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VOL. VIII. NO. 11

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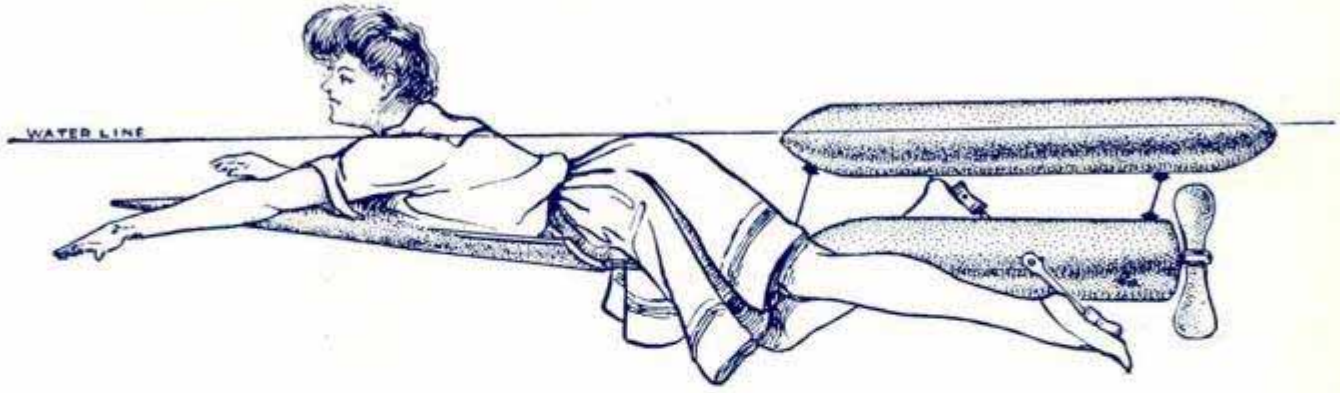

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108 Illustrations—126 Articles

NOVEMBER, 1906

POPULAR MECHANICS

160 WASHINGTON ST., CHICAGO, U. S. A.

H. H. WINDSOR, : : : : : : EDITOR

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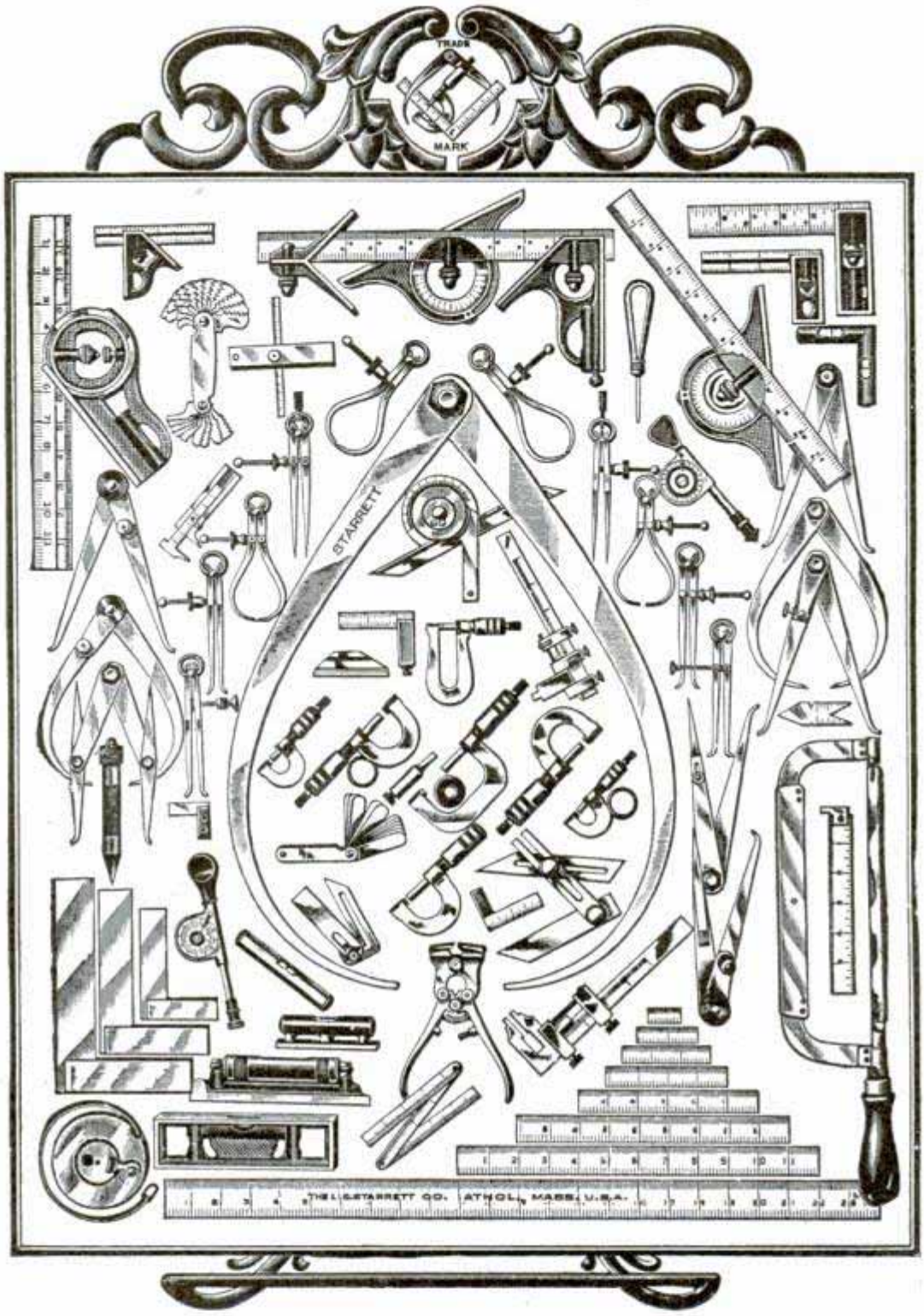

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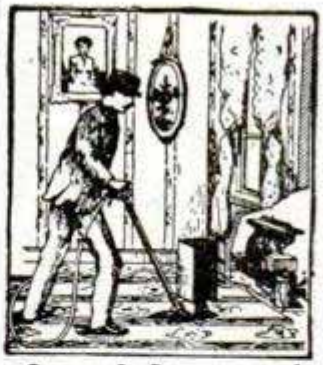

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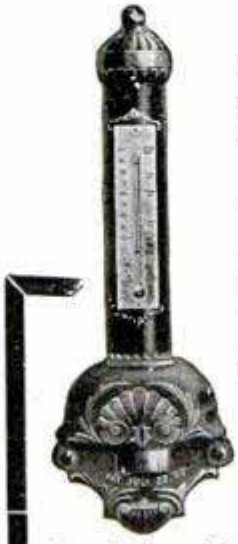

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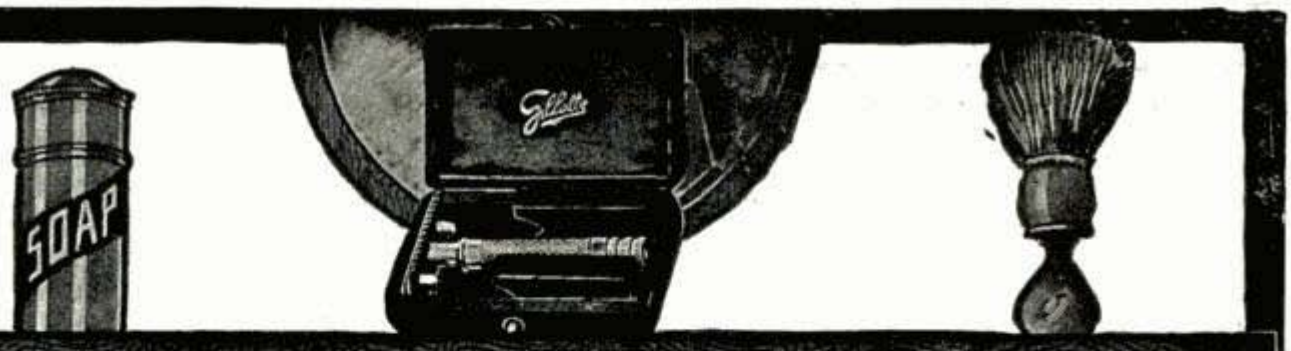

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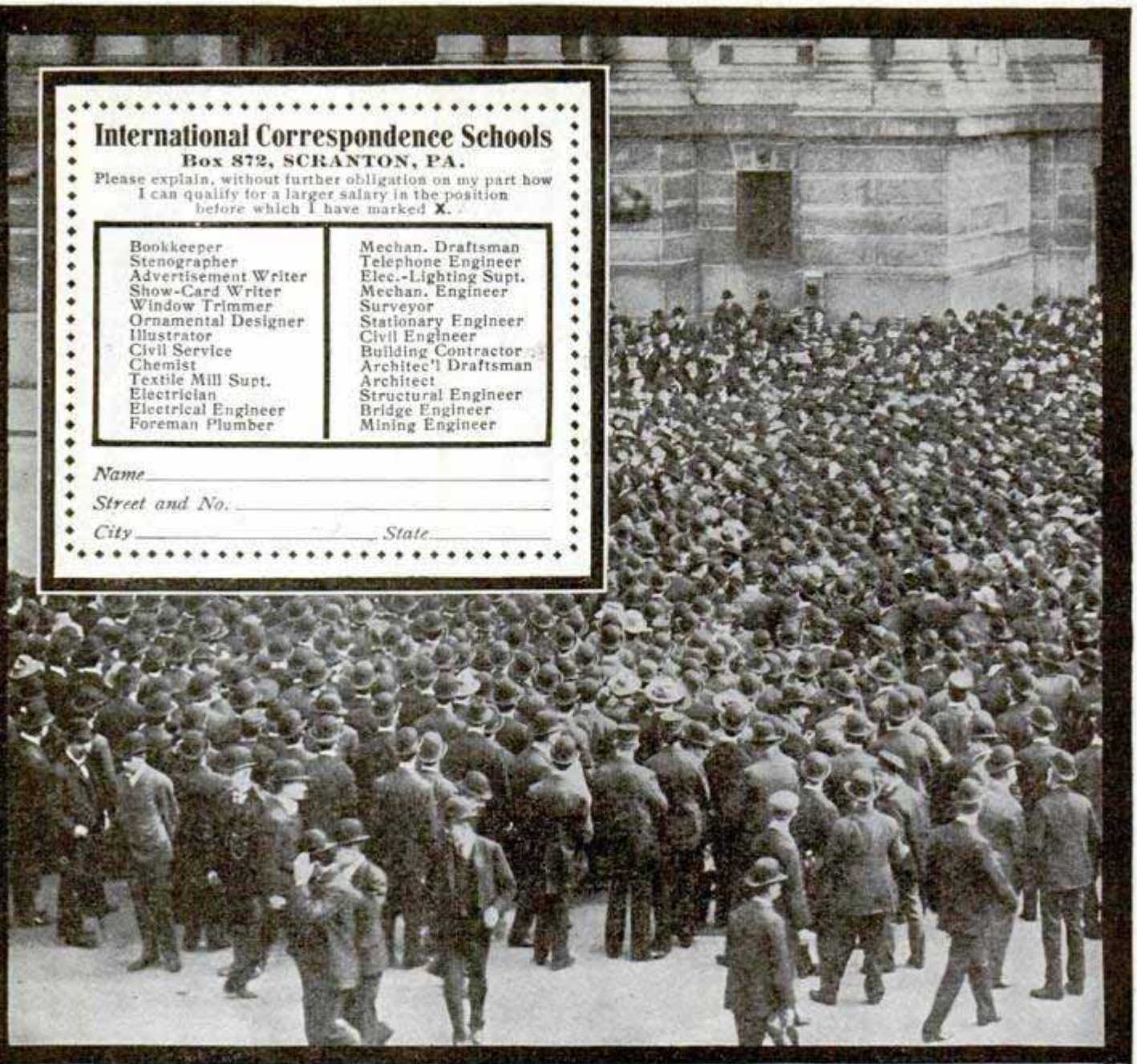

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Illustrator	Civil Engineer
Civil Service	Building Contractor
Chemist	Architec'l Draftsman
Textile Mill Supt.	Architect
Electrician	Structural Engineer
Electrical Engineer	Bridge Engineer
Foreman Plumber	Mining Engineer

Name _____

Street and No. _____

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POPULAR MECHANICS

Vol. 8. No. 11. CHICAGO, NOVEMBER, 1906. 10 Cents a copy $1.00 a year

IS BALLOONING SAFER THAN RAILROADING?

Figures Show Travel Twice as Dangerous to Passengers as Ten Years Ago

Is the work of the aeronaut safer than that of the trainman on American railroads? Is there less chance of being killed in steering an airship than taking a train over a division? It would almost seem that such was the fact, judging by the recent report of the Interstate Commerce Commission. The startling statement is made that the ratio of both killed and injured to the total number of passengers carried is twice as large as ten years ago. In other words, it is only half as safe to travel on steam roads now as a decade since.

What it means to be an employe in the operating department of a steam railroad will be understood in the following terrible showing:

In 1905 one employe was killed out of every 411 employed.
In 1905 one employe was injured out of every 21 employed.

In the above figures employes in every department are counted, including the thousands engaged in the safe occupations of clerks, telegraph operators, depot men, etc. When the score is counted among the men actually engaged in operating the trains—that is enginemen, firemen, conductors and other trainmen—the rate of fatalities is astounding.

In 1905 one trainman was killed out of every 133 employed.
In 1905 one trainman was injured out of every 9 employed.

With the increased use of heavy and vestibuled cars; improved air brakes; steam heat in place of stoves; gas and electric lights; gates and fences in depots; block signals; double tracks; electric headlights, and other safety devices, one would suppose that, however dangerous might be the position of the trainmen, that the passenger had been very materially safeguarded. A statement that it was twice as safe to travel on the passenger trains of ten years ago than today would find few hearers who would believe it; and yet such is the fact according to the best government authority. In proof of this assertion note these figures:

In 1905 one passenger killed to each 1,375,856 carried.
In 1895 one passenger killed to each 2,984,832 carried.
In 1905 one passenger injured to each 70,655 carried.
In 1895 one passenger injured to each 213,651 carried.

The ratio of fatalities to passengers carried more than doubled, and of passengers injured more than trebled. When computed on the basis of passenger miles traveled we find—

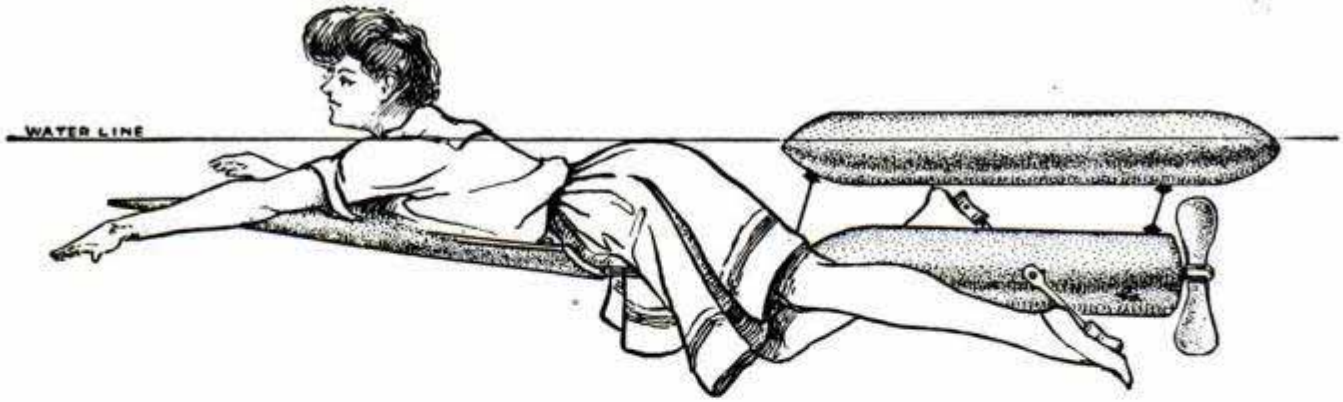
In 1905 one passenger killed for each 44,320,576 passenger miles.
In 1895 one passenger killed for each 71,696,743 passenger miles.

When stated in another form the showing is apparently a good one, for during the year 1905 there were carried as passengers 738,834,667 persons, or about eight times the population of the entire United States, and of this vast army only 537 were killed. But while this by itself would seem to be a commendable record, it is overshadowed by the other statements showing an increase in ten years of 100 per cent killed and 300 per cent injured. Nor is 1905 an exceptional year, for it shows more deaths and accidents than 1904.

Is the percentage of death and danger going to continue to increase with the inevitable increase in the number of passengers? The American people travel more each year and will continue to do so as the country becomes richer and more densely populated.

And what is the explanation of this retrogression? Is it in the higher speeds, or the heavier engines and cars, or the crowding of too many trains on too few tracks? Has the big locomotive outgrown the factor of safety of bridges and tracks? It would hardly seem to rest with the employes, for never in the history of American railroads has there been so high a grade of employes in the service as there is today.

Then what is the reason?



MOTOR SWIMMING WITH FOOT AND GAS ENGINE POWER

What with automobiles and motor boats to ride in, motor skates to walk on, and a screw propeller to push a swimmer through the water, it begins to look as though the class in physical culture had little to do but enjoy itself, while a gasoline engine does the work. Of all the varied applications of the gas motor the swimming outfit is the most unique. Its utility would seem quite doubtful, but as a curiosity or amusement it is worth knowing.

M. Constantini, of Paris, who invented the motor skate, has brought out a motor swimming device which, the Scientific American says, consists of "a waterproof casing containing a gasoline motor which drives a screw. The machine is strapped to the swimmer's back and propels him through the water" at a rate faster than he would swim, and, of course, without physical exertion. Air bags are used to float the machinery.

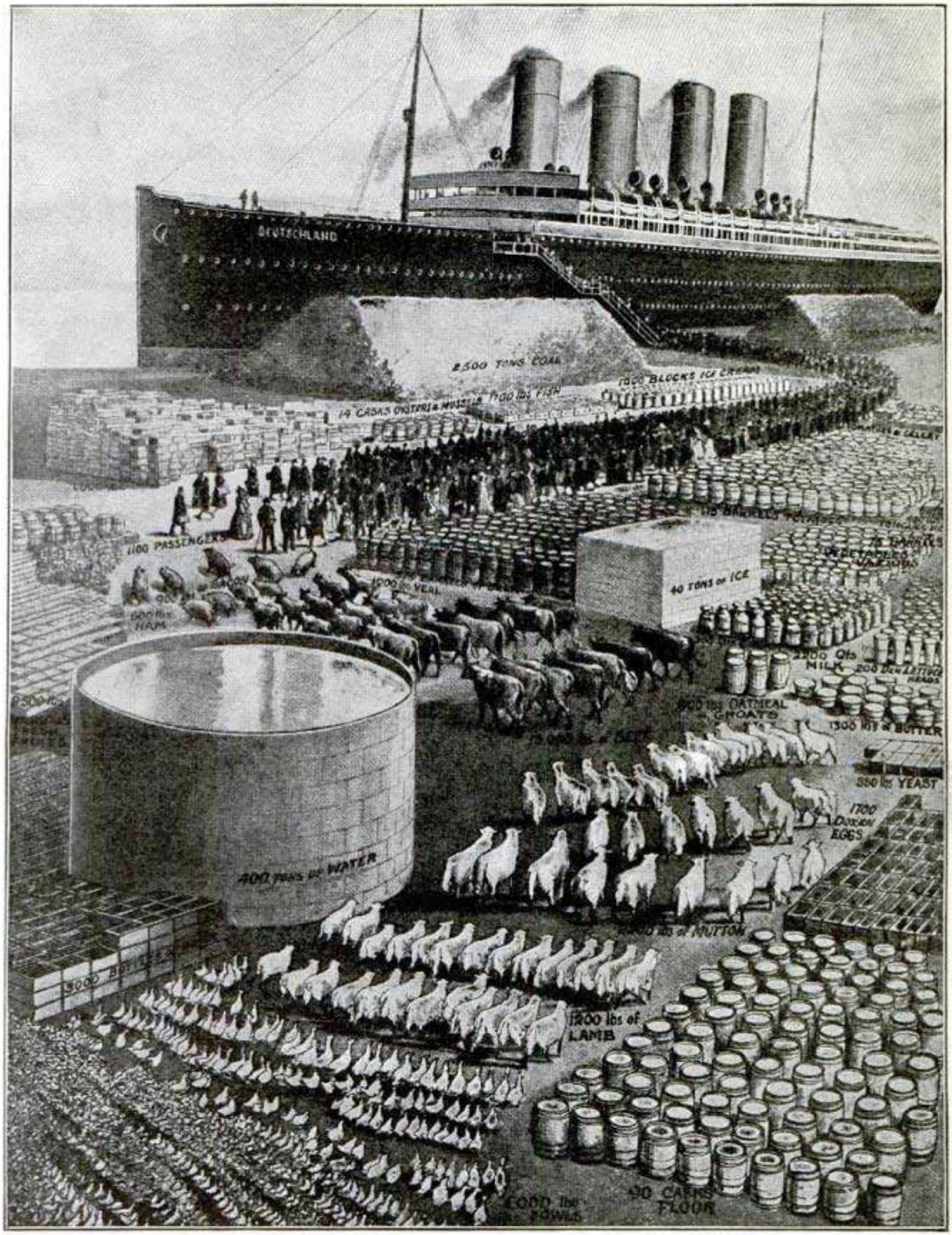
Gasoline Motor Outfit

An American has also invented a swimming machine, but in his case the swimmer must furnish the motive power himself. This device is capable of considerable speed with comparatively small effort. The operator stretches at full length upon a float which is pointed at the forward end. The propeller is driven by gearing driven by means of foot pedals similar to the pedals of a bicycle. Another float over the machinery serves to support it in the water. This arrangement permits the swimmer to keep his head out of water and to undertake long distances. When tired one has simply to cease working the pedals until rested.

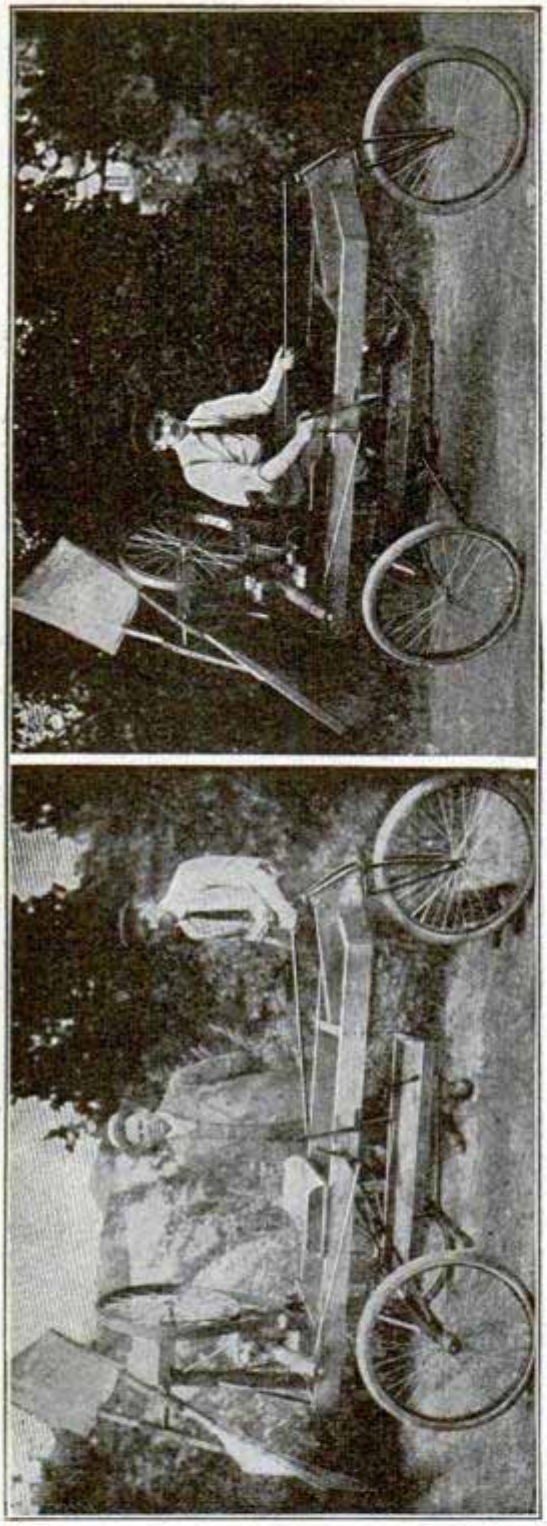
The machine is constructed of nickeled copper, aluminum and bronze metals, and is from 5 ft. to 6 ft. 6 in. long. The swimmer is carried forward 3 ft. for each revolution of the pedal shaft. The gear is 6 to 1. The weight of the machine out of water is only 25 lb. It is the inven'ion of a physician, who states any one can learn to use it in a few minutes.

INTERNATIONAL BALLOON RACE

The international balloon race occurred October 1, with 16 entries, and was won by an American, Lieut. Frank P. Lahm, after a flight of 415 miles from Paris to a landing 50 miles north of Hull, England. Seven of the contestants failed to cross the channel and made landings in France. Santos Dumont was one of these, being obliged to descend for surgical treatment of his arm, which was badly torn. Lieut. Lahm, who belongs to the Sixth cavalry, U. S. A., started to cross the English channel at 11 p. m. and at 3 a. m. was over England.



FEEDING AN OCEAN GREYHOUND.—The supplies for a single trip include: Coal, 5,000 tons; beef, 13,000 lb.; mutton, 2,200 lb.; lamb, 1,200 lb.; ham, 600 lb.; pork, 900 lb.; veal, 1,200 lb.; beer, 375 bbl.,and 3,000 bottles; milk, 2,200 qt.; ice cream, 300 qt.; ice, 40 tons; butter, 1,300 lb.; cereals, 600 lb.; eggs, 1,700 doz.; fowls, 6,000; potatoes, 175 bbl; tongue, 400 lb.; vegetables, 75 bbl.; lettuce, 200 doz.; flour, 900 bbl.; yeast, 350 lb.; fresh fruit, 8,500 lb.; oysters, 40 bbl.; fish, 1,700 lb.



The "Wind Wagon" Travels 30 Miles per Hour

DECADENCE OF TIN ROOFING

The tin roof, which has fallen into disrepute and disuse, is made the subject of an editorial in the American Artisan, which explains the present condition as a result of using poor material—a consequence of intense competition.

The statement is made that the good tin roof is still one of the best, and that no better tin plate is made in the world than right here in the United States. "Nothing in roofing is more meritorious in all ways than a tin roof correctly made and laid and containing absolutely good materials."

A MOTOR WIND WAGON

Tests Engines for Air Ships

A "wind wagon" is what G. H. Curtiss, of Hammondsport, N. Y., calls the peculiar looking vehicle of which two views appear in this page. The machine is no idle fancy, but was built with a definite purpose. Mr. Curtiss desired to make a series of experiments with propellers for air ships, and wisely concluded he could work faster on the ground, and that a device which would run a vehicle on wheels would certainly push a gas bag through the air.

And so the wind wagon was conceived and built. The frame, which is of wood, is both light and strong, and the wheels are of the ordinary bicycle type. It is a 3-wheeler, steering being accomplished by the forward wheel. The motor is a 2-cylinder, air-cooled gasoline of the V-type, such as have been generally used in air ship work, and is placed below the propeller shaft and as near to it as possible. The engine belts to a driving wheel on the propeller shaft, which reduces the revolutions of the propeller to 250 per minute.

Mr. Curtiss says: "The machine, although of no commercial value, is thoroughly practical and will easily run at the speed mentioned, 30 miles per hour. The propeller is 6 ft. in diameter and has a pitch of about 5½ ft. I believe this form of propeller is most efficient for aerial navigation., having arrived at this decision after much experimenting. It is needless to say that the rig is a great horse scarer, and blows up a great cloud of dust when passing along the road, and will even pull the leaves from the trees where the branches are low." The machine complete weighs 300 lb. There is no patent on the idea and any of our readers who have a small gasoline motor can build their own craft from the suggestions given in the illustrations. An ice boat can also be driven in the same manner.

The same idea has just been utilized in France, where M. Archdeacon, of Acheres, applied the propeller to a motorcycle. In his case the propeller was carried in front, which had the effect of pulling instead of pushing. The entire outfit weighs 160 lb. and made a speed of 49½ miles per hour over short distances. The tests were required by the authorities to be made on secluded roads, for the French horses go wild as the big whirling blades come toward them.

ARCH OF COAL AND COKE

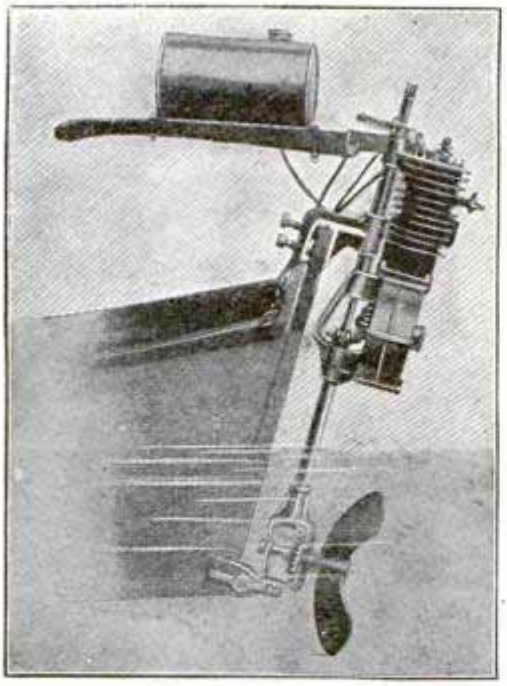
The one-hundredth anniversary of the town of Connellsville, Pa., was celebrated by the erection of a double arch built of coal

Arch Built of Fuel

and coke, for the production of which the town is noted. At night the arches were illuminated with hundreds of electric lights.

CHEAP PORTABLE BOAT MOTOR

A portable outfit weighing complete only 35 lb. can now be had for use on row boats. The outfit is so compact and light it can be carried in a trunk or by the hand and on arrival at destination requires only a few minutes to attach ready for use. After a



Row Boat Motor

person has placed the motor on a boat once or twice he can do the work in three minutes. The only tool required is a small wrench. The illustration shows the manner of fastening to the boat and the gearing connection to the propeller shaft. For duck hunters, fishermen, and families spending a few weeks at a lake, or visiting different places each year such a motor would prove a great convenience. The tank holds a supply for 60 miles which will cover ordinary requirements for one day. A speed of about 5 miles an hour can be made. The outfit is comparatively inexpensive.

TRACK TELEPHONES ON BAVARIAN RAILROADS

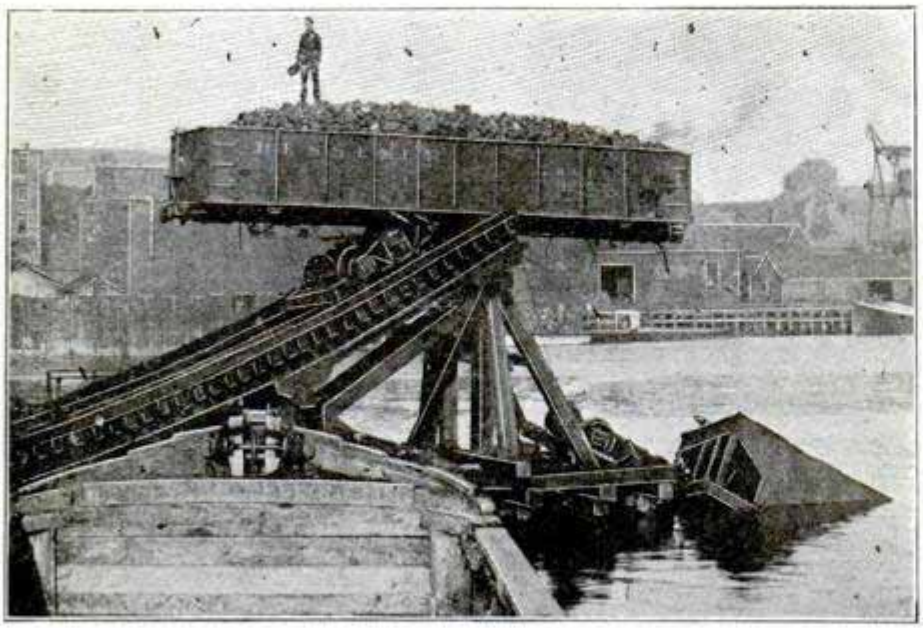
Nearly all the lines of the Bavarian state railways are equipped with a telephone

Trackman Telephoning

service which can be used at any point. Trains, track foremen and others are supplied with small portable instruments which enable connection with headquarters. The system offers many advantages in every-day use as well as for emergency cases.

A single copper wire carried on the telegraph poles is used in connection with the track rails. The portable instrument is connected to the overhead wire by means of an extension pole, and to the track by a clamp, which can be done in a few seconds. The telephone is then ready for use. The advantage over a telegraph instrument is that any one can use the telephone.

REMARKABLE ACCIDENT--THE BALANCED COAL CAR



Not one time in ten thousand could the accident to a train terminate as did the one illustrated.

A string of twelve steel cars, each loaded with 50 tons of coal, broke away and ran down hill to the dock at Conneaut, O. A strong buffer had been built to prevent cars from going too far, but this string came so fast that two cars went up and over into the water.

The third car by chance stopped in such a way that a perfect balance was maintained.

LIFE OF ELECTRICAL MACHINERY

The very great increase in efficiency of electrical machinery during the past 15 years has resulted in the throwing out of millions of dollars' worth of apparatus because improved types were so much more economical. While improvements will doubtless continue it must not be expected that further economies of operation from improved construction will continue in anything like the ratio of the past decade. This makes the question "What is the life of electrical machinery?" one of more consequence than formerly.

Sir William Preece, an eminent English expert, recently made a report respecting the municipal works at Bristol, and from this report the Electrical Review, New York, condenses the following:

"In his opinion, the life of the dynamos and alternators is 30 years, and the residual value 8 per cent. The life of the armored cables is 35 years, with a residual value of 15 per cent. The life of motors is put at 25 years, and their value at the end of that time at 9 per cent. Compare these figures with the similar ones for other parts of the equipment. The water-tube boilers, for example, are given a life of 25 years and a residual value of 5 per cent. The engines and other machinery are given 25 years and a residual value of 6 per cent. It is evident that, according to this report, the electrical machinery has a longer useful life than have other moving mechanisms, and this is to be expected if one considers the character of the work performed.

"A few other figures from this report may be interesting. Storage batteries, for example, are given a life of 15 years, with a residual value of 10 per cent—figures which will, doubtless, be a surprise to many."

MOUNTAINS OF FLAX

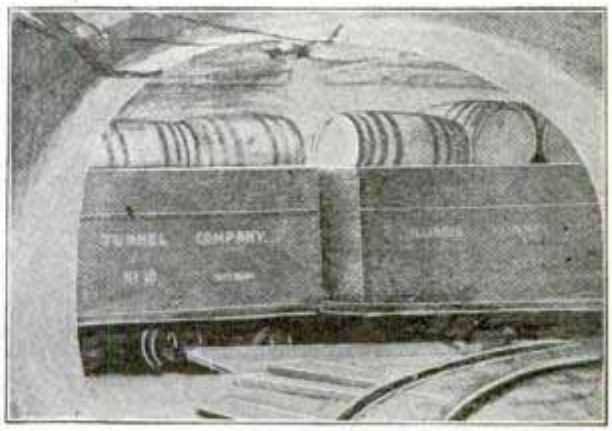
The consumption of flax in the manufacture of binding twine, rope, etc., is increasing so rapidly that special effort is being made by the manufacturers to induce the planting of vast fields. Michigan is taking up the culture of flax on a large scale, one company alone contracting to take the entire product of 4,000 acres. The illustration shows one of the many mammoth stacks of flax which is heaped up in great piles 42 ft. high, 50 ft. wide and 460 ft. long. The photograph is furnished us by the Summers Fibre Company.

Stack 460 Feet Long

CHICAGO'S UNDERGROUND FREIGHT RAILWAY

Vast Electric System Honeycombs the City--Freight, Mail and Building Materials Moving Night and Day

While New York, London and Paris are hauling their passengers through subways under conditions of greater speed than comfort, Chicago has reversed the order and is now diverting its teaming traffic from the streets to its system of underground electric lines. This change not only permits of continuous movement of freight commodities during every hour of the night and day, regardless of weather, but it is relieving the congestion of street traffic, which in the business district had become almost unbearable.

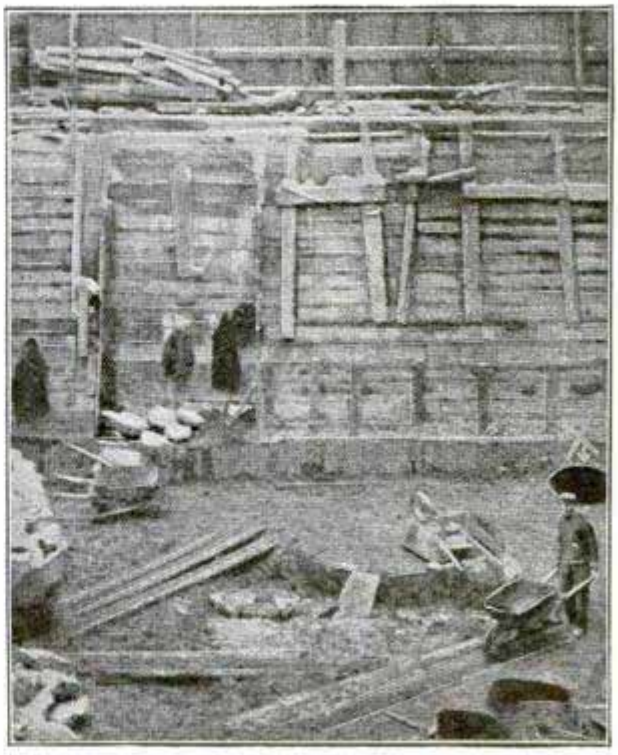


Curve to Cross-Line

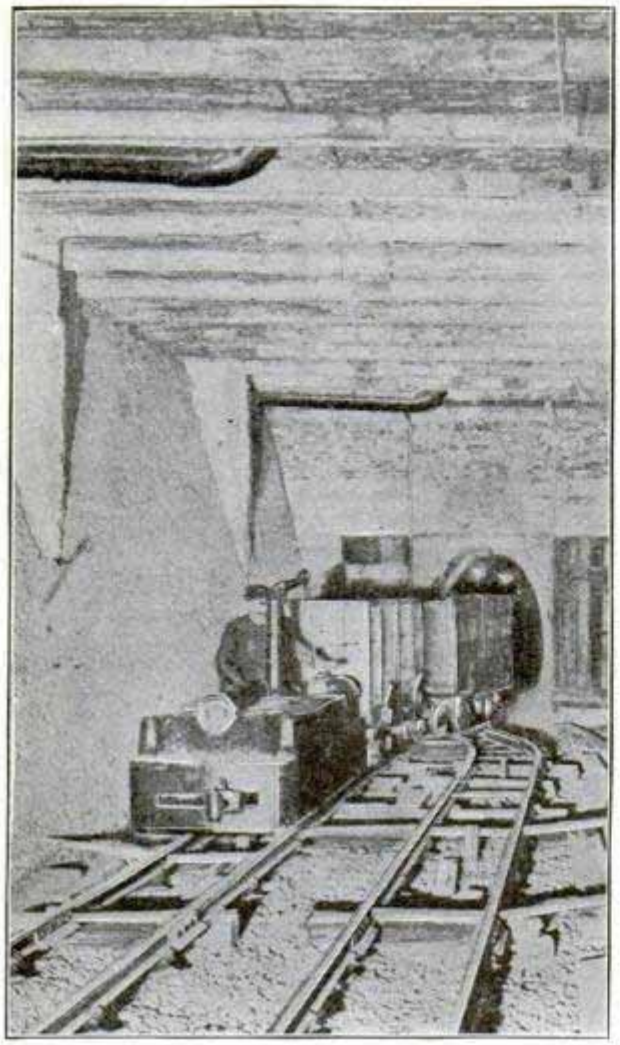
A detailed description of the tunnel construction appeared in this magazine in May, 1902, which was the first information the public had that the principal streets of the city had been tunneled. The boring has been done through blue clay, 40 ft. to 60 ft. below the pavement; the walls and floors are made of concrete. Fifty miles of these waterproof, jointless concrete tubes are already completed and new tunnels are reaching out toward the suburbs. The large trunk tunnels are 12 ft. by 14 ft., while the single

Method of Tunnel Construction

First, 14 in. of concrete is placed in bottom. Five-inch by 5-in. timbers are used to form recess in order to lay the 56-lb. rails. On top of 5-in. by 5-in. timbers 2-in. lagging is placed. Then 5-in. steel channels weighing 10 lb. to the foot are placed 3 ft. to centers. Then 2-in. by 6-in. lagging is placed, and concrete rammed between lagging and excavation, 6 in. in height, filling all voids before another section of the 2-in. by 6-in. is placed, and so on until concrete is all placed. The channel ribs and lagging are left in place until concrete has had at least six days to set.



Excavating a Basement--The White "X" is 4-Ft. Chute to Tunnel Cars Below

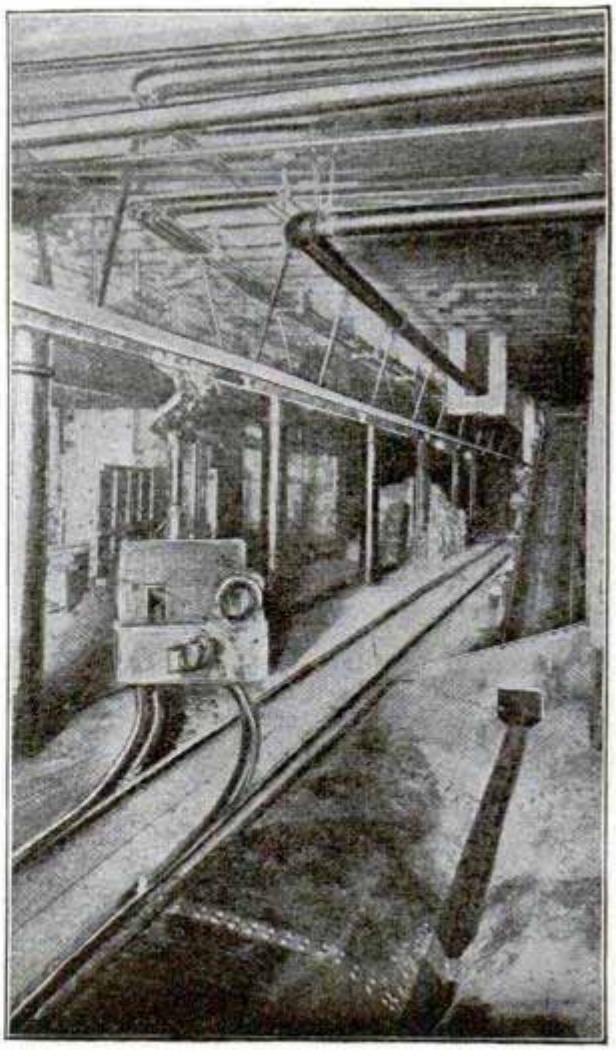


Underground Switch Tracks--Marshall Field's Retail Store

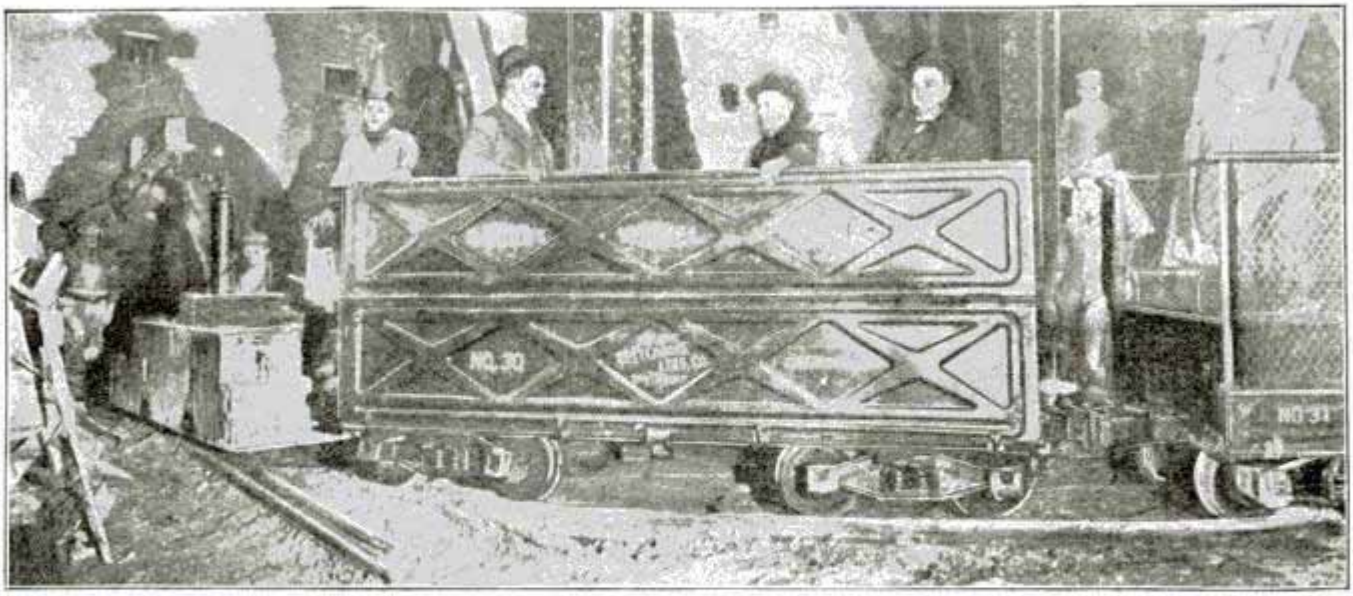
track sections are 6 ft. by 8 ft. Not only is every down-town street tunneled, but branches run beneath the Chicago River and are extending for miles out on the north, west and south sides. The enormous amount of excavated material is loaded in the company's own cars and carried on trestles far out into the lake, where it is dumped and is making land that some day will be a beautiful park where once large vessels sailed. When this filling is ended the shore line will have been advanced nearly a mile out into Lake Michigan. Not only does the company dispose of its own waste in this way, but in all the business district the excavated material from each new building, the debris of torn-down structures, and the daily accumulation of ashes from hundreds of steam plants find a quick and economical avenue of escape through the tunnel system. The manner of loading such debris is clearly shown in one of the illustrations. Much of the construction material for new buildings —in fact, the greater part of it, except the large steel members or big stones—is brought from the various freight houses through the tunnels.

New buildings are now built with three to five stories underground, and into each retail store is laid a switch track. Coal that comes from the mines in cars which open at the bottom is transferred by gravity to the smaller tunnel cars. These are built of steel, the box being 44 in. high, 48 in. wide, and 10 ft. 6 in. long. Such a car holds up to 15 tons. It is a trip of only a few minutes from depot to destination, and as much of this work is being done during the night as in the day time. The cars of fuel or goods are run into the "depot" of the retail store, and the next morning unloaded and carried by elevators to all parts of the building. Two round trips between a retail store and any one of the freight depots has been counted a good day's work for a team. The same service via the tunnel is performed in one hour, the time used in loading being about the same in each case, only there is no team waiting, sometimes hours, in line to receive or discharge its load.

The enormous saving to shippers and receivers is already several million dollars a



40 Ft. Below Another Store--Coal Conveyer at Right



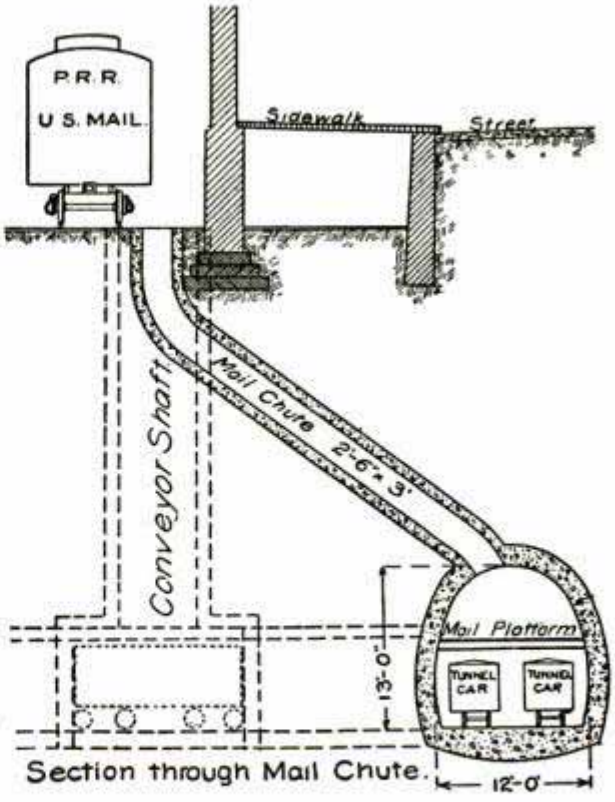
Electric Locomotive and Train

year, but what it ultimately will amount to can be suggested when it is known that there is paid each year for teaming in the city of Chicago a sum equal to the gross earnings of one of its big trunk railroads with a mileage of over 8,000 miles.

While the letter mail is shot between postoffice and depots in a few seconds by means of compressed air and underground steel tubes (see Popular Mechanics, February, 1906), the hundreds of tons daily of other mail matter is now being diverted to the tunnel system as fast as elevators can be put in at the railway stations. The big wire screen mail wagons which for years have lumbered heavily along the streets day and night are rapidly disappearing and will soon be a thing of the past in Chicago. Underground sidetracks beneath the main postoffice furnish loading places for the sacks which are slid down from the sorting rooms, and a train of several cars can be loaded in one or two minutes. An electric locomotive makes a flying trip and a few minutes later the cars are going up in big elevators at the proper depot and the mail sacks loaded into the railway mail cars. This means that the mails can be held open fully a half hour longer than when hauled on the street surface in wagons, besides avoiding the frequent delays from open bridges, blockades, fires, etc.

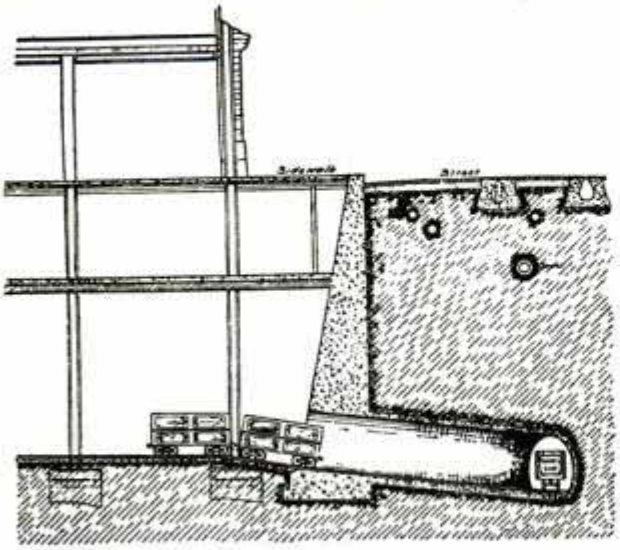
Trains hauling freight are run at about 10 miles per hour, but mail at a much higher rate. The cars are specially built for tunnel service and have hopper bottoms, or folding sides, or ends, according to the contents to be hauled. The present equipment includes 82 electric locomotives, operating with the overhead trolley system, and 650 freight cars. The equipment is steadily being increased. The track is 56-lb. rail laid to 24 in. gauge. The capacity of the road is expected to be about 40,000 tons every 24 hours.

From the roof of the tunnel are hung large lead covered cables containing the wires of the company's public telephone system. Probably the most remarkable fact in connection with the entire enterprise is that it has thus far been accomplished without the loss of a single life or even the serious injury of any of the workmen. Pockets of



At the Union Depot the Mail is Elevated in a Conveyer, but Sent Down Through a Chute

quicksand are frequently encountered while boring and often compressed air has to be used to keep back the water, but notwithstanding so great an excavation has been



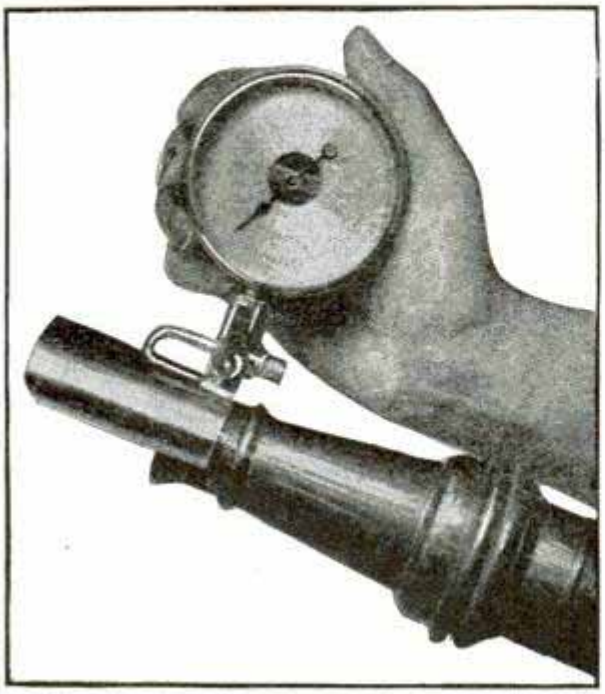
Entrance to a Sub-Basement

made within a few feet of the foundations of the tallest office buildings, no disaster has occurred.

The completion of the system contemplates 100 miles of tunnel. When this is done the pavements will last longer because relieved of their greatest destructive force, the streets will be clean on account of dirt and ashes no longer being spilled in transit, and also will be for the safe and unrestricted use of the people.

A DIRECT READING NOZZLE PIEZOMETER

The device here illustrated will indicate immediately the nozzle pressure of a stream of water and give the number of gallons per minute discharged from the ordinary standard nozzles of 1-in., 1⅛-in. and 1¼-in. bores.



The Piezometer in Use

The pressure is transmitted to the gauge by means of a small tube, about $\frac{1}{16}$ in. on the inside, says the Engineering News, and registers the pressure in the usual manner. In addition to the regular pressure-index on the dial, there is a scale which indicates the discharge in gallons per minute, thus obviating the old practice of consulting tables or using formulas.

MELTED LEAD FILLS BASEMENT

Then Cools in One Solid Block Weighing 1,000 Tons --Sawing with Electric Arc

When the fire swept over San Francisco a great smelting company had 1,000 tons of lead, tin, zinc and other soft metals stored in its warehouse. Beneath the building was a very deep basement and into this the melted metals poured, and afterward cooled into one vast, solid block of metal. How to remove and recover these metals was a problem. Various methods were tried but all proved too slow and expensive until a local electric company took hold. The metal is nearly 4 ft. thick and covered the entire floor.

The plan employed was that known as the electric arc process which was described in detail in Popular Mechanics May 17, 1902, and consists in cutting channels at frequent intervals. The heat and light from this arc is so intense the operators must cover their faces with heavy masks of oilcloth, and wear gloves. Small windows of specially prepared glass are made in the masks to enable the workmen to see. The crew engaged in this work present a most unusual sight and are constantly watched by large crowds from a safe distance.

As fast as the blocks of metal are cut out they are hoisted by derricks and sent to the smelter.

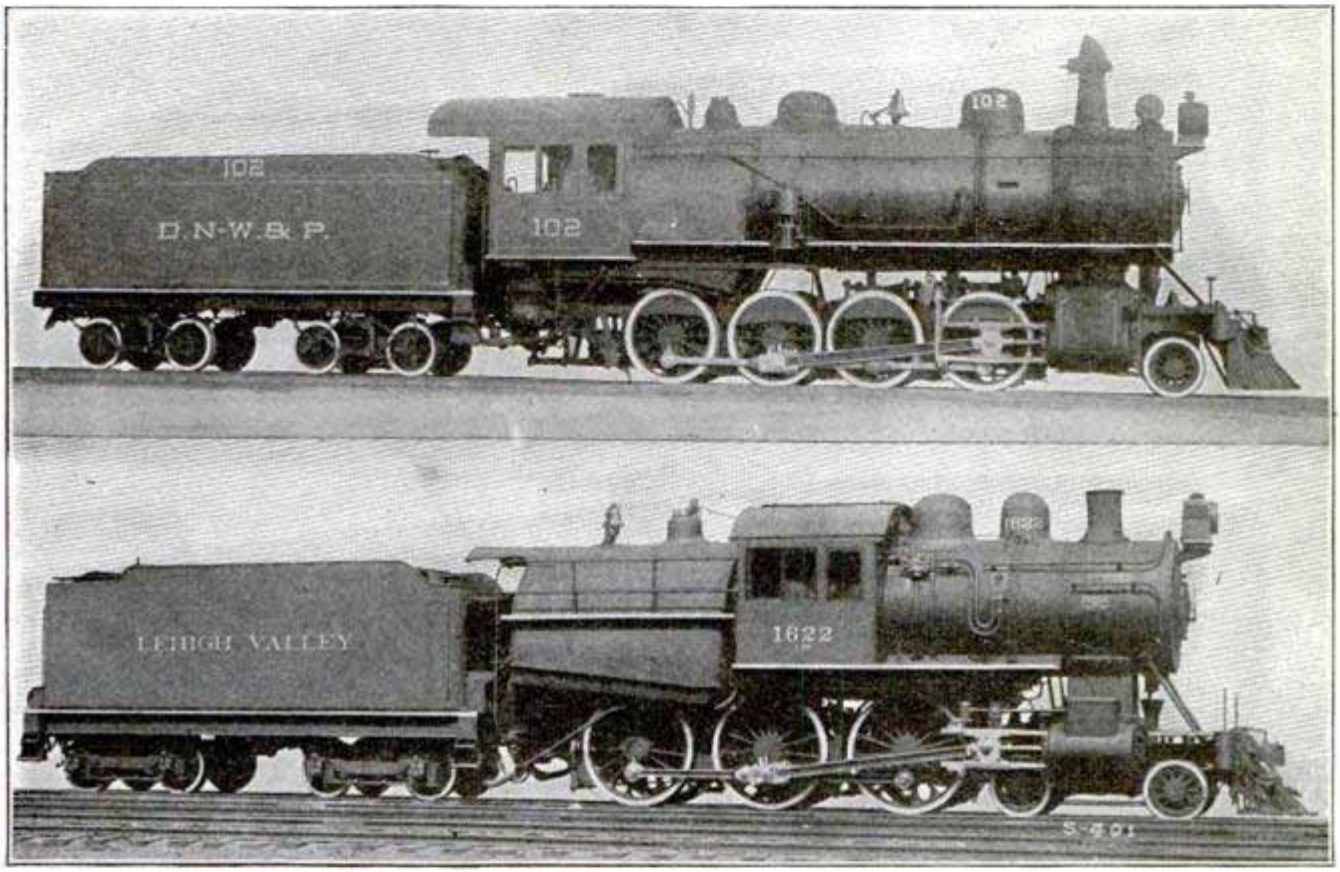
The same process is also being used in cutting up large beams of structural steel which are bent and twisted in the ruins. By means of the arc a 15-in. girder is cut in two in 20 minutes. To have cut it with a hand saw would require several hours of hard work. A current of about 250 amperes at from 90 to 100 volts is used. At several points in the city where service wires do not reach, a current is secured from a portable generating outfit using a gasoline engine.

NO KNIVES FOR MAN AT WHEEL

The loss of many English fishing boats is now believed to have been due to the fact that the man at the wheel carried in his pocket a specially forged fisherman's knife. These knives possess strong magnetic properties sufficient to deflect the compass needle two or three points. Many wrecks have occurred while steering apparently a true course, and the discovery of the knives is now believed to account for many wrecks.

RECENT AMERICAN LOCOMOTIVES

The illustration shows two interesting types of locomotives recently turned out by the American Locomotive Company. The first, No. 102, is of a consolidation type with wide firebox and piston valves, for the Denver, Northwestern & Pacific. This locomotive is equipped with a smoke hood for use in snow sheds and tunnels. Weight of engine, 209,500 lb.; weight of tender, loaded, 134,300 lb.



Two Modern Locomotives

TEACHING FARMING BY MAIL

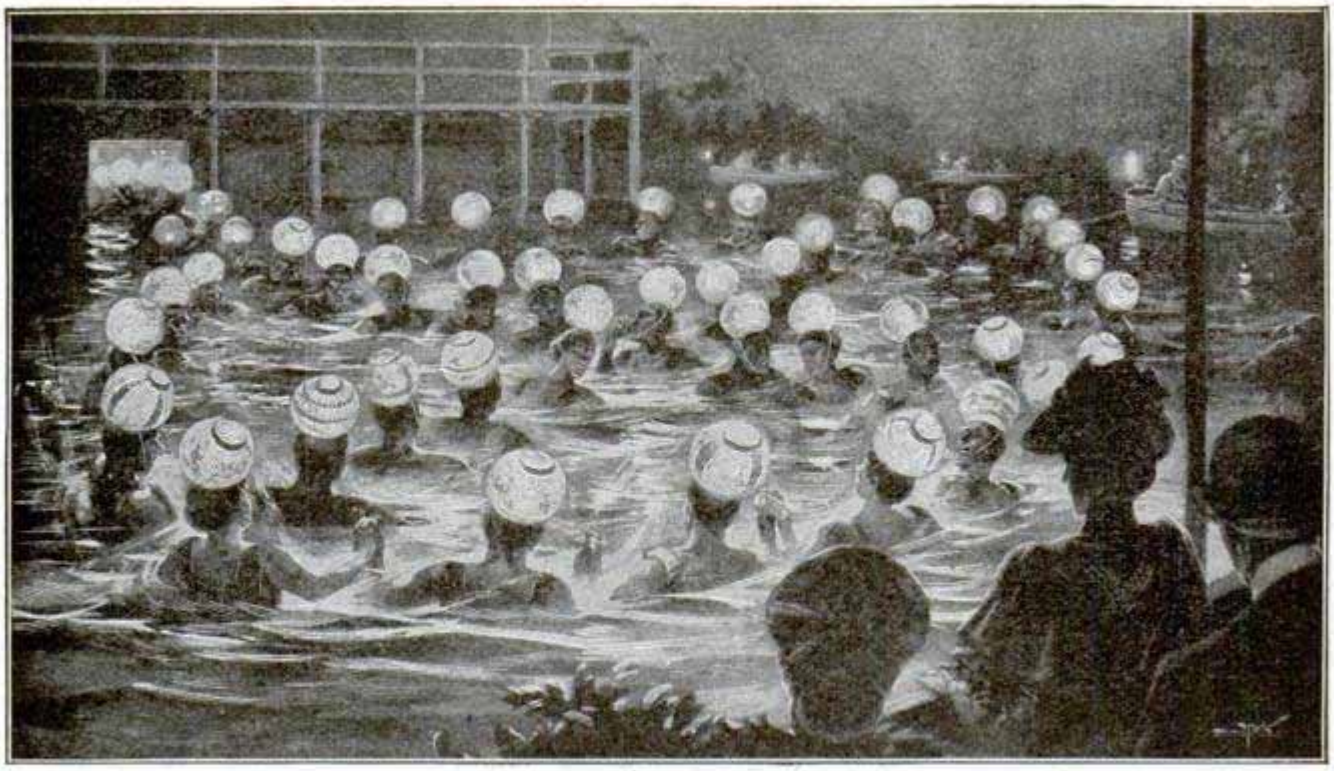
Correspondence courses by mail are recommended by the land commissioner of one of the big granger railroads. The result of experiments in this line have been so promising that it is now planned to have the state universities and agricultural colleges take up the work. The plan contemplates a four-year course, the student to use one acre of land per year in connection with his studies and to keep records and report results.

The scheme has already received the endorsement of the governors and state university presidents of Illinois, Iowa, Nebraska and Missouri. The instruction is to be practically free.

No. 1622 is a Lehigh Valley, 10-wheel, with very wide firebox, designed for fine anthracite coal. Weight of engine, 199,200 lb.; of tender, 151,900 lb. Carries 7,500 gal. water and 12 tons coal.

CARE OF PNEUMATIC TIRES

If a car is in daily use, the tires should, of course, be left inflated always, and it is not necessary to jack up the car, says Automobile Topics. If, however, the car is to remain for some weeks without being used, it is well to jack up the wheels until the tires are free from the floor, and to then allow a portion of the air to escape, relieving the fabric of practically all tension.



"FIRE-FLY" WATER DANCES IN BERLIN—Lamplight dances in the water form a brilliantly picturesque feature of the festival of the Berlin Swimming Club. Each swimmer, men and women alike, adorns his head with a lighted Chinese lantern; the merry crowd then swim in procession from the bath house, and at a signal from their commander perform various evolutions, the figures being, as it were, outlined in fire upon the waters. Large numbers of people delight in the spectacle, and the wonderful effects produced display considerable skill on the part of the performers.

SAN FRANCISCO FIRE DISCOVERS NEW PROCESS IN TREATING CHAMPAGNE

Hundred Thousand Bottles Boiled in a Million Gallons of Sherry

At the time of the San Francisco fire last April, 100,000 quart bottles of choice California champagne boiled for over 48 hours in a million gallons of sherry. The result was the production of 10,000 qt. of champagne of rare flavor at a cost, however, never before expended on a like quantity.

The sherry was contained in 80,000-gal. casks on the upper floors of the building of the California Wine Association. The fire destroyed the casks and the flood of sherry poured into the cellars where were stored the 100,000 bottles of wine. The fury of the flames soon heated the sherry to boiling point, and the boiling continued for two days and nights. When cooled the sherry was found to be filled with extraneous matter, and worthless, so it was pumped out into the streets. Then it was found that 10,000 of the bottles of champagne were unbroken and that the unparalleled process had imparted to the wine a rare flavor. Wine experts are now testing out the "boiling process," and the result may be a revolution of the methods of this industry.

SWISS DINNER HORN

This queer contrivance, which looks like a mammoth clay pipe, is a big horn whose notes can be heard for miles. It is used by the landlords of the Swiss mountain hotels to sound the call to meals.

"Dinner's Ready"

POTASIMITE--A NEW EXPLOSIVE

A new explosive, said to rival dynamite, has been perfected in Monterey, Mexico, and is being used by the Mexican Central Railway. A factory for its manufacture in large quantities is being built. Potasimite is pronounced safer, cheaper, and more powerful than dynamite. Those explosives based upon nitrogen produce a gas that necessitates abandoning closed works, such as a mine or tunnel, during the explosion, and the laborers can not return to work for a long time thereafter, depending upon the facility for carrying off the gas. Potasimite is said to produce no obnoxious gas, the only precaution being for the workmen to get out of the way of the flying particles of the blasted rock.

HOUSE RAN DOWN MOUNTAIN SIDE

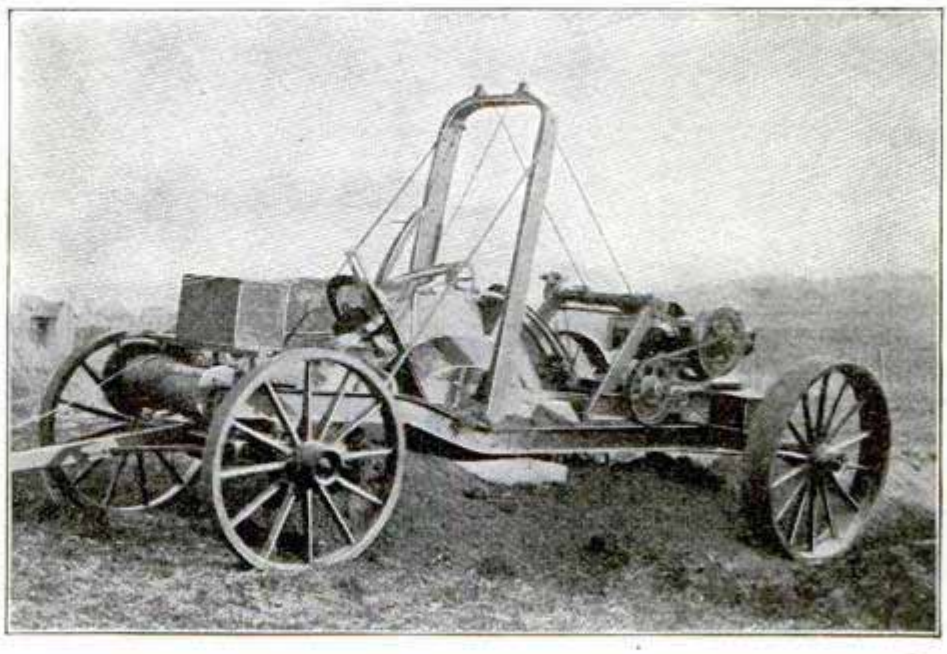
A one-story house, which was being moved on rollers at Butte, Mont., recently, got away from the movers and wrought havoc and ruin for a distance of three blocks. Butte is located on a steep mountain side, and so the runaway house, operating under Newton's law, went down hill. It killed four horses, tore down poles and wires and wrecked vehicles, but was itself undamaged.

DITCHING WITH MACHINES

Digging ditches by hand, except for short distances, is being supplanted by machines. Few occupations are harder on the workmen than excavating trenches, especially under a hot sun. The modern method, which is at once greatly quicker and cheaper, is to use a gasoline engine outfit. These machines are now made in small sizes for light work, such as farm and road drainage. The illustrations show two views of such an outfit, which is operated by a 7-hp. gasoline engine. A small steel cable is carried 200 ft. ahead of the machine and anchored to a post or tree, and

Ditcher at Work

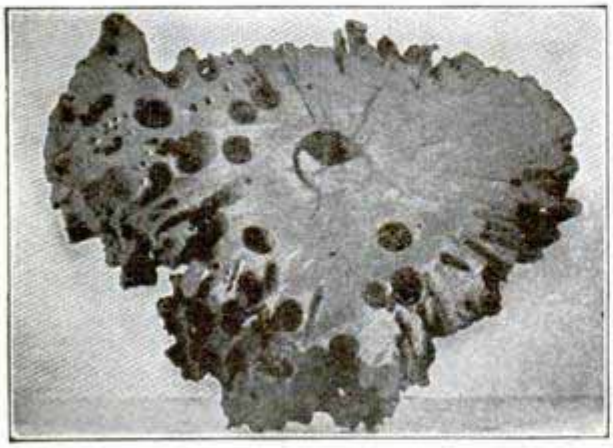
the engine, which is on the ditcher, winds the cable on a drum, thus drawing the machine forward as fast as the excavator opens the ground. A ditch such as is used for laying tile, for instance, 10 in. wide and 3 ft. deep, can be excavated at the rate of 180 ft. per hour.



Side View of Ditching Machine

PROTECTION AGAINST TEREDOES

What seems to be complete protection of submerged wooden piles against the unseen but rapid ravages of the teredo and similar marine wood borers has recently been invented. Previous efforts have been in the

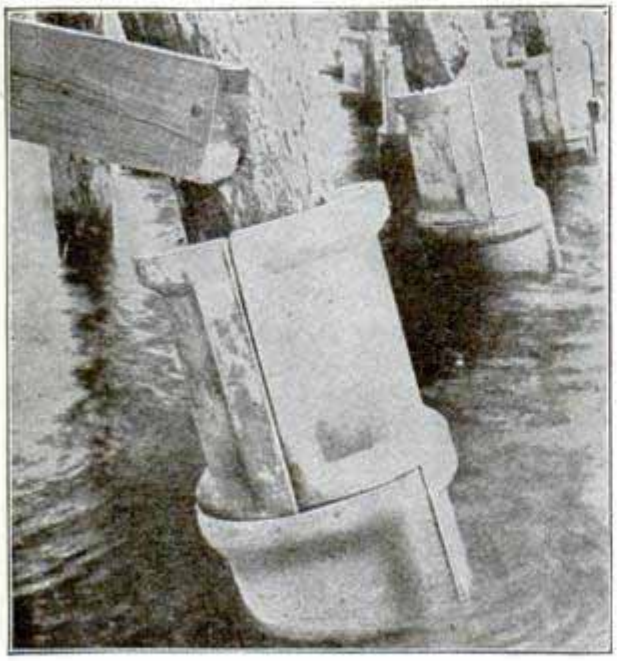


Three Years' Work of Teredoes on Piling

line of creosoting or inclosing the pile in a vitrified tube made in ring sections, and this last method, while the most effective, could only be employed when the pile was driven and before any further construction.

A new invention uses a lockjoint pipe, made of cement, divided longitudinally into halves, which are fastened with a key. The joint is then sealed absolutely tight so the joint will hold the finest sand. Sand has been found to be the most practical filling.

After the sand has been allowed to settle, the tops of the pipes are sealed with a thin coating of cement mortar, which prevents the sand from being washed out by wave action during a storm.



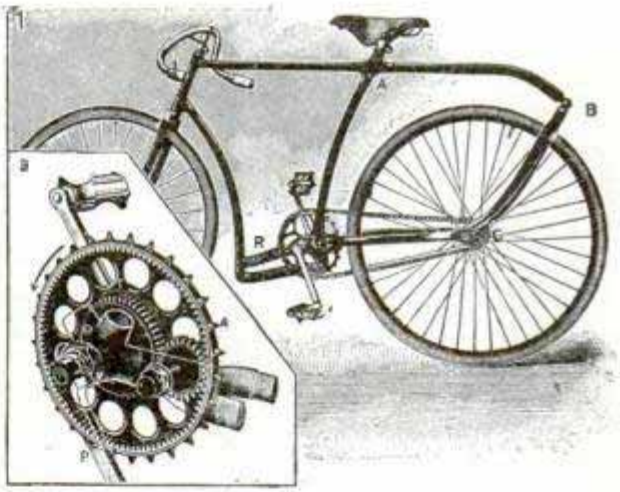
Lock Joint Pipe on Trestle Piles

Marine borers in a number of localities attacked and rendered useless creosoted piles in from fifteen months to fifteen years.

The teredo attacks a pile at all points from the high water line to the mud line or bottom, and to live must have free access to sea water. This is proven by the fact that the teredo has never been known to work below the mud line.

EASILY PROPELLED MODERN BICYCLE

At a recent Paris exhibition a number of bicycles of modern construction were shown which possessed features entirely new. The one illustrated has a jointed frame and also a spring, R, which is placed between the pedals and a point on the frame, with a resultant elasticity which greatly reduces the motive force required to propel the bike. Fig. 2 shows the gearing at the pedals in detail. The bicycle is still a favorite vehicle with tourists and the improved construction has attracted considerable interest.



Bicycle Showing Jointed Frame

SHINGLES FOR INTERIOR DECORATION

Wood shingles are becoming sufficiently valuable to warrant their use in interior decoration. A house was recently finished in this manner, the rooms selected being those in the upper story next the roof. The shingles were laid with the thin edge up, and, being of cedar, are supposed to make the rooms moth proof.

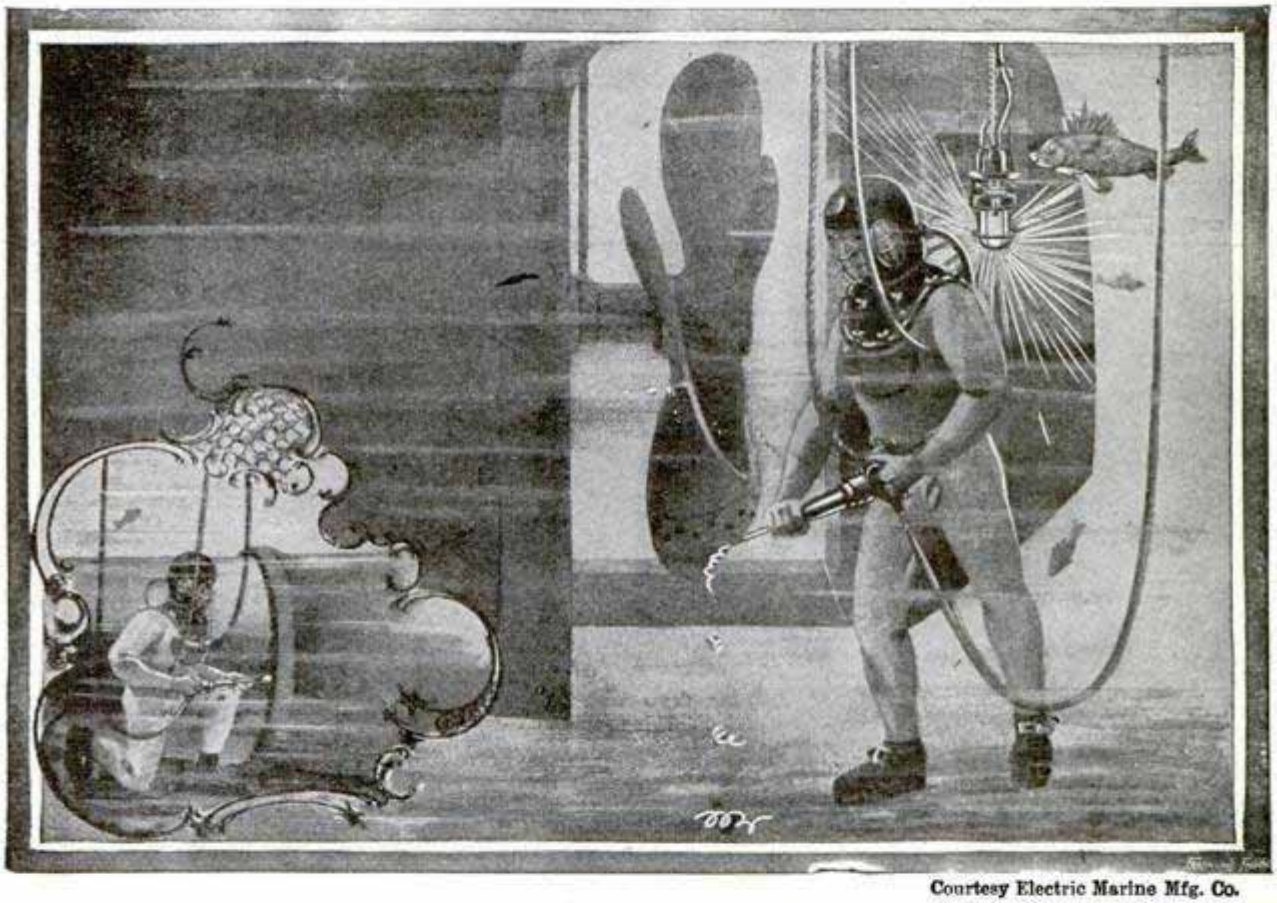
To avoid the injurious effects on the eyes usually resulting from reading while traveling, sit backwards in the car.

COMPRESSED AIR AND ELECTRIC LIGHT HELPS DIVERS

Air compressed to a greater pressure than that which surrounds a diver when he goes under water has been the prime essential to submarine work, and now the same force has been harnessed and serves as his greatest helper. In fact, the submarine electric light and pneumatic tools are revolutionizing diving work.

In sea water especially one has not to go many feet below the surface before his vision is greatly obscured. But with a strong electric light which can be carried under docks and vessels, and even into the hold of a sunken ship the conditions are radically improved. In most cases a diver is sent down, not for exploration alone, but for the purpose of making repairs. This involves the use of tools, but a repair job which would be easy on shore becomes very difficult when attempted under water. In addition to the impediment in the free use of his arms which his ungainly and heavily weighted armor involves, there is the resistance of the water to every motion he makes. The use of a saw is not quite so hard, but to hammer or strike a blow is a highly exhausting effort. It is as if one above water should undertake to drive a nail with a rope attached to his wrist and passed over the shoulder with a weight at the end. As submarine repairs are almost always on heavy materials, such as hard wood, metals, or stone, the work has been laborious and slow, and consequently very expensive.

Now that pneumatic tools have been added to the diver's outfit, his efficiency has been immeasurably increased. Every hour a large vessel is tied up for repairs means a big loss, and in time of war the cost of such delays cannot be estimated in dollars.



Courtesy Electric Marine Mfg. Co.

Diver Boring Propeller Blade

The application of this system of labor-saving tools to submarine work is one of the most important advances in many years.

No less important, and in some cases more so, is the submarine electric light which enables the diver to find the object of his search. Especially is this true where he must enter the hold of sunken vessels and make his way through cabins or over tumbled cargo. The great danger in such work is that the air pipe or the life line may catch on some obstacle, or even worse, be cut in two, in which event his chances of coming up alive are very slim. With the electric light he can avoid these dangers.

CLIMBING TALL STACKS WITH AID OF KITES

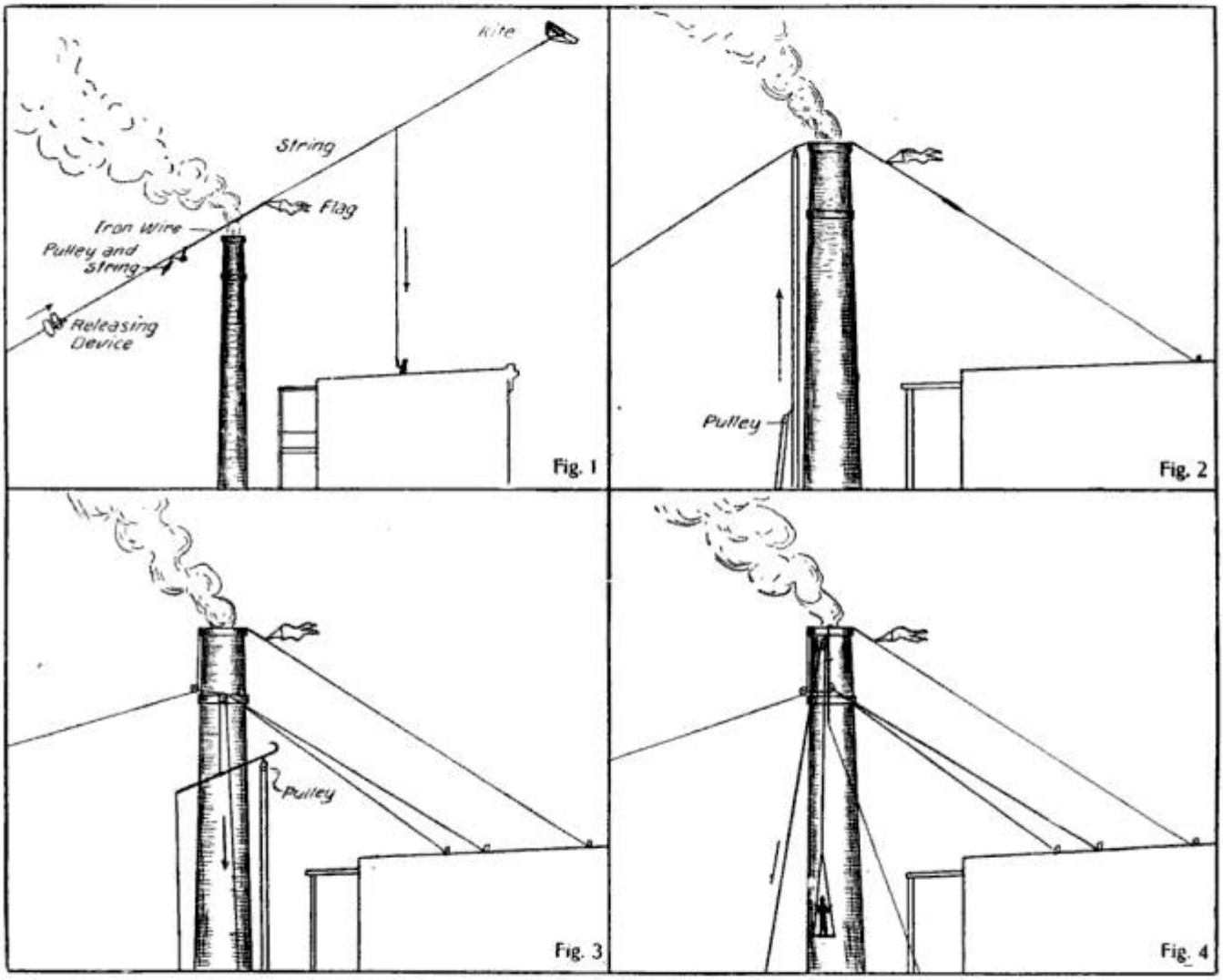
Novel Method of Repairing 170-Ft. Chimney—Kite Expert Tells How It Was Done

By E. E. Harbert

Having occasion to make emergency repairs to the large 170-ft. chimney of the Consumers' Ice Company, Chicago, and finding that the cost of erecting a scaffold ran up into hundreds of dollars and would take too much time, I decided to use one of my cellular kites for the purpose of hoisting and attaching a suitable block and tackle.

As one of the requirements of the undertaking was to obtain access to the top of the chimney without discontinuing its use, it was found necessary to interpose a 25-ft. section of iron wire in the kite string, to prevent the intense heat of the chimney from burning it. A flag was placed at the farther end of the wire, as shown in Fig. 1, in order to furnish a guide for locating the position of the wire, which was nearly invisible.

After the correct position of the wire was obtained the kite was hauled down and the cord fastened to the roof of a building, as shown in Fig. 2. A releasing device was then sent up, which consists of two wings attached to a frame, supported from the kite string by means of small grooved wheels. This allowed the device to be blown along the kite string in the maner of a "messenger" and was so arranged that the contact with a trigger near the chimney top caused a ball of string to drop to the ground, leaving a double string suspended to the pulley and allowing the elevation of a larger pulley and rope, as indicated.



The large pulley was hoisted a short distance above the collar of the chimney, which was 14 ft. from the top, and the ropes were then brought around each side of the chimney and fastened to the roof of the adjoining building.

This produced a fairly strong support, but not strong enough to bear the weight of a man, and still lacking 14 ft. of the top. A strong wood and iron hook was accordingly made and provided with a pulley at the hook end and a piece of rope attached to the

other end, for the purpose of raising the hook and making it catch over the top of the chimney. After the hook was caught on the top, a man was hoisted up and the work of painting and repairing continued in the usual manner.

Although it is often required to reach the top of a chimney in this way the future possibilities of kite-flying are by no means limited to this operation.

The operation of painting and repairing the roofs of church steeples has always been a serious problem and an expensive undertaking. If possible, the top is lassoed from the highest window, thus allowing a man to climb to the top of the spire and attach the necessary tackle, but when there is no window near the top it is necessary to break a hole in the roof. This has often been done in the past, but will probably be superseded by the use of kites in the future. Kites have also been used for stringing telephone wires and have proved very valuable for that purpose.

TUNNEL STERN MOTOR BOAT

American boat builders are following the English practice of tunnel stern construction, which enables the use of a good sized propeller in a craft of small draft. The illustration shows a boat built the past season for use on Lake Michigan and for exploring trips on rivers. The dimensions are: Length, 50 ft.; breadth, 10 ft. 6 in.; extreme draft with fuel and stores aboard, 14 in.

The dining room, 14 ft. by 10 ft., is forward, with folding berths; the engine room and cook's galley with berth for engineer come next, while the after-end has two staterooms. The bridge deck at the forward end is shaded with an awning and will accommodate a large party. The power is a 4-cylinder gasoline engine. The American Shipbuilder says:

While the yacht is not intended for speed or rough weather service, she made the trip across Lake Michigan in fairly heavy weather and behaved admirably, at the same time making good speed. This type of boat is between a cruising motor-boat and an out and out houseboat, having a part of the speed of the former and the good accommodations of the latter. Such a craft is well adapted for summer use on our great rivers or along the sheltered waters of the coast or the Great Lakes.

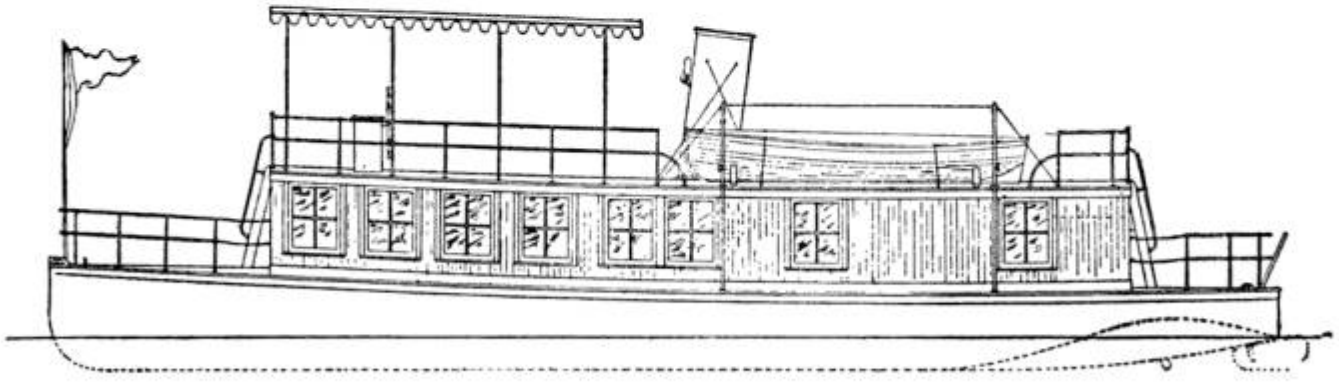
NOVEL USE OF RURAL TELEPHONE

A Kansas thresherman, who operates a large crew and several machines, has made use of the rural telephone lines in a way which will prove suggestive with others. The nature of his work calls for a change of location every few days. The first wagon to pull up and move is the office, which is equipped with a telephone. Immediately on arrival at a new place wires are run from the field to the nearest rural telephone line, and connection made. It is then an easy matter to order supplies, repairs, and whatever is needed, from the nearest town.

Arrangements are also made in the same way with the farmer to whom the outfit intends to move next, and help is secured from as many nearby farms or villages as may be required. The actual saving in money to a single contractor during one season amounts to a large sum, and saves hundreds of miles of driving, to say nothing of the increased comforts and convenience.

QUICK SETTING PLASTER OF PARIS

To accelerate the setting qualities of plaster of Paris, add a pinch of potassium sulphate to the water. This hastens the setting without injuring the plaster in any way.—Contributed by Dr. Carl Fossum, Wells Block, Aberdeen, So. Dak.



Draft Only 14 in.--Crossed Lake Michigan

LATEST MECHANICAL FEATURES IN FRENCH ARMY

The recent annual maneuvers of the French army disclosed four interesting features. One was the mounted extension ladder which can be wheeled into position, elevated and a lookout sent up in the same time required to unlimber a piece of field artillery. The idea is borrowed from the Japanese with some improvements, and can be extended to a height of 100 ft.

A portable light railway with the peculiar steam locomotives, shown in Fig. 2, is for transport use of both men and supplies. The track is ready made in sections and has only to be placed on fairly level ground and connected with fastenings which require but a moment to accomplish.

The new field use of the motor car is in transporting water which is carried in large casks, as shown in Fig. 4. The latest French siege gun is shown in Fig. 3.

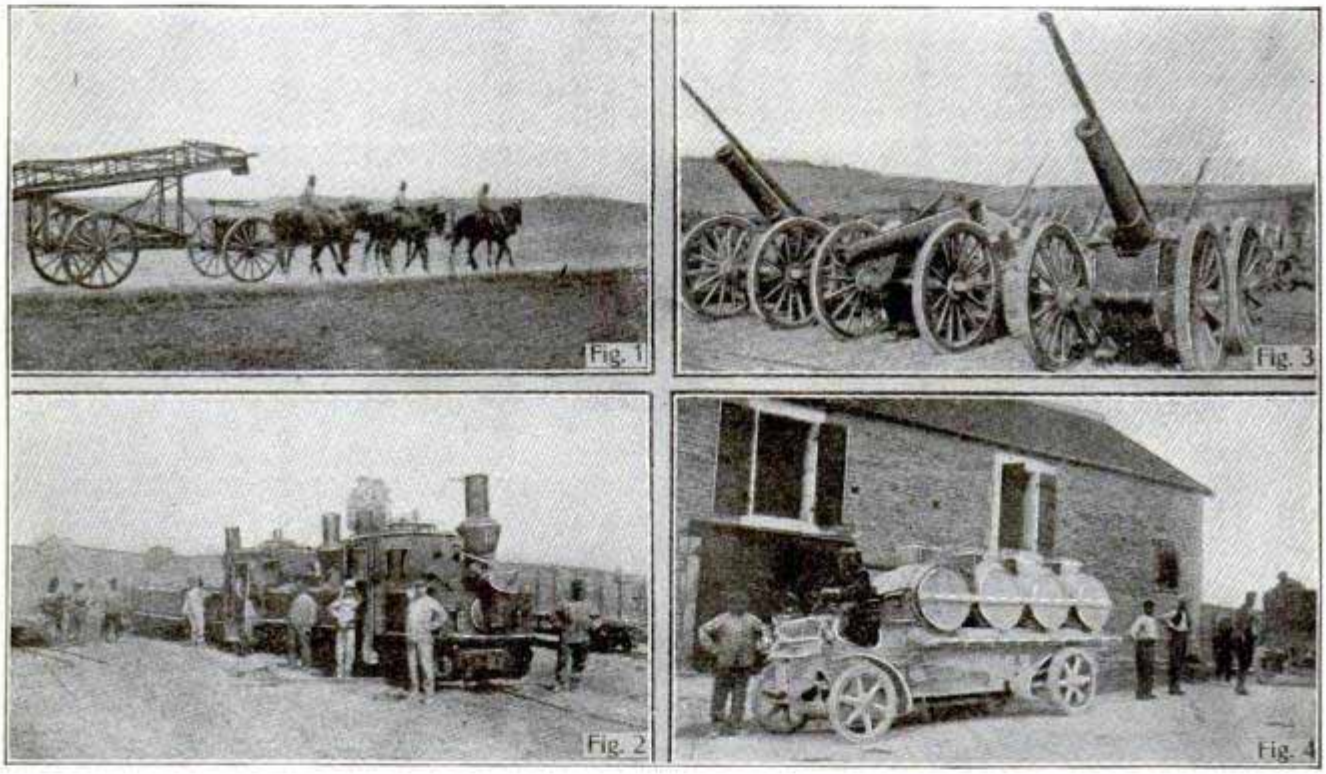


Fig. 1--Lookout Ladder
Fig. 2--Portable Tramway

Fig. 3--New Siege Guns
Fig. 4--Water Wagon

COST OF HANDLING IRON PIPE

The cost per ton for unloading cast-iron pipe is the same for all sizes. The cost of laying per ton, for pipe under 30 in. in diameter, is about 30% more than for pipe over 30 in. in diameter. As a matter of fact, 18-in. pipe costs twice as much per ton to lay as 48-in. pipe.

NEW METHOD OF MAKING CONCRETE PILES

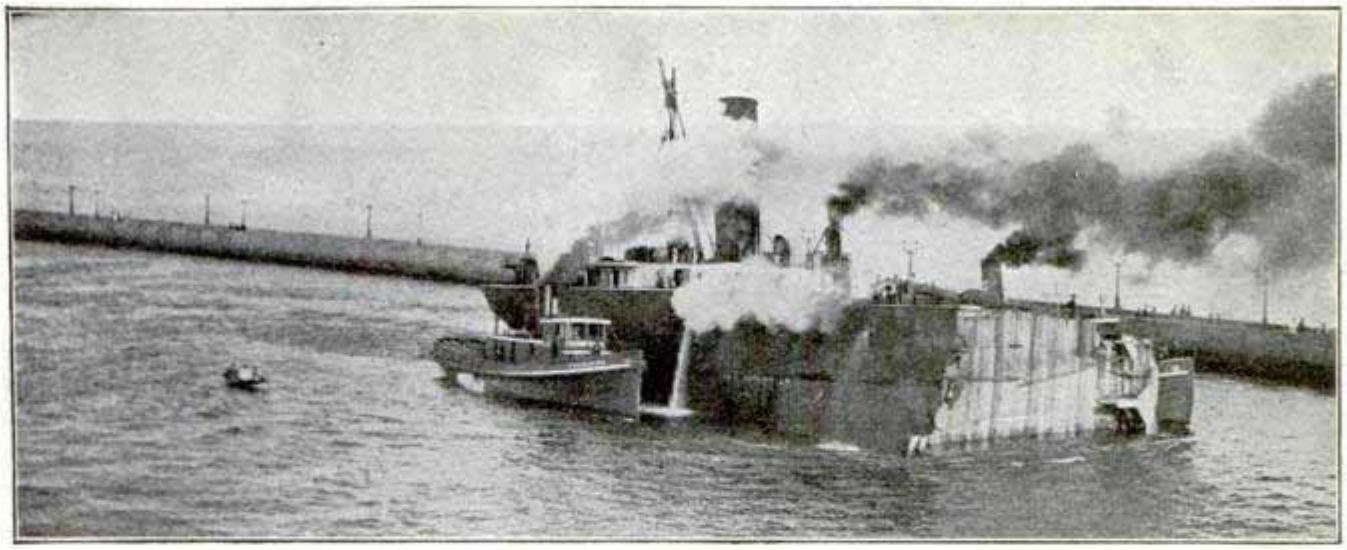
Now that reinforced concrete piles have demonstrated their superiority over wood, and the prospect of their general use, the new and greatly improved process of manufacturing concrete piles deserves mention.

The method, which is patented, uses a steel pipe as a form around which is wound the expanded metal or wire netting, and this is placed in a machine in which the pile is made by a rolling process. Piles and poles have already been made up to 61 ft. in length, but lengths of 100 ft. can be made by enlarging the machine. The cost for material and labor of a 61-ft. pile 13 in. in diameter is $1 per foot of length. A 30-ft. pile can be made and driven for $30.

LARGER CAR WHEEL FLANGES

The Master Car Builders' Association has voted in favor of increasing the thickness of the flange on a standard cast iron wheel, by ⅛ of an inch. The increased thickness, however, is back from the edge of the flange and will not interfere with present frogs and switches. The increase in weight for a 33-in. wheel is about 15 lb.

The dumb waiter does not take a tip, but it often takes a drop.



BRINGING IN A WRECK

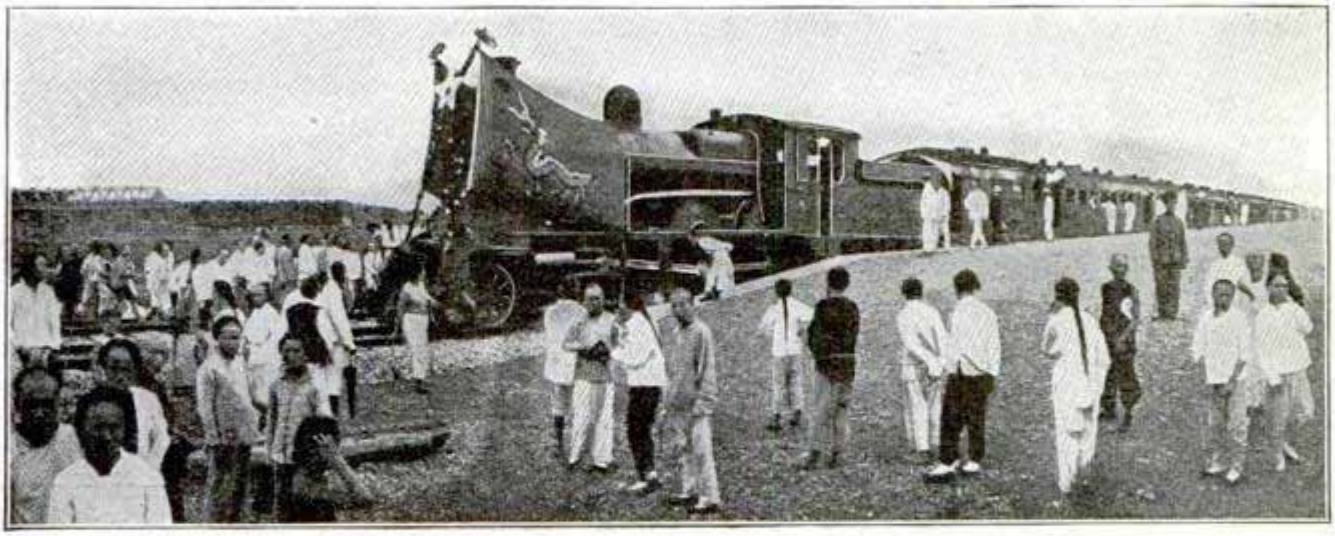
Piece of Steamer Recovered One Year after it Sank

The strangest craft which ever entered the Duluth harbor came in a few weeks ago. It was "all that's left" of the once proud steamer "Lafayette," which went down off Encampment Island, on the north shore of Lake Superior, during the great storm of November 28, 1905.

The "Lafayette" was 470 ft. long, one of the new steel boats that was considered storm proof, and at the time of the storm had in tow the steel barge "Manila." The forward part of the steamer pounded to pieces on the rocks and the section aft, containing the machinery, went down. This section was raised, brought into port by tugs, and the machinery taken out and put into another hull. The picture shows the wreck coming through the Duluth canal.

ALCOHOL FROM CORN COBS

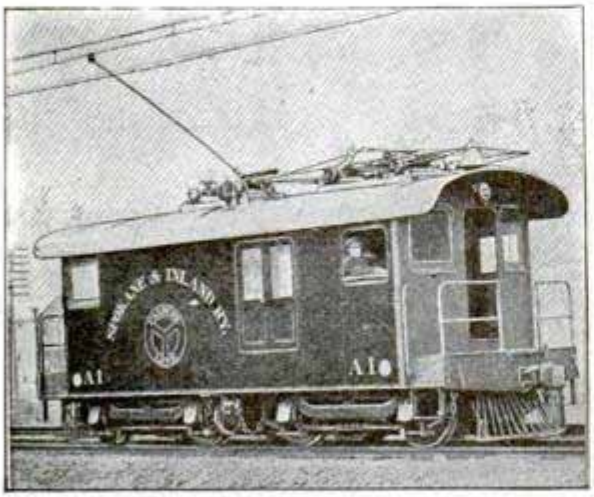
Government experts have found that 11 gal. of alcohol can be made from one ton of green corn cobs and about 6 gal. from a ton of the green stalks. These experiments were made with a view to making use of the waste from plants already engaged in canning sweet corn. Ordinary field corn shows about the same results. It is estimated that in the corn stalks of Iowa alone last year there were over 1,000,000 gal. of alcohol which went to waste.



IMPORTANT NEW RAILWAY IN CHINA—The new railway connecting Shanghai and Nankin, China, was recently opened amid great public rejoicing. A special train, decorated with evergreens and red and yellow bunting, carried 700 Shanghai merchants, guests of the railway corporation, over the line, along which a guard of Chinese soldiers and marines were stationed for the entire distance. Firecrackers and bombs figured in the demonstration. The railway crosses a rich district and promises to be a profitable venture. The effect of the innovation on the government of Nankin, so long opposed to progress in any form, is a matter of great interest, and will be an important factor in determining China's future development.

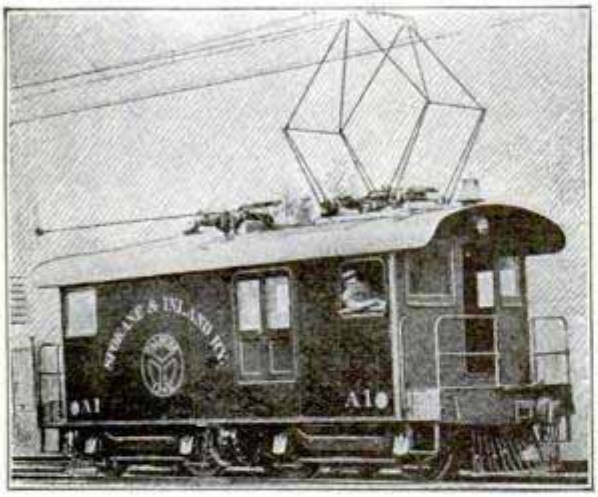
ELECTRIC FREIGHT LOCOMOTIVES AT SPOKANE

An interesting freight and passenger electric interurban road is running out of Spokane, Wash. The electric locomotives are



Trolley Used in Town

29 ft. long, weigh 49 tons, and will pull seven loaded standard freight cars at 30 miles an hour; there are four 150-hp. motors on each locomotive. The overhead trolley system is used, with a direct current of 600 volts in Spokane, 700 volts alternating current in the other towns, and 6,600 volts single phase system in the country. In the towns a trolley is used; on the high tension sections a pantograph collector. The only



Collector Used in Country

mechanical operation in changing from the direct to alternating sections is to change the trolleys.

TELEPHONES VALUABLE IN JAPAN

The telephone business in Japan is a government monopoly and when a subscriber dies, his instrument is worth just $400 to his heirs, because there is always such a long waiting list of would-be subscribers, and the only way to get a 'phone is to wait one's turn, else buy out some subscriber.

Usually the waiting list numbers about 8,000 and the government has neither the instruments nor the working force required to meet the demand. No matter what the 'phone is to be used for, business or residence, the rental is a flat rate.

In Tokio the cost per annum is $40 gold in advance, and there are 22,000 subscribers in that city and thousands more who would be glad to give $100 for telephone service. With the present waiting list alone, in Tokio it would be four years before the last man could be supplied.

ALCOHOL POTATOES IN GERMANY

Germany leads today in the manufacture and use of alcohol for light and power. In that country potatoes is the chief product from which alcohol is made. The potato crop last year reached the astounding proportions of 1,775,579,000 bu., or more than 53,000,000 standard tons. Of this amount nearly one-half was used in the manufacture of alcohol and starch. One-eighth of all the tillable land in Germany is planted to potatoes, which show an average production of 217 bu. per acre, which sold at an average of 27.6 cts. per bushel, or about $60 per acre.

In France alcohol for manufacturing purposes is made chiefly from molasses and sugar beets.

SAFETY EXPLOSIVE TESTED

A remarkable exhibition of a new safety powder was given at San Jose, Cal., recently. For transportation the powder is packed in two separate parts, each part alone being non-explosive.

In the demonstration each part was placed separately upon a sledge and struck with an iron rod, but neither preparation exploded. Then the two parts mixed were treated in the same manner, with a like result. An attempt to explode "sticks" of the separate parts with a cap and fuse was attempted, but only the caps exploded. Then a stick was filled with the mixture and fired with a cap and fuse, a terrific explosion following. One and one-half pounds of the mixture placed in a 6-ft. hole drilled in a rock weighing from 50 to 75 tons completely shattered the rock, pieces being thrown to a distance of 10 to 15 ft.

AN EARLY AUTOMOBILE.—Hancock's steam-coach, the "Era," plied the roads daily between London and Greenwich in 1833, just 73 years ago. The ponderous vehicle resembled two stage-coaches on end, with a rear compartment like a mail or luggage van. Parcels were carried on top also. The inventor claimed that he could keep up a speed of 10 miles per hour with his machine, but the record does not state that he demonstrated the matter.

WHALE FISHING WITH NETS

At Wangamumu bay, on the northeast shore of New Zealand, whales are caught in big steel nets. The nets are made of ¾-in. wire rope in 6-ft. mesh and have barrel buoys along the edges to hold them close to the surface.

A whale cruising along the shore strikes the net and gets his head through a mesh, and instead of backing out he rushes forward and entangles himself in the wire ropes. He may carry the net away from its anchorage with the momentum of his rush, but the buoys impede him, and instead of heading out to sea and taking the net with him, the whale thrashes about furiously and soon gets the wire ropes wound about his fins and flukes. The animal thrashes around until worn out, then the boats of the fishermen creep in upon him and the harpoon and lance are used.

When the whalers give chase in the old-fashioned way nowadays power launches are used instead of row boats. At Wangamumu all the parts of the whale are utilized, the bones and refuse being converted into fertilizer.

WELLMAN ARCTIC BALLOON HOUSE

The big balloon-house on Dane's Island, 600 miles from the North Pole, for the use of the Wellman Record-Herald polar expedition, is still under construction, but the great venture is not to take place until next summer. The reason for the delay is given as the late coming of the Arctic summer this year, making it impossible to lay the foundations of the house as early as was expected.

The balloon-house is 180 ft. in length, 82 ft. broad and 82 ft. high. The space it encloses is necessarily free of supporting columns of any sort. Five principal arches and four smaller ones braced together by 20 wooden bridges 36 ft. long are used in the structure and steel guy lines give it rigidity; the roof and walls will be covered with 5,500 sq. yd. of heavy sail cloth.

During the winter a thermal equipment for raising and lowering the balloon by the introduction of hot and cold air will be added to the air ship and the capacity of the gas bag will be increased by 1,000 cubic metres.

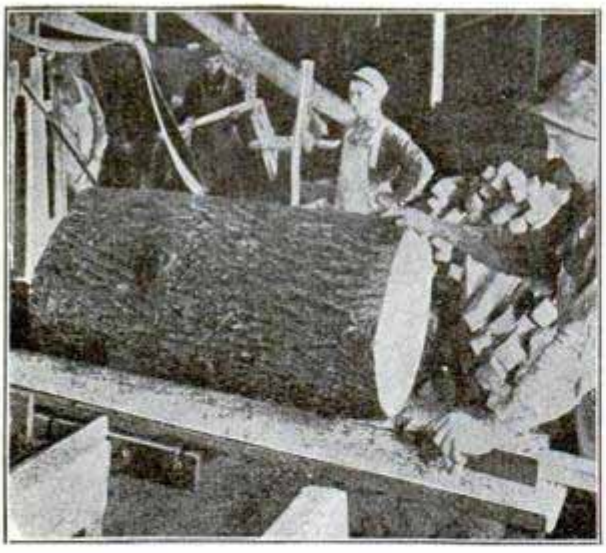
A LAMPLESS LIGHTHOUSE—This strange but ingenious beacon is located at Arnish Rock, Stornoway Bay, in the Hebrides, Scotland. It is a cone of cast iron plates, surmounted by an arrangement of prisms and a mirror, which reflect the light from the lighthouse on Lewis Island, 500 ft. distant across the channel.

LARGEST GREAT LAKES CARGO

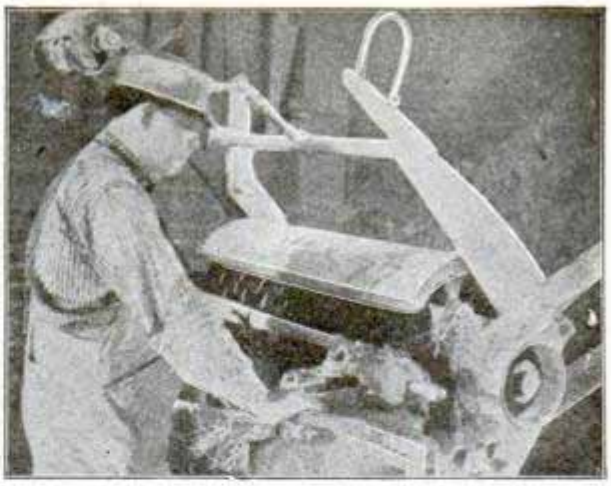
What is said to be the largest cargo ever loaded on the great lakes was put into the steamship "Henry H. Rogers," at Escanaba, Mich., on September 18th. It consisted of 15,081 net tons of iron ore. The vessel draws 21½ ft.

MAKING BASEBALL BATS

What becomes of all the baseball bats? is quite like the old inquiry of "What becomes of all the pins?" At any rate, big factories are running all the year round, turning out nothing but bats. When one considers the 10,000,000 small boys in this country, and that each one averages four bats during his early baseball days, the problem is reduced to figures which account for the demand. Bats are no longer whittled out of a piece of board as was done 40 years ago but are made on machines which turn out their thousands daily.

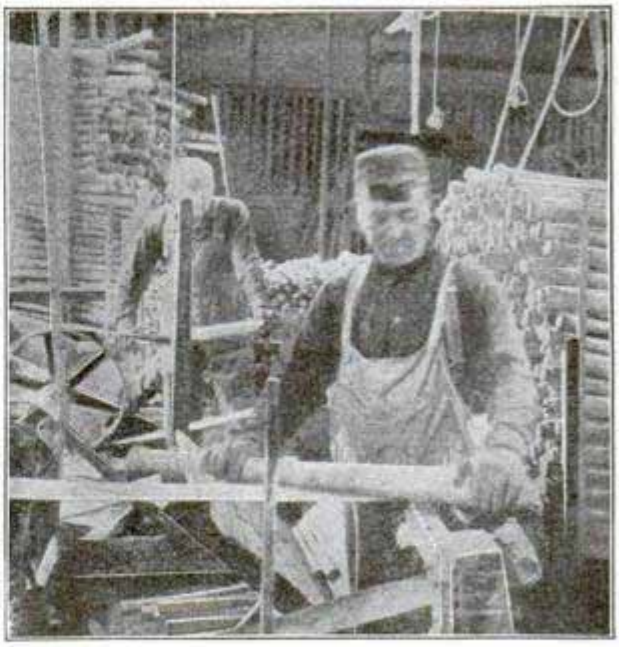


Sawing into Billets



Turned in Automatic Lathe

The process is simple but slow. First the logs are cut into "bolts" of from 32 in. to 42 in. long and the bolts sawed into billets 2½ in. or 3 in. square at the ends. Three years' seasoning is required for the best bats, either in the log or billet. The kiln drying process is rapid but not considered as good. The billets are placed in an automatic lathe which quickly transforms the stick into the graceful form of the bat. The bat is then smoothed and polished by being held against a rapidly moving, horizontal belt which is covered with sand. It is then ready for its coat of oil, varnish, or paint, as the case may be. White hickory and ash are the best woods, but these are becoming scarce and the small boy of a few years hence may have to use a bat made of paper, fiber, or even metal. The Sporting Goods Dealer says most of the wood used comes from Michigan and Ohio.



Polished on Sand Belt

LONG ARCTIC DAY IMPEDES WIRELESS

Wireless telegraphy works much better at night than in the daytime, consequently wireless operations in the Arctic regions have been much hampered throughout the continuous day. Wireless is used between Fort Michaels and Nome, as it was impossible to maintain a cable there on account of the ice movements. The difficulty in transmitting messages, however, does not exist for protracted periods, but only intermittently.

8,000 MILES OF PACIFIC CABLE

A line of cable 8,000 miles in length now connects San Francisco with the Philippines and forms a huge link in the communication facilities between the United States and the Sandwich Islands, the Philippines, China and Japan. The work was inaugurated in the face of formidable obstacles by John W. Mackay in 1902, and on his death the enterprise was carried to completion by his son. The depths through which the cable is laid are the greatest ever encountered and the absence of stations is extreme, yet the work was carried on with remarkable rapidity.

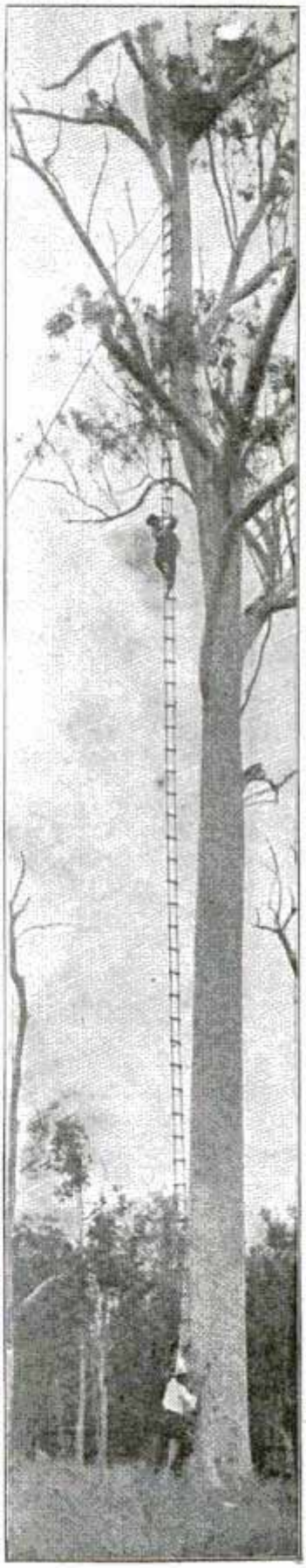
DOES IRON GROW?

The technical journals of the world are conducting a discussion on the question "Can iron grow?" The Iron Age, commenting on the experiments of A. E. Outerbridge, Jr., of Philadelphia, Pa., says that all of his experiments show a remarkable difference between cast iron on the one hand and steel or wrought iron on the other, when heated red hot, allowed to cool, and reheated a number of times. It was shown that unless cast iron was heated to a cherry red it does not permanently expand. This was proved by means of bars heated daily for nine hours for more than a year in an oven and cooled overnight. There was no permanent change. The increase in length of rails on a swing bridge may be attributable to a purely mechanical cause, namely, the stretching of the rails, due to the rolling of heavy trains across them. Mr. Outerbridge says: "Heating and cooling day and night would not appreciably change the length of rails permanently. This, of course, has nothing to do with the temporary change in length, due to changes of temperature."

ROPE LADDER FOR TREE CLIMBING

The Australian naturalist, S. W. Jackson, who is making a study of all the bird life of that continent, utilizes a rope ladder in reaching the nests of eagles and other large birds which build their nests in lofty places.

A gun and life line, such as are used by life-saving crews, serve to pass a small rope over the tree top, after which a stronger rope draws up the rope ladder. The tree in the illustration is nearly 150 ft. high.



TO EMPTY SALTON SEA

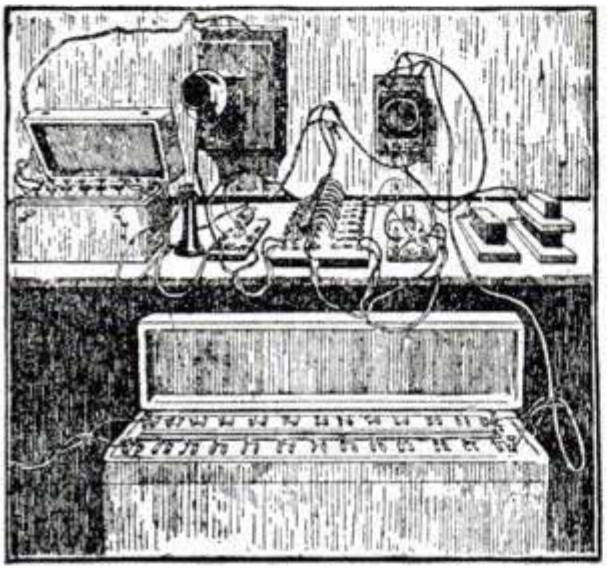
Salton sea in the Colorado desert was created by the diversion of the Colorado river from its regular channel into the Salton basin, 262 ft. below sea level, following the exploitation of an irrigation company. To the Southern Pacific railroad, the desert sea brought trouble. Six times parts of its tracks have had to be removed and all effort to stay the inrushing waters proved vain.

The railroad company now plans to construct heavy embankments at the point where the river waters flow into the old channels and thence into the basin. The work will cost $700,000, but it is believed will be effectual.

Though Salton sea is 30 ft. deep, it will entirely disappear in three years, through percolation and evaporation under the fierce desert heat, if its supply is shut off.

TESTING LONG DISTANCE TELEPHONES

The device here shown was constructed for the purpose of producing artificially the



Artificial Resistance for Telephone Line

amount of resistance found in long distance telephone lines. It was designed for testing long distance telephones and apparatus which would be impractical to use in ordinary tests.

The large box on the floor contains several miles of wire, which can be connected up to give a resistance corresponding to a line of any distance from one to one thousand miles.

ALL-STEEL TRACK PREDICTED

In discussing the question "Where shall we get the second crop of ties to replace those now being used?" L. T. Nichols, manager of a southern road, says: "We won't get them." He adds: "In my humble opinion we must abandon all ties of whatever material when used across the track and instead use a tee girder under the rails with width of web sufficient to give necessary bearing on the ballast to bear up the weight required, and tie together these two longitudinal tee girders under the rail with a cross tee of equal web, forming a complete girder with the rails fastened on them by a fastening similar to the rail brace.

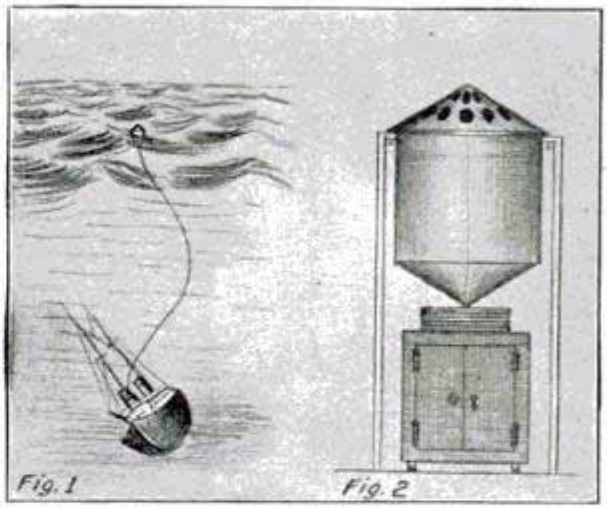
"In order to hold the ballast under the web it will be necessary to cover the web with an additional plate tucked over an inch in the ballast. A track of this character can be surfaced and lined and otherwise maintained without much additional difficulty over the present form of construction."

BUOY FOR LOCATING SUNKEN VESSELS

A Dawson, Y. T., inventor has recently devised an apparatus for indicating the location of a sunken vessel by means of a buoy, which is released by the sinking of the ship. When this occurs the buoy floats to the surface, where it remains, attached to the vessel by means of a long rope, as shown in Fig. 1.

The apparatus is not only used for marking sunken vessels, but also for enabling the immediate recovery of the principal valuables of a ship, by means of a second rope attached to the safe or box, as shown in Fig. 2.

In order that the buoy may be more readily discovered a large bell, placed above the air chamber, is sounded continuously by the impact of an iron ball which rolls



Buoy for Locating Sunken Vessels

from one side to the other by the motion of the waves. The ball is so arranged that it is confined to one place until the buoy floats in the water, thus obviating the annoyance that would be occasioned by allowing it to operate at all times.

HOW WALL PAPER IS MANUFACTURED

Vivid Contrast with Earlier Times--Annual Consumption 250,000,000 Rolls

By W. Frank McClure

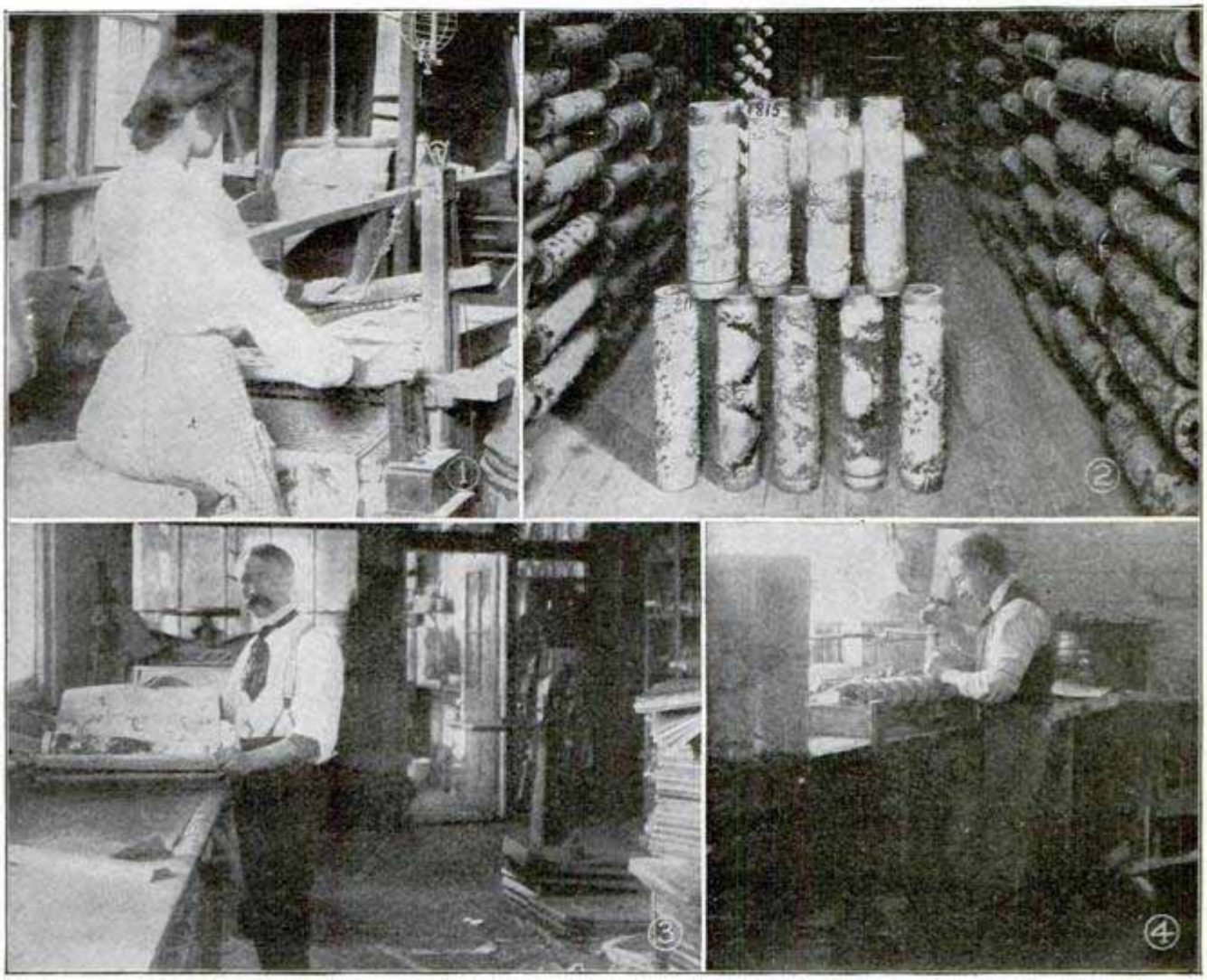
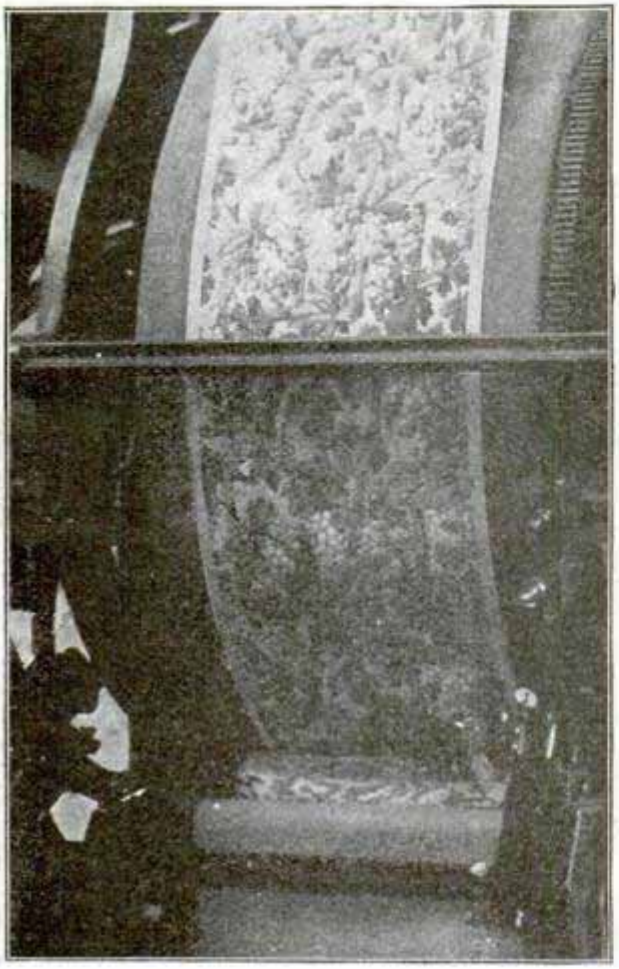


Fig. 1--Cutting the Finished Wall Paper. Fig. 2--Printing Rollers Showing Designs. Fig. 3--Making Sample Books. Fig. 4--Engraving a Printing Roller.

Wall paper was not always made in webs or rolls and in the multitudinous designs and colors with which we are familiar today. Although it is claimed that the Chinese did, to some extent, use paper for wall decorations, the early history of wall coverings, in the main, is lost in the hand-woven tapestries which adorned the sides of the first Jewish palaces or the palatial living quarters of the ancients of the Far East. For centuries the countries of Europe knew no other wall covering than hangings of cloth and leather. Some time after the United States was settled, tapestries made their appearance in this country but never found the favor that was accorded them in the Old World. Then came the real wall paper in imitation of tapestry, but not in rolls. To the contrary, it was made in sheets and was sold by the booksellers at a fancy price. For a long time it could only be afforded by the rich. Today a roll printed in numerous colors can be had for a cent and the most menial laborer refreshes his domicile by a new coat of paper with notable frequency.

The United States, but loosely fettered to the conventional tapestries, in due time broke away from somber colors and early ideas with the result that nowhere on the globe can such a variety of designs be found. As our population has increased and moved into new territory, and the pioneer cabins have given place to better homes,

the wall paper industry has kept growing, until today our annual consumption in this



Paper Leaving Press

country is about 250,000,000 rolls with no prospect of a decreasing demand. Ten thousand people are employed in the wall paper industry aside from those who sell the product and those engaged in hanging it upon the walls.

The paper for modern wall hangings is made from wood pulp and arrives at the wall paper factory in huge rolls from which it is fed into the printing machines. It comes in at least four different thicknesses.

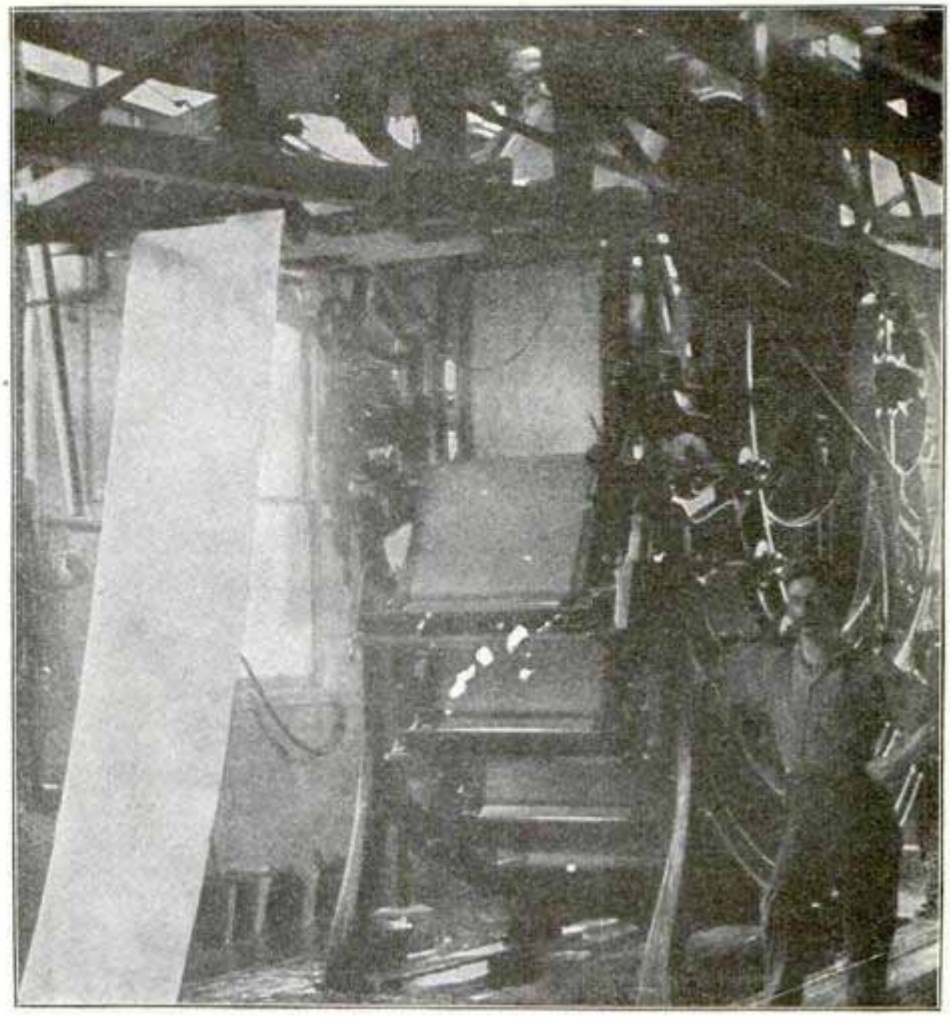
The chief preliminary operations to the actual printing of the paper are the making of the pattern rollers and the mixing of the colors. Both operations require skilled workmen. A slight mistake in the preparation of a single tint might mar the beauty of an entire pattern. All the tints must be kept uniform throughout each pattern. The many colors used in the making of wall paper come to the factory in their raw state from different parts of the country and are prepared in vats and handled in buckets.

The designs for wall paper are first sketched and then painted by hand. The pattern is then transferred to rollers. Each color is applied to the paper by a distinct roller. One roller, for example, prints the leaves of a floral design and another the petals of a rose. The rollers are usually cut from maple wood. The outline for a design is marked upon a roller and then a workman with a sharp instrument cuts this outline into the wood to a stated depth. A brass strip is next shaped and then pounded into this outline, only a portion of it, however, is imbedded in the roller, the remainder constitutes a raised outline corresponding to that which was first drawn and then cut upon the roller. This outline is subsequently filled in with felt cut to fit. For a workman to make an entire wall paper design consisting of sides, ceiling and border often requires weeks of time. A pattern calling for ten colors would require ten rollers for the sides, another set for the ceiling, and still another set for the border. These rollers, when not in use, are stored in tiers after the manner illustrated in one of the accompanying photographs.

Where the Colors Are Mixed

Before the white paper reaches the rollers of the printing machine it passes through a device equipped with mechanical brushes which apply the background. As it leaves

this device it is gathered up in festoons and automatically carried to the opposite end of the building over a system of steam pipes, while simultaneously hot air is blown into the folds, all of which dries the freshly applied background in preparation for its journey through the printing machine proper. It is now carried for some distance upon a cloth web to a large drum — a conspicuous feature of the printing machine. This drum brings the paper to be printed in contact with the printing rolls. Each roller is supplied with its respective color from a separate receptacle and each receptacle in turn is kept well filled at all times by attendants with buckets. After leaving the printing machine the operation of gathering the paper into festoons and its transportation over steam pipes is repeated. All this is decidedly in contrast to the days of 70 years ago when small sheets of wall paper were printed by hand from wooden blocks. In 1843, a machine was invented by a Yankee for printing two colors at the same time. It was considered a great achievement.



Rotary Wall Paper Printing Press

On the modern wall paper machine there is an automatic device which measures the finished paper into double rolls and places upon the margin a small black line while at the same time it registers the number of rolls turned out. Girls at machines cut the webs of paper into double rolls after which the requisite number are tied into bundles ready for shipment.

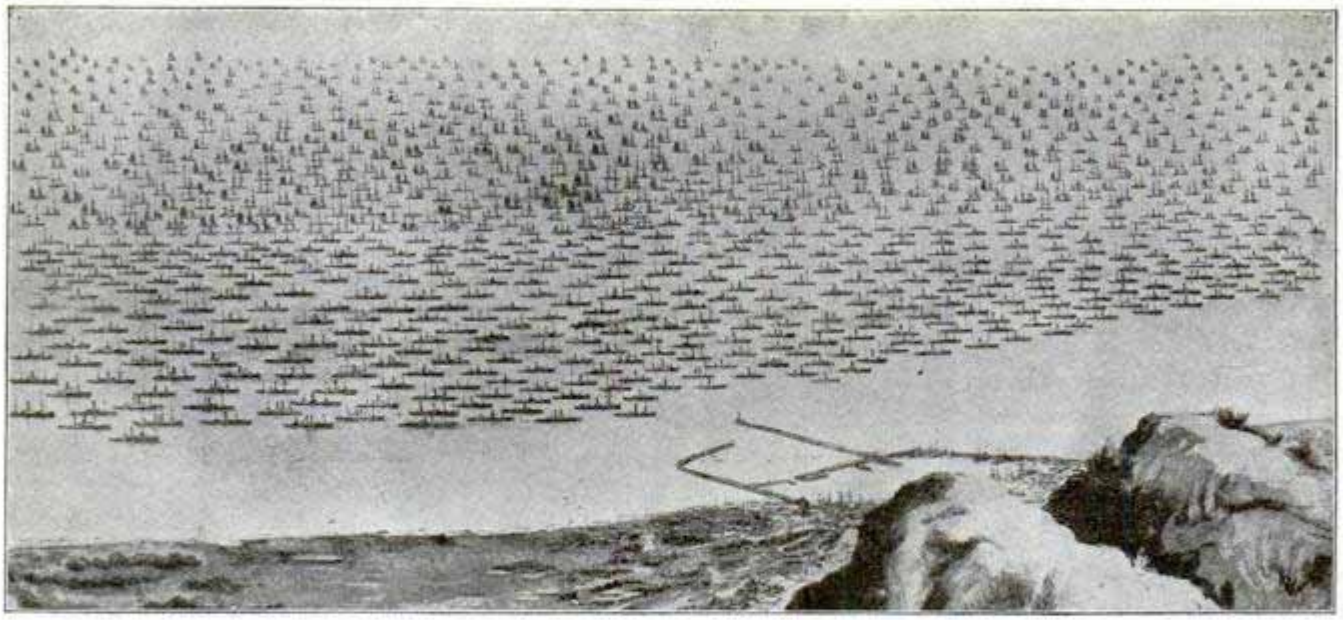
The present styles in wall paper are very unique and beautiful. There is quite a tendency again toward the old tapestry designs and a decided demand for picturesque papers embracing scenery and birds. Dutch children, Mother Goose, and even animals figure in the wall paper of the nursery and, as in the days of a century ago, there is a demand for marine scenery on the walls or upon borders. Large floral designs in gorgeous effects are likewise very salable.

Every time the style changes, and this is often in America, new sample books must be made up. In fact sample books are prepared every year. A visit to a wall paper factory would not be complete without a glimpse at the sample department. Tons of paper are used in this way by many factories. These books are made up a year or so in advance of the styles on the market. Designers and pattern makers work far in advance. Much of the printing, too, must be done a year ahead.

TO TELL 50 POUNDS OF ICE

If you would know whether your dealer gives you full weight when you order ice, use your tape measure. A 50-lb. block should be 15 in. long, 10 in. deep and 10 in. broad.

The military medical and hospital corps of Turkey uses a red crescent as its emblem, instead of the red cross used by other countries. This is in deference to the soldiers' religious opinions.



The Sea's Toll for 1905--1,038 Vessels

ONE YEAR'S TOLL OF THE SEA.—The occasional account in daily papers of a vessel lost at sea gives no adequate idea of the magnitude of marine disasters. During 1905 the losses amounted to a great fleet: 389 steamships and 649 sailing vessels, a total of 1,038. The fact is graphically portrayed by the London Illustrated News, from which the above illustration is taken.

GREAT PHILIPPINE NAVAL BASE

Improvements to Cost $1,000,000--Impregnable Fortifications to be Established.

At Port Olongopo, not far from Cavite, in the Philippines, and where the huge dry dock "Dewey" is now stationed, the Government is establishing a large and completely equipped naval base at an estimated cost of $10,000,000. Enormous machine shops, eight of them all told, and roomy and perfectly appointed quarters for officers and men are among the specifications, while the fortifications are to be such that danger from attack by sea will be minimized to the lowest degree.

The coaling system will comprise six units, all in duplicate, and each made up of a steel and concrete wharf 250 ft. long and 80 ft. wide, a storage shed of 15,000 tons capacity (sufficient to coal four to six large ships) and modern coal-handling apparatus. The deck of each wharf will be 42 in. thick along the outer edge, where the load is heaviest, and 24 in. thick at the shore. Along the shore a concrete retaining wall is being built into which the decks of the wharves extend. Huge pillars of concrete, 4 ft. 6 in. in diameter, and going down to a depth of 39 ft. in some places, will be used to support the wharves.

The conveying machinery on each wharf will be able to unload and store the coal from a collier at the rate of 200 tons per hour, and a battleship can be coaled twice as fast. The coal handling apparatus includes belt conveyer systems and traveling cranes with clam-shell buckets. An electric alarm system will warn of fires in any of the wharf bunkers and powerful pumping apparatus is to be provided for fire protection. A notable feature is the absence of wood construction throughout, offering nothing for the white ants and teredoes of a tropical climate to undermine and destroy.

RAILROAD ACROSS MEXICO TO PACIFIC

The Mexican Central is pushing its line across the country to Manzanillo on the Pacific coast. The road is to be completed within two years. One section of 40 miles will cost $5,000,000. The route is across vast chasms hundreds of feet deep, through numerous long tunnels and passes close to the active volcano, Colima. The track construction is the best in Mexico. A large lake at Manzanillo will afford a magnificent harbor by canal connection to the ocean. Indications are that this city will become one of the important ports of the world.

Compressed air has more weight than is generally supposed, a cubic foot at 300 lb. pressure weighing 1½ lb.

BRIDGE HALF MILE IN AIR

Highest in the World--Will Carry Trolley Cars Across the Royal Gorge

The Royal Gorge, in the Rocky Mountains of Colorado, one of the most famous scenic points in this country, is being spanned by a suspension bridge from which the passengers on a trolley line can look down one-half mile. Below, the waters of the Arkansas river roar through a channel less than 50 ft. wide, and so nearly vertical are the walls of the canon that the bridge is only 230 ft. in length.

The bridge construction is the usual suspension type, with a single track, and extra high railings. A decided novelty is the glass floor through which tourists can look down without any danger. The notable "hanging bridge" of the Rio Grande road is directly beneath this new and scarcely less remarkable construction.

Heretofore the highest bridge in the world was the one only recently completed over the Zambesi river on the line of the Cape-to-Cairo railroad at Victoria Falls, in Rhodesia, in South Africa. This bridge is 450 ft. above the river—only a little more than one-sixth of the height of the one that is to span Royal Gorge. It is, however, much longer, being 650 ft., comprising three spans.

Highest Bridge Has Floor of Glass

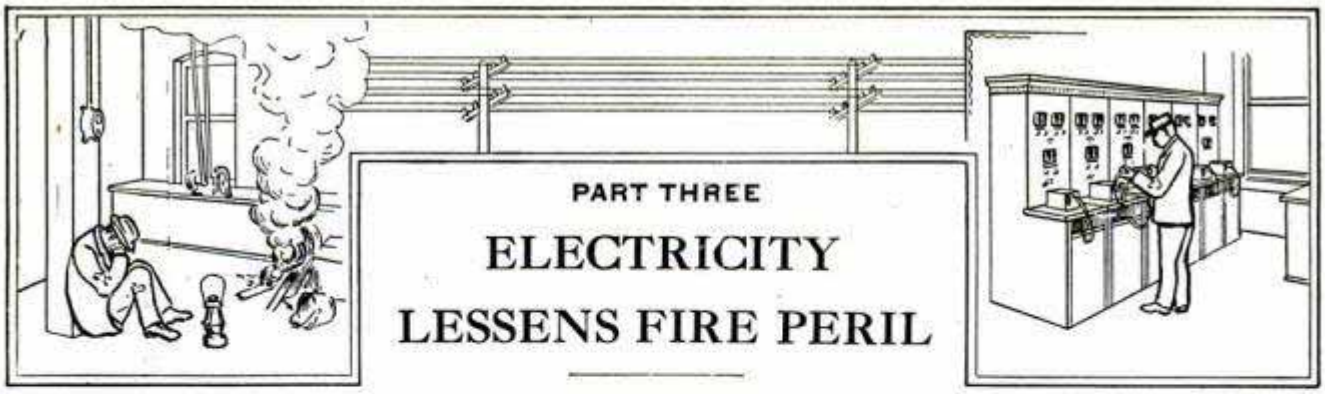
JAP BATTLESHIP "MIKASA" FLOATED

The Japanese battleship "Mikasa," which sank in September, 1905, as a result of an explosion on board, has been raised and successfully floated. The "Mikasa" was one of the "hero ships" of the late war and figured bravely and formidably in the annihilation of the Russian fleet. The vessel sank in the home harbor of Sasebo and many brave men went down with her. She is 400 ft. long, 75½ ft. beam, draws 27 ft.; h. p., 16,400; speed, 18.6 knots.

MECHANICS WAGES SHOW INCREASE

Industrial wages paid in the United States for 1905 were 1.6 per cent higher than for the preceding year, according to official figures. The cost of food increased by 0.6 per cent, which left the workingman 1 per cent additional revenue.

Alum boiled in water until dissolved and then applied hot with a brush will destroy vermin without endangering human life or injuring property.



PART THREE

ELECTRICITY LESSENS FIRE PERIL

How Fire Alarm Companies Are Warned of Danger

In order to reduce fire insurance rates there have been organized in several of the large cities of this country, private fire alarm companies whose purpose it is to provide suitable devices for increasing the effectiveness of city alarms and for automatically reporting any disorder in sprinkler systems and other apparatus. When the amount of money that is paid yearly for insurance is taken into consideration, it will explain the incentive that has led some of the most clever mechanics and ablest electricians to give the closest study and most assiduous labor to the solution of these problems. The success that has attended their efforts is apparent in the reduction of insurance rates, offered to all policy holders whose property is under fire alarm company's supervision. The reduction is usually from 10 to 25 per cent, depending on conditions, the exact amount being determined by the local governing body of fire underwriters.

Switchboard at Central Office

The general practice among fire alarm companies is to have a central office, from which all the lines radiate to the various points where apparatus is installed.

Most of the fire alarm devices in use at the present time are operated on a short circuit, i. e., when the current is flowing it indicates that everything is normal and in order to give a signal the current is interrupted. The advantage of this system over the open-circuit system is that the circuits are under test at all times. Suppose, for example, that a wire should become broken: the current would be interrupted and the instrument at the central office would make a long dash on the tape. A man could then be sent out immediately to make the necessary repair, while if an open-circuit system were used, there would be no way of discovering the disorder until the lines were tested.

Another advantage of the closed-circuit system is, that the alarms are sent by breaking the circuit instead of completing it. A device for breaking a circuit of ordinary voltage is always more reliable than one for making it. For instance, suppose a wire were cut and the free ends separated, the circuit then would surely be broken. But if the ends of the wire were brought together again the circuit might be completed, or it might not. If the wire were corroded or dirty, so that the ends would be slightly separated, the circuit would certainly not be complete. Most of the brushes and contacts used in fire alarm construction are operated by comparatively delicate forces and for this reason a small amount of dirt or corrosion would prevent their operation.

Another advantage of the closed-circuit

system is that it can be made absolutely tamper proof, any attempt to cut or short-circuit the wires being instantly known at the central office. Not only is the circuit tamper proof, but also all devices connected with it. In some of the apparatus the mere loosening of a nut will break the circuit and give an alarm to the central office, and any attempt to make a short circuit while performing that operation will also be made known, as a secret resistance coil, inside the device itself, would be cut out and the resulting increase in the current would give a trouble signal.

This practice of employing secret resistance is used very extensively in all fire alarm apparatus, especially in a device which could possibly tempt any malicious person to destroy the effectiveness of the system. So thoroughly are the devices protected that a person would not dare to open a cover, turn a screw, or tamper with the contrivances in any way and even the employees of the company who are familiar with the construction of the apparatus are required to notify the operator when they intend to examine them. The alarms are then ignored at the central office until the required tests or repairs are completed.

Although less complicated than some circuits, the fire alarm circuits are by far the most ingenious ever devised. The system usually adopted consists of two wires and a ground. The current goes out on the line wire and comes back either through the return wire, or across the ground, or both, according to conditions. When everything is in order, the signal circuit is through both return wire and ground, but in case the line becomes crossed with an outside wire, short-circuited, or broken, the signal will come in over the ground only. There are two sets of instruments at the central office: one for the metallic circuit and one for the ground circuit, and each one works independently of the other, but if for any reason either circuit becomes disordered, it is repaired as soon as possible in order to reduce the chances of both becoming disordered at the same time.

It frequently happens that telephone linemen, when making repairs or testing their circuits, mistake a fire alarm wire for a telephone wire and get the two lines crossed. When this happens there is a click and a buzz at the central office and the instruments pour out the long strips of paper tape until the operator turns a switch, which throws them out of the circuit. The fire alarm circuit is then entirely dependent on the ground and for this reason every possible effort is made to clear the line as soon as possible. The operator usually attaches a telephone to the disordered circuit and informs the lineman of his mistake, and if this will not remedy the trouble, he turns on a small motor dynamo. This sends a current out over the line which either gives the troublesome person a shock, or, should he be using a telephone, produces such an abominable noise that communication is impossible.

As stated before, the current in most fire-alarm circuits flows continuously until a signal is sent over the line, the interruptions in the circuit being produced by small notched wheels (Fig. 1), placed in the various sending devices. The brushes rest on the blank part of the wheel normally, as shown, but when the wheel revolves, the notches in passing the brushes cause interruptions in the circuit and thus produce the signal, which is recorded on the paper tape at the central office. Any failure on the part of this device either in breaking the circuit or making it again would render the system ineffective at that point and for this reason the lines and all devices are regularly tested.

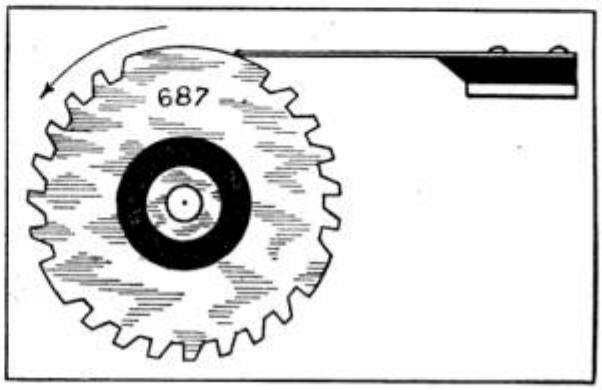


Fig 1--Circuit-Breaking Device

A man goes around to all the watch boxes, transmitter boxes, manuals, and other devices and starts the notched contact wheels in each, to see if they are working properly. It is sometimes necessary to adjust the brushes and when this is done the lineman calls up the operator and by means of a portable 'phone inquires if the signal has been properly recorded by the receiving instrument.

Undoubtedly the greatest protection against fire is found in the automatic sprinkler system, which, if kept in order, makes the conditions for a large fire almost impossible, except in buildings containing large quantities of oil or other inflammable material. However, if these sprinkler systems are neglected their reliability is greatly reduced. For instance, if the water in

the storage tank were allowed to evaporate or freeze the entire system would be inoperative, but when the sprinkler system is under the supervision of the fire alarm company all these dangerous disorders are eradicated.

The operator sitting at his desk in the central office knows the conditions of all the sprinkler plants under the company's supervision just as well as though gifted with a "second sight" that would enable him to see all parts of the various plants, and he can tell within certain limits the height of the water in all tanks, the temperature of

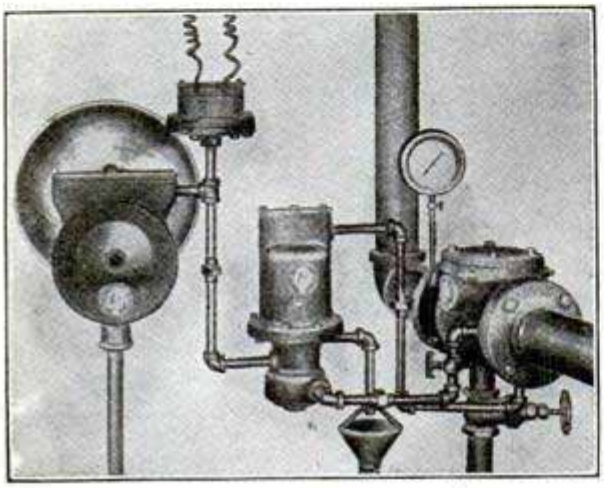


Fig. 2--Sprinkler Head Alarm

the water, the air pressure in dry pipe lines and in pressure tanks, etc.

The operator can also tell whenever a sprinkler head is opened, and if this occurs during the night, he sends in a city fire alarm.

In the day time the alarm is not sent, but instead, the operator calls up the building wnere the sprinkler head has opened and sends a man out to shut off the water. The reason for this is that an open sprinkler head in the day time is usually caused by an accident, such as striking it while moving a ladder, or in some other way breaking the link without fusing it.

One of the devices for giving a sprinkler head alarm is shown in the illustration (Fig. 2). This device consists of a special check valve, the clapper of which uncovers a number of ports in the seat when any flow of water takes place and thus operates an electrical and mechanical alarm device. The electrical alarm notifies the central office and the mechanical alarm, which consists of a water motor and a large gong, will attract attention in the vicinity of the trouble.

Ever since the Iroquois Theater disaster the playhouses of Chicago have been protected by a special theater circuit. In one theater a large damper directly over the stage is arranged to open automatically when the temperature exceeds 160°, thereby making an opening 22 ft. by 6 ft., thus allowing the flames to ascend to the open air instead of spreading through the auditorium. The damper is operated by a weight of several hundred pounds, which is held by a system of levers, connected to the armature of a small electro-magnet.

An attractive force of only a few ounces will prevent the weight from falling, but when one of the thermostats melts, the current which flows through the magnet normally will be broken. The magnet will then release the armature and the levers will allow the weight to fall, thus opening the dampers and perhaps saving hundreds of lives.

RAILROAD BUYS A TOWN AND MOVES IT OUT OF THE WAY

A railroad out in California has actually bought an entire town, and a good sized one at that, and moved it back out of a valley up on to the hillsides in order to make room for its roundhouses and big switching yards. The town is Roseville, for the name was moved along with the stores, houses and streets, and it is the Southern Pacific which has made all this stir, and is spending $500,000 in laying 50 miles of sidings. What it cost the company to buy and move the town is a well guarded secret. Roseville will be a triple junction point for the line east and west, north to Portland, and south to Los Angeles.

A part of the town was moved each way, leaving the tracks between, but all the cross streets have been closed, and to go from one side of town to the other requires a trip of several miles around the switch yards. Through freight trains will be made up at this point with a saving of 24 hours over present arrangements.

UNITED STATES CAVALRY JOURNAL

Through an unintentional oversight, the interesting article on "Team Work in War," by Major Squier, reprinted in our August issue, was not credited to the Journal of the U. S. Cavalry Association, in which the article first appeared. The Journal is a fine 200-page quarterly, which ranks with the best magazines, and is a credit to the service and its editor, Capt. Herbert A. White.

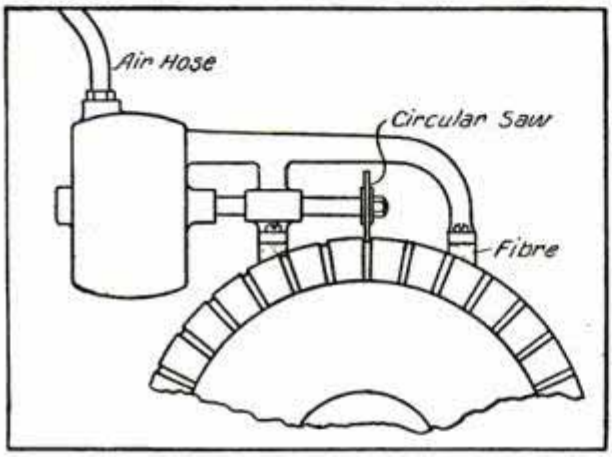
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

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

UNDERCUT COMMUTATORS

It has been found to be good practice to undercut the mica, to the depth of about 1-32 in. between the commutator bars on all of the larger types of both direct and alternating current commutator type railway motors. It is claimed of commutators so treated that the heating from poor commutation, which in the untreated commutator is caused chiefly by unequal wearing of mica



For Undercutting Commutator Insulation

and copper, is reduced to a minimum, also that it is not necessary to use as heavy a spring tension, which cuts down brush friction and its consequent heating. It also reduces the breakage and chipping of carbons by cutting out the hammer effect which is produced by running over a roughened surface with a 7- or 8-lb. spring tension.

The method adopted by one of the largest manufacturers is clearly shown in the illustration, and needs but a few words of explanation. The armature which is to have its commutator under-cut is set up on a couple of horses, and the tool (see sketch) is started in the groove at the inside end of the commutator.

The tool consists of a small air motor with an extended shaft and an outboard bearing. On the outer end of the shaft is placed a small circular saw, about 1-32 in. by ¾ in. Two blocks of fiber, cut to the arc of the commutator, are riveted to the outboard bearings, to act as guides, also as gauges to prevent the saw from cutting too deeply

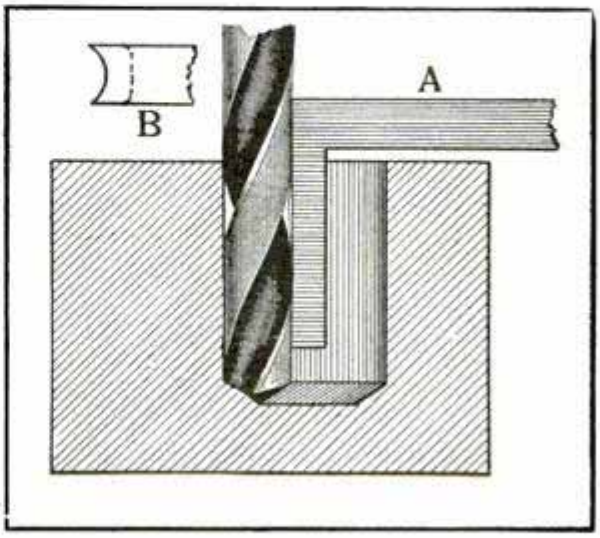
After the mica is under-cut the commutator is cleaned up and polished in a lathe; then the armature is subjected to a bar to bar resistance test. A current is applied to the winding on any two adjacent bars and the voltage read; comparative readings are then made on all of the bars around the commutator, 1-2, 2-3, 3-4, 4-5, etc.

A good substitute for the air motor would be a heavy flywheel with a pedal arrangement and a flexible shaft, similar to a dentist's drill, only larger.—Contributed by G. D. H.

TO DRILL CAVITIES OF ANY DESIRED SHAPE

This may be easily done by employing a steel finger, A, shown in plan at B. The finger is made of tool steel, hardened, and is made concave along the edge, to fit the radius of the drill. To make the cavity, first drill a hole the required depth and then move the work along and drill again, using the steel finger to guide the drill and prevent springing or breaking it. Continue in this way until the desired shape is obtained.

The manner of holding the finger in position is not shown in the cut, as each problem presents different conditions and requires individual treatment. In my work a cylindrical piece requires a cavity in one end, so I made a collar to fit the cylinder

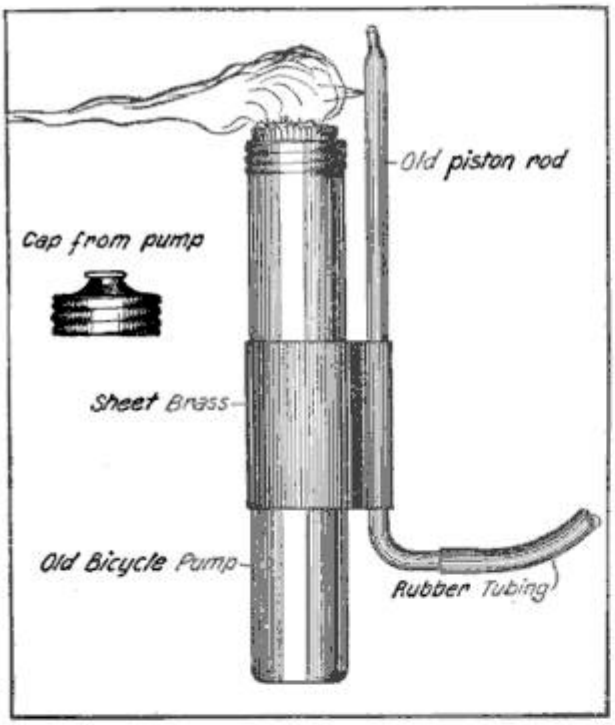


Drilling an Oval Shaped Cavity

and then fastened the finger to the collar with a cap screw. The finger was enlarged and slotted to receive the cap screw and thus allowed the necessary adjustment. But the manner of fastening the finger, A, can be changed to suit the work, and if not objectionable can be fastened to the work itself.—Contributed by L. G. Warren, 14 Barnett St., New Haven, Conn.

HOW TO MAKE AN ALCOHOL BLOW-TORCH

A good alcohol blow-torch suitable for soldering and experimental work can be made from an old bicycle pump and a piece of rubber tubing. Cut the handle and piston off the small tube and pinch one end of the tube together with a vise or a pair of pliers. If not then airtight it should be soldered. Drill a 1-32-in. hole about ½ in. from the



Home-Made Alcohol Blow-Torch

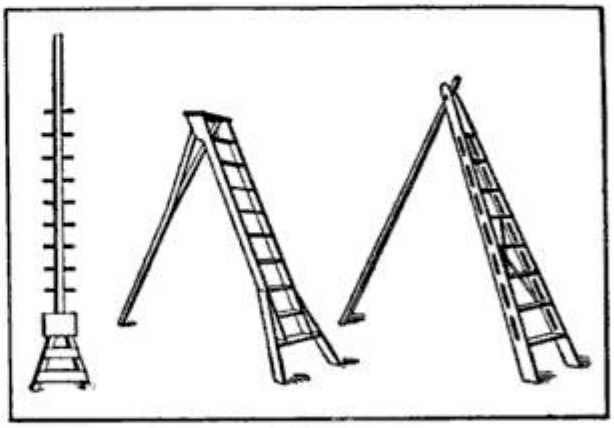
end, or if you have no drill that small, use a brad and small hammer.

Bend a piece of sheet brass to fit the cylinders snugly and solder the tube to it as shown. Then attach the rubber tubing to the lower end of the brass tube. Fill the cylinder with a piece of torch wick and pour alcohol in the top. Then light the wick and adjust the blast tube to give the desired form of flame.

Solder a small piece of tin over the hole in the cap and use it as a cover for the torch when not in use. This prevents the alcohol evaporating.—Contributed by B. Washington, Bar Harbor, Maine.

FRUIT PICKING LADDERS

An ordinary ladder is not suitable for fruit picking, as it cannot be placed near the edges of the tree where the fruit is most abundant. A step ladder is a little better, but is usually very unstable, as one leg is



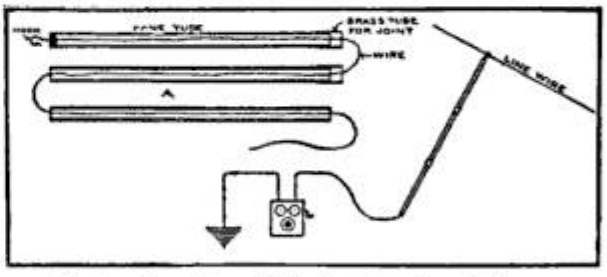
Ladders for Picking Fruit

usually off the ground. The ladders shown in the accompanying illustration, from the Rural New-Yorker, are the kind generally used for fruit picking, although the single pole ladder at the left is considered dangerous by many. The middle one is perhaps the most preferable, as it has a wide base and wide steps.

DEVICE FOR RURAL TELEPHONE INSPECTION

Telephone linemen, who frequently have occasion to call the home office or one of the stations, will find the following device very useful and convenient. This contrivance, which was designed by a correspondent of the American Telephone Journal, has been found to make the inspector's work more easily accomplished than if he carried climbers and put them on and climbed up a pole each time he wished to make a test.

The device consists simply of a triple jointed cane tube, which may be put together



Extension Cane Pole for Tapping Wires

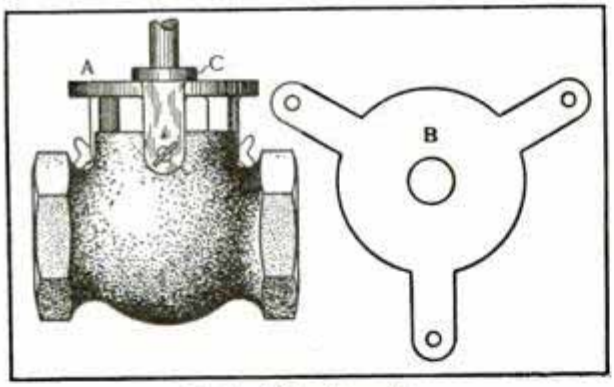
in the same way as a fish pole. It carries a wire or lamp cord through the center, terminating in a hook and fastened in a plug at the upper end. The wire at the lower

end may be terminated in suitable snaps for fastening to a telephone or test box. If it is used on a grounded line a ground rod and mallet may be carried, and still the work of connecting to a line and talking is easier than is possible for a person who has to hold tightly to a pole without cross arms. Of course, a double cane would be necessary for a metallic line. This device may be carried in a buggy or on a horse's back, and as it weighs but a few ounces and can be put together in a few seconds, it has given very good results in actual service.

TO REPAIR LEAKY VALVES

When the brass seats of globe and angle valves become worn so that they leak badly the device here illustrated will be found useful. Remove the bonnet from the valve and clamp on the iron piece, A, which is made by cutting out a piece of sheet iron or steel as at B, and bending the three legs down and tapping to receive the three thumb screws.

A bushing, C, will be required, and should



Valve Grinding Jig

have a hole just large enough to admit the valve stem. By making a number of bushings of different sizes the device may be used on different sized valves.

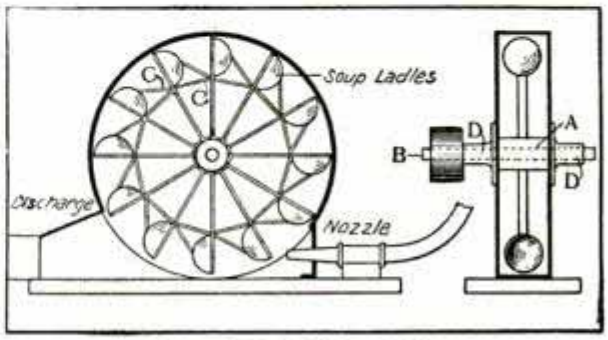
To grind a valve, replace the bonnet with the jig as shown and put a little emery dust and oil on the valve seat. Then turn the stem, first in one direction and then in the opposite direction, at the time applying vertical pressure to make the emery take hold. Valves ground in this way are just as good as new and unless very badly worn or cut by the steam can be easily and quickly repaired.—Contributed by Scott H. Phillips, Fairmount, W. Va.

The world's annual production of raw silk is 61,000,000 lb., of which China produces one-half and Japan one-fourth.

HOW TO MAKE A WATER WHEEL

Make a wooden hub, A (see sketch), and bore to fit the shaft, B. Fasten a number of soup ladles to the hub, as shown, and connect with metal strips, C C. These may be obtained from the handles of the ladles, if of sufficient length, and should be firmly soldered together.

The outside casing may be constructed of wood or heavy galvanized iron and should



Home-Made Water Motor

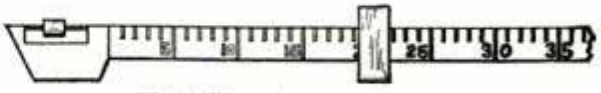
be strong enough to support the bearings, D D. These may be made of pieces of pipe with flanges screwed on the ends, the pipes being then poured with babbitt, or they may be made from castings of a wood pattern made specially for the purpose.

The nozzle may be constructed of heavy galvanized iron, well soldered together and fastened to the base, as shown. If the wheel is well balanced and the bearings carefully made a motor of this kind will run up to 3,000 revolutions per minute.—Contributed by Lee R. Clarke, Bozeman, Mont.

RENUMBERING SCALES

A novel method of renumbering scale beams, which through continual use and exposure to smoke, dust or other substances, have become very indistinct, is described by a correspondent of the American Miller as follows:

You can always have nice, visible white figures on your scales without employing an

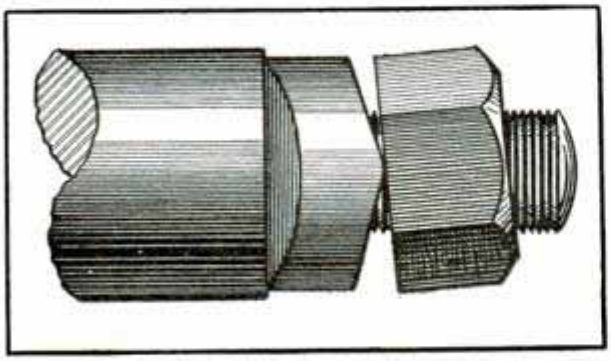


Plain Numbers on Scales

expert painter to renumber them, simply by taking a piece of common white chalk and rubbing it over the numbers on the beam. You can make your one-half pound marks blue and the pound marks white by employ- ink chalk of those colors.

AN UNIVERSAL WASHER

All machinists know that when a nut is tapped out of true and then screwed up tight, the strain will all come on one side of the threads. In the case of milling machine arbors and other devices requiring great accuracy, the threaded portion is liable



Washer for Inaccurate Nuts

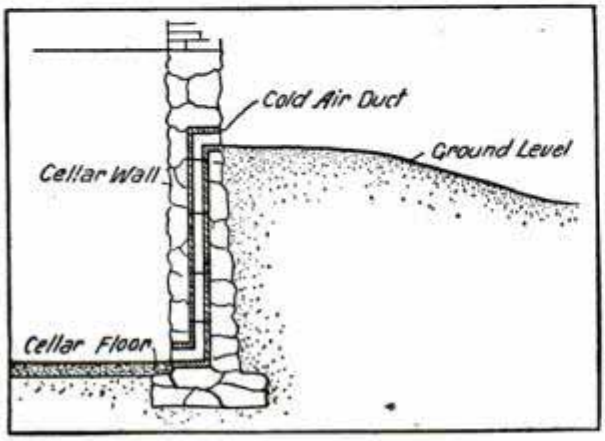
to be damaged, either by being sprung, or by having the threads stripped.

To prevent this happening, I devised the washer shown in the sketch, which is drawn greatly exaggerated, in order to make it plain. Each face of the washer is beveled off at two opposite edges, leaving a ridge across the middle, the ridges on each side being at right angles to each other, so that only one shows in the sketch. The hole in the washer being a little larger than the screw allows the washer to swing and thus take up the inaccuracy of the nut.—Contributed by Wm. Rosenblohm, 997 Hancock St., Brooklyn, N. Y.

CELLAR VENTILATION

The accompanying sketch shows a system of cellar ventilation, which is described by a correspondent of the Rural New-Yorker as follows:

In building the cellar wall, build in on each side a line of 2 or 3-in. drain pipe, emptying



Section Through Ventilating Duct

into the cellar just above the floor, and into the open air just above the ground level. During the summer these can be left open, and the cool air of early morning will flow in, and the cellar will be cool and pleasant all day. During the winter they can be closed except when it is desirable to ventilate or air the cellar, which can be done better and with less danger of frost by opening these ducts than it can be by opening windows.

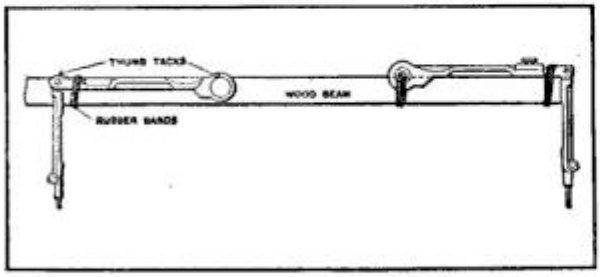
REPAIRING WASHED OUT TRESTLE

One of our readers, Geo. W. Crumb, of Bloomfield, Mo., formerly president of the Missouri Southwestern Railroad (now a part of the 'Frisco system), tells how, a few years ago, he had to repair a washed out trestle approach to a river bridge on his small line, using 40-ft. piling, a pendulum driver mounted on a flat car and operated by a detached portable engine, drum and ordinary drop head. He says: I discovered that the piston head of the driver engine was so worn that it wasted a large part of the steam and power and that its boiler was unsafe. No machine shop was accessible. To obviate these difficulties, I disconnected the pile-driver engine from its boiler and connected it, by 50 ft., or more, of pipe to the boiler-head of the locomotive. To make it elastic and allow for the "slack" between the locomotive tender and the driver car, I put in a flexible joint, over the coupling (draw-head made with six "ells"), three short nipples and two pieces of pipe, 4-ft. long and a union, making, with the union, four joints, the 4-ft. pieces of pipe extending upward and joined at the top, thus allowing plenty of lost motion, or "slack." Then I put a suitable sheave in a heavy strap shackle, attached it to the top of the trip shackle for the hammer and passed the hammer hoisting rope down from the driver head under the special sheave and back to the gallows head, where it was made fast. This, of course, doubled the pull of the pile-driver engine and made it ample for the 2,000-lb. hammer. The flexible joint worked with very little leakage. The piling was delivered a thousand feet from the washout, at the side of the track, each stick being pulled in front of the leads by the driver engine and the hoisting line raised in the clear and the whole train was then run to the washout (1,000 ft.), adjusted, the piling placed between the leads and driven from 12 to 15 ft. Within two days, in midwinter, in a continuous snow and rain storm, with six men, we drove four bents (16 pieces of

piling), put on caps, stringers and ties and ran the train across the break, the piling being all driven in a swollen stream. Of course, large railroads are always prepared for such emergencies.

A SHORT-ORDER BEAM COMPASS

A friend of mine, having need of a beam compass in a land where there was none,



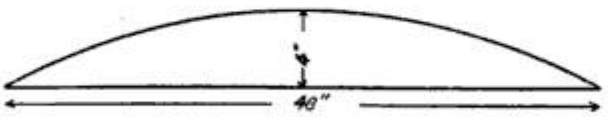
Beam Compass Made From Ordinary Compass

hit upon a scheme as illustrated by the sketch, writes a correspondent of Machinery. He dismantled the compass belonging to his drawing set and fastened the needle-point end firmly to a stick about one-half inch square, and of the desired length. This fastening was accomplished by first notching one side of the stick to admit the hinge of the compass leg, so it might lie squarely on top, and tying it with stout cord. The pencil leg was fastened by a thumb-tack through the eye, another on top to prevent "backlash," and some rubber bands. This part, by the way, was placed at the side and not on top of the beam. The radius was easily adjusted by removing the two thumb-tacks and sliding the pencil leg to the right location. Once constructed, the compass worked as well as an expensive beam compass.

LAYING OUT SEGMENTS

When it is necessary to saw out a lot of segment pieces, such as are used over door and window frames, says the Wood-Worker, proceed as follows:

Suppose the segments are to be 48 in. long with a rise of 4 in.: Square one-half the length (24 in.), which gives 576; square the rise, which gives 16; add 576 and 16, ob-



Laying Out Segments

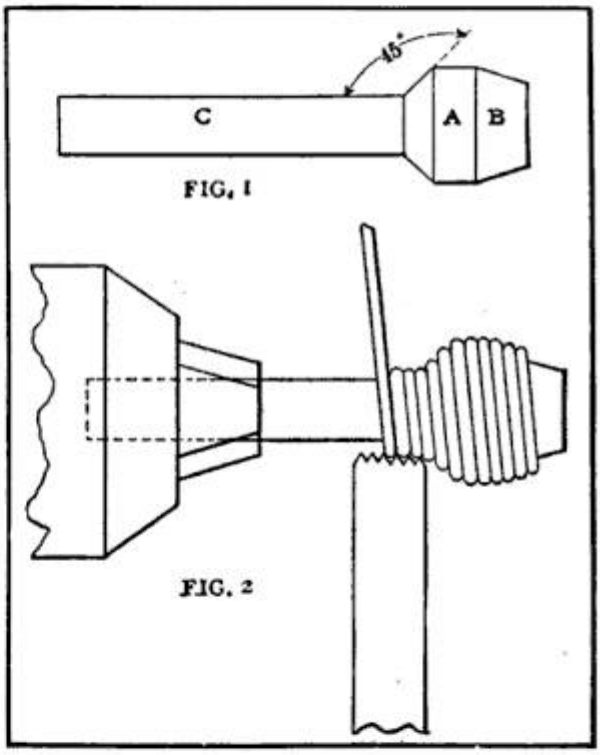
taining 592; divide 592 by twice the rise (2×4=8), which gives 74 in., the radius. This rule may be used in any case.

WINDING LONG SPRINGS

There are many methods of winding springs in a lathe, but in the following plan, which has been used successfully by a correspondent of the American Machinist, the length of the spring will be limited only by the length of the wire:

The only thing to be made is a mandrel, Fig. 1, the length depending on the size of wire; for No. 20 B. & S. gage, 1½ in. is long enough. The diameter of the small part, C, to be the same size as an ordinary mandrel for winding the same size spring, the angle to be about 45 degrees, the larger diameter, A, to be as large as possible without giving a permanent set to the spring, and its length to be three times the pitch of the spring.

The end, B, is tapered so as to let the spring slide off easily. It will generally be



Spring Winder for Long Springs

found that each problem will require some "cut and try" on account of the variations of the temper in the material of which the wire is constructed.

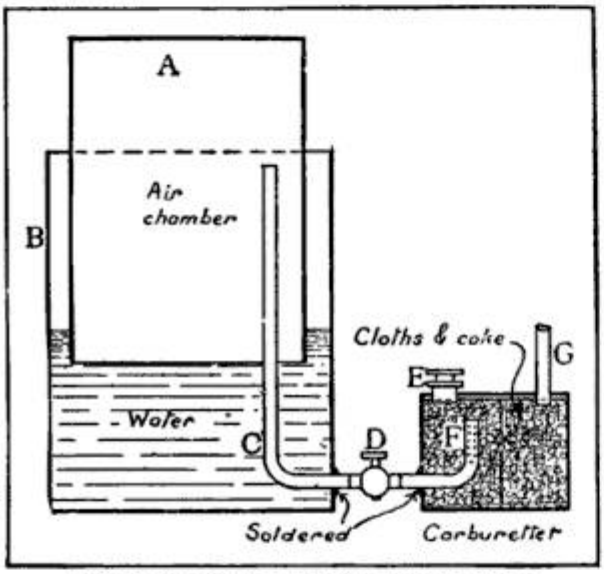
To wind the spring, place the mandrel in a lathe chuck. Select a thread chaser of about the pitch of the spring you are to wind, place it in the tool post in a position to bear evenly on the mandrel. Wind the small straight part of the mandrel full of wire by hand with the free end toward the point. Push the spring thus made over the larger part of the mandrel till you have but 3 or 4 turns left on the small part. Bring

up the chaser so as to engage these turns and start the lathe (see Fig. 2).

The pitch of the spring will be modified by the distance between the chaser teeth, the bevel of the mandrel and the angle of the bevel. The shorter the distance between the chaser and the bevel and the steeper the bevel, the closer the spring will be wound.

A HOME-MADE GAS GENERATOR

A gas generator, suitable for use in a country residence, is described by a correspondent of the Model Engineer and Electrician as follows: The generator is designed for producing gas from gasoline by forcing air through a chamber containing the gasoline, thereby saturating the air with



Small Gas Generator for Illuminating

gasoline fumes and making a combustible gas.

The gas made in this way is too rich to be an explosive mixture, i. e., the amount of air contained in it is insufficient to support combustion, but if the gasoline becomes nearly exhausted an explosive mixture is then formed and the flame from the burner is liable to strike back and ignite the mixture in the generator. As the amount of gas contained in the generator is very small, the effect of such an explosion would probably be of little consequence, but it is well to take all precautions and keep the carburettor well filled with gasoline.

The burners used with this device must be of the incandescent type. The ordinary fish-tail burners are useless; they would burn without shedding any light. With burners with mantles the light produced is equal to electric light.

The generator may be described as follows: A and B are two dust bins; B is 4 in. larger in diameter than A. A is put open end downwards into the water in tank B, care being taken to get them water-tight and air-tight. About 1 in. from bottom of B is a piece of tube, ⅜ in. diameter, with a bend as shown at C, and runs the same height as dust bin. A tap at D (this regulates the air from chamber to carburettor, and also gas from carburettor to burners). If it does not make enough gas, all that is required is to put a weight on top of A. The drawback of the apparatus is that when all the air is used the tank A has to be pulled up and the burners lit again. The tube F in the carburettor is perforated with holes. The carburettor is a biscuit tin with a few sponge cloths hanging down from wires soldered to the top of tin. It is then filled up with coke the size of walnuts; this helps to soak up the gasoline. E is a plug for filling and G is the supply to burners.

ELECTRICALLY PRODUCED STEEL

The enormous amount of energy that is now going to waste in the unused water power at Trallhatta, Sweden, will soon be converted into electrical energy, to be used in the production of steel in the large mill about to be constructed there. The plant will be operated under the Kjelin patents, in which the ore is reduced in large electric furnaces. As the ore deposits are very extensive and the available water power enormous, the steel will no doubt be produced at a great profit. The first plant will be from 10,000 to 15,000 hp. and will turn out about 500,000 tons annually.

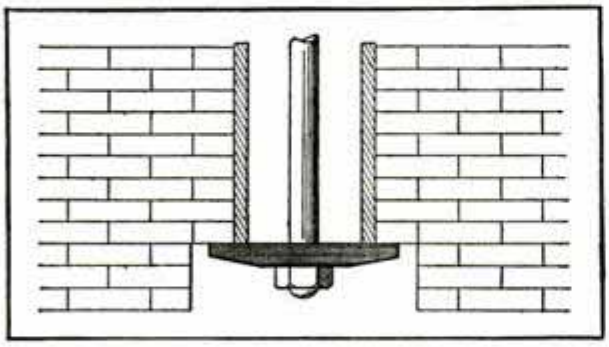
VENT NECESSARY IN WATER MUFFLER FOR TWO-CYCLE GAS ENGINE

The water muffler described in Shop Notes for October will work all right with a 4-cycle engine, but if used in connection with a 2-cycle engine it may happen that the partial vacuum produced in starting would draw water into the cylinder and cause trouble. To prevent this, drill a small hole in the pipe above the water level.—Contributed by D. H. Reeves, 645 Iowa St., Oak Park, Ill.

At Portland, Oregon, recently, 25,000,000 ft. of lumber was loaded: 20,000,000 ft. on vessels for foreign ports, and 5,000,000 ft. for home ports. That city is said to be the greatest lumber port in the world.

REMOVABLE ANCHOR BOLT FOR ENGINE FOUNDATION

The anchor bolts generally used for engine foundations cannot be removed and for that reason cannot be renewed when broken. The accompanying sketch shows a new form of anchor bolt which was used successfully by a correspondent of the Engineers' Review.

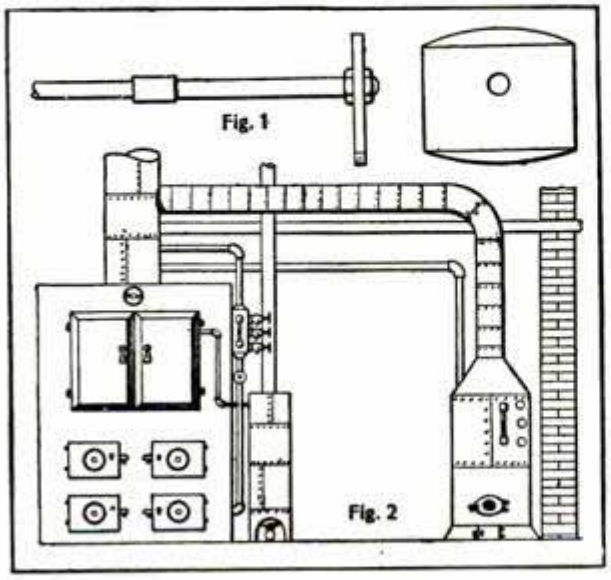


Lower End of Anchor Bolt

In this case a different method of putting in the anchor bolts was employed than usual. The bottom of the bolts were not secured firmly in the foundation, but spaces were provided for them, and they were put in place after the foundation was furnished. This method of placing anchor bolts is a good one, as it allows for removing them in case one becomes broken at any time after the engine gets to running, without damaging the foundation.

HOW TO CLEAN A BOILER

A very useful and efficient boiler cleaning hoe can be made as shown in Fig. 1. The bottom is made to conform to the curve of the boiler shell and is made just large enough to pass through the front manhole, says a correspondent of the Engineers' Review.



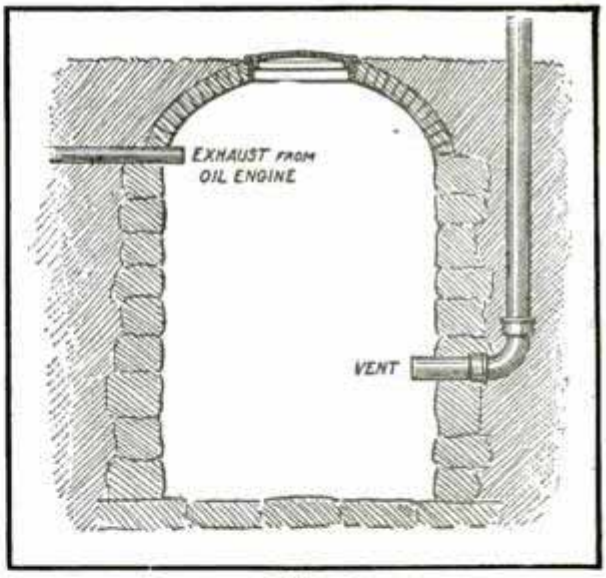
Boiler Cleaning Hoe and Auxiliary Boiler

A small boiler to assist in cleaning a large one will soon pay for itself in time when the large boiler comprises the plant. Fig. 2 shows such an auxiliary boiler for cleaning. The boiler should have the steam piped to the feed pump of the large boiler, and a feed line from the same piped to the small boiler. On cleaning day let the water out of the large boiler and open it up. Have about 40 to 50 lb. steam pressure in the small boiler and attach a hose to the discharge pipe of the feed pump, and proceed to wash out the boiler.

It can be seen that with an arrangement of this kind the engineer or fireman can wash a boiler out clean under a good pressure.

DISPOSING OF OIL ENGINE ODORS

Offensive odors from oil engines can be disposed of by turning a portion of the jacket water into the exhaust line and conducting it into a cesspool, says a correspondent of the Metal Worker. Make the cesspool about 8 ft. deep by 5 ft. in diameter, of field stone, with a brick arch and a cast-iron rim and cover, as illustrated. Between 2 and 3 ft. above the bottom of the cesspool take a 5-in. pipe out of the side and carry it up a distance of 10 or 12 ft.

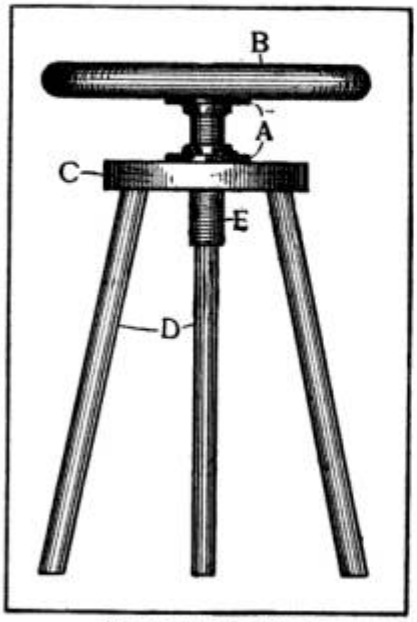


Destroys Offensive Odors

To avoid the treacherous back kick when starting the motor the automobilist should learn to crank with his left hand, which throws the hand and arm out of the path of the recoiling crank.

HOME-MADE REVOLVING STOOL

The materials required for this handy revolving stool are: A piece of hard wood 1½ in. thick and cut out in a circle for the top, B; a piece of hard wood 1½ in. thick, octagonal in shape, for a base, C, for the legs and flange; three legs, D, 17 in. long, sawed from an old rake handle; a piece of 1-in. pipe, E, 8½ in. long with a 1-in. thread on one end and a 6¾-in. thread on the other end; two flanges, A, to fit the threads on the pipe; eight stove bolts, 2 in. long, to hold the flanges to the top and base, and three 3-in. screws to hold the legs in the base.



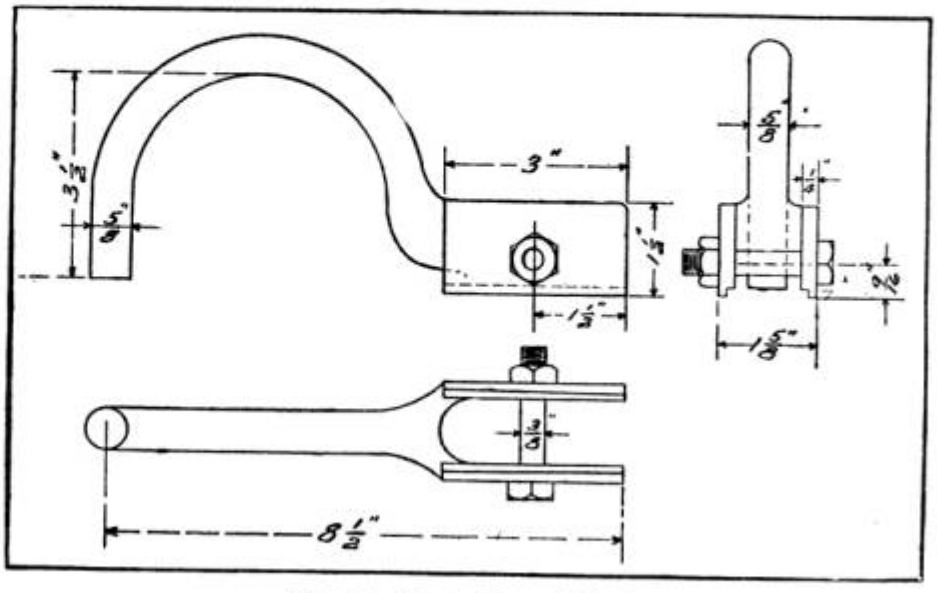
Home-Made Stool

Countersink the holes for the heads of the stove bolts and the screws. When all the parts are put together sandpaper the wood until smooth and apply a coat of varnish. The stool will cost about 30 cents.—Contributed by Godfrey Aman, Dolgeville, New York.

HOW TO MAKE A CLAMP HANDLE FOR A FILE

In filing large work, such as elevator guides, connecting rods for large engines and other surfaces which are longer than the file, it is necessary to provide means for holding the file without lifting any portion of the file from the work.

Such a device is shown in the accompanying illustration, where the dimensions are given for a file $1\frac{5}{16}$ in. wide. A file is placed in the clamp and the nut tightened, and it is then ready to use.—Contributed by John Weldon, 433 Columbia St., Brooklyn, N. Y.



File Handle for Large Work

WHY BRICKS ARE MADE SMALL

How much easier it is to criticize than to do better! We view the results of another's life labor and seem to discern at once some chance of improvement, which has evidently been overlooked by the expert, who has given all his time and energy to the problem.

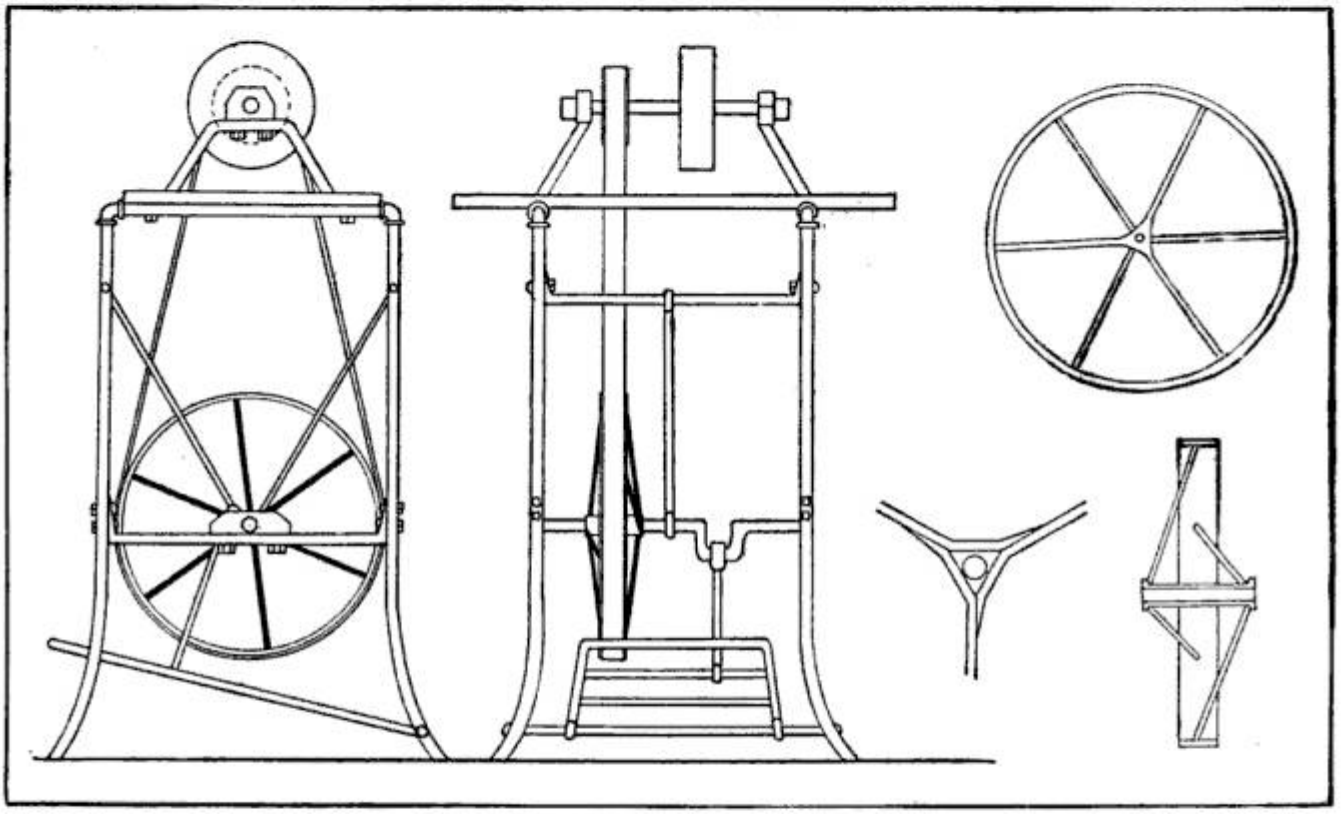
A recent example of this tendency is illustrated in the proposed large size building brick. Instead of the ordinary standard size brick, which is only 8 in. by 4 in. by 2¼ in., a brick 3 ft. long, 8 in. wide, and 2½ in. thick has been suggested. It has been pointed out that bricks of this size would require less labor in laying; would make stronger and better walls, and among other advantages, would be immune against earthquakes.

Brick manufacturers discovered many years ago that there are many advantages and disadvantages to be found in either large or small bricks, and after a careful study of all the conditions, decided to compromise on a brick which should have as many advantages and as few disadvantages as possible. This investigation resulted in the adoption of the present standard size, which is 8 in. by 4 in. by 2¼ in.

There are many reasons why the large brick mentioned above would not be practical. In the first place it would be almost impossible to handle a "green" brick of that size, without bending and stretching it, and the process of burning would be more difficult, and would invariably result in warping and distortion. Bricks of that size would not conform to the standard size window boxes, door frames, and other building material.

A HOME-MADE FOOT-POWER EMERY WHEEL

The accompanying engraving shows a foot-power emery wheel stand which I made and am using in my shop for grinding small tools such as cold chisels and drill bits, says a correspondent of the American Blacksmith. I used ¾-in. gas pipe for the legs and top pieces, and four ¾-in. elbows. The pipes were threaded and screwed into the elbows and the legs were then bent as shown in the engraving. I then used ½-in. pipe flattened at the ends and arranged them as leg braces, putting them together with ¼-in. bolts. The top of the frame is 14 in. square from center to center of elbows and is bolted on a 14 by 18 in. board for the table. The brackets which hold the shaft for the emery wheel are made of 1 by 1¼-in. iron and are bolted on top of the table. The shaft for the emery wheel is a piece of ⅝-in. round stock with a 2 by 1¾-in. piece shrunk on and used as a pulley. A 2½-in. washer is also shrunk on this shaft as a wheel flange. This is turned up in a lathe. The small wheel shaft runs in two small boxings on the top of the brackets. The large wheel, or fly-wheel, is 26 in. in diameter with a rim 2 in. wide and ½ in. thick. The spokes are of ½-in. rods and are arranged as shown in the engraving. They are six in number and each set of three are welded in such a manner as to leave a triangular shaped hole into which a piece of ¾-in. pipe 5 in. long is fitted. For the crank shaft I use a ¾-in. rod, and after drilling a ¼-in. hole through the hub of the wheel and shaft, fasten them together. Any practical craftsman can make an emery wheel stand with little or no cost. An emery wheel suitable for this stand would be about 8 in. in diameter by ½ in. thick. If a suitable belt or fly-wheel can be secured from some discarded farm implement it will save the trouble of making one. This is a very handy tool, and will often save time in starting up the engine or using the old grindstone.



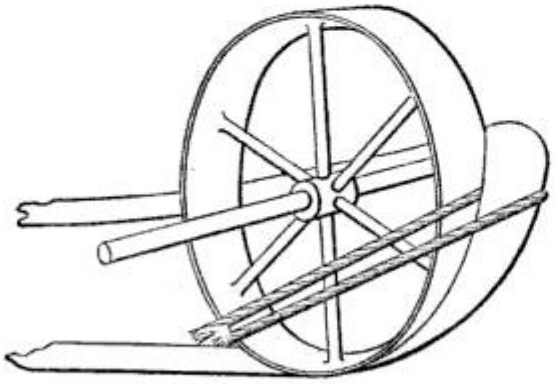
Emery Wheel Made of Pipes and Fittings

Although the height and size of this stand may be altered to suit various conditions, the following is about right: Height of stand, 38 in. Dimensions at top, 14 in. square; stock for legs to be ¾-in. gas pipe. Leg braces: ½-in. gas pipe bolted with ¼-in. bolts. Treadle is made of 1¼ by 2-in. stock bolted firmly together. The large wheel is 26 in. in diameter.

The Government is to make a test of Chinese labor for digging the Panama canal. In the test 2,500 Chinese will be employed. The work is said to be too hard for the large number of Jamaicans now employed, and a sufficient number of Spaniards cannot be secured immediately.

TO PUT A BELT ON A RUNNING PULLEY

In many shops it is the practice to throw on the belts while the machinery is running rather than lose eight or ten minutes by shutting down. Where the belt comes on at the top of the pulley it can usually be thrown on from the floor by two men using stout poles having spurs in the end and a



Method of Putting Belt on Running Pulley

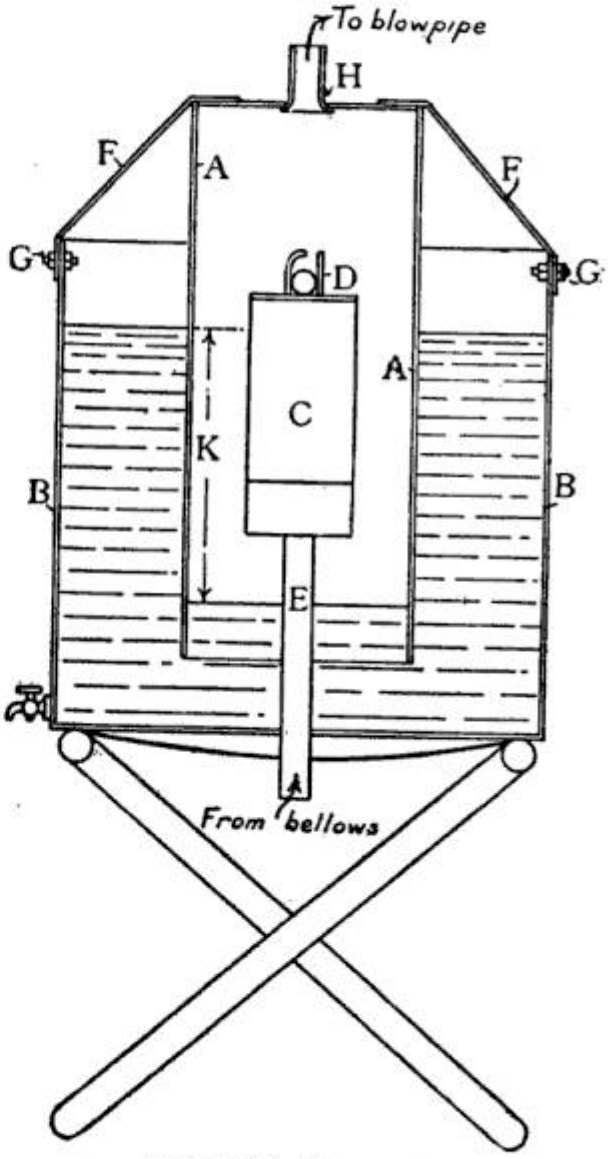
finger on the side, says a correspondent of the American Machinist. One man holds the belt up on the face of the pulley and the other catches the edge of the belt with the pole finger and pulls it on. Where the belt runs on from the other side of the pulley, or in cases of very tight belts, the following plan is better:

Take a piece of common bale rope up on the ladder, slip it around the belt and bring the two ends even as in the sketch. Steady the belt with one hand while the man on the floor pushes it up onto the pulley with one of the poles, then with the other hand pass the two ends of the rope twice around the shaft close to the hub of the pulley and in the direction of the rotation. Be careful and keep clear of set screws by keeping just a little tension on the rope. Step down a step or two on the ladder and grasping the ends of the rope in one hand, give the man on the floor a signal for a concerted effort, and with a pull the belt is on and the rope may be removed if it has not already removed itself. Under no circumstances should the rope be wrapped around the hand; be content to merely grasp it firmly. If it catches on the side of the belt, you won't have to be told to let go. Clean shafting and a cool head are required for the successful performance of this operation.

When throwing on a belt, if the pulley or belt is wet, wipe both fairly dry before attempting to throw the belt. If the belt is of rubber, with the rubber partly worn off, get it back on the pulleys as soon as possible, as if wet it will draw up several inches in a short time.

STEADY FLAME VARIABLE BLAST APPARATUS

In keeping a steady blast with foot bellows and a blowpipe the india-rubber diaphragm generally used does not always give the best results, especially in maintaining a small flame. The apparatus illustrated is an excellent substitute and by its use the strength of the blast can be regulated with ease to suit a full jet of gas, says the Model Engineer, London, or the smallest flame required for fine work, and will not change, no matter how much work is expended on the bellows.



Variable Blast Apparatus

To make the device, invert a long tin can, A, in a larger tin, B; through the bottom of B pass an upright pipe, E, and

make the joint tight. To the top of E solder a small tin, C, by its lid. To the bottom of C sweat a piece of sheet copper with a $\frac{5}{16}$-in. hole in the middle of it. The edges of this hole should be knife-sharp. Make the ball-valve, D, a ½-in. steel ball and seat it in the hole in the copper with a smart tap of the hammer. Sweat three brass wire guides into the copper and bend one of them over to keep the ball from being blown off its seating. Test the valve by filling the tin with water and holding the ball down tight to its seating, to keep the water from running out. If the valve is tight, proceed by soldering tin C into its lid at the top of E. Solder four straps of sheet tin, F, onto A and fasten them to the top edge of the large tin, B, by four small bolts, G.

In operation, water is poured into B, and when the bellows are not worked, it partially fills A. As soon as air is blown in, it expels the water from A, and a steady blast is delivered to the blowpipe through the pipe H. This blast depends for its strength on the head of water, K, due to difference of water level in A and B, and this difference can be varied at will by pouring more or less water into B.

The blast cannot be stronger than the pressure due to the head of water, K, as any superfluous air pumped in only bubbles harmlessly out from under A and escapes.

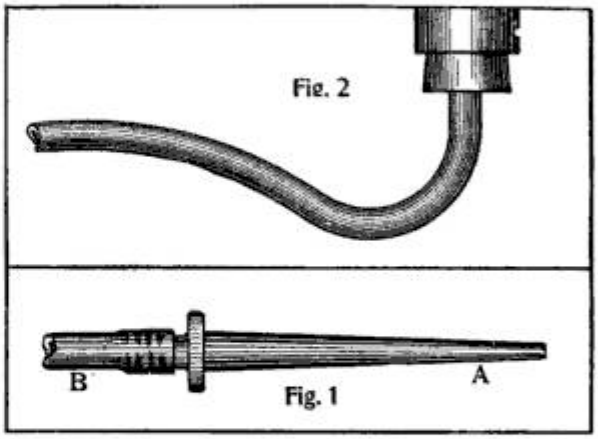
It is advisable to have the difference between the tins A and B large enough, or the escaping air blows the water over the edge of B. A large square biscuit tin answers perfectly. The whole should be mounted on a camp stool, with a hole cut in the seat for the pipe E to pass through.

WASHING PHOTOGRAPHIC NEGATIVES AND PRINTS

The customary process of washing negatives and prints is tedious and consumes considerable time. A correspondent of the Photographic Times describes an easier method which he has used with excellent success.

Fasten a small oil can nozzle (A, Fig. 1) to a long piece of rubber tubing, B. Fasten the other end of the tubing to the hydrant as in Fig. 2, or to the bottom of a small tank elevated above the table on which the washing is done.

After the plates or prints are rinsed, turn on the water and spray them with the fine stream. Plates may be held in the hand or the rack, but prints should be placed on a pane of glass and turned frequently. All traces of hypo, which would cause the pictures to fade or turn yellow easily if allowed to remain, can be removed in this way in from eight to twelve minutes. If the stream is too strong, however, it will cause blisters.

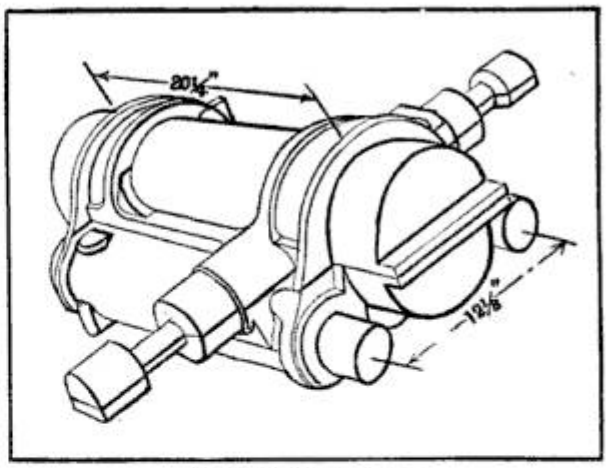


Fine Spraying Nozzle

When many are to be washed, have a tray of clean water in which to place the prints between times. After the treatment, soak them for a few minutes and dry.

OUTLINE DRAWING MADE WITH HELP OF CAMERA

The use of the camera as a drafting tool was described in Shop Notes for September, 1906; the accompanying illustration is reproduced from an outline of a pattern actually made by the process, and shows what accurate results may be obtained in this way at small cost.



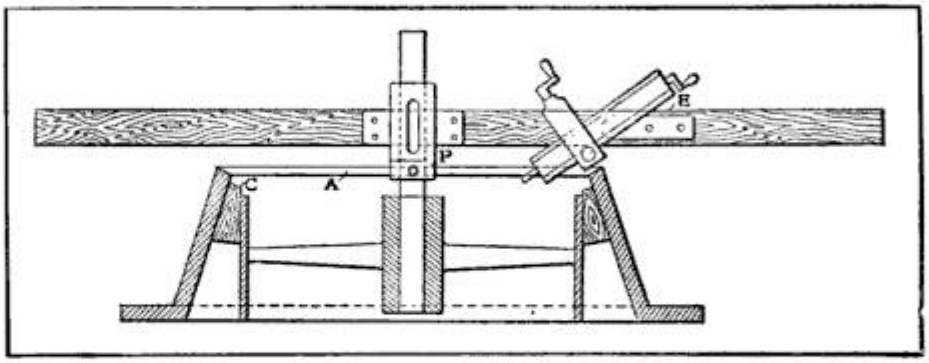
Made by a Camera

At a mild red heat, good steel can be drawn out under the hammer to a fine point; at a bright red heat, it will crumble under the hammer, and at a white heat it will fall to pieces.

FACING A LARGE CASTING BY HAND

The illustration shows how a large furnace hopper for a blast furnace was faced by hand. In describing this operation, a correspondent of the American Machinist says:

The boring mill in our shop having only a 10-ft. swing, we had to rig up for the job. We found a large pulley, which we keyed into the inside with wooden keys, C. A piece of shafting was then obtained and secured in the bore of the pulley. A collar, P, was put on this and an old bearing to which was attached the beam. We then secured an old slide rest to the beam at E. With two men to turn the beam and feed the tool in by hand, the job was done in about half a day. The hopper was in six sections bolted together, and as the surface of A was very rough, we had to take several cuts.

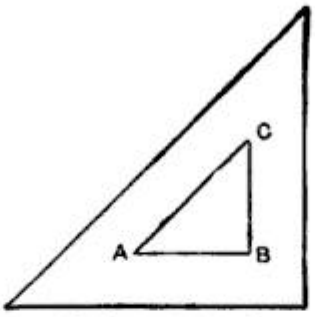


Finishing a Casting by Hand

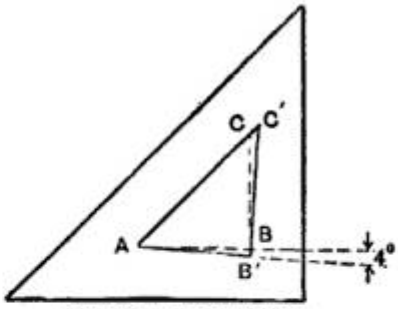
TRIANGLE FOR DRAWING SCREW THREADS

Drawing screw threads is often rather difficult for the draftsman, but by the use of the triangle illustrated, the task can be made much easier and the threads more uniform.

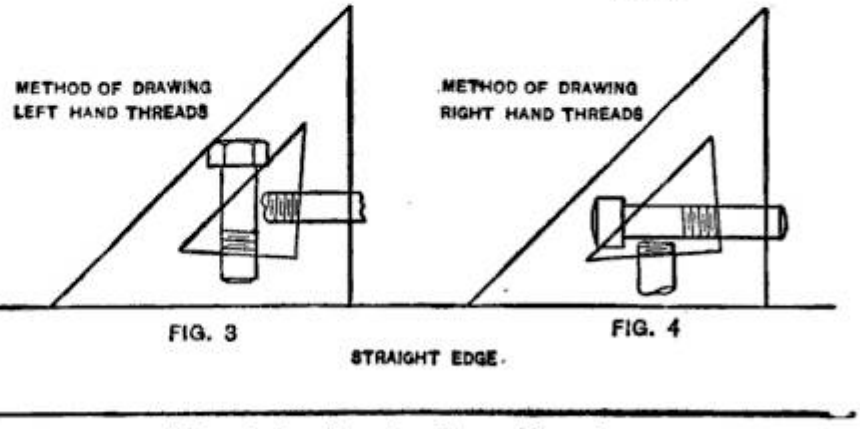
This triangle is made of an ordinary 45-degree celluloid triangle, like that shown in Fig. 1. Make the lines A B' and B' C' on the triangle, as shown in Fig. 2, scribing them with any sharp instrument and at an angle of about 4 degrees with the horizontal. With a sharp knife cut the celluloid away almost down to the lines, says Machinery, and finish off to the lines with a fine file, making smooth, straight edges. Either horizontal or vertical threads may be drawn without changing the position of the triangle, and right or left-hand threads are drawn by simply turning it over.



ORDINARY TRIANGLE
FIG. 1



TRIANGLE WITH DEVICE FOR DRAWING SCREW THREADS
FIG. 2



Triangle for Drawing Screw Threads

Low brass is more likely to fire-crack than is high brass; the amount of it used is comparatively small, says American Machinist, and is confined to drawn or spun articles which cannot be successfully made from high brass.

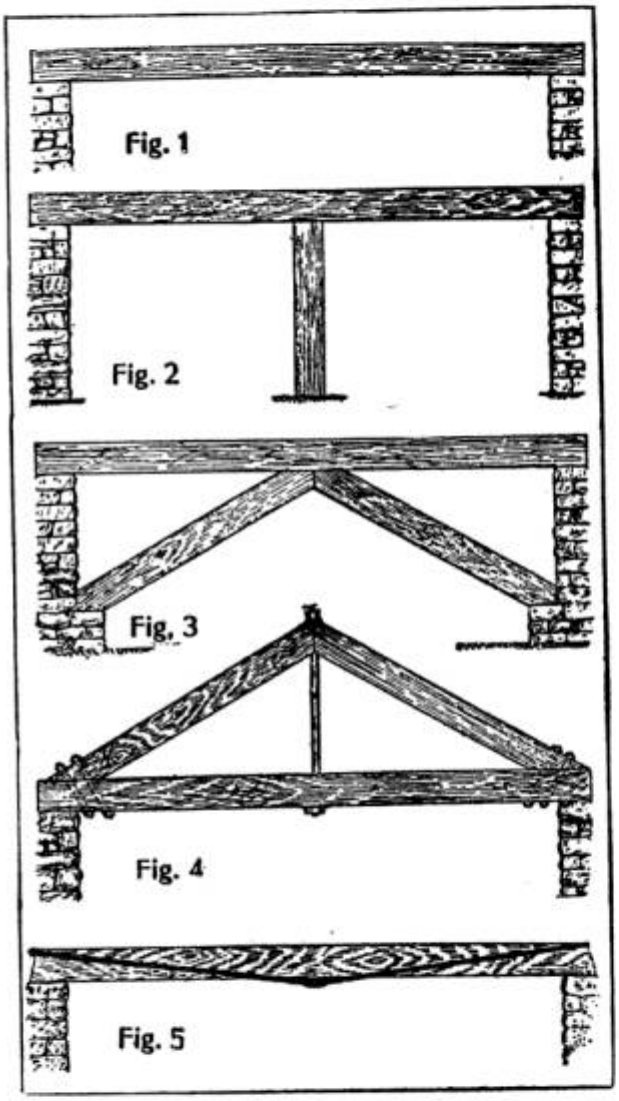
A safe way of discovering a leak in a gas pipe is suggested by a fireman. It is to use a small brush and ordinary lather. The escaping gas will blow bubbles, however small the leak may be, and will thus show the exact place.

Zinc dust, when properly packed, is not liable to spontaneous combustion, as is generally believed, according to a German scientist. Wetting of the material is without danger, and ignition and explosion only occur in the presence of air. Many steamship owners refuse to transport zinc dust, because of the idea that it is dangerous.

THE OBJECT OF TRUSSES

Readers of the articles on strength of materials will understand that the span of a beam may be so large that a single beam could not be had of sufficient size to hold the load without bending too much, says the Practical Carpenter.

Such a case is shown in Fig. 1, which can be remedied by supporting it with an upright post or column in the middle, as shown in Fig. 2; this would practically make two short beams of the long beam and consequently greatly increase the strength of the long beam.



In cases where a post would not be admissible in the center a support may be had by using two braces as shown in Fig. 3. Here the pressure instead of acting downward on a post acts downward in a diagonal direction, transferring the pressure to the walls or other supports of the long beam. A little thought will show that these braces (used for the same purpose as the center post in Fig. 2) are subject to compression the same as the post.

When the load on the long beam is concentrated at the center or evenly distributed the pressure on each of the braces is the same.

In many cases a clear opening is desired and no braces can be used underneath, but the same support can be had by placing the braces above the beam and suspending from them a rod holding up the center of the beam as shown in Fig. 4.

It makes no difference if a weight is placed directly on top of a board or if a string is tied to the board and the weight suspended by the string, the pressure on the board is just the same.

In Fig. 4, instead of being supported directly on the braces, the beam is suspended from the braces by means of the rod; hence the pressure on the braces is just the same as in Fig. 3 (that is, with the slight addition of the weight of the rod itself).

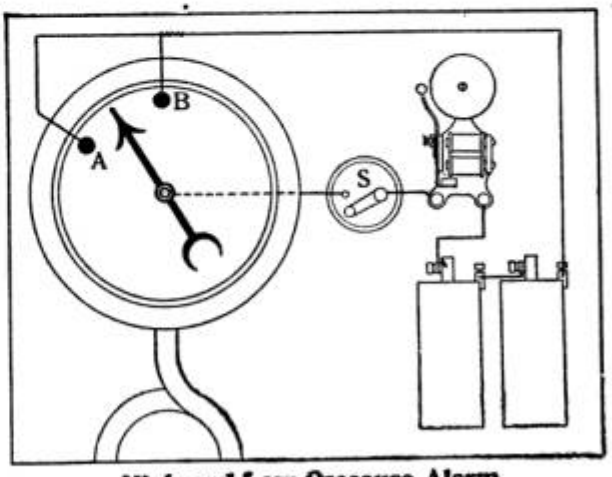
Fig. 4 shows the simplest form of a truss, but all trusses are on the same principle of transferring the load to the support.

In the truss shown in Fig. 4 the load is placed on the beam, but when used for roofs the load is placed on the slanting braces or rafters, as they are called.

Where the span is comparatively short, the beam may be trussed as shown in Fig. 5. Here two iron rods ¾ or 1 in. in diameter are placed on the beam as shown—one on each side. A piece of flat bar-iron, about 3 in. wide and ½ in. in thickness, with ends turned over about ¾ in., forms the middle support for the beam. When the nuts are tightened the tendency will be for the middle of the beam to go upward, thus counteracting the downward bending.

ALARM FOR STEAM GAUGE

This is a handy device for firemen, as it will sound an alarm when the pressure becomes either too high or too low, thus obviating the necessity of constantly watching



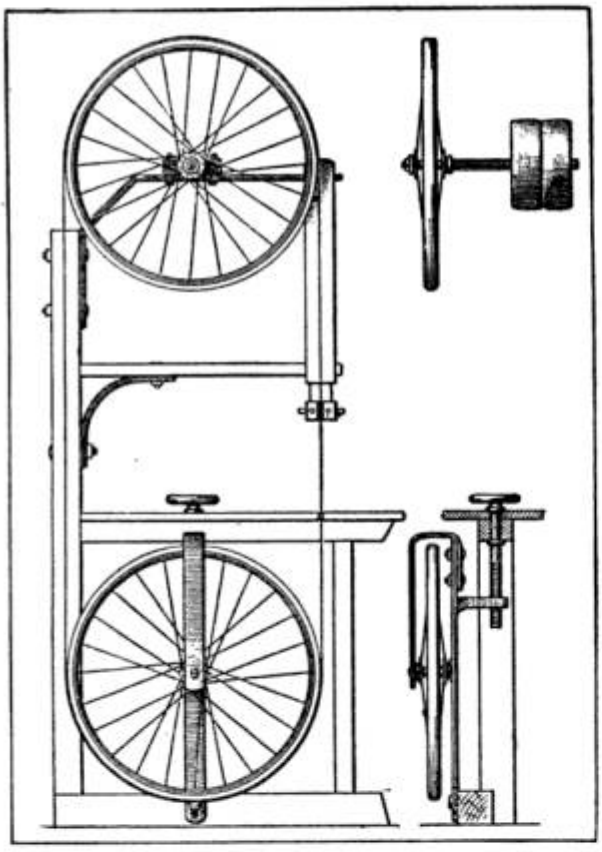
High and Low Pressure Alarm

the gauge. An ordinary door bell outfit will supply nearly all the parts necessary for constructing this alarm, except that a switch, S, should be substituted for the ordinary push button.

The contacts, A and B, are placed at the two extremes of the permitted pressure variation and are connected to the bell circuit as shown. The switch, S, is closed normally, but when the alarm is sounded it may be opened until the required pressure is obtained.—Contributed by Robert Glaubke, Malott Park, Ind.

A HOME-MADE BAND-SAW

A good, practical band-saw, as made by a correspondent of The Blacksmith and Wheelwright, is shown in the illustration. The frame is made mostly of wood and braced with iron and the wheels are from an old bicycle. The tires are 1¼-in. solid rubber. The top wheel is fixed on a shaft having



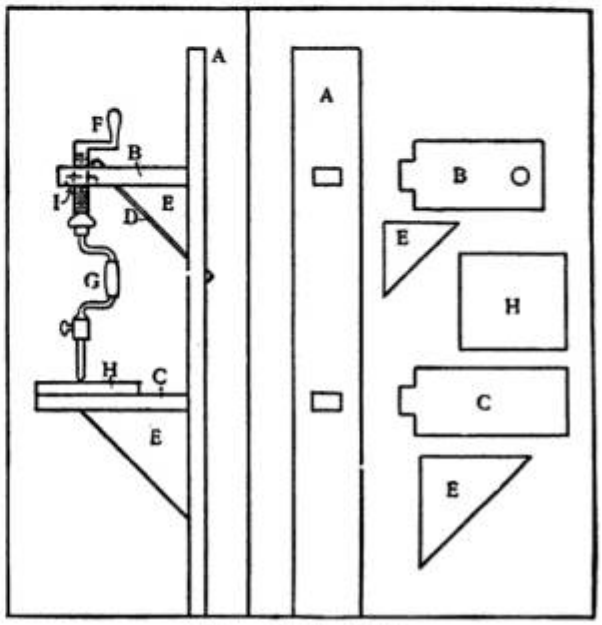
Home-Made Band-Saw

a tight and loose pulley, while the bottom wheel is fastened in an iron fork, which can be raised and lowered by the screw and hand wheel.

Cordite used in the cartridges was found to be the cause of the bursting of several rifles during target practice of the Canadian militia.

HOW TO MAKE A DRILL

A serviceable drill can be made of old lumber and pipe at very little cost. The parts used in its construction are as follows: A, piece of lumber (2 by 8 in.); B and C, pieces of wood set into A; D, iron rod to strengthen frame; E E, wooden brackets supporting B and C; I, set nut set into B; F, piece of old pipe or iron

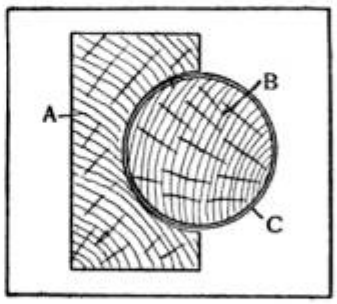


Home-Made Drill

threaded to set gauge nut; G, old brace or made of pipe fittings, with a set screw, K, to hold the drill; H, table to which the work is fastened.—Contributed by F. B. Ewing, Santa Clara, Cal.

TO SANDPAPER A CORE BOX

In the accompanying sketch, A is the core box, B a cylindrical piece of wood, turned a little smaller than the diameter of the required core, and C is a piece of sandpaper glued on B. The wooden cylinder, B, is fastened in the lathe and revolved at high speed, the core box being then brought up against it, as shown. If there are any shoulders in the core box the cylinder should be shaped accordingly and a separate piece of sandpaper glued to each section.—Contributed by Donald Reeves, 6453 Iowa St., Oak Park, Ill.



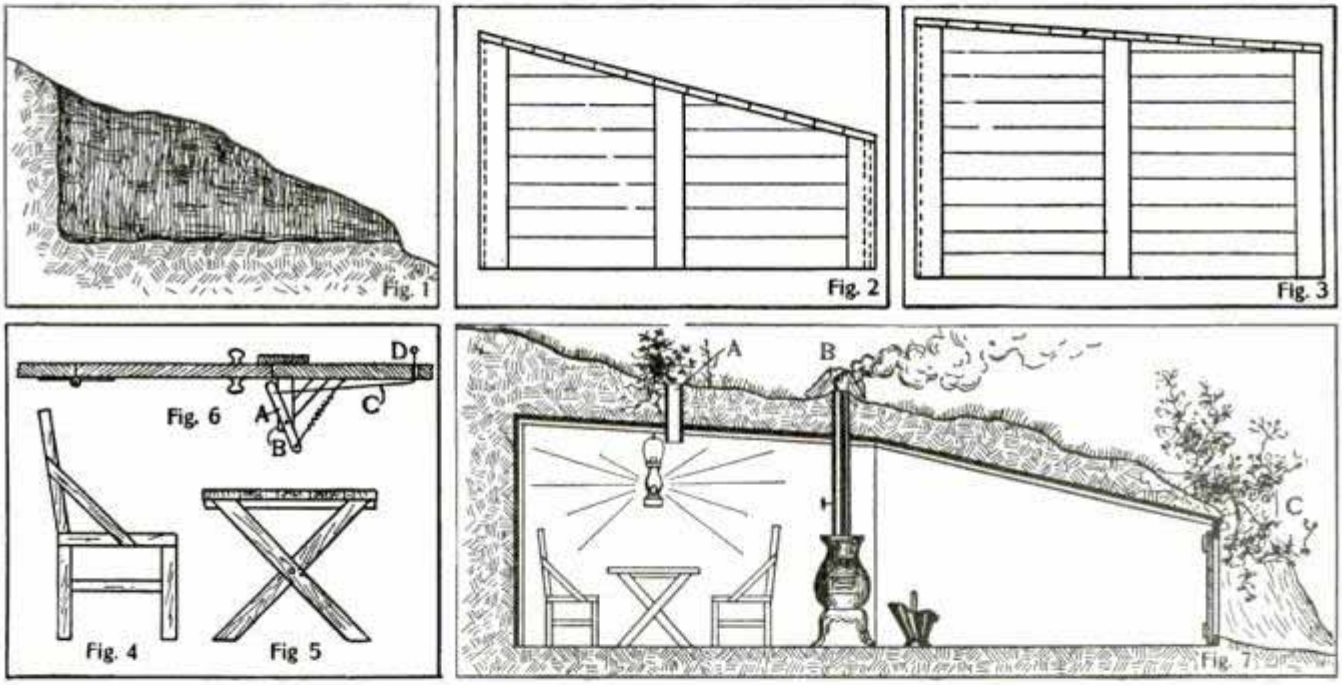
MECHANICS FOR YOUNG AMERICA

AN UNDERGROUND CLUB-HOUSE

Nearly every boys' club wants a place to meet and it was for this purpose that the underground house here shown was constructed. The house is built in a hill which was first excavated, as shown in Fig. 1, the dirt being thrown on each side, to be used later for banking and covering the roof.

The house consists of two principal parts: the entry, Fig. 2, and the club room, Fig. 3. This may be made any length desired, but should not be more than 5 or 6 ft. wide, as a greater width would require cross beams of furniture that are usually required. These may be either home-made, as shown, or may be obtained from the old furniture discarded from the home. The door, Fig. 6, is provided with a secret lock which consists of a latch, A, supported on a strong frame, B, and swinging on a pivot near the center.

A string, C, is fastened to the latch and terminates in a ring, D, which is placed in a location known only to the members of the club. A light spring or rubber band may be used to make the latch spring over



Details of Construction and Equipment of Underground Club-House

to support the roof and would thereby make the construction much more complicated.

The lumber used should be about 1 in. thick and should be fastened together in a good workmanlike manner. This is especially true of the roof, which is required to support the weight of the earth above in addition to the weight of any possible intruder and which, if too weak, will endanger the occupants of the house. The boards should be nailed across the short way to give greater strength and it is well to nail a long board along the middle the entire length of the roof.

In Figs. 4 and 5 are shown the articles in front of the door, and when the door is closed it will lock itself.

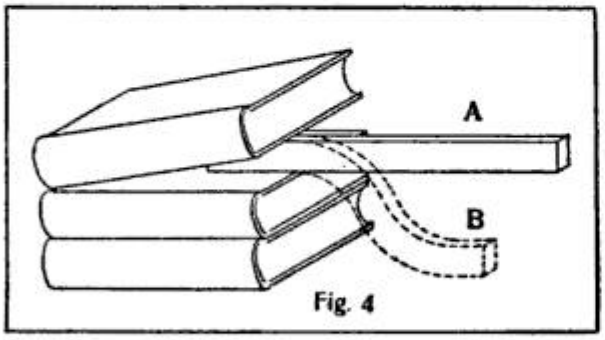
The longitudinal section of the complete house is shown in Fig. 7. The ventilator, A, can be made of either wood or stove pipe and if desired can have a small cover over the top to prevent rain coming in. If a stove is used, a pile of burnt wood can be placed around the stack, as shown at B, so that the suspicions of passers-by will not be aroused in any way. Also a bush, C, transplanted at the entrance, will hide the door.

An underground club-house of this kind will prove a source of mystery to those

uninformed of the secret entrance.—Contributed by Charles Edwards, Jr., 2623 E. Preston St., Baltimore, Md.

SEALING WAX BENT WHILE COLD

If a piece of sealing wax is supported in a horizontal position by one end, as shown at A in the sketch, it will gradually bend to the shape indicated by the dotted lines, B.



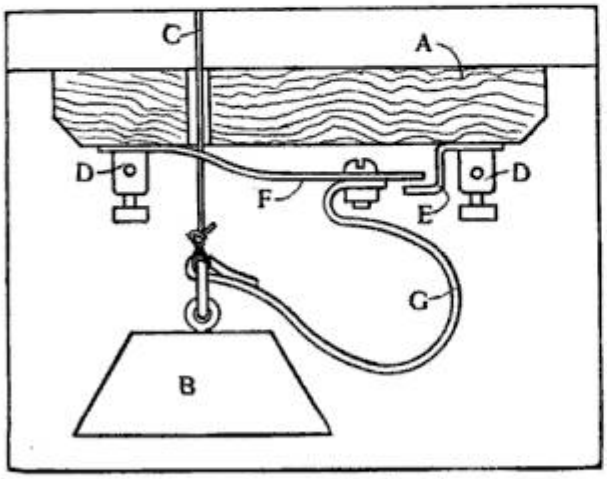
Bending Cold Sealing Wax

To attempt bending it with the hands would result in breaking it unless a steady pressure were applied for a long time. This peculiar property is also found in ice.

A CHEAP FIRE ALARM

An electrical device for the barn that will give an alarm in case of fire is shown in the accompanying diagram. A is a wooden block, which is fastened under the loft at a gable end of the barn; B is an iron weight attached to the string, C, and this string passes up through the barn to the roof, then over a hook or pulley and across the barn, under the gable, and is fastened to the opposite end of the barn.

D D are binding posts for electric wires. They have screw ends, as shown, by which means they are fastened to the wooden block, A. They also hold the brass piece, E, and the strip of spring brass, F, in place against the wooden block. G is a leather strap, fastened to the weight, B, and the spring, F. connected to the latter by a small sink bolt.



Automatic Circuit-Closing Device

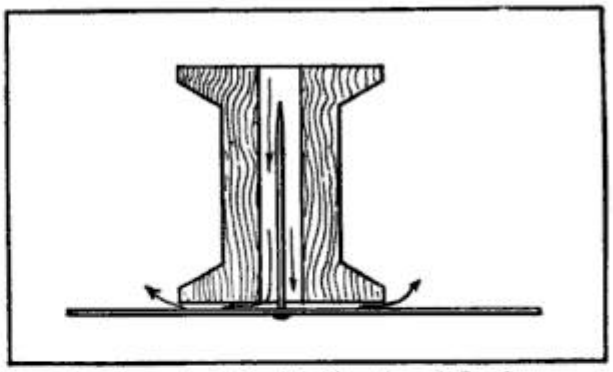
At the house an electric bell is placed wherever convenient. Several battery cells, of course, are also needed. Dry batteries are most convenient. The battery cells and bell are connected in the usual manner, and one wire from the bell and one from the battery are strung to the barn and connected to the binding posts, D D.

If a fire occurs in the hay mow the blaze will generally shoot toward the gable soon after it starts, and will then burn the string, C, which allows the weight, B, to fall and pull the brass spring against the iron piece, E, which closes the circuit and rings the bell that is in the house.

If desired, the string can be stretched back and forth under the roof several times or drawn through any place that is in danger of fire.—Contributed by Geo. B. Wrenn, Ashland, Ohio.

A CURIOUS COMPRESSED AIR PHENOMENON

Push a pin through an ordinary business card and place the card against one end of a spool with the pin inside the bore, as

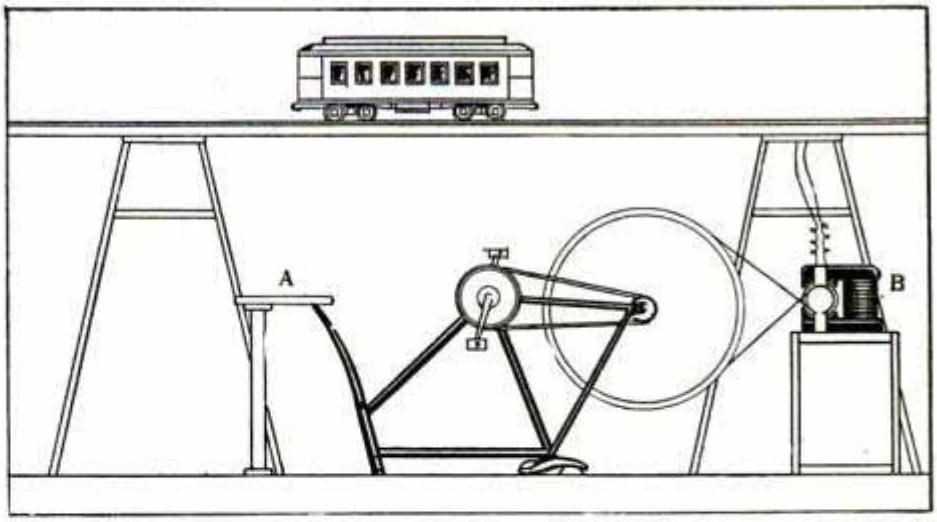


Experiment with Spool and Card

shown in the sketch. Then blow through the spool and it will be found that the card will not be blown away but will remain suspended without any visible support. This is explained by the fact that the air radiates from the center at a velocity which is nearly constant, thereby producing a partial vacuum between the spool and the card. Can any of the readers of Mechanics for Young America devise a practical application of this contrivance?

BICYCLE POWER FOR RUNNING MINIATURE TRAINS

Remove the front wheel from the bicycle and in its place fix a seat as at A in the sketch. Take the tire off the back wheel and run a small leather belt around the wheel to transmit power to the dynamo, B, which is connected up, as shown, and causes the little electric car to run when the wheel is operated. — Contributed by Clifford B. Brainerd, Chevy Chase, Md.



Bicycle Power for Electric Railway

RUSTIC WINDOW BOXES

Instead of using an ordinary green painted window box why not make an artistic one in which the color does not clash with the plants contained in it but rather harmonizes with them and brings out the beauty of the foliage to the most advantage.

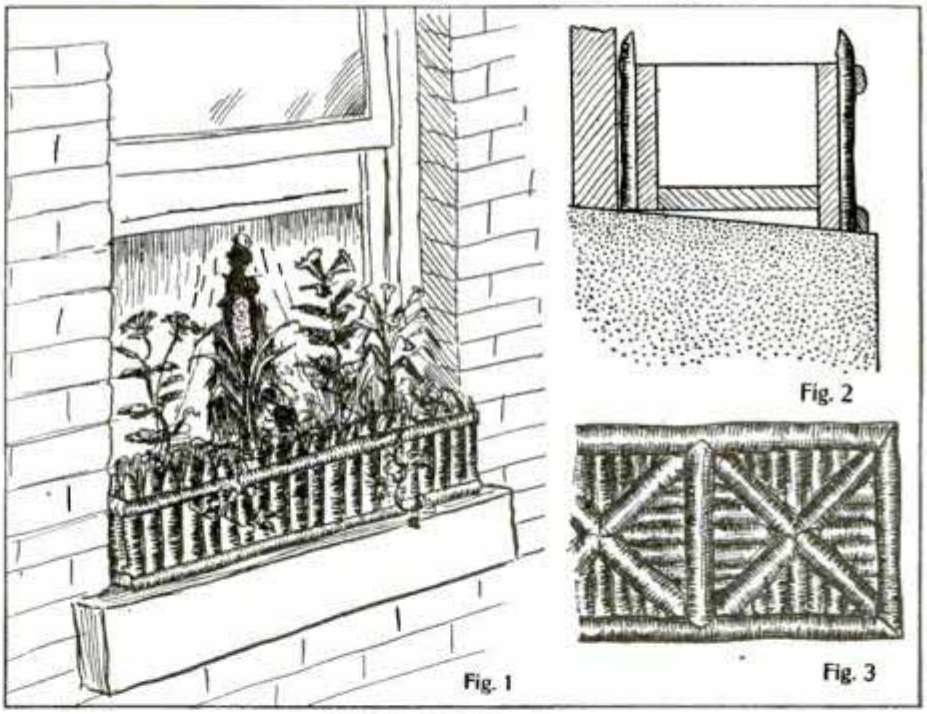
Such a window box can be made by anyone having usual mechanical ability and will furnish more opportunities for artistic and original design than many other articles of more complicated construction.

The box proper should be made a little shorter than the length of the window to allow for the extra space taken up in trimming and should be nearly equal in width to the sill, as shown in Fig. 1. If the sill is inclined, as is usually the case, the box will require a greater height in front, to make it set level, as shown in Fig. 2.

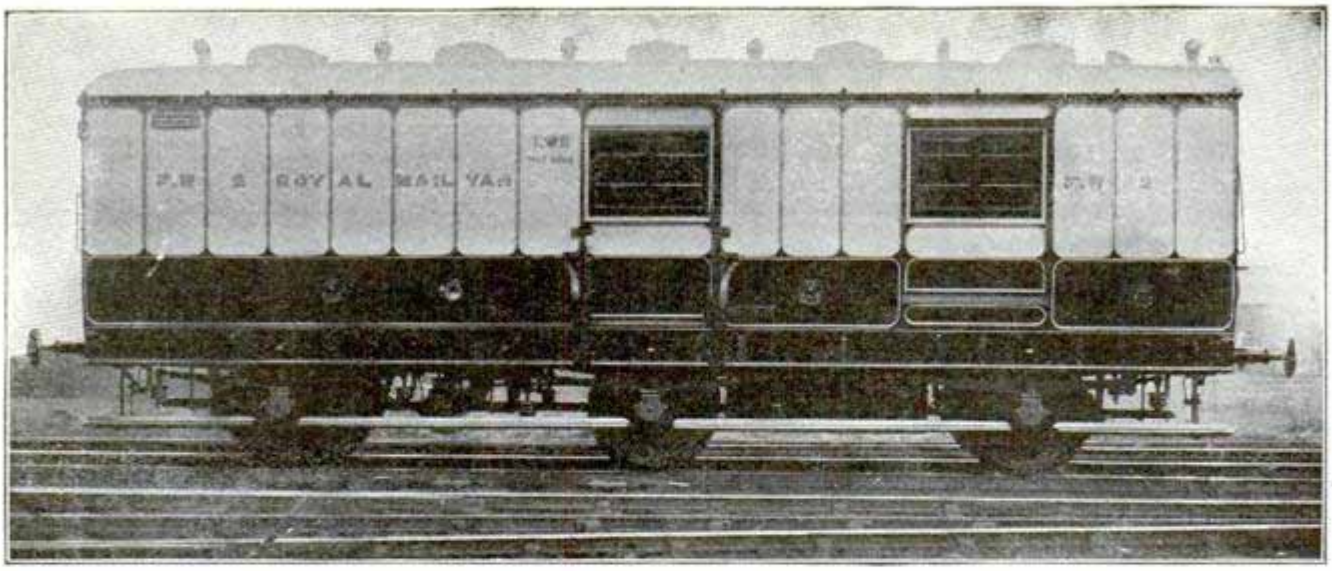
The box should be well nailed or screwed together and should then be painted all over to make it more durable. A number of ½-in. holes should be drilled in the bottom, thus allowing the excess water to run out and prevent rotting the plants and box.

Having completed the bare box it may be trimmed to suit the fancy of the maker. The design shown in Fig. 1 is very simple and easy to construct but may be replaced with a panel or other design. One form of panel design is shown in Fig. 3.

Trimming having too rough a surface will be found unsuitable for this work as it is difficult to fasten and cannot be split as well as smooth trimming. It should be cut the proper length before being split and should be fastened on with brads. The half-round hoops of barrels will be found very useful in trimming, especially for filling-in purposes, and by using them the operation of splitting is avoided. After the box is trimmed, the rustic work should be varnished, in order to thoroughly preserve it, as well as improve its appearance.



Artistic Window Boxes



ENGLISH MAIL CAR—The above illustration shows the type of railway mail car in use on the Furness Railway of England. The sorting table extends the entire length of one side of the car. It is equipped with electric lights.

PORTABLE TELEPHONE SERVICE

New and Practical Idea Which is Likely to be Generally Adopted

Detroit is to have the first portable city telephone service in the world. The scheme is so good it will certainly spread rapidly to all large cities.

Portable telephones will be rented to owners of automobiles, delivery wagons, doctors, and others who are about the city most of the time. Connection boxes will be located in all parts of the city, being fastened to poles, buildings or posts. In the box is a metal plate with two holes, into which the subscriber places the metal plugs which are at the end of the service wires of his portable telephone. When connection is thus made the subscriber can call up and talk with any telephone on the entire city system. A pocket directory giving the location of all the boxes will be furnished subscribers.

The great utility of the service is at once apparent. An auto breaks down; the owner takes his telephone to the nearest box—which may be a long distance from any other telephone—calls up a garage, and the repair outfit starts at once to his relief. Doctors can keep in constant touch with their offices or homes, or get as frequent reports as desired as to the condition of critical cases. A report that a patient had suddenly taken a turn for the worse would bring the doctor back without needless loss of time.

The service is patterned after the telephone system already in use on interurban trolley lines, where the conductor carries a telephone on the car and makes connection at boxes placed each half mile.

PHOTOGRAPHS ON FINGER NAILS

The latest London fad is to have the portrait of lover or favorite relative photographed on a finger nail. Young brides select the nail of the wedding ring finger. The process of picture making is best done by what is known as the carbon process. A photograph of the subject is first made in the ordinary way, and reduced to a size suitable for the finger nail. A print is then made from the negative on carbon paper, which is made in substantially every color. After the print has been fixed and toned, it is transferred to what is known as transfer paper. At this stage the finger nail must be rubbed with pumice powder, to render it quite smooth. Then the wet transfer paper is placed with the photograph on the finger nail. When dry, the transfer paper is stripped off and a finished photograph is left on the finger nail. Finally, a fine coat of transparent enamel is brushed over the photograph, rendering it perfectly safe to wash the hand without damaging the picture.

WHY FLOUR MILLS CHANGE IN QUALITY OF PRODUCTION

It is a curious fact that certain mills in a very short time, only a few weeks with some, change from good flour producers to bad, or the opposite, and the matter is frequently inexplicable to the miller. In one instance, where a miller had been putting out a satisfactory grade of flour, a new miller, who promised great things, was engaged.

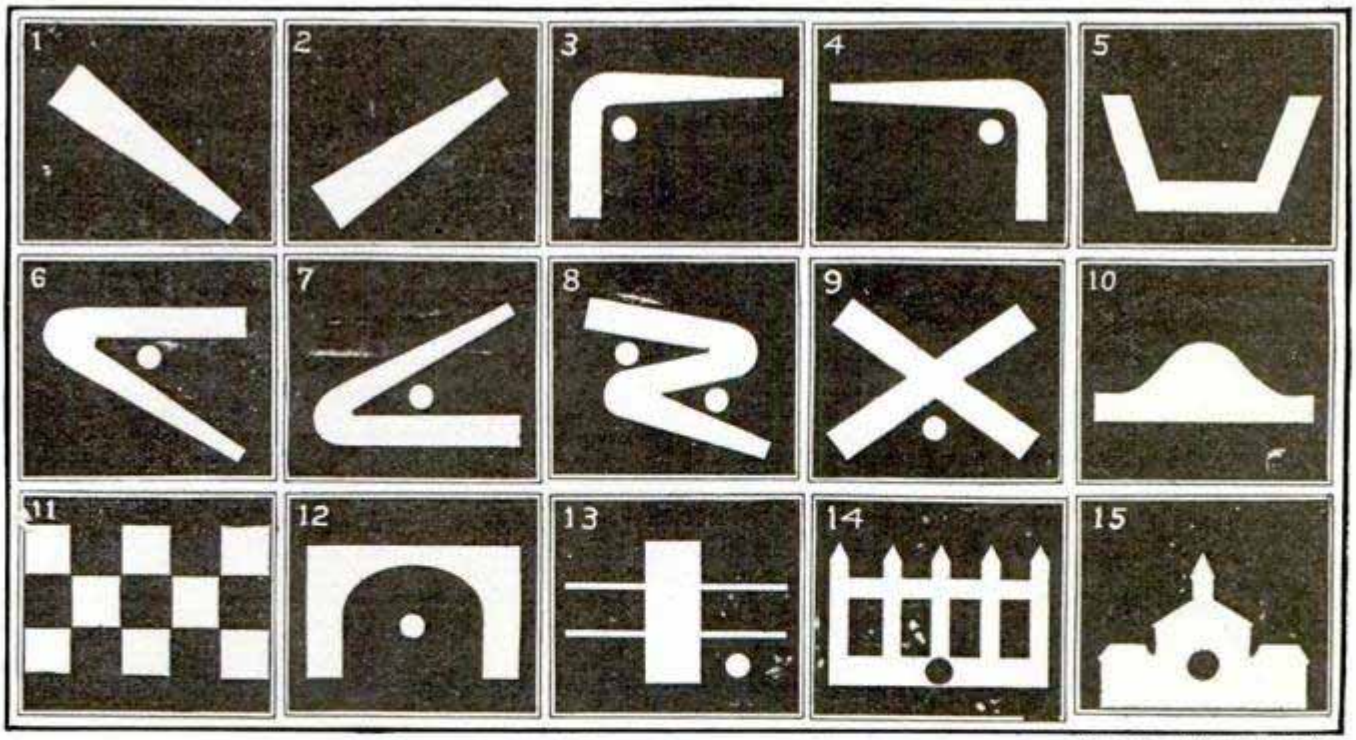
The new man, says the American Miller, proceeded to change nearly all the separating sheets on the tail of reels and, after a while, started. Quantity as well as quality was the new man's object. For three months or so, he changed morning, noon and night, while his Sundays were reserved for spout changing. Meanwhile complaints commenced coming in, and in several cases flour also, till finally the mill was shut down with three thousand barrels of flour on hand that would not stay out.

In this case it was believed by one or two millers that the new tailing sheets returned too much dirty stock to the rolls, and the miller began to return a vast amount of stock to be reground over and over and, with trying to raise capacity, ground closer and closer. Previous to his coming a 20-in. round reel had been taking care of all stock coming from the last, or low grade, roll; but it soon proved too small and a 36-in. reel was added to help out.

The new man's career was brief but exciting. The next man was cautious, but by degrees brought about good results and kept it up for several years.

In another case, however, a new man who did not change a foot of cloth nor a spout in a brief career of six weeks so ruined a mill's reputation for good product that every merchant in town was refusing the flour. Such cases are not infrequent.

A theory advanced in explanation is that hot rolls flaking the stock going through, the stock itself being in bad condition—that is, a good percentage sufficiently reduced to go through an average flour number of cloth—will produce poor flour even though the grinding is, so called, open. It matters not whether the bolting system be reel or sifter. Too fine cloth on the sifter, or one wrongly flowed, resulting in a heavy load of stock on the sieves, or the returning practiced in a reel mill in an effort to clear flour, will produce a flour the baking quality of which will be found unsatisfactory.



Courtesy of the Automobile

THE ABOVE DANGER SIGNS, WHICH ARE NOW USED IN FRANCE AND HAVE BEEN PROPOSED FOR USE IN THIS COUNTRY, ENABLE AUTOMOBILISTS TRAVELING AT THE RATE OF 50 MILES AN HOUR TO DETERMINE THE CHARACTER OF THE ROAD 300 YD. AHEAD. THE INTERPRETATION OF THESE SIGNS IS AS FOLLOWS: 1, RAPID DESCENT; 2, STEEP HILL; 3, TURN TO RIGHT; 4, TURN TO LEFT; 5, DITCH ACROSS ROAD; 6, TURN FOLLOWED BY DOWN-GRADE; 7, TURN FOLLOWED BY HILL; 8, WINDING DESCENT WITH BAD TURNS; 9, BAD CROSSROADS; 10, "DONKEY'S BACK"; 11, BAD STONE PAVING; 12, PASSAGE UNDER ROAD; 13, TRAM LINE ABOVE ROAD LEVEL; 14, GRADE CROSSING; 15, VILLAGE.

SAILING AIRSHIPS IS SERIOUS BUSINESS

Machinery Breaks and Aeronaut Drifts 250 Miles After Having Thrown Out Everything But Himself

Capt. William Matteray, 25 years of age, had a thrilling but terrible experience when he recently made an ascension from Oconto, Mich. He tells his experiences as follows:

"The crowd was great at the fair grounds, but I at first did not care to take the trip on account of high winds which I could gauge by the fast traveling clouds. The crowd, which had come over 100 miles to see the big ship, which had been on exhibition for two days, began to talk fake, and I saw no way out of it. I started to make the trip between 5:30 and 6 o'clock in the afternoon, and in about two minutes after I got under way I ran into high winds which threw the small gasoline engine out of kilter. I was already over Green Bay. I got there so fast that landing was impossible. It began to get dark and I tried to land again, but got into the water. I threw out some ballast and rose above the clouds. The next time I tried to land was in a big lake—I think it was Lake Michigan, for I could see nothing but water.

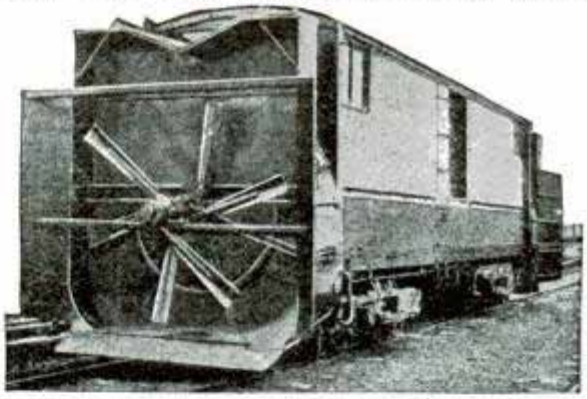
"I saw several big vessels and got within fifty feet over one big fellow. I called to a man on deck to catch the anchor rope, but he replied he was not in the catching business. It would have been an easy matter to have pulled me down then. The next time I landed I got up to my hips in water and had to throw out some more ballast.

"I had thrown the engine out shortly after I started, as I wished to save the lighter ballast to make a landing if I got a good chance. The third time when I arose I got the higher atmosphere and my wet clothes froze to my body. The big gas bag was dripping and as soon as we struck the higher air it was covered with a thick coating of ice. I expected to get killed any moment, but made up my mind I would stick till the finish, but was going to cut the ropes from the framework of the ship and float with the gas bag if the worst came. The framework is so frail that one misstep would have thrown me out into space. I was hungry and thirsty from being in the high air and nearly frozen, and became exhausted, so I made a net out of the landing rope across the frame of the ship, tied myself to it and fell asleep. I must have slept a long time, for I was awakened by the basket striking on a tree. I untied myself and made a lasso out of the drag rope and, after striking several trees, finally got the rope over one and fastened it, climbing down to the ground and pulling the ship with me. I unfastened the canvas rudder, made a bed out of it at the foot of the tree and went to sleep. I was awakened in the night by a big black bear which came sniffing around, but did not attempt to do any harm. I saw all kinds of wild animals and dozens of deer, which would give a stare at the big thing in the air and run away in alarm.

"I traveled about 250 miles as the crow flies and was over the water most of the way and on an average of 15,000 feet in the air. I arose in the morning and walked around for four hours, covering about ten miles, and found myself at the starting point. I took another start and arrived at Gaylord in an exhausted condition."

ELECTRIC SNOW PLOW

Many interurban electric lines are adopting the big rotary plows used by the steam roads. The only difference is that electric-



Works in Either Direction

ity instead of steam is the working power. The revolving blades are placed at each end of the car so it can work in either direction. A 100-hp. motor drives the blades with great rapidity, throwing the snow out at the top, where it rises on both sides of the car and falls a considerable distance from the track. The car itself is propelled by another set of motors.

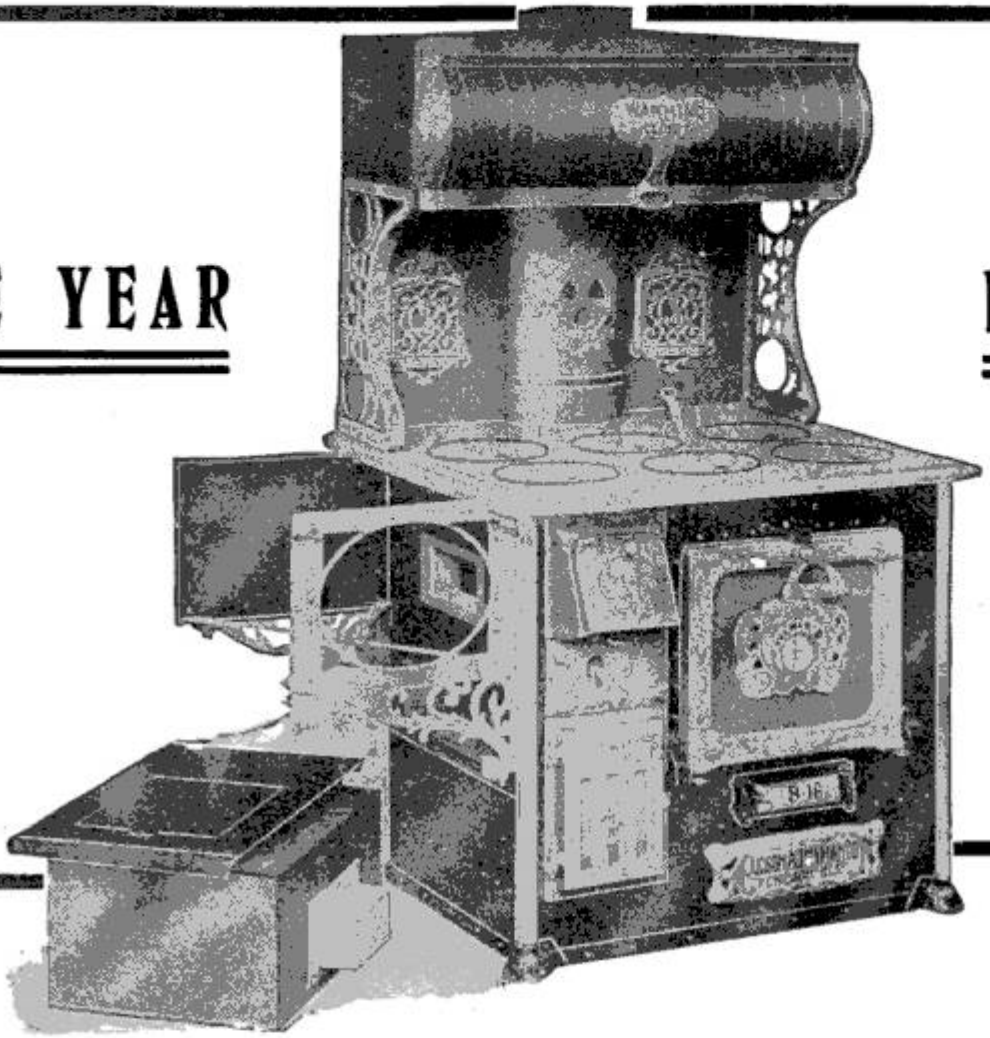
A TRAVELING FACTORY

The electric interurban roads are equipped with repair cars which with a crew of expert men are kept in constant readiness for emergency calls. In order to avoid a waste of time, one of these cars has been fitted up with tools and machinery for making repair parts. In this way the men are kept constantly employed.

BUILT TO BAKE

Will You Let Us Place a TOLMAN Range in Your Home on

ONE YEAR FREE TRIAL



WE want to prove to you, at *our risk,* in *your own* home, without any obligation on your part *whatever,* that Tolman Ranges are *absolute range perfection* and that one in your home will cut the *fuel bill and housework in half.* Let us explain to you how we sell direct to you from our factory at

ACTUAL WHOLESALE PRICES

and thus save you $15 to $40 profits of middlemen and dealers. We give with every range a TEN YEAR GUARANTEE, which is as broad and binding as we can make it. WE CLAIM THAT TOLMAN RANGES ARE THE ONLY RANGES MADE WHICH POSSESS ALL THESE FIVE POINTS OF MERITORIOUS PERFECTION—

Isn't This What You Want When You Buy a Stove or a Range?

1. The range that will bake, heat and endure.
2. The range that is REALLY economical.
3. The range which turns the gases and smoke into BAKING HEAT.
4. The range that has an OLD ESTABLISHED, REPUTABLE manufacturer behind it.
5. THE RANGE THAT WILL LAST THE LONGEST.

The riveting, the mounting, the finishing are all done BY HAND, by skilled workmen, under the personal direction of our PRESIDENT. We guarantee that there is not a better range made today, and few AS GOOD.

Is it not worth a minute's time and a postal card to send for our catalog, which tells all about this liberal special offer? Our catalog shows over 100 different styles and sizes of Wood Cook Stoves, Heating Stoves, Steel Ranges, etc. We are making many other liberal offers for the summer months. Are you interested? If so

SEND POSTAL FOR FREE CATALOG "G"

Twenty-three years of Manufacturing and Selling

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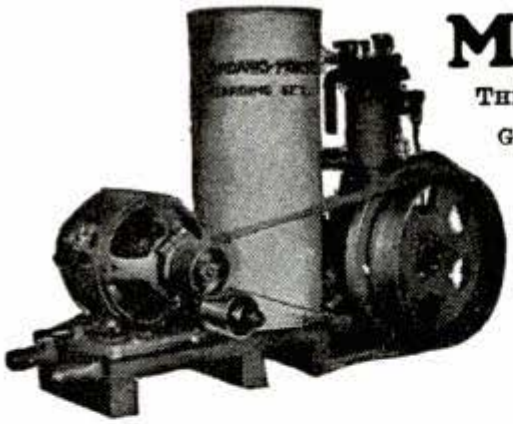
REMOVED TELEPHONE, BANKRUPTCY FOLLOWED.—The head of an established New York firm—an old man—returned to his place of business for a couple of days' work after having absented himself for several years. The constant ringing of the telephones so annoyed him that he ordered them all removed, saying his father and grandfather had prospered without the instruments and so could he. The business was local wholesaling and jobbing, taking nearly all its orders by 'phone. When the convenience was removed, the business fell off and in three years the house went into bankruptcy.

LUCKY NUMBER GETS RENT FREE.—A Paris flat owner has hit upon an idea which is popular with his tenants. On the door of every apartment is a number, and on the first of each month the landlord draws a lottery, and the occupant of the flat the number of which proves to be the winning one pays no rent that month.—Building Management.

ABSOLUTION BY TELEPHONE.—A Catholic priest recently expressed an opinion that in cases of great emergency it would be valid for a priest to receive a confession and grant absolution over the telephone. As, for instance, were miners cut off from rescue and yet had telephonic communication with those on the surface, the church would not refuse absolution because of the means by which it must be granted. Such an instance occurred in Europe, is said.

STEEL GRAVE FOR RUSSELL SAGE.—The body of Russell Sage was entombed in a steel walled grave, so massive that it looked like a solid ingot of the metal. The steel structure weighs 3 tons and is equipped with an intricate system of electric alarms. The steel box is 7 ft. 11 in. long, 42 in. wide and 32 in. deep, cost $22,000, and is strong enough to resist repeated charges of dynamite.



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THE FAIRBANKS-MORSE Electric Light Outfit gives plenty of good light at a moderate cost.
Gas, Gasoline or Kerosene Engines for all purposes, from 2 h. p. up.
Cut out complete advertisement and send to

Fairbanks, Morse & Co.

Monroe Street, Chicago, Ill.

Please send me illustrated Catalogue No. C 449 Gasoline Engines

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

Name..... .....

Street No..... .....

Town..... .....State..... .....

SMALL MOTORS
All Variable Speed

	Each
Alternating dental and jewelers' motors...	$25.00
Direct current " " " " ...	22.00
Alternating forge blowers.....	40.00
Direct current forge blowers.....	30.00
Alternating current friction drive motors for Gordon Presses, 100 to 2,000 impressions per hour.....	60.00
Same motor wound for direct current.....	40.00

These motors are the newest improved variable speed motors, and guaranteed for two years.

Send for booklet "B." A thousand other bargains in stock.

GUARANTEE ELECTRIC CO. CHICAGO, ILL.

Engine Castings

4 H. P.

Complete set, with Prints

$32.50

Finished Engine

$100.00

STATIONARY or MARINE

Nielson Motor Works

St. Joseph, Mo.

THE LARGEST

AIR-COOLED MOTOR MADE

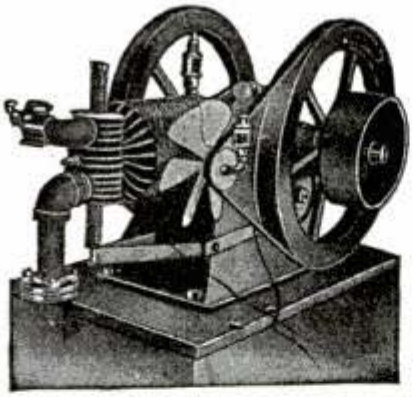
5 HORSE POWER

Bore 6x6 inches.

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

Write for Agency.

Gasoline tank in base or outside.



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

SEND FOR IT

MY REVISED LIST OF MACHINERY AND CONTRACTORS' EQUIPMENT IS NOW READY, AND COVERS TWELVE PRINTED PAGES WITH LOCATION AND PRICES. I WILL BE VERY PLEASED TO SEND A COPY TO YOU IF YOU WILL LET ME HAVE YOUR ADDRESS.

Willis Shaw, Machinery

171 La Salle St. CHICAGO, ILL.

YOUR INTERESTS AND OURS ARE IDENTICAL

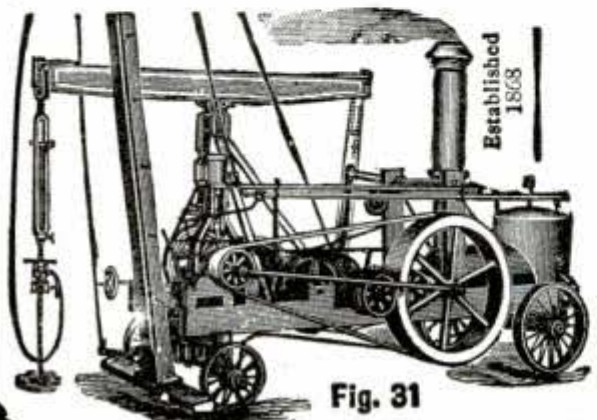


Fig. 31

You Want Practical

WELL DRILLING MACHINERY

to develope that

Mineral, Oil or Water

proposition; we have it. Guarantee it to work satisfactorily.

Tell us about the formations, depth, diameter holes; will send printed matter and can save you money.

THE AMERICAN WELL WORKS,

AURORA, ILL., U. S. A.

CHICAGO, ILL. DALLAS, TEXAS

CHICAGO POWER-BOAT SHOW.—The second annual Power-Boat Show will be held in Chicago March 2-9, 1907, and promises to be highly successful, with a large line of exhibits.

A NEW STANDARD FOR SCREW THREADS.—The Association of Licensed Automobile Manufacturers' standard screw is a new standard evolved from the old U. S. standard as a basis. It is nothing revolutionary in any sense of the word, but, on the contrary, it conforms to the general practice of many machine tool and automobile builders.

A finer thread than that of the U. S. standard has been found necessary, and this new standard is intended to fill this want. Like any new standard, it can not be hoped that it will be adopted immediately or universally, but it is believed that it will gradually creep into use.

Considerable study was put on the dimensions of the nuts and heads; careful destructive tests were made before the standard was adopted, to make it absolutely certain that the nuts and heads were large enough and that the threads would not strip.

Tests were made with ordinary material and with the material it is proposed to use for automobile work. The results were the same in both cases—that is, the screw broke at the base of the thread inside the nut, which was to be expected.

The material to be used for the screws in automobile work (and which can be easily worked in automatic screw machines) is about twice as strong as ordinary screw stock. Not only is it strong, but very much tougher, being lower in the impurities, and showing a very fine fracture, characteristic of a tough steel.

As time goes on, it is probable that these screws will be found in stock just as the ordinary U. S. standard is now found. This can not be done immediately; it must be accomplished by merit—that is, merit in this standard.

LARGEST ROOM IN THE WORLD WITHOUT COLUMNS.—The imambra connected with the Mohammedan mosque at Lucknow, India, says Valve World, contains the largest room in the world without columns, being 162 ft. long, 54 ft. wide and 53 ft. high. It was built during the great famine in 1784 to supply work for a starving people. It is a solid mass of concrete of simple form and still simpler construction. In its erection a mold or framework of timber and bricks several feet in thickness was first made, which was then filled with concrete. The concrete was allowed about a year to set and dry, when the mold was removed. Although the building has been standing 122 years, it is said to show no signs of decay or deterioration.

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can be applied, its perfect safety, convenience, and above all its portability, instantly recommend it to the man who solders anything, anywhere. Let us send you our little booklet, with a story which while quickly read, is never forgotten. Shall we mail it?

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You put my Calipers over your work and you know *in an instant* just what size it is and *how much too small or too large.* Agents wanted. **Send for Catalogue and Special Discount.**

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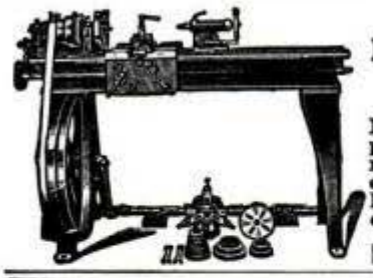
WHEN YOU WANT ANYTHING

AND DON'T KNOW WHERE TO FIND IT

WRITE POPULAR MECHANICS

FIFTY SNAP GASOLENE AUTOMOBILE AND MARINE ENGINES, SECOND HAND. WRITE FOR SNAPS.

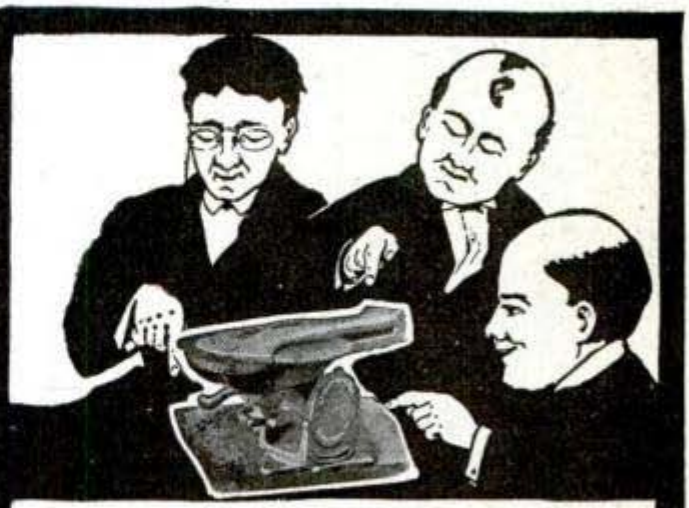
NEUSTADT AUTOMOBILE & SUPPLY CO., St. Louis, Mo.



B. F. BARNES' ELEVEN-INCH SCREW CUTTING LATHE

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

B. F. BARNES CO., Rockford, Ill



WISE HEADS

Discussing the Merits of the

Grammes Circular Saw Vise

never fail to emphasize the fact that its adjustability to all positions—absence of protruding levers and heavy jaws makes it the most desirable Saw Vise ever invented.

Pliable as a ball of putty. Stout as a chunk of iron. Neat to look at—everlasting to work with.

Price $6.50—Thirty days free trial. Returnable at our expense, if not worth double the price asked.

L. F. GRAMMES & SONS, Allentown. Pa.

AGENTS WANTED. LIBERAL COMMISSIONS PAID.

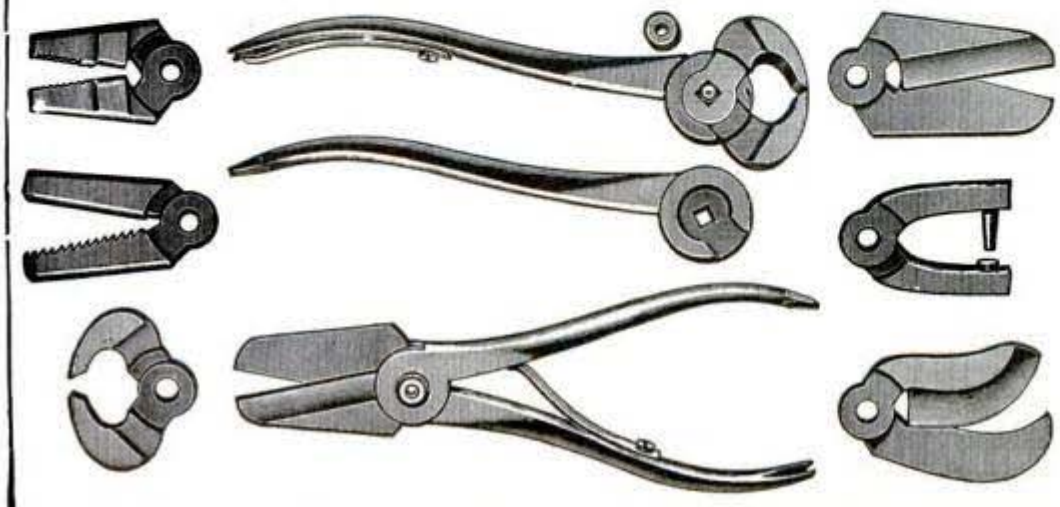
WE WILL SEND YOU

One Vise, One Set GENUINE Armstrong Stocks and Dies, One Pipe Cutter, One Wrench. All for handling pipe from ⅛ to 1 inch.

ON RECEIPT OF $10.50

Send for Catalogue of Complete Line,

ARMSTRONG MFG. CO., Bridgeport, Conn.



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$19 now, regular price $30 In order to bring to the attention of those interested in electricity the character of our instruction in Electricity, we will send the books

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Two hundred page illustrated Bulletin, giving full outline of Electrical, Mechanical, Steam and Civil Engineering courses, Architecture, Heating, Ventilation and Plumbing, Mechanical Drawing, Etc., sent free on request.

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Part II. Direct Current Dynamos and Motors, including Types-Motor Drives-Storage Batteries.

Part III. Electric Lighting—Railways—Management of Dynamos and Motors—Power Station.

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AMERICAN SCHOOL OF CORRESPONDENCE
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AUTOMOBILES $100 AND UP

We will mail our large Illustrated Bargain Sheet of new and slightly used Automobiles on receipt of your name and address. This sheet shows accurate photographic views of more than 50 Automobiles offered as low as $100. Write plainly to

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Established 14 years. **601-603-605 Madison Street, CHICAGO, ILL**

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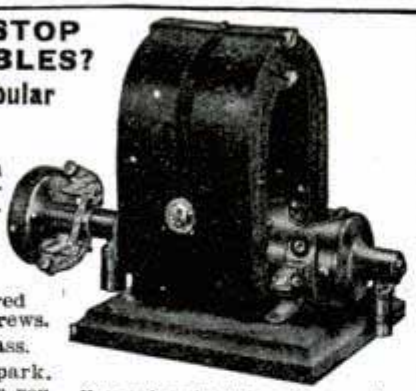
A "Wizard" Tubular Does It.



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All brass screws.
Friction, Belt or Governor drive.
Brush-holders removed without loosening screws.
All parts polished brass.
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A TRIAL WILL CONVINCE YOU. Most popular and satisfactory Magneto on the market. Price as popular as machine. Governor does away with Batteries and Switches.

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ELECTRIC BOOK FREE Full of HOLIDAY Suggestions

Shows all the newest high grade Electric Supplies and Novelties at lowest prices in the world. T. DEWEY ELECTRIC CO., Milwaukee, Wis.

Gasolene Motors AND Castings

A complete line from 1¼ to 10 h. p., for Bicycle, Automobile, Marine or Stationary. Also attachable motor outfits and Complete MOTOR-CYCLES. Send stamp for catalogue

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

BUILT UPON HONOR—ACCURACY, EFFICIENCY, MODERATE PRICES.

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

Sebastian Lathe Company, 107 Culvert St., Cincinnati, O.

POINTS FOR INVENTORS

1. When you have made an invention, show a drawing or model of it to two friends in whom you have confidence, and have them sign the drawing or write their names on the model. Don't lose or destroy the drawing or model, for some day it may be needed as evidence.

2. Select a good patent attorney, pay him $5 to find out whether your invention is new and patentable, and have him send you copies of the patents which he finds most closely resembling your invention.

3. If there are real differences between your invention and those shown in the patents sent you, and your invention is better than the others, apply for a patent as soon as possible. If, on the other hand, the differences are slight or superficial, and do not add to the commercial value of the article, don't waste any money in getting a patent.

4. If you cannot afford to apply for a patent, give an interest in your invention to some good business man who will furnish the necessary money to get the patent and build a satisfactory model or sample of your invention.

5. After you have applied for a patent and made a model or sample, prepare either to manufacture and sell your invention yourself, or to sell the patent to some one who will do so. Find out what it will cost to manufacture the invention in quantities, what such things usually sell for to jobbers, retailers and the public. This information is valuable in negotiating the sale of the patent and should be full and accurate.

6. Don't expect to make a fortune from your patent at once. If you cannot sell for cash, sell on a royalty, provided the buyer is reliable and responsible.

7. Don't sign any contracts without first submitting them to your patent attorney, and be governed by his advice.

8. If there are any other points about which you want advice or information write to us and enclose a stamp for reply. Send for our booklet containing suggestions on "What to Invent" and "What to Avoid."

POPULAR MECHANICS PATENT BUREAU,
160 Washington Street,
Chicago, Ill.

Branch office at
Washington, D. C.

TYPEWRITER IMPROVEMENT.—Robert Eugene Turner, an 18-year-old boy, has invented a mechanism which is expected to greatly simplify typewriting machines using it. The device is a paper carriage, which is returned automatically when the end of the writing line is reached, or from any desired point of the writing line, and simultaneously spaces the lines by the operator touching a key on the keyboard.

EXPOSITION OF LIFE SAFEGUARDS.—An exposition of devices for safeguarding the lives and members of working men and women and for preventing accidents to the public in general from machinery, and other industrial devices, will be held in New York City, January, 1907. The exposition will include model scaffolding, protective devices for steam, electrical and acetylenic machinery and apparatus, for mining and quarrying, fire protection and prevention of explosives, and safety devices for all industries where dangerous machinery is used; also ventilation systems.

FIFTY-CENT BOOK WORTH $5.—The following letter explains itself: "Popular Mechanics, Chicago: While riding on one of our street cars this morning, as I was glancing through 'The Shop Notes for 1906,' which I just received from you, a man called my attention to the book, asked me the price, looked it over and handed me 50 cents, and said: 'That book is worth $5. Will you have it sent to me immediately?' His address you will find inclosed. Wishing you grand success, I remain, Yours very truly, Chas. Edwards, Jr., 2623 E. Preston St., Baltimore."

HOLDING POWER OF RAILROAD SPIKES.—The Forest Service of the United States Department of Agriculture has completed a series of tests to determine the holding power of different forms of railroad spikes, says the Railway Review. The tests were made on ordinary commercial ties of loblolly pine, oak, chestnut and other woods. The spikes used were of four kinds: common driven spikes, a driven spike which has about the same form as the common spike with a lengthwise channel on the side away from the rail; screw spikes of the American type; and screw spikes similar to those in use on European railroads, and differing from the American spike mainly in the manner of finishing the thread under the head . . . common and the channeled spikes were driven into the ties in the usual manner to a depth of 5 in. A hole of the same diameter as the spike at the base of the thread was bored for the screw spikes, which were then screwed down to the same depth as the driven spikes. The ties were then placed in the testing machine and the force required to pull each spike was recorded. The average force required to pull common spikes varies from 7,000 lb. in white oak to 3,600 lb. in loblolly pine, and 3,000 lb. in chestnut. The holding power of the channeled spike is somewhat greater. For example, about 11 per cent more force, or 4,000 lb., is required to pull it from the loblolly pine tie. The two forms of screw spike have about the same holding power, ranging from 13,000 lb. in white oak to 9,400 lb. in chestnut and 7,700 lb. in loblolly pine. There is a marked difference between the behavior of driven and screwed spikes in knots and in clear wood. Knots are brittle and lack elasticity, so driven spikes do not hold as well in them as in clear wood. In the case of common spikes in loblolly pine the decrease of holding power in knots is as great as 25 per cent. On the other hand, screw spikes tend to pull out the whole knot which they penetrate. This increases the resistance so much that in loblolly pine the increase of holding power of screw spikes in knots is about 35 per cent over that for clear wood.

FOLDING SKATES.—Fold perfectly flat and to such small dimensions that they can be carried in the pocket. A leather wallet with two pockets is supplied with each pair, and when closed the package is ¾ in. wide, 1 in. thick and the length of the skates.

CORY INSERTS are being used in the face of iron pulleys to secure better transmitting results in the belt, and are also used in the face of metal friction clutches. An increase of from 50 to 100 per cent is claimed. They are also being used in brake shoes on street railways and in the transmission gear of automobiles.

Watering a lawn once won't keep it green the rest of the year. Advertising once won't make any noticeable difference in the annual profits.—Judicious Advertising.

NEW BOOKS

DIARY AND TIME-SAVER FOR 1907.—Full black or red leather, gold stamping, gilt edges, vest-pocket size, 25 cents. Laird & Lee, Chicago. Contains memorandum for full year, calendars, astrological signs, moon's changes for 1907, medical data, maps, wax paper stamp and ticket holder, etc.

TELEGRAPH SECONDARY CELL INSTALLATIONS.—By Arthur Crotch. Cloth, 180 pp., 100 illust. Price, 75 cents. Guilbert Pitman, 85 Fleet St., E. C., London. A practical work on the charging and management of accumulators.

ELECTRIC BELLS, INDICATORS AND AERIAL LINES.—By Umberto Zeda. Translated by S. R. Bottone. Cloth, 120 pp., illust. Price, 60 cents. Guilbert Pitman, 85 Fleet St., E. C., London. This little book is fully explanatory and tells how to make all the apparatus required, as well as to use it.

MANAGEMENT OF ELECTRICAL MACHINERY.—By Francis B. Crocker, E. M., Ph. D., and Schuyler S. Wheeler, D. Sc. 12mo, cloth, 232 pp., 134 illust. Price, $1.00. The D. Van Nostrand Co., New York. A revised and enlarged edition of Practical Management of Dynamos and Motors. Gives simple directions for the practical use and management of all electrical machinery.

JOURNAL OF THE FRANKLIN INSTITUTE.—Complete sets, comprising 160 vols., from Jan. 1, 1826, to Dec. 1, 1905. Address Franklin Institute, Philadelphia, Pa.

WIRING A HOUSE.—By Herbert Pratt. Pamphlet form, 25 cents. The Derry-Collard Co., New York. Shows every step in the wiring of a modern house, and explains everything clearly.

CATALOGS RECEIVED

FEED WATER HEATERS: Sims Co., Erie, Pa.

MEDIUM SPEED AUTOMATIC FOUR-VALVE ENGINES: Atlas Engine Works, Indianapolis.

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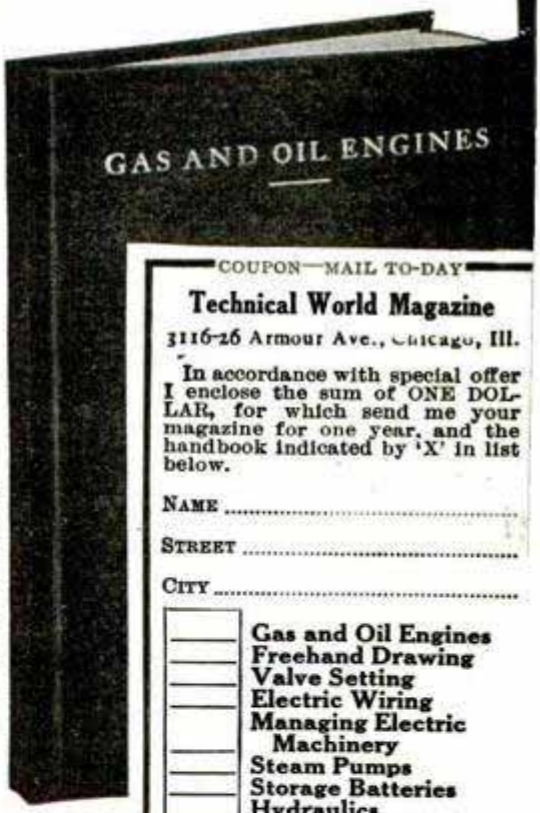

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Pop. Mech. 11-0

LINING LEAKY FREIGHT CARS.—To prevent loss of grain in transit where the cars are leaky a liner is now available made of tough paper stock. The material to line a car is made in four sections, and is fastened to the sides and ends of the car by means of tacks with large heads.

A BIG, EXPENSIVE FLEET.—In June, 1895, there were collected in the Pittsburg harbor 1,200,000 tons of coal, loaded on about 2,500 vessels, awaiting water to move down the Ohio River, the largest tonnage ever assembled in any harbor of the world at one time. The rise did not come until November 27. The cost of freight and vessels engaged in the service was estimated at $6,310,000. It cost $2,000 per day to keep the tonnage afloat, and $1,000 a day interest on the investment; total, $3,000 per day. This tonnage was kept waiting in the Pittsburg harbor for water in the Ohio River an average time of five months, or 150 days, at a cost of $450,000, which is 5 per cent on $9,000,000.—Marine Journal.

CHEAPER LIQUID AIR.—Recent experiments in England performed with liquid air producing apparatus have resulted in a cheaper process of manufacture, which, it is thought, will give an ultimate low price of less than 3 cents per gal.

The process is purely mechanical, the air being compressed to 2,500 lb. pressure and then liquefied at 125 lb. pressure, by the cold obtained from its expansion.

It is said that the component gases of liquid air are readily separated, and it could, therefore, be used to furnish oxygen gas for medical and scientific purposes, and liquid oxygen for welding iron and steel. The liquid nitrogen would also be valuable, and could be used for refrigerating and fertilizing purposes.

AUTOMATIC SCREWDRIVER.—A machine for applying screws at the rate of fifty a minute, if necessary, has recently been placed on the market, and consists of a hopper connected by a vertical flexible shaft and tube to the driving mechanism below.

The withdrawal of the bit from each screw as it is driven causes a new screw to drop out of a magazine and fall in line with the bit, and also allows a screw to fall from the hopper into the magazine. The use of the intermediate magazine was found necessary, as the operation of the machine is so rapid that too much time would be wasted in waiting for it to drop from the hopper.

The screws are caused to revolve at the rate of 1,200 revolutions per minute by means of a friction drive so adjusted that the screw stops after it has been driven the required distance.

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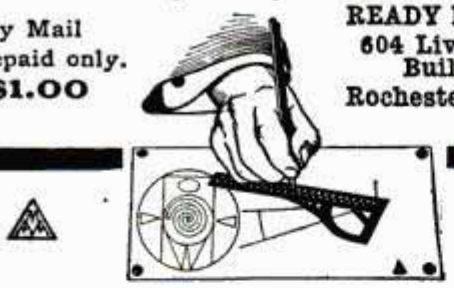

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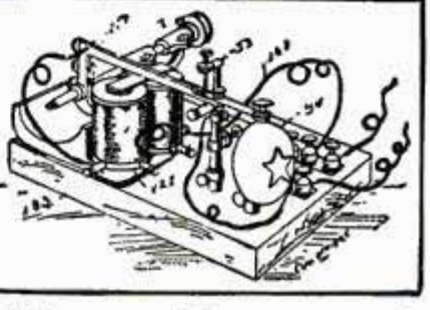

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Editor INVESTORS' REVIEW, 1461 Gaff Bldg., CHICAGO, ILL.

MECHANICS IN THE KITCHEN.—"I want to complain of the flour you sent me the other day," said Mrs. Newliwed, severely. The grocer inquired what was the matter with it. "It was tough," replied the housekeeper. "My husband simply could not eat the biscuits I made with it."—Philadelphia Public Ledger.

A HIGH DUTY METAL.—A new discovery in bronze mixture which is reported to give to valves designed for 250 lb. pressures an increased life of over 40 per cent. It is specially adapted to service where very high temperatures are required. It is now on the market after 8 months' severe but successful tests.

TO TOLMAN RANGE USERS

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of any kind, shall be entirely satisfied, and we will do everything possible to give our customers this satisfaction.

If you have a Tolman Range in use, and know of anyone who is in need of a range, send us their name and tell us what range you have We have a proposition which will interest you.

You may be thinking of buying a Stove or Range. If so, send for our catalog and we will try to give you the same satisfaction as we are trying to give our old customers. Notice our ad. on another page.

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THE CIRCUS AND THE TELEPHONE.—The telephone has penetrated into many strange places and in all has proved its usefulness. A traveling circus has installed a telephone in its ticket wagon and connection is made with the local exchange whenever the circus reaches a town in which a performance is to be given. It is thus possible for any one desiring to engage a "reserved" seat in advance to do so by telephone without the necessity of an extra and perhaps inconvenient visit to the grounds.

TRAVELING BATH TUBS.—Several bathing establishments in Rheims—and this is true of other French cities—have portable bath tubs, which are placed on two-wheeled vehicles provided with a large iron boiler filled with hot water. As orders for baths to be delivered at the doors of the residences are received, the boilers are filled with hot water and the bath-laden vehicles, each pulled by two men, start out for the delivery. The bath tub is filled with the hot water and carried into the residence, and while the family bath is going on the vehicle may fill another order, returning again for the tub, which is in regular commission as a visitor to the residences throughout the city. The price of a delivered-at-your-residence bath in Rheims is 30 cents, while at the establishment it costs 20 cents.

Rheims has a public bath in connection with the lavoirs publiques owned by the city, where the nominal charge of 4 cents is made for baths.

GREAT DIFFERENCES IN TIDES.—It would seem at first thought that all tides should be of equal height, as they are all caused by the attraction of the moon and sun, which attractions are practically the same on all parts of the globe. But the tides in some parts of the world are nearly one hundred times as high as in others.

Thus, in the Bay of Fundy the Spring tide (highest tide) is 50.5 ft., the Neap tide (lowest tide) is 43.5 ft. At Point Barrow, Alaska, the Spring tide is .6 ft., Neap tide .2 ft. At Burntcoat Head Light-house, Nova Scotia, the Spring tide is 50.5 ft. and the Neap tide 37.4 ft., while at Sabine Pass, Texas, Spring tide is 1.4 ft., Neap tide .8 ft.

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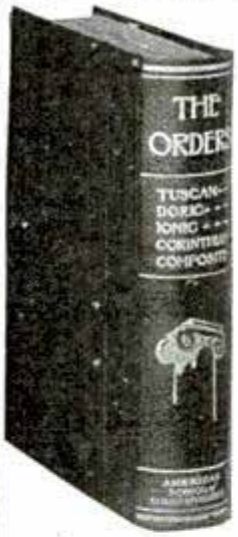

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Pop. Mech. 11-00

REQUIREMENTS OF A FOREMAN.—A large manufacturer, who was interviewed by a correspondent of the Woodworker, said:

"The one great requirement in a foreman, to be a success, is executiveness. A foreman never should allow a man to come to him and ask him what he shall do next. By that I mean that a foreman should always be ahead of his men—ready to tell them what to do next, and then see that they do it. If he wants a certain workman to do a certain piece of work, he should have the stuff at the man's hand when he is ready for it."

"What do you mean by saying 'and then see that they do it?'"

"Just what I said. A good foreman never works; he gets the other fellow to do that, and that is what he is paid for. The best foreman I ever saw in any furniture factory walked up and down from one end of his room to the other continually. He never stopped, unless it was to speak to a man or arrange for some work. There never was a longer period than five minutes that he did not see every workman and what he was doing, and more often it was every three minutes. A man cannot go very far wrong in three to five minutes. He absolutely saw that his men carried out the orders he gave them. Many a poor workman makes a good foreman because of the executive in him, and hundreds of good mechanics fail to become foremen or superintendents because they lack that quality.

"A case in point was that of a young fellow who had worked for me for a number of years, and was one of the best mechanics I ever saw. He placed every machine in the factory. Of course, I laid out the plans and he executed them. He could do anything with a machine. He came to me one day and asked for an increase in wages. I asked him why he wanted it, and he said because he thought he was earning more than he was getting.

" 'There does not seem to be any chance for me to be promoted,' he said, 'and I have learned all there is to learn in my department.'

" 'Is that so?' I asked. 'Tell me, please, the most economical lumber to cut for that 411 case.'

"He looked at me in utter astonishment. 'Why, I don't know,' he said. 'Why don't you?' I asked again. 'Which is the more economical, to put a 75 cent boy or a $1.50 man on that machine?' and again he said he did not know.

" 'You see,' I said, 'there are still a few things for you to learn.' He was sore, though, and the next day came to me and asked me when I could fill his place."

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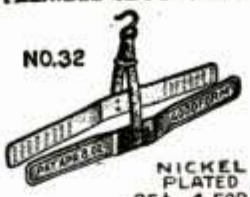

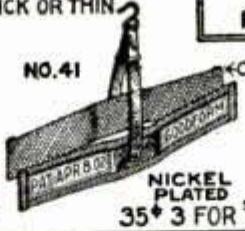

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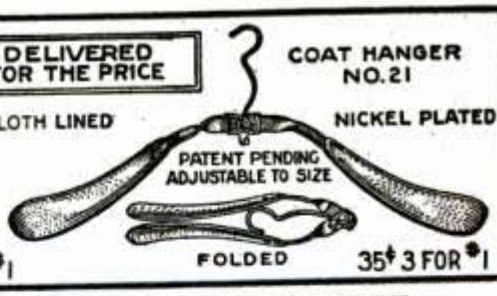

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TRAINING A TELEPHONE GIRL.—The selection and training of a telephone operator was fully described in a paper read by Miss Dempsey, a chief operator of Buffalo, before a telephone convention. In part, she said:

While the success of an exchange is not entirely dependent upon the punctuality of its employes, the general discipline of the office is affected if it is not required. Operators who make a practice of hurrying in on the stroke of the hour, or a few minutes after, breathless and flurried, are in no condition to take up the exacting work at the switchboard. The embarrassment caused by entering the exchange late does not prevent a repetition of the offense, but the penalty of a few minutes' overtime to be worked at the end of the day has proved effectual in remedying the tardy habit.

The student, after being examined and accepted, should be placed under the instruction of an experienced operator and allowed to listen in for several days. The names of the parts of the apparatus on the face of the switchboard and their various uses should be learned. Then the system of numbering and the markings, used to denote the change of calling number, telephone removed, etc., should be taken up, and the student thoroughly drilled until she is able to answer any question without hesitation.

After sufficient time has been spent in listening in and receiving instructions to enable the student to understand the method of operation, the practical application of the rules of the exchange, and the correct phrases to be used in dealing with subscribers, should be taught. No exchange is too small to be benefited by a set of rules for the guidance of its employes. The course to be taken, under circumstances that are likely to arise in the daily handling of the business, should be outlined, and the operators required to conform to their directions as closely as possible. It is advisable to have the rules both brief and comprehensive.

If the student shows, upon being examined, that she is competent to take up the work, she is assigned to a position at the switchboard, either during the light hours of the day, or next to a skillful operator during regular hours, if her presence does not interfere with the quick handling of the work. Until a student is able to do the work with

confidence, and some degree of speed, she should be watched carefully by a monitor or instructing operator. The training of a student does not end when she is assigned to a position at the switchboard. In fact, a most important part of her training begins at this time, and great care should be taken to guard against the forming of improper habits of handling cords and plugs, making a careless busy test, and last, but not least, indifferent supervision of connection. I find that it is advisable to consider each mistake or violation of the rules of sufficient importance to warrant correction, but the mistakes should be brought to the student's attention in an agreeable manner. No one should be allowed to give instructions or make corrections in a nagging way. It only causes extreme nervousness in the student, which occasions more serious blunders.

Particular attention should be given to the student's enunciation. Time spent in repetition of numbers and sentences not only wastes the subscriber's time and exasperates him, but will tend to slow the service. It is well known that ordinarily it is more difficult to make one's self understood over a telephone line than in direct conversation, and for this reason greater care should be taken to speak distinctly.

A serious difficulty which is encountered in the small exchanges, from which the larger offices are comparatively free, is the custom generally followed by subscribers of calling by name instead of by number. While this is most convenient from the subscribers' standpoint, one can readily understand how detrimental such a practice is when students begin work at the switchboard. To allow subscribers to call in this way occasions much delay in the work, and the habit should be discouraged. In places where it is found impossible to induce the use of number calls exclusively, the students should be upheld when the service is slow. Knowledge of names and numbers may be a help to quick service, but it should be regarded as an accomplishment rather than as a duty of the operator.

WETTING LEAD PENCILS.—The act of putting a lead pencil to the tongue to wet it just before writing, which is habitual with many people, is one of the oddities for which it is hard to give any reason, unless it began in the days when pencils were poorer than now, and was continued by example to the next generation, says Graphite. A lead pencil should never be wet. It hardens the lead and ruins the pencil. This fact is known to newspaper men and stenographers. But nearly every one else does wet a pencil before using it. The fact was definitely settled by a newspaper clerk away down East. Being of a mathematical turn of mind, he ascertained by actual count that of fifty persons who came into his office to write an advertisement or a church notice, forty-nine wet a pencil in their mouths before using it. Now, this clerk always uses the best pencils, cherishing a good one with something of the pride a soldier feels in his gun or sword, and it hurts his feelings to have his pencils spoiled. But politeness and business considerations require him to lend his pencil scores of times a day. And often, after it had been wet till it was hard and brittle and refused to mark, his feelings would overpower him. Finally he got some cheap pencils and sharpened them, and kept them to lend. The first person who took the stock pencil was a drayman, whose breath smelled of onions and whisky. He held the point in his mouth and soaked it several minutes, while he was torturing himself in the effort to write an advertisement for a missing bulldog. Then a sweet-looking young lady came into the office, with kid gloves that buttoned half the length of her arm. She picked up the same old pencil and pressed it to her dainty lips preparatory to writing an advertisement for a lost bracelet. The clerk would have stayed her hand, even at the risk of a box of the best Dixon pencils, but he was too late. And thus that pencil passed from mouth to mouth for a week. It was sucked by people of all ranks and stations, and all degrees of cleanliness and uncleanliness. But 'twere well to forbear. Surely no one who reads this will ever again wet a lead pencil.

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