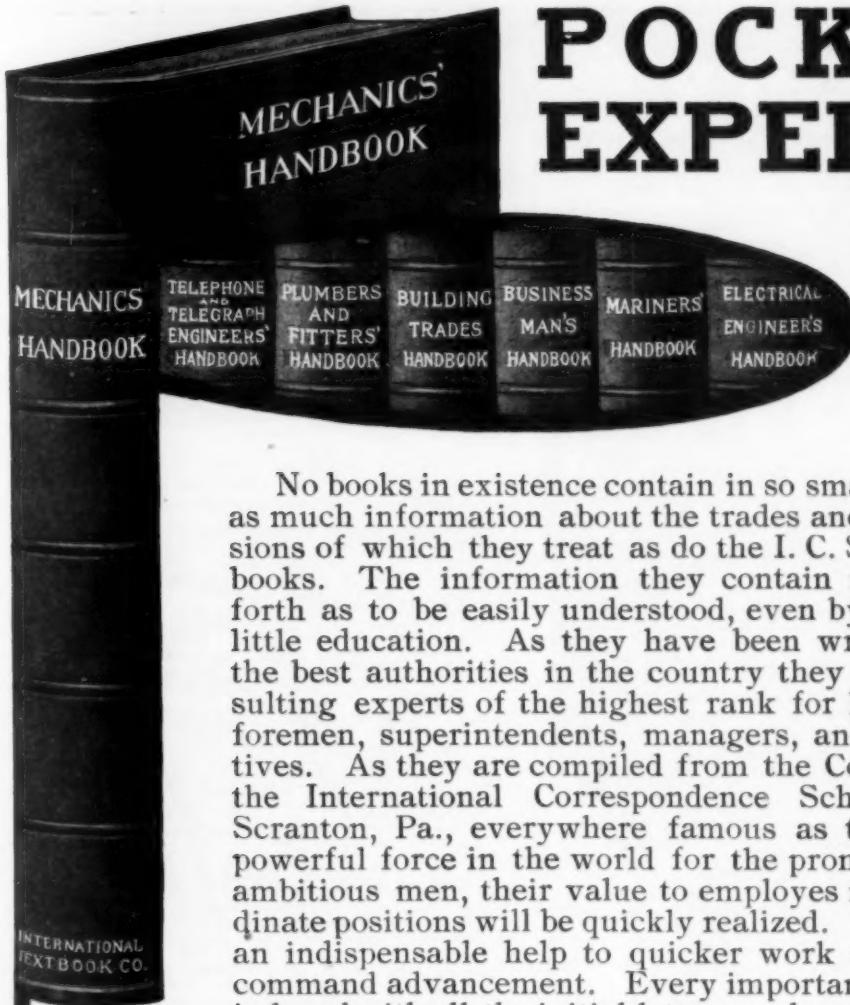
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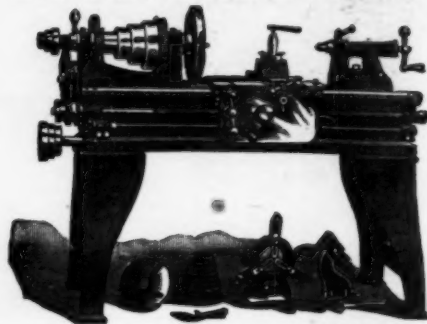
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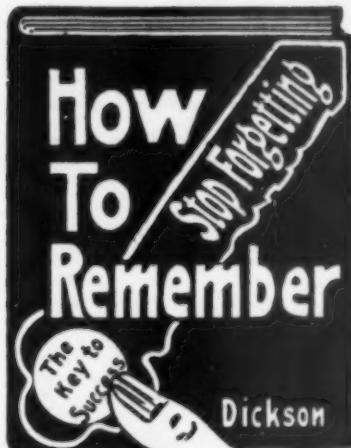
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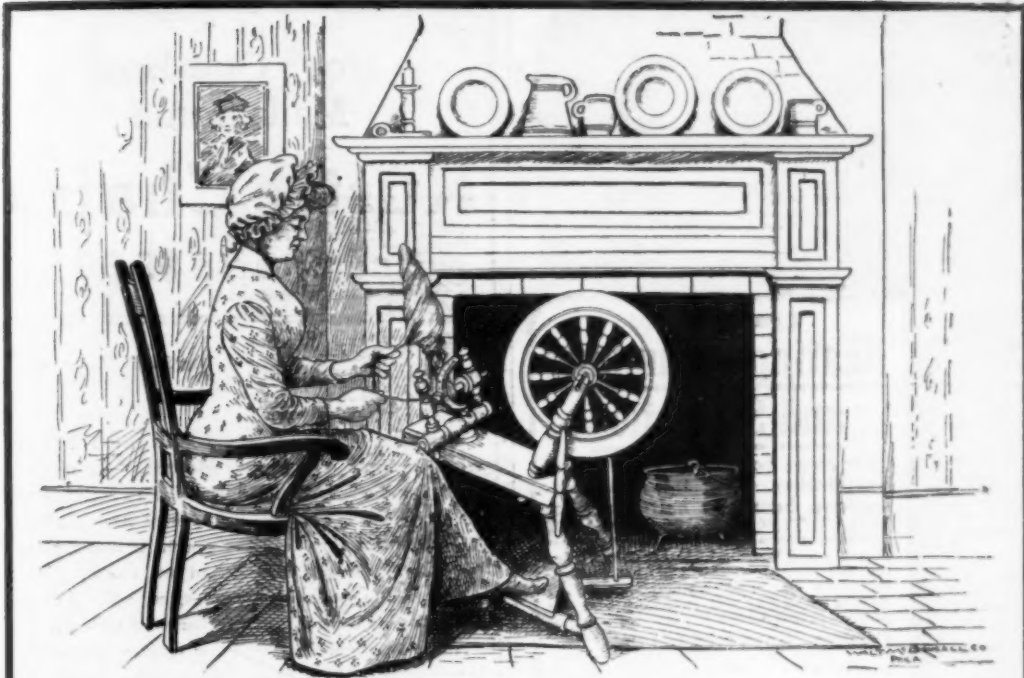
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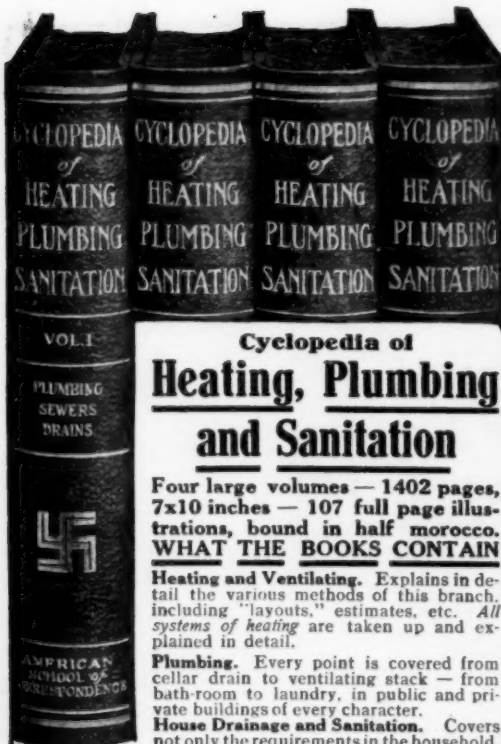
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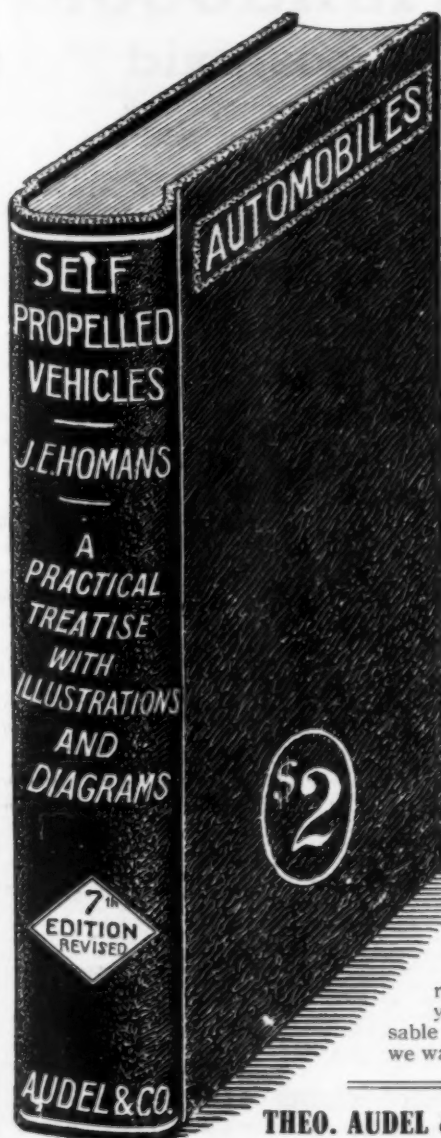
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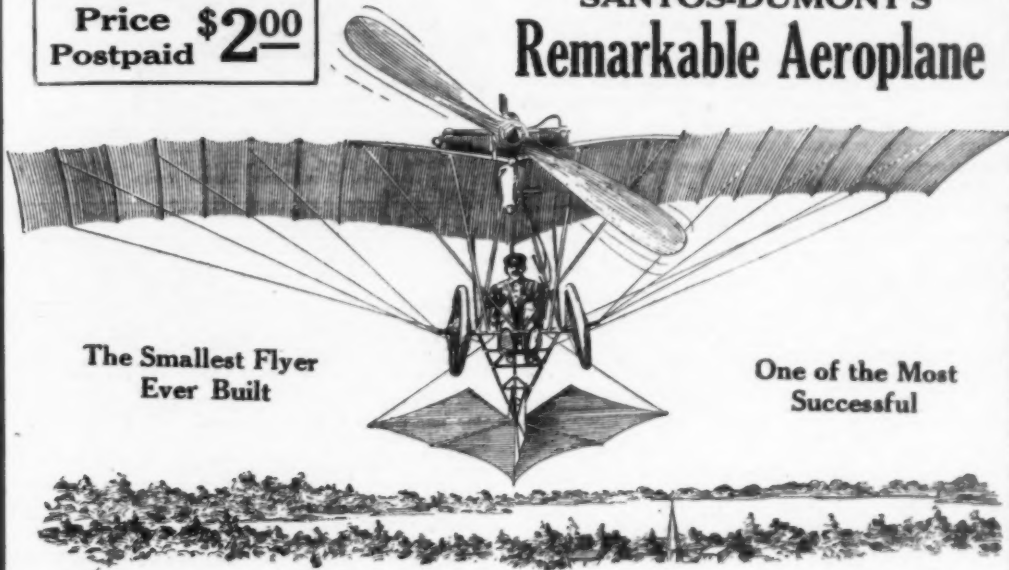
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MAKE MONEY on your kitchen table in Your Spare Time. Silver new and re-silver spotted mirrors. We teach the world's best known French Process, (Copyrighted), of silvering mirrors. Send 10c for booklet and sample mirror. French Mirror Company, 277 Willard Avenue, Providence, R. I.

INVEST \$5 and be your own boss: earn \$5 to \$10, daily: circulars free. The World Business House, 205 Freedman Bldg., East Chicago, Ind.

WE TEACH SALESMANSHIP FREE—and help furnish positions. Stamp brings information. Commercial Salesmen Information Bureau, Jamestown, N. Y.

WANTED TO CORRESPOND with competent owner of an article of merit, always seasonable, not perishable, and marketable any place. We manufacture and sell. Address W. H. Davis & Sons, Newark, Ohio.

MILL SITE; best in New England. Two railroads. Running water. Side track graded 650 feet. Two Electric Power stations within 1/2 mile. Labor conditions good. Will sell to settle estate. Fred S. Sibley, 19 Woodlawn St., Clinton, Mass.

DAILY HOME BUSINESS, selling names, formulas and other valuable information by mail. Some make \$100 to \$1000 monthly. Instructive booklet for stamp. Information System, Dept. X, Marietta, Ohio.

OWN YOUR OWN FACTORY. I'll start you in the canvas glove business and furnish you the tools free. Address Manager, Box No. 36, Lancaster, Ohio.

I MADE \$50,000 in five years with a small mail order business; began with \$5. Send for free booklet. Tells how. Heacock, 5074, Lockport, N. Y.

START AN EASY and lucrative business. We teach you how to establish a successful Collection Business and refer business to you. No capital required. Little competition. Rare opportunities. Write for Free Pointers today. American Collection Service, 101 State St., Detroit, Mich.

HOW TO SUCCESSFULLY CONDUCT a Mail-Order Business; 95-page book of real secrets and facts for 25c. Postpaid. Stark Co., Dept. A, Whiting, Ind.

MAIL ORDER BUSINESSES of proven merit, easily conducted by anyone, anywhere. Bought and Sold. Easy Terms. Business advice and instruction given. Advertisements and literature prepared. Orders for anything filled at wholesale prices. Mention requirements and receive full particulars. Popular Club, 7105 N. Robey, Chicago.

OVER 100 WAYS to make money. Descriptive circular free. Write. Wm. Waelder, Hannibal, Mo.

MANUFACTURERS' accounts wanted by Theo. Boerner, 28 Union Square, N. Y.

WE EXCHANGE ANYTHING you require for whatever you don't need. List For Stamp. Jenkins Exchange, Chicago.

GIVEN AWAY FREE to the first hundred people answering this advertisement map of all the California oil fields. Sagar-Loomis Company, 790 Phelan Building, San Francisco California.

HAVE VALUABLE PATENT on absolutely new article of great importance for schools; want party to manufacture on royalty, also high-class agents to solicit orders. Write C. A. Ifert, Monroe, Wis.

200 WAYS TO INCREASE your income 10 cents. Send for this valuable collection of money making secrets today, and turn your spare time into cash. Satisfaction guaranteed or dime refunded. Be. Frankson Co., Baltimore, Md.

WE WANT TO START YOU in the dyeing and cleaning business, splendid field, excellent profits. Practically no capital required. Write for booklet. Ben-Vonde Co., Dept. C, Staunton, Va.

A BIG MONEY MAKER for you. "How to make wall paper cleaning compound." Formula 25 cents. No stamps. Jon. McDonough, No. 908, 17th Street, Altoona, Pa.

MY CO-OPERATIVE IRRIGATED FARMS enterprise is earning large income for members, \$2.50 month lets you in. Does not interfere with your occupation. Beautiful view of farms and particulars free. Norman Stauter, 1444 Champa, Denver, Colo.

30 DOLLARS WILL START YOU a life income of two thousand dollars. A year book free. "Tells How." Gannt, 1131, 3rd Ave. So., Minneapolis, Minn.

WANTED—Catalogue. Samples and Prices from manufacturers, wholesalers and mail order supply houses, of goods suitable for growing mail order business. O. D. Edwards, Pruett Bldg., Harrisburg, Ill.

HIGHEST PAY for spare time home work. P. O. Box 1021, New York.

FIFTY DOLLARS AND UP weekly made by any live hustling Agent selling Thurman Vacuum Cleaners. "The Standard of the World." Not toys, but machines of the highest grade. Every sale means an agent working for you. You can build up a permanent, paying business. Write for agency proposition. Gen'l Compressed Air & Vacuum Mach'y Co., 553 Taylor Ave., St. Louis.

MAKE MIRRORS AT HOME. Big profits with little outlay. One 18x36-in. mirror costs \$2 to \$5. You can silver a glass this size for 20c. Send 50c in stamps or money order and we will send you explicit directions how to do it; also how to emboss, grind, foil, gold leaf, frost, chip and make imitation stained glass. How to transfer photos on glass, bore holes in glass and cut skylights. George L. Patterson & Co., Dept. 3, Brookville, Ky.

WHAT TERRITORY do you want on our propositions? Send stamp for copy of "Money Maker" catalogue. Frank & Bill, Jamestown, New York.

LIVE MEN: If you are making less than \$25 weekly, send your address quick. If you have a horse and buggy or bicycle you can use, all the better. We teach you. You can start right where you live. You owe it to yourself to investigate this opportunity and let us prove that we can better your condition. The Thomas Company, 962 Third St., Dayton, Ohio.

WE START YOU IN A PERMANENT BUSINESS with us and furnish everything. We have new easy selling plans and seasonal leaders in the Mail Order line to keep our factories busy. No canvassing. Small capital. You pay us out of the business. Large profits. Spare time only required. Personal assistance. Write today for plans, positive proof and sworn statements. Pease Mfg. Co., 1017 Pease Bldg., Buffalo, N. Y.

START legitimate mail-order mercantile business of your own; possibilities unlimited; cash orders, good profits; conducted by anyone. We originate and supply everything; sell you merchandise at wholesale; show you how on small investment. Write for free booklet and sample catalog. Central Supply Co., Kansas City, Mo.

AGENTS MAKE \$103.50 per month selling wonderful self-sharpening scissors and cutlery. V. C. Gebner sold 22 pairs in 5 hours, made \$13; you can do it. We show how. Free outfit. Thomas Mfg. Co., 362 Third St., Dayton, Ohio.

RUBBER IN SURINAM DUTCH GUIANA. Bright prospects for investments in Para Rubber (Hevea Brasiliensis) plantations, land cheap, soil and climate identical to Amazon district. Labor abundant and wages reasonable. Big dividends after the first seven years. For further particulars, enclose 10 cts. stamps for statement which will be posted to any address in the United States and Canada. Address J. B. Percival, Paramaribo, Surinam, D. G., South America.

FREE—"PATENT SENSE AND PATENT NON-SENSE" Broad and narrow claims compared. Obed Billman, Cleveland, Ohio.

GINSENG AT CUT PRICES, for want of room. Send stamp. Epworth City Ginseng Garden, Ludington, Mich.

AGENTS—\$300 every month selling our wonderful 7-piece Kitchen Set. Send for sworn statement of \$12 daily profit. Outfit free. Thomas Mfg. Co., 262 Third St., Dayton, Ohio.

SEE WHAT I SAY under "Typewriters." Atchison.

AGENTS WANTED

WANTED: Wide-awake general agents to organize sales force for new and winning bath invention. Combines Shower, Shampoo and Massage. Transforms any bathroom. Supplies modern bathing facilities for country homes. Extensively advertised. Irresistible selling proposition. Everybody wants one. Agents selling nine out of ten people. Alfred Reno, Miss., writes: "Samples arrived this morning, sold \$25.00 worth this afternoon." No competition, we protect territory. Sales-compelling samples furnished. Write today for selling plan. The Progress Company, 240 Monroe St., Chicago, Ill.

AGENTS AND DEALERS—Something new; sell imported household goods and ladies' wearing apparel. Not listed in catalogs or handled by every mail order dealer. Write for particulars. Roman Resen, 137 Avenue D., New York.

SEND FOR OUR BEAUTIFUL catalog of pictures, novelties, jewelry and watches. It's free. Enclose 20c in stamps and we will mail you a magnificent sample picture that retails like hot cakes for 60c. Big commissions. Write today. A. W. Holmes & Co., 865 Broad St., Providence, R. I.

AGENTS WANTED: to sell the best, most useful article, used in the home. Send 60 cents for samples and particulars. No triflers. Address James J. Walsh, 687 6th Ave., Dept. P., North Troy, N. Y.

THE WONDERFUL Improved Modern Self-heating Sad-Irons, Gasoline or Alcohol. Big money made. Sell on sight. Hundreds of testimonials. Agents write for Free Catalogue "D." Modern Specialty Co., Milwaukee, Wis. Patentes and Sold Manufacturers.

AGENTS WANTED—In every state to handle our line of "High Grade Brushes," sell to houses, hotels, libraries, schools, offices, etc. Rapid sellers and good profits. Write for catalogue, territory and terms. Torrington Brush Works, Torrington, Conn.

AGENTS—WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Parrish & Co., 216 S. Clark St., Chicago.

SIX HUNDRED LOTS in Amarillo, Texas. Seven thousand and forty acres Texas Lands; Seven Houses; Thirty thousand dollars Building and Loan Endowment Fund benefit purchasers, embraced in this special sale. Money refunded if not satisfied. Free Deed in case of Death. Big commissions to Agents. Write for particulars. Amarillo Improvement Co., Amarillo, Texas.

WANT MEN AND WOMEN to sell Peerless Gas Flame Covers, house to house. Cost 35c per set, sell for \$1.00 per set. Write for circulars. E. H. Levinstein, 132 S. Clinton St., Chicago.

BECOME MANUFACTURERS' AGENTS and establish a permanent business. Make \$5.00 a day from the start—\$10.00 if you are a hustler. Our novel assortment of soaps and toilet articles are the cleverest stunts yet. Write today and be convinced that you can make more money in one month than in six with any other agent's proposition. Davis Soap Co., 80 Union Park Court, Chicago.

ALADDIN Kerosene Mantle Lamps sell fast as you can demonstrate them. Needed in every home. Generate gas from kerosene (coal oil) and give light more brilliant than city gas, gasoline or electricity. Our Sunbeam Burners fit other lamps. You are losing dollars every minute you hesitate. Write nearest office. Mantle Lamp Co., Desk 167, Chicago; Portland, Ore.; Waterbury, Conn.; Winnipeg, Montreal, Can.

ATTENTION MACHINISTS. We want agents in every shop to sell our new Adjustable Size Block. A very useful tool, particularly for planer and milling machine hands. Write today. Tip Top Tool Co., 78 Vernon St., Worcester, Mass.

GOLD AND SILVER Sign Letters; attractive, durable, inexpensive; sample free. Johnston Mfg. Co., Quincy, Ill.

AGENTS. Something entirely new. Gem flatiron shoe, just out. Everybody will use it; will work on any iron; big profit. For particulars address Dexter Supply Co., 334 Dearborn St., Chicago.

25 BRINGS FULL INSTRUCTIONS for transferring photos to watch cases, dials, chinaware, etc. Snap for agents. P. Benson, Stewartville, Minn.

WOMEN AND MEN—New Offer on goods needed and used in every home. Big profits. Easy work, no experience necessary. Spare time or steady work. We are manufacturers' headquarters for best agents articles. Write Fair Mfg. Co., HF 51, Racine, Wis.

AGENTS—New invention; never before sold in your territory; horse owners buy them quickly. Get territory and make big money. Free sample to workers. Write for particulars, terms and territory. Automatic Fastener Co., G 1016, Cincinnati, O.

AGENTS. Enclose a 2c stamp for Demonstration Sample of the quickest selling, best paying article in the agency business. Girard Mfg. Co., U. Melrose, Mass.

AGENTS INCREASE YOUR INCOME by joining the ranks of our successful agents and introduce "Cook's Cleaner," the Wonderful Grease and Dirt Spot Remover. Particulars Free. Cook Manufacturing Co., Milford, Mass.

AUTOMATIC TEAKETTLE COVER sells in every kitchen, 25c; aluminum, rustless, prevents scalds. Sample 15c. W. D. Cram, Box 8704, Haverhill, Mass.

BOYS AND GIRLS. Sell ten needle packages 10 cents each, return \$1 get camera free. We trust. Macks Premium House, 2906 McLean Ave., Chicago, Ill.

COLLECT NAMES, addresses and valuable information. Fascinating home work. Steady income. Instructive booklet for stamp. Information System, Dept. R., Marietta, Ohio.

I MADE \$50,000 in five years with a small mail order business; began with \$5. Send for free booklet. Tells how. Heacock, 5075, Lockport, N. Y.

AEROPLANES, DYNAMOS, ELECTRIC FANS, Picture Machines, Mechanical Toys, at half price. Catalogs, 300 illustrations with your name on. Samples and particulars free. Murphy Company, Norwalk, Conn.

AGENTS—Sell McKibban's Guaranteed Hosiery direct, factory to wearer. For particulars address Ralph Seasholtz, Royersford, Pa.

AGENTS are making \$50 daily introducing us. For instructions write to O. A. Walker Mfg. Co., Xenia, Ohio.

AGENTS—Send ten cents for sample and terms of the greatest seller on the market. The Cryptograph. The George Wharton Co., Harrisburg, Pa.

AGENTS for a staple article. Enormous sales. Big profits. Sample 10 cents. Macks Premium House, 2906 McLean Ave., Chicago, Ill.

RUBBER STAMPS, ink pads, etc. A. S. Mankin & Co., Alexandria, Va. Agents wanted. Send red stamp for particulars.

DOLLARBACK Stewart, San Jose, Cal.—3 Usefultes 3c.

WANTED—WIDE-AWAKE SALES AGENTS everywhere to sell New Sicilian Portrait. Nothing similar ever produced. Quick sales, big profits. Drop your dead line and start Spring with live seller. Sales-Compelling samples furnished. Illinois Art Company, 6316 Wentworth Ave., Chicago.

500 MONEY MAKERS—Home Labor Savers. Every woman buys; catalogue free. Household Service Co., 718 W. 63d Street, Chicago.

PORTRAIT AGENTS WANTED—Guaranteed Crayons, size 16x 20, 40c. Frames at your own price. 30 days' credit, samples free. We are not in the picture and frame trust. We own a large frame factory and sell at one-half the price portrait companies can. Our business established 25 years. We can give you steady employment. Our big wholesale art catalog with confidential prices and instructions mailed free to agents. Williams Picture & Frame Co., 2548 Taylor St., Chicago.

AGENTS MAKE \$100.00 MONTHLY selling our 500 hand household articles; catalogue free. Scheff Co., 1639 Wells St., Chicago.

WANTED, AGENTS, MACHINISTS ATTENTION! Increase salary, new revised Saunders Hand Book Patent Mechanics. Best ever ready reference. Thousands in use. Postpaid \$1.00 cloth; \$1.25, \$1.50 leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

POCKET ADDING MACHINE—Lightning seller. Agents write us. Cincinnati Specialty Manufacturing Co., Cincinnati, Ohio.

BOYS—Can you use more spending money? Print your name and address on a postal, we tell you how and send beautiful free sample. Western Novelty Works, Dept. G, Fairbury, Neb.

GET NEXT QUICK to biggest success on record, most wonderful money-maker for agents, street men and distributors ever offered. When operated people stop, look, listen, become fascinated, buy. Demand world-wide; agents making \$10 to \$50 day. Risk postal. J. D. Ellison, Sales Agent, Post-Office Bldg., Ludington, Mich.

AGENTS: 100 PER CENT PROFIT. Monkey-wrench, plumbers' pliers, with 13 other tools combined. Most wonderful combination of tools ever made. Lightning seller. Sample free for examination. Forshee Co., B. 1335, Dayton, Ohio.

\$1,500.00 A YEAR FOR LOCAL REPRESENTATIVES. Last year 577 agents made over \$1,500.00 each, selling our wonderful everlasting Cooking Utensils. An excellent proposition for high-class agents. Write to-night. American Aluminum Mfg. Co., Dept. 101, Lemont, Ill.

AGENTS—Portraits 25c. Frames 15c. Sheet Pictures 1c. Stereoscopes 25c. Views 1c. 30 days' credit. Samples and catalogue free. Consolidated Portrait, Dept. 1194, 1027 W. Adams St., Chicago.

EXCEPTIONAL OPPORTUNITY for energetic solicitors with grit and selling power. Article absolutely new and guaranteed. Tremendous seller. Everybody buys if shown. 60c to \$3 profit each sale. Virgin field awaits hustlers everywhere. Write today. Saultx Co., 2309 Wabash Ave., Chicago.

MEDALLIONS SELL AT SIGHT. 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 1205 W. Randolph St., Chicago.

THE NEW "SWIFTLIT" LAMPS light instantly with 1/2 match; like city gas; no alcohol used; radically different from any other; portable or systems, 100 to 1,000 candle power at will; burners cheap for old lamps; Agents making money; great novelty; wholesale price for introduction. Planet Mfg. Co., Dept. 4, St. Louis. (Established 1868.)

AGENTS—Salary or commission. Greatest seller yet. Every user pen and ink buys on sight. 200 to 500 per cent profit. One agent's sales \$620 in six days; another \$32 in two hours. Monroe Mfg. Co., X-6, La Crosse, Wis.

WANTED—A Man or Woman to act as our Information Reporter. All or spare time. No experience necessary. \$50 to \$300 per month. Nothing to sell. Send stamp for circulars. Sales-Association, 601 Association Bldg., Indianapolis, Ind.

I WANT HIGH CLASS SALESMEN to act as state and district managers to introduce my new invention—more useful than typewriters, more profitable than cash registers. J. W. Bolte, 8 E. Michigan St., Chicago, Ill.

WONDERFUL INVENTION—Canchester Kerosene Incandescent Lamp. Burns with or without mantle, 6 times brighter than electricity, gas, acetylene, or gasoline, at 1/10 cost. Burner fits any lamp, saves 75 per cent oil. No trimming wicks. \$10 daily. Beware of imitations. Handsome outfit furnished. Canchester Light Co., 26 State St., Dept. P. M., Chicago.

AGENTS—\$75 monthly. Combination Rolling Pin. Nine articles combined. Lightning seller. Sample free. Forshee Mfg. Co., Box 248, Dayton, O.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

POPULAR MECHANICS wishes to secure an agent in every town and city in this country to sell our 6 volume set of Shop Notes. These books sell readily among machinists, shoemen, farmers, carpenters, blacksmiths and all who use tools. The commission to agents is very liberal. If interested write Mgr. of Book Dept., Popular Mechanics Co., 225 Washington St., Chicago.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

EVERYBODY MAKES BIG MONEY selling our reliable watches, tableware, diamonds, leather goods and low priced jewelry. Big commissions. Sample outfit furnished. Free catalog with 1260 beautiful pictures. All shipments at our expense. Write today for particulars of best offer ever made agents. A. W. Holmes & Co., 860 Broad St., Providence, R. I.

MALE HELP WANTED

WANTED—1,000 CHAUFFEURS and Repair Men. Our demand for automobile engineers exceeds the supply; calls for men of intelligence and mechanical bent, capable of commanding \$100 to \$150 monthly upon graduation. Resident course \$20 to \$60. Home correspondence courses completed by practical road and shop work at any of our branches or affiliated schools, highly successful. Look This Up. Auto Schools of America, 1681 Michigan Ave., Chicago.

MEN WANTED—To try coming Railway Mail, Internal Revenue and Postoffice examinations, \$50.00 to \$125.00 monthly. Common education sufficient. Political influence unnecessary. Candidates prepared free. Write immediately for dates of coming examinations in your neighborhood. Franklin Institute, Dept T 21, Rochester, N. Y.

HOME WORK, collecting names, addresses and other information. Some make \$100 monthly. Instructive booklet for stamp. Information System, Dept. D, Marietta, Ohio.

I MADE \$50,000 in five years with a small mail order business; began with \$5. Send for free booklet. Tells how. Heacock, 5076, Lockport, N. Y.

MEN WANTED—To try coming Railway Mail Clerk Examinations. \$600 to \$1,500. Preparation free. Write for examination schedule. Franklin Institute, Dept T 21, Rochester, N. Y.

LIVE MAN IN EACH COMMUNITY to own and operate a business in his home. Profits are \$200 each week. Money comes in every day and all yours. Brand new business. No canvassing. No capital. Particulars free. Frank C. Voorhies, Desk C. R. Omaha, Neb.

YOUNG MEN WANTED—To try coming Railway Mail and Internal Revenue examinations, \$600.00 to \$1500.00. Preparation free. Write immediately for schedule of examinations. Franklin Institute, Dept T 21, Rochester, N. Y.

\$3,000 to \$10,000 YEARLY in real estate business; no capital required; if you are honest and ambitious, we will teach you the business by mail, appoint you special representative of leading real estate company, list with your salable properties, cooperate with and assist you to a permanent success; a thorough commercial law course free, this month, to each representative. 62-page book, free. The Cross Co., Dept. 3934, Chicago.

HARDWARE AND SPECIALTY SALESMEN to sell as side line our enclosed gear tool grinders to jobbers. State territory. Milwaukee Grinder & Specialties Co., Milwaukee, Wis.

RAILWAY MAIL CLERKS WANTED—Average salary, \$1100.00. Examinations coming. Candidates coached free. Write immediately. Franklin Institute, Dept T 21, Rochester, N. Y.

SUCCESSFUL GASOLINE LIGHT SALESMEN to handle the only instantaneous lighting system known to science; no alcohol, step-ladders, torches, matches or time wasted. Pull the chain and they light instantly; for home and commercial lighting; write for territory; small capital required. Gloria Light Co., 1275 Washington Blvd., Chicago.

MEN WANTED—To try coming Railway Mail, Internal Revenue and Postoffice examinations, \$50.00 to \$125.00 monthly. Annual vacations. Short hours. Steady work. Common education sufficient. Over 15,000 appointments this year. Influence unnecessary. Write immediately for dates of coming examinations in your neighborhood. Candidates prepared free. Franklin Institute, Dept T 21, Rochester, N. Y.

WANTED—DINING CAR CONDUCTORS, NO experience necessary, we teach you. \$75-\$125. School of D. C. Condra., 263 Clark St., Chicago, Ill.

RAILWAY MAIL CLERKS WANTED—Average salary \$1100.00. Write immediately. Franklin Institute, Dept. T 21, Rochester, N. Y.

BIG INCITEMENT TO SALESMEN of ability to sell lubricating oils and greases on commission. Champion Refining Co., Cleveland, O.

PLUMBING, ELECTRICITY, BRICKLAYING or Mechanical Drafting, taught by expert workmen. Short time and small cost. Positions always open. Catalogue free. Write today. Coyne National Trade Schools, 1698 N. Ashland Ave., Chicago.

RAILWAY MAIL CLERKS WANTED—Average salary, \$1100.00. Candidates prepared free. Write immediately. Franklin Institute, Dept. T 21, Rochester, N. Y.

WANTED—General foreman for machine room in automobile plant. Must be capable, have had experience and come well recommended. Address Streator Motor Car Co., Streator, Illinois.

SALESMEN to handle High Grade Smoking Tobacco. Big pay. Experience unnecessary. Particulars and large sample pouches, all brands, 25 cents allover. Word Tobacco Co., Greensboro, N. C.

WANTED—HIGH-CLASS SOLICITORS and crew managers for high-grade specialty. A patented trade mark guaranteed. Sells to hotels, barbers, hair-dressers, best homes, etc. Big profits, permanent business. Sanitax Co., 2309 Washab Ave., Chicago.

WANTED: INSIDE WIREMEN, TINSMITHS, Coppermiths, Sheet Metal workers, Schwartz and Crucible Furnace Hands and Punch Press hands. Apply at the Employment Department, Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

WANTED—Plain, Slab and Portable Milling Machine hands, Horizontal and Vertical Boring Mill hands, Automatic Screw Machine hands, Shaper hands, Universal Tool and Shaft Grinders. Apply at the Employment Department, Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

WANTED: DIE SETTERS, DIE MAKERS, Jig and Fixture makers and Wood Pattern makers. Apply at the Employment Department, Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

I WANT TO START YOU in business; work in spare time, will pay you from \$100 to \$500 per month. \$10 capital. No canvassing. Increase from profits. A new idea, never fails. Free particulars. F. E. Abbott, Desk Bl, Omaha, Neb.

WANTED—TRAVELING SALESMEN to handle as a side line, a series of mechanical hand books, to be sold in book-stores. These books are "written so you can understand them" and retail at popular prices. Address Popular Mechanics Co., 225 Washington St., Chicago.

WANTED

WANTED secondhand 5 room portable house; must be sound. R. B. Comstock, La Pryor, Zavalla Co., Texas.

WANTED—6 to 20 H. P. Marine engine, must be cheap. Steam indicator, reducing wheel and architect's level to trade. F. T. Ritter, Orange, Texas.

WANTED—A motorcycle, an engine. A. Wolke, Louisville, Ky.

WANTED SECOND HAND 10 H. P. Locomotion boiler, subject to inspection. F. Comstock, Wilton, Conn.

FOR SALE

BICYCLE ENGINE \$15; motorcycle engine \$20, 3 H. P. like new. 719 Walnut St., Hamilton, Ohio.

TO CLOSE AN ESTATE we will sell jobbing foundry and Sleigh Business for \$5,000. \$2,000 cash, balance any reasonable terms. Beach Brothers, Administrators, Millington, Mich.

AUTOMOBILES \$40 up. Illustrated catalogue, for stamp. All machines guaranteed. Rubel Co., Louisville, Ky.

COMPLETE Railway Mail Course. Write for particulars. Orville F. Ostewig, Shabbona, Ill.

USED MOTORCYCLES, \$25 up. Largest stock for your selection in South. Catalogue for stamp. Rubel Co., Louisville, Ky.

CIVIL ENGINEERING library. Walter Willmann, Hartford City, Ind.

HAVE TWO NEW STYLE "A" Leiman pressure or vacuum pumps. One price \$17.00, will sell for \$10.00. One equipped with Westinghouse Motor, cost \$42.00, will sell for \$27.50, with gears. Address, Box 12, Rahway, N. J.

EDISON HOME PHONOGRAPH and 40 records; cost \$50, \$25 takes it. Myron Rice, Hickory, N. C.

LIMITED NUMBER \$25. 16s Waltham watches in 20 yr. gold filled cases \$17. Money refunded if too late. A. Stoltz, 216 W. Ohio St., Chicago.

PRINTING PLANT COMPLETE, two presses 8x13 in. and 11x17 in., 24 in. Cutter; will sell whole or part. John W. Taylor, No. 7 North Florida Ave., Atlantic City, N. J.

FOR SALE CHEAP—I. C. S. Mechanical Drawing Course. Address, Paul F. Wilber, 23 Summit St., Norwalk, Ohio.

UNION-MADE CIGARS—Write for lowest factory prices. Krum Clear Co., Reading, Pa.

'08 6 H. P. Gray Motor. Roy E. Atkinson, Fowler, Ind.

MACHINE SHOP and Foundry, no competition, saw mills and mines. Bargain Foundry, Chewelah, Wash.

\$60 PRINTING PRESS and outfit, \$25 cash! Broer L. Grundel, Lindsborg, Kansas.

FOR SALE—Moving picture film 1c per ft. H. Davis, Watertown, Wis.

I. C. S. Mapping-Surveying course—\$12.00. Williams, Box 47, Arsenal Station, St. Louis, Mo.

BICYCLE engine attachment, electrical goods, camera. Lloyd Pierce, Decatur, Illinois.

EMERY GRINDERS—Buy a Good one. Best foot power and shelf Emery Grinders. Write for catalog. Angle Mfg. Co., Freeport, Ill.

SEE WHAT I SAY under "Typewriters." Atchison.

FREE BOOKS—All about patents and their cost. Shepherd & Campbell, 500B Victor Bldg., Washington, D. C.

SALE OR EXCHANGE

4 ROLL DEERING CORN SHREDDER and husker, almost new, \$125.00. Submit trades, cash values only. Western Creamery Exchange, Omaha, Neb.

GOD MOTORCYCLE CHEAP, electrical and scientific apparatus, track suit. I. C. S. Telephoning Course and Gillette Safety Razor. Box 169, Pipestone, Minn.

ONE LOCOMOBILE full leather top, good running order, will sell or exchange for three or four cylinder high speed Gasoline Engine. W. H. H. Gardner, Rock Pleasant, West Va.

EXCHANGE—1909 MODEL RELIABLE DAYTON Runabout, 15 H. P., good running order, for good engine lathe with gasoline engine and all attachments. Must be in good condition. John H. McBe, Lexington, Miss.

EXCHANGE, Reo Runabout for marine engine, ten H. P. or larger. A. West, Green River, Utah.

8 H. P. AUTOMOBILE, M. M. motorcycle, typewriter, lathe, want twin cylinder motorcycle. Ulysses Fortier, Tulsa, Oklahoma.

CAMERAS, WATCHES, Diamonds, Jewelry, Typewriters, etc. bought, sold and exchanged. List For Stamp, Jenkins Exchange, Chicago.

PIANOS AND MUSICAL INSTRUMENTS

PIANO PURCHASERS DECEIVED. Write for particulars. "Why are \$150.00 pianos selling for \$300.00." A. F. Snyder, Weissport, Pa.

GENUINE BARGAINS in high-class upright pianos, slightly used instruments. 7 Steinways from \$350 up; 5 Lyon & Healy from \$250 up; 7 Washburns from \$200 up; 4 Knabes from \$250 up; 5 Chickering from \$250 up; also good second-hand Uprights \$125 up; also 6 very fine Baby Grand Pianos at about half. Write for full particulars. Cash or two years' time. Lyon & Healy, 50 Adams St., Chicago. (We ship everywhere on approval. Fullest guarantee with every piano.)

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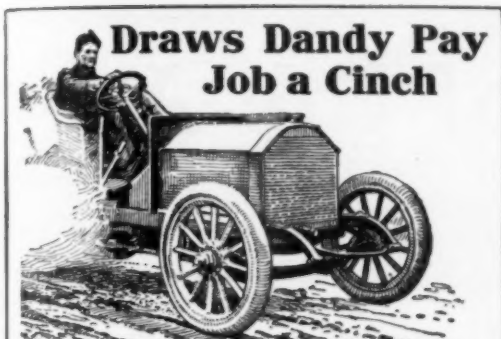
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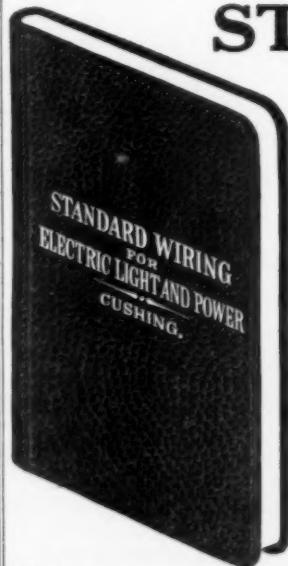
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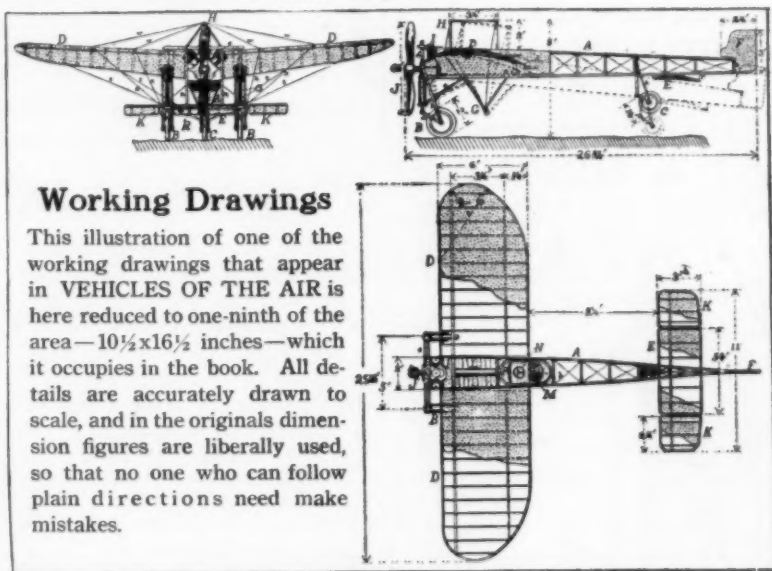


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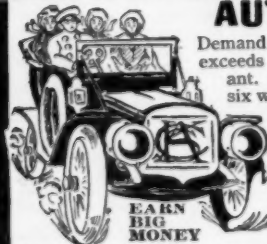


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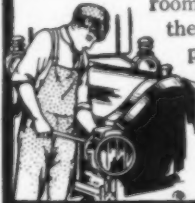
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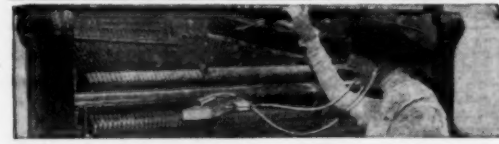
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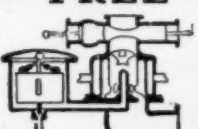
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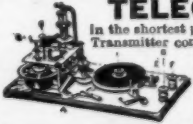
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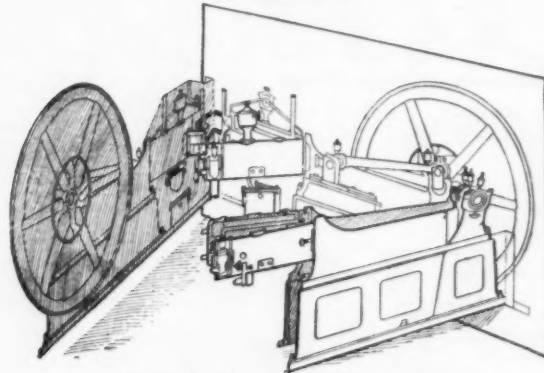
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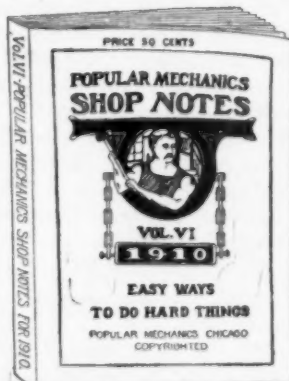
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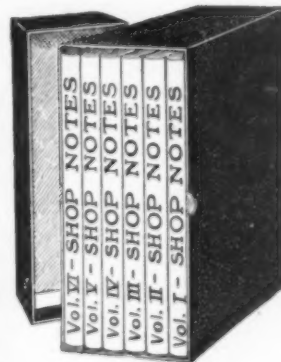


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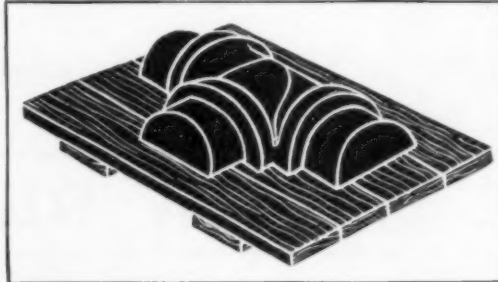
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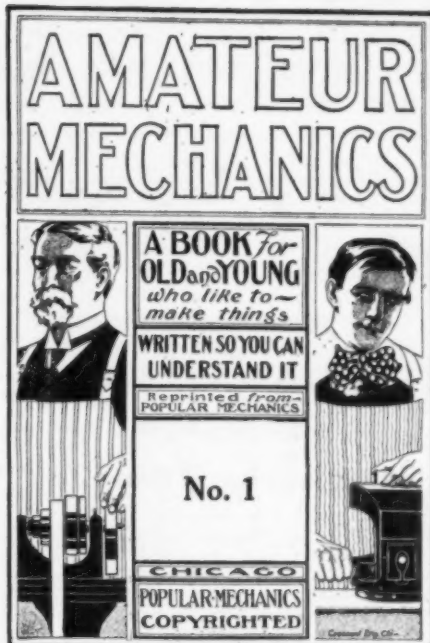
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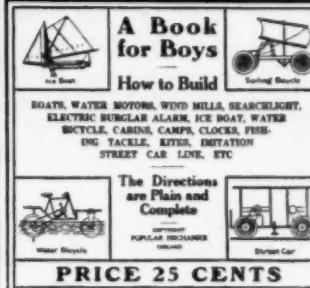
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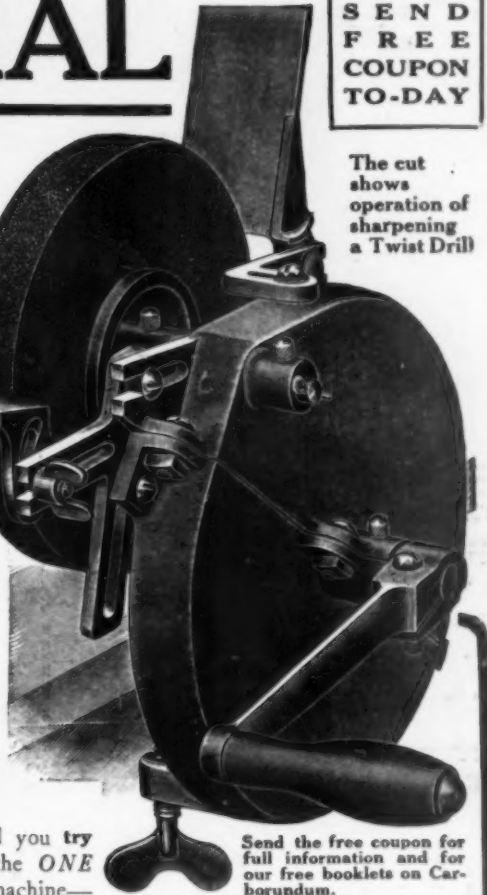
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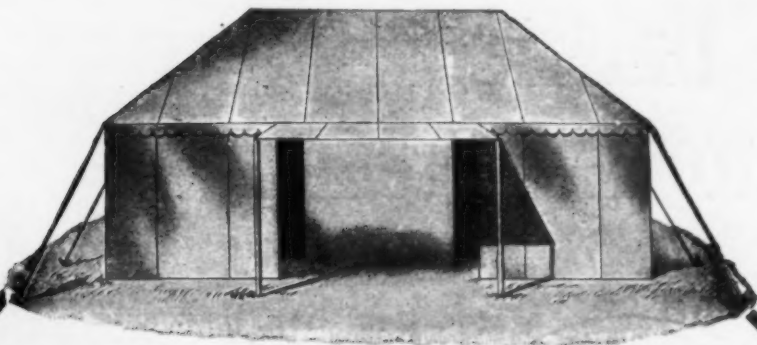
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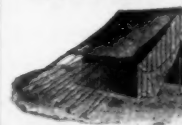
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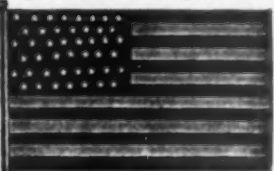
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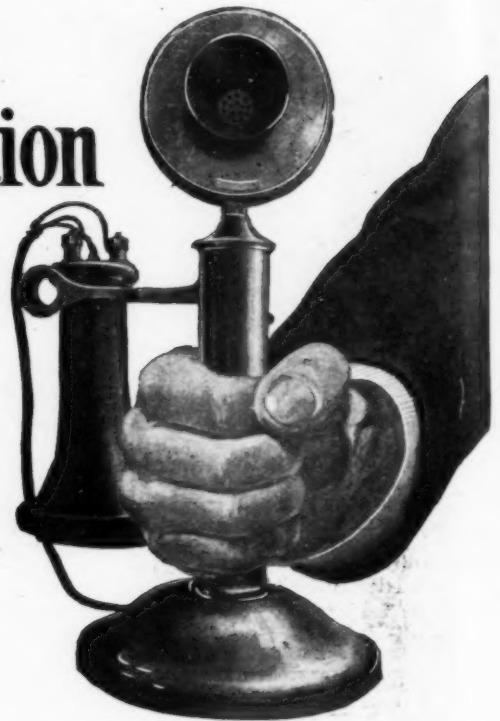
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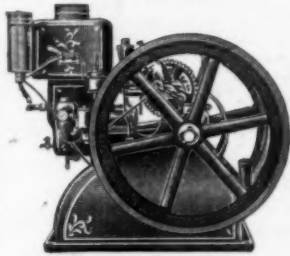


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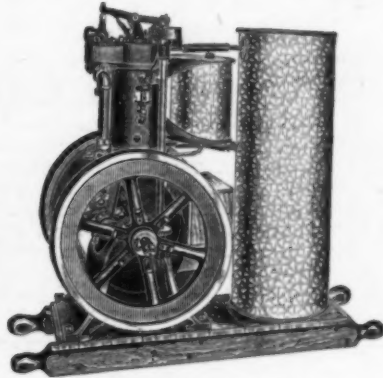
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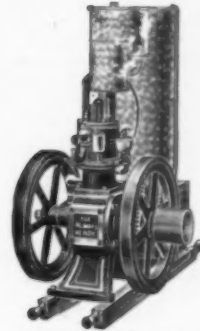
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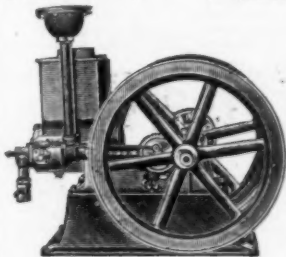
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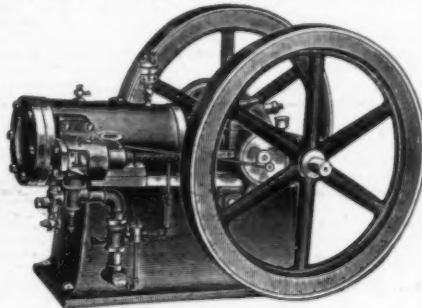
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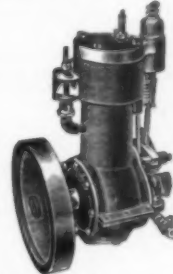
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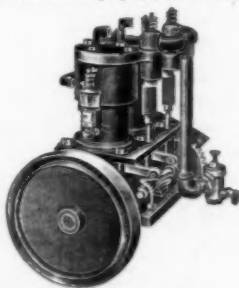
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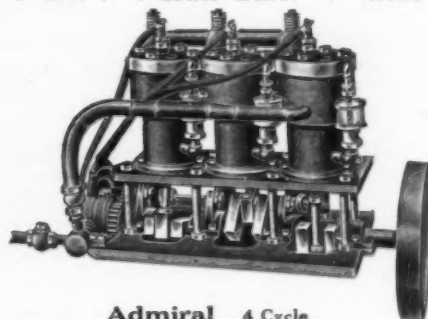
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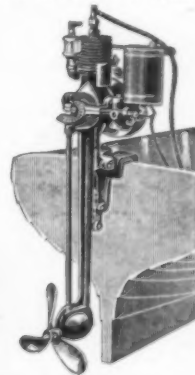
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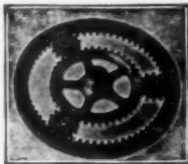


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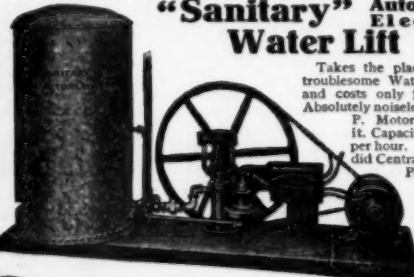
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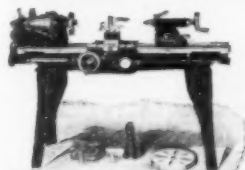
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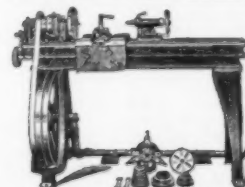
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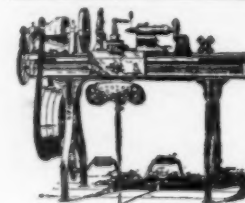
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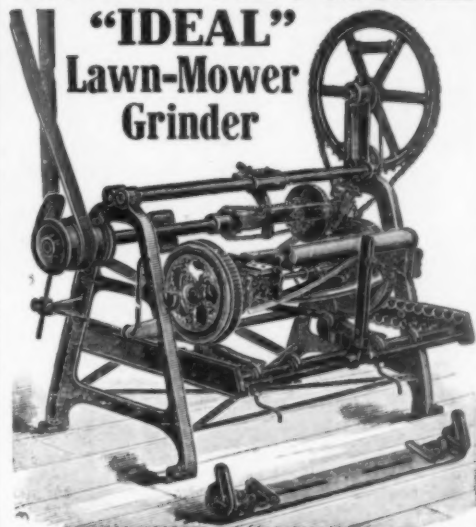


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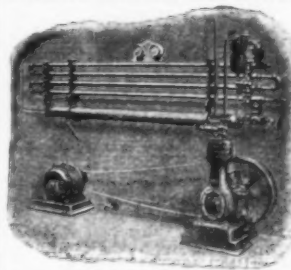
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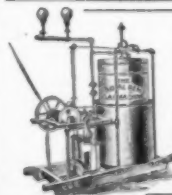
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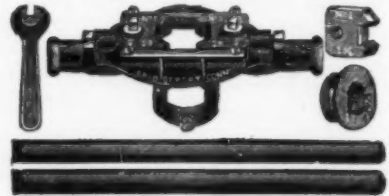
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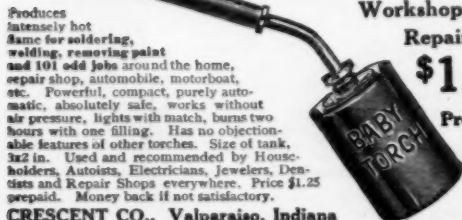


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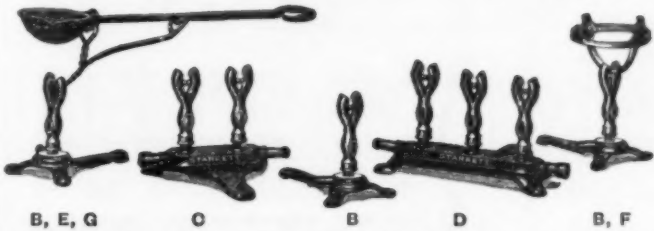
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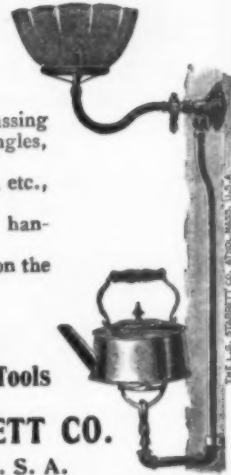
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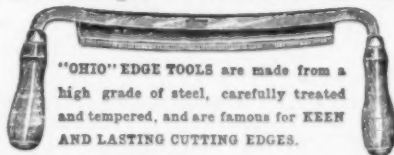
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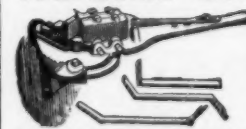
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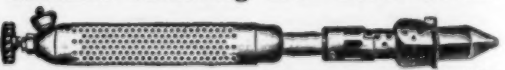
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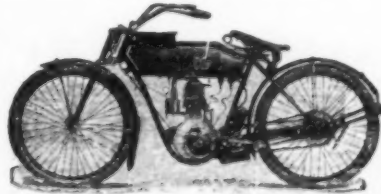
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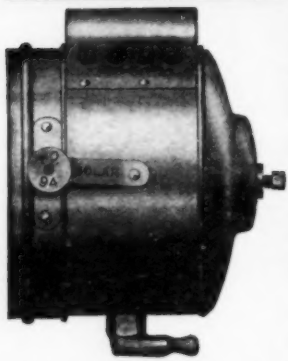
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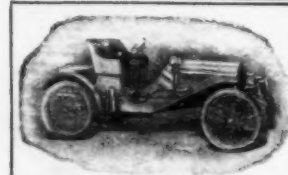


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The first trial was made on a freighter in a storm on the Atlantic. A large quantity of soap and water was discharged over the bow, and its effect was nearly instantaneous, the height of the waves being so diminished that the vessel could be managed without difficulty.

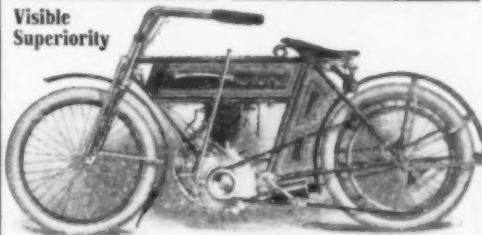
The steamer "Senegal," struck by a squall in the Adriatic, used soap and water with the same result. Six pounds of soap was dissolved in two barrels of water. This solution when dripped over the bow made a quiet space about 10 yd. wide, preventing the sea from breaking over the vessel to any considerable extent.



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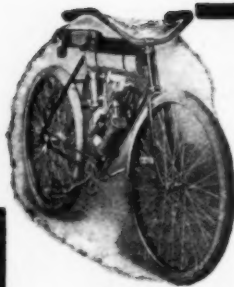
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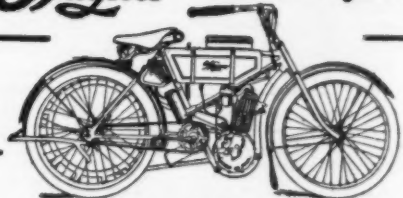
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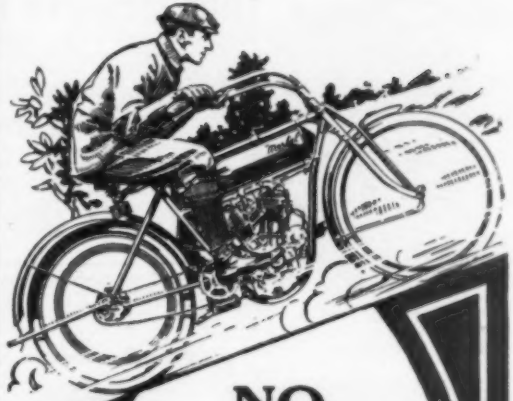
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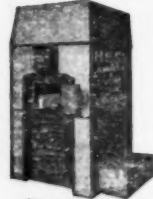
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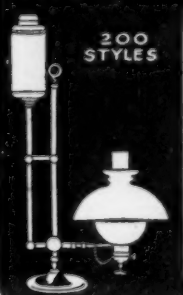


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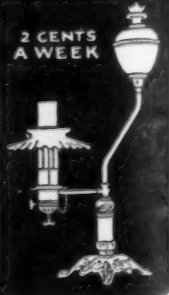


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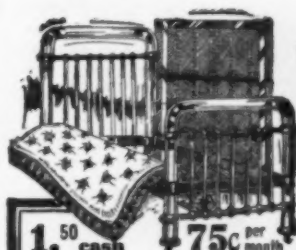
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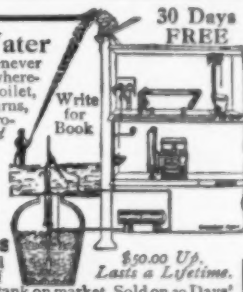
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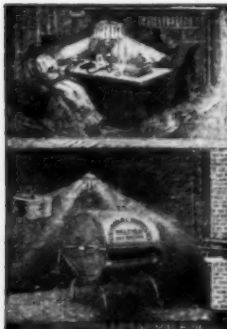
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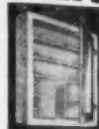
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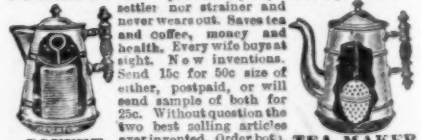
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Fuel Drawn Principally from Atmosphere

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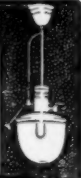
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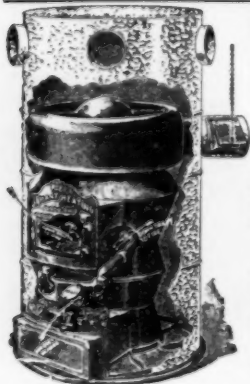
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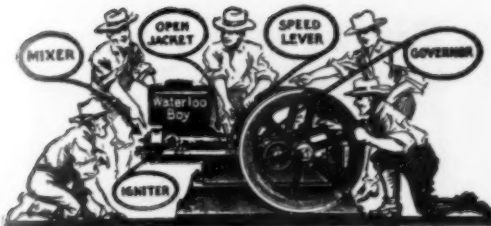
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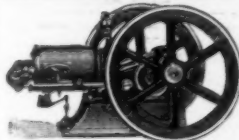
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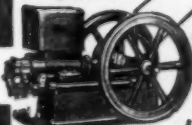
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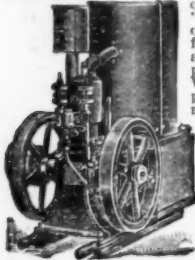
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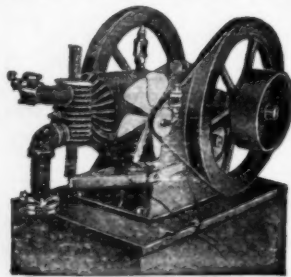
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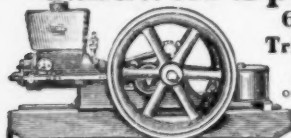
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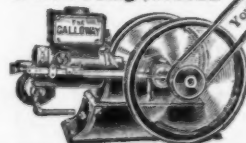
A scientific gentleman in London has been investigating the skull of a woman who, he says, lived 600,000 years ago. He finds that she was a shrewd woman, abundantly capable of taking care of herself, and, although he doesn't say so, he seems to be convinced that if she were alive today she would be a militant suffragette.—Chicago Tribune.

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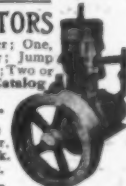


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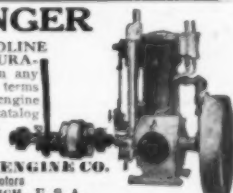
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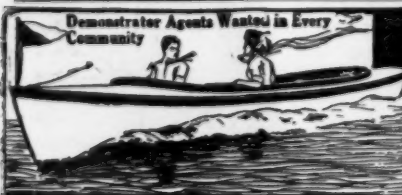


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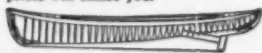


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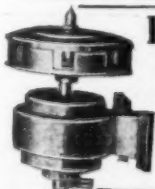
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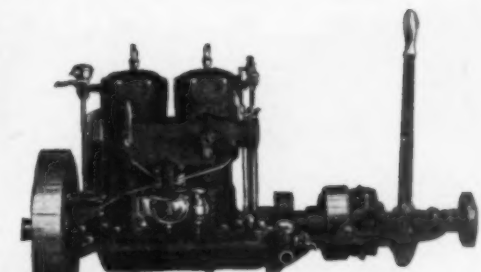
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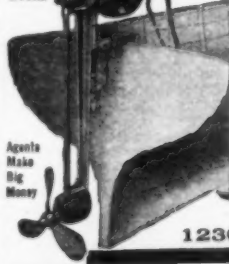
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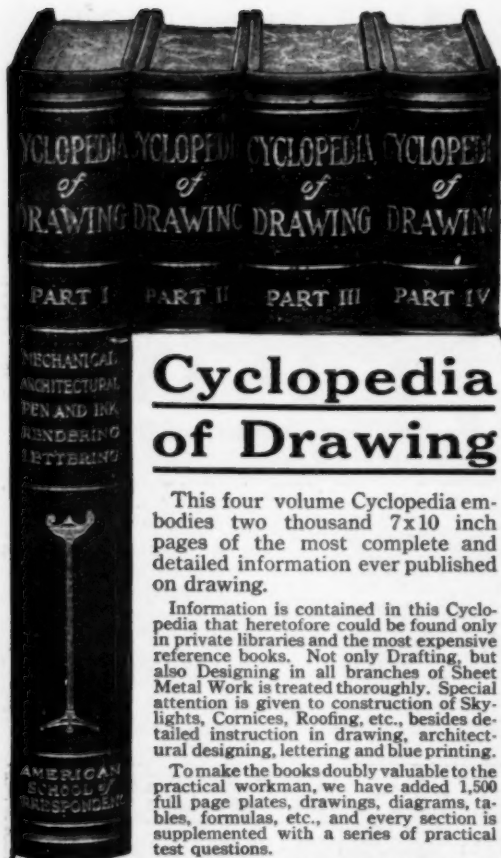
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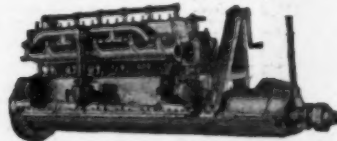
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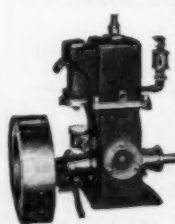
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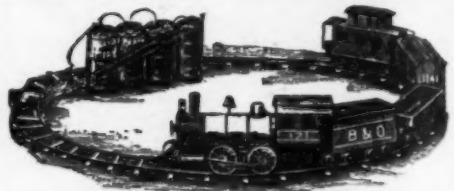
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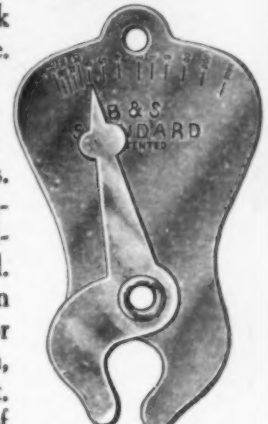
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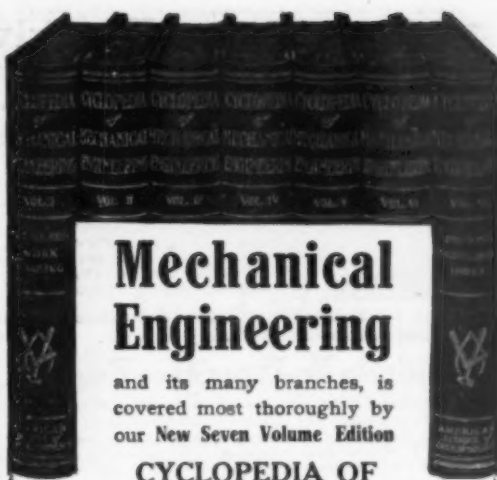
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Additional Button Plates \$1.00 per hundred
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It can turn out cards at the rate of 6,000 to 8,000 per hour. Prints them in two or more different colors, as the register is good. Easily operated by hand, belt or electric motor. No experience needed. Anybody can run it after one day's practice and make big profits.

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It has been the means, with a small investment, of establishing others in a nice, profitable business. It will do the same for you. Write us today for particulars.

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900 Georgia Street, - LOUISIANA, MO.

\$25 WEEKLY

and expenses to men and women to collect names, distribute samples and advertise. Steady work, S. Scheffer, Treas., E3, Chicago, Ill.

graver's work form miniature works of art that in their kind have never been surpassed or even equaled. The envelopes bore an elaborate allegorical design by William Mulready, R. A., in which Britannia was seen dispatching winged messengers to all the quarters of the globe.

At the end of ten years after the introduction of Rowland Hill's stamp only thirteen foreign countries had adopted the invention, and it is curious to think that the example of Great Britain should first have been followed, in 1843, not by other great powers, but by Brazil and two Swiss cantons. But during the '50s the

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We want a Representative in EVERY County of the U. S. to handle our FOOD PRODUCTS

for young men to make a start in life. Easy selling goods, for everyone must eat food; therefore, big demand. "E your own boss." Write for particulars, stating county wanted.

We furnish you with the goods to run your business, and you pay us after you are paid by your customers. Greatest chance in a life-

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Established 1849 DEPT. A
SHREWSBURY, N. J.

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Live Agents Wanted

For an ambitious salesman—a "live wire" who is not satisfied to draw \$20 or \$25 a week, but able and anxious to go out and earn \$3000 or more per year. Don't fool away your time on dead ones. If you are making less than \$50 a week, write for our Profit Sharing Premium Catalog and Special Offer to Salesmen. The "Davis" Plan is a big winner. One agent sold 100 boxes in 1½ days, profit \$30; another in Michigan made \$65 in 47 hours; another \$21 in 8 hours. Big profits and splendid premiums to our salesmen. They write to us like this: "I received the camera"; "The fountain pen is a beauty"; "Received my watch all right". We are manufacturers. No middlemen's profits. Write now! Every day lost means from \$10 to \$15 out of your pocket, if you are the man we are looking for. Address E. M. DAVIS SOAP COMPANY, 1431 Carroll Avenue, Chicago, Ill.

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Circling Wave the great amusement device, enjoyed by old and young. Produces big daily profits. Ask about it, write now and we will answer at once.

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\$1.00 Mexican Palm Hat 50c
For Men, Women and Children. All Sizes

Greatest hat bargain of the season. Over 65,000 satisfactory sales. Guaranteed genuine Mexican hand woven from palm fibre. Colored design brim. Light, comfortable, cool and durable—water will not hurt it. Retail at \$1.00. Our introductory price, only 50 cents postpaid. Three for \$1.25.



Genuine Panama Hat \$1.00

Imported Direct
An exceptional introductory bargain. Same as a \$10.00 Panama hat, but slightly coarser weave. Weight, 2 oz.; durable and so flexible it can be shaped to any style. Price, \$1.00 prepaid. Two for \$1.88. Money back if not satisfactory. Write today for FREE Catalogue of Mexican and Panama Hats.

FRANCIS E. LESTER CO., Dept. EA6, MESILLA PARK, NEW MEX.

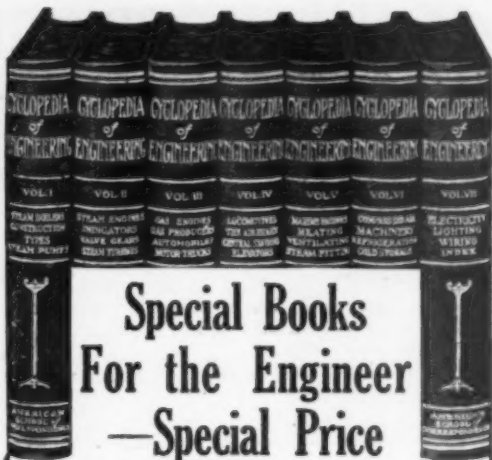
accessions came thick and fast, till by January, 1860, there were eighty-five countries that had issued postage stamps. These colored labels soon began to attract the notice of the curious, and early in the '50s a few individuals here and there were forming stamp collections. But it was not until 1861 that the hobby attracted public attention, developing in the following year into a veritable craze.—Chicago Tribune.

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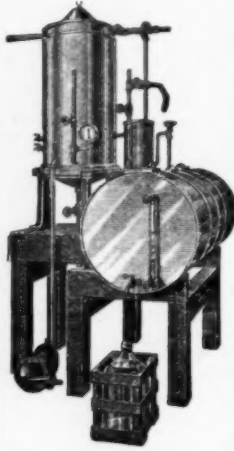
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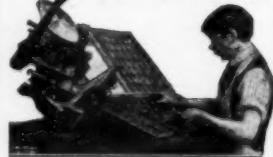
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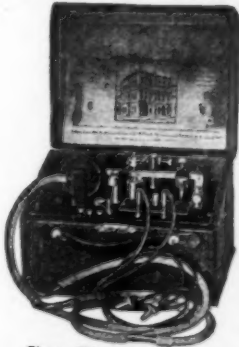
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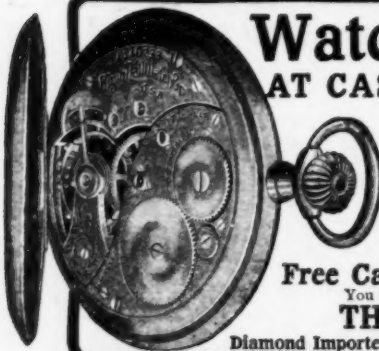
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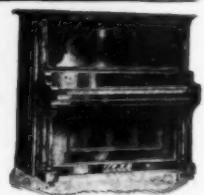
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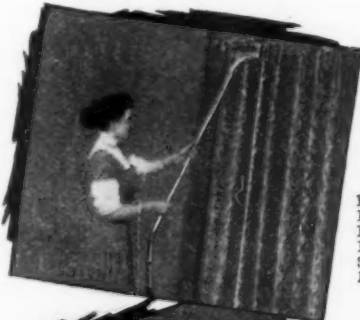
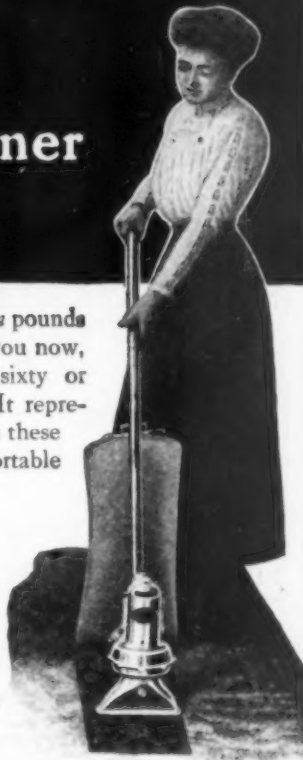
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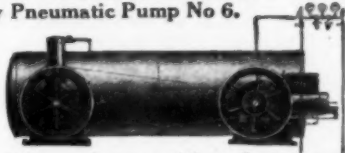
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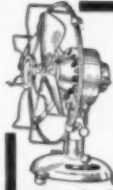


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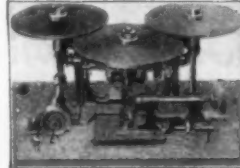
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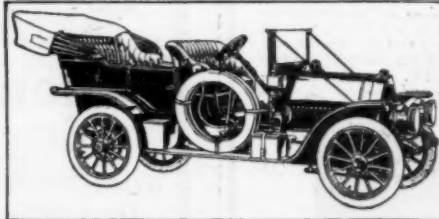
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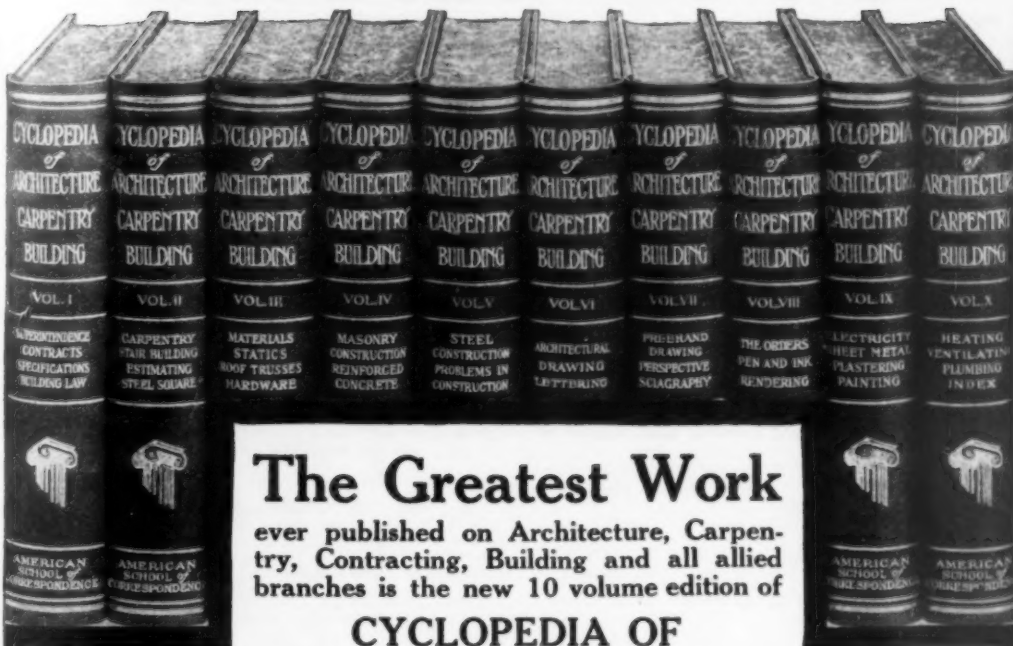
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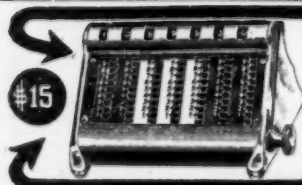


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The island of Aldabra, to the northwest of Madagascar, is becoming smaller and smaller through the action of the mangroves that grow along the foot of the cliffs. They eat their way into the rock in all directions, and into the gaps thus formed the waves force their way. In time they will probably destroy the island.—London Globe.

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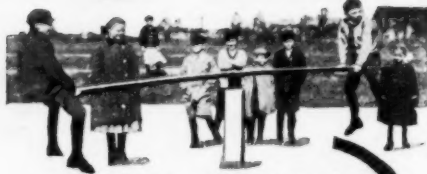
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MONTHLY CASH PRIZES

Until further notice in this magazine the Editor of Popular Mechanics will pay two cash prizes each month for the best original contributions to it:

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\$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 APRIL, 1910

First Prize—THOMAS L. PARKER, Olaf, Iowa, \$10
"Self-Feed for a Hand Drill."

Second Prize—F. G. CHRISTENSEN, Santa Rosa, Calif., .. \$5
"Automatic Switch for Basement Lights."

EXTRA AWARD

On account of there being five contributions this month, each of which deserved second prize, we have made an EXTRA AWARD of four additional second prizes, as follows:

JAS. E. NOBLE, Toronto, Can., \$5
"Hot and Cold Water Mixer for Shower Baths."

W. A. JAQUYTHE, Richmond, Calif., \$5
"Handsaw Guard."

A. P. CONNOR, Washington, D. C., \$5
"Home-Made Glass Drip Board for a Sink."

J. N. BAGLEY, Webber, Kans., \$5
"An Adjustable Lathe Tool Holder."

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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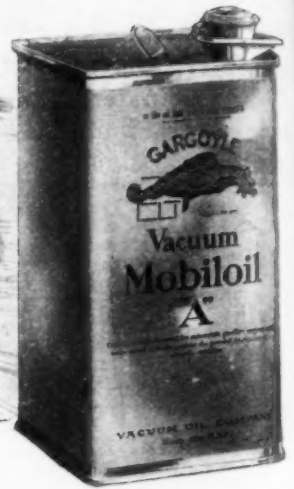
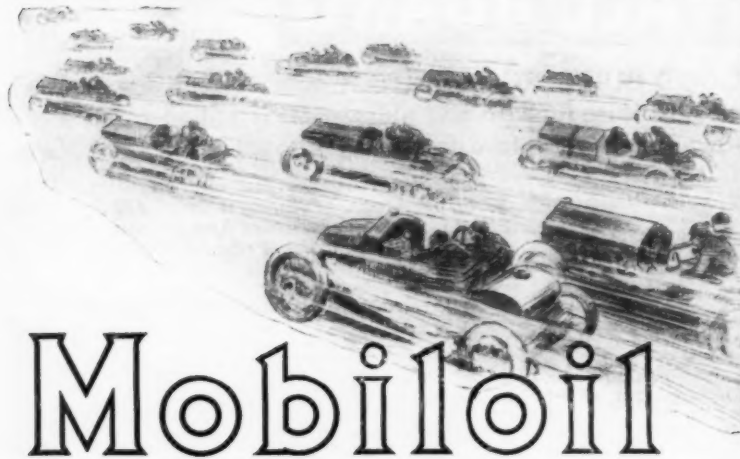
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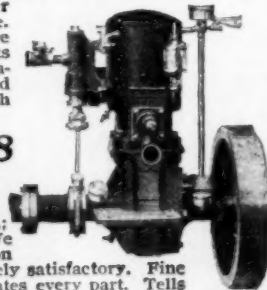
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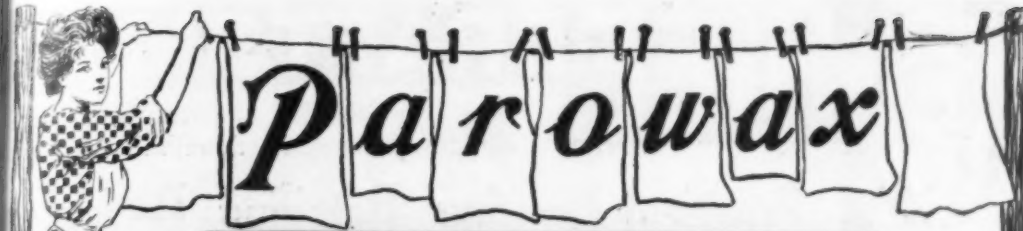
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