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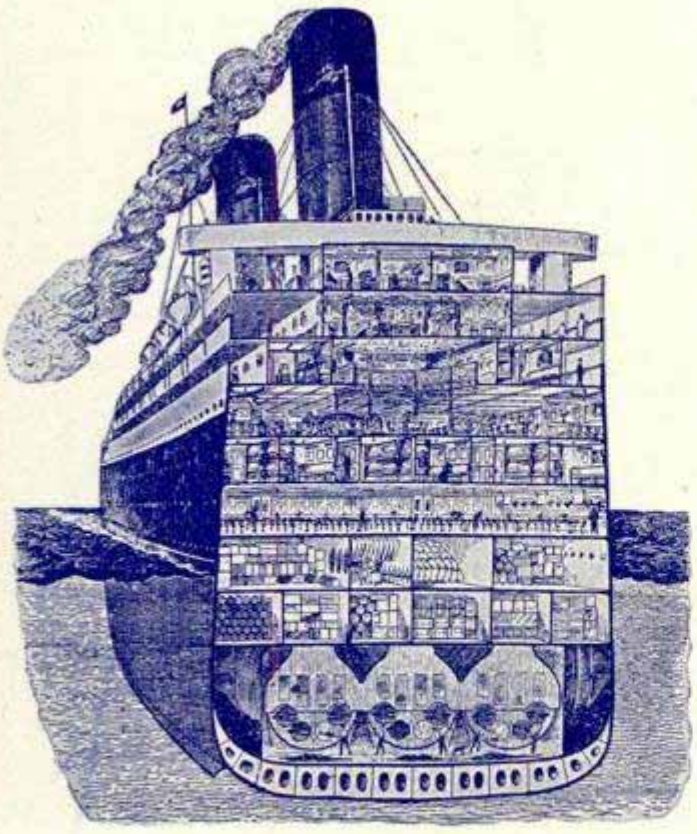

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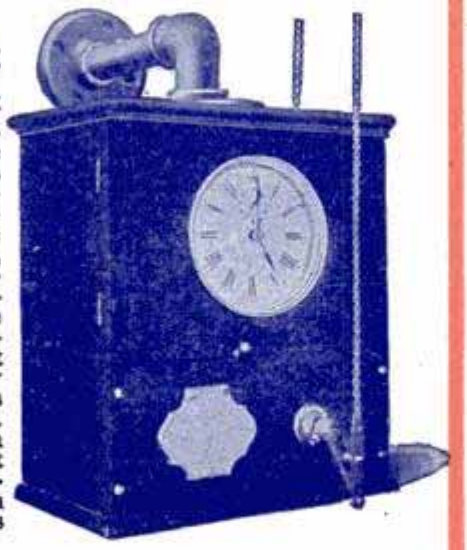

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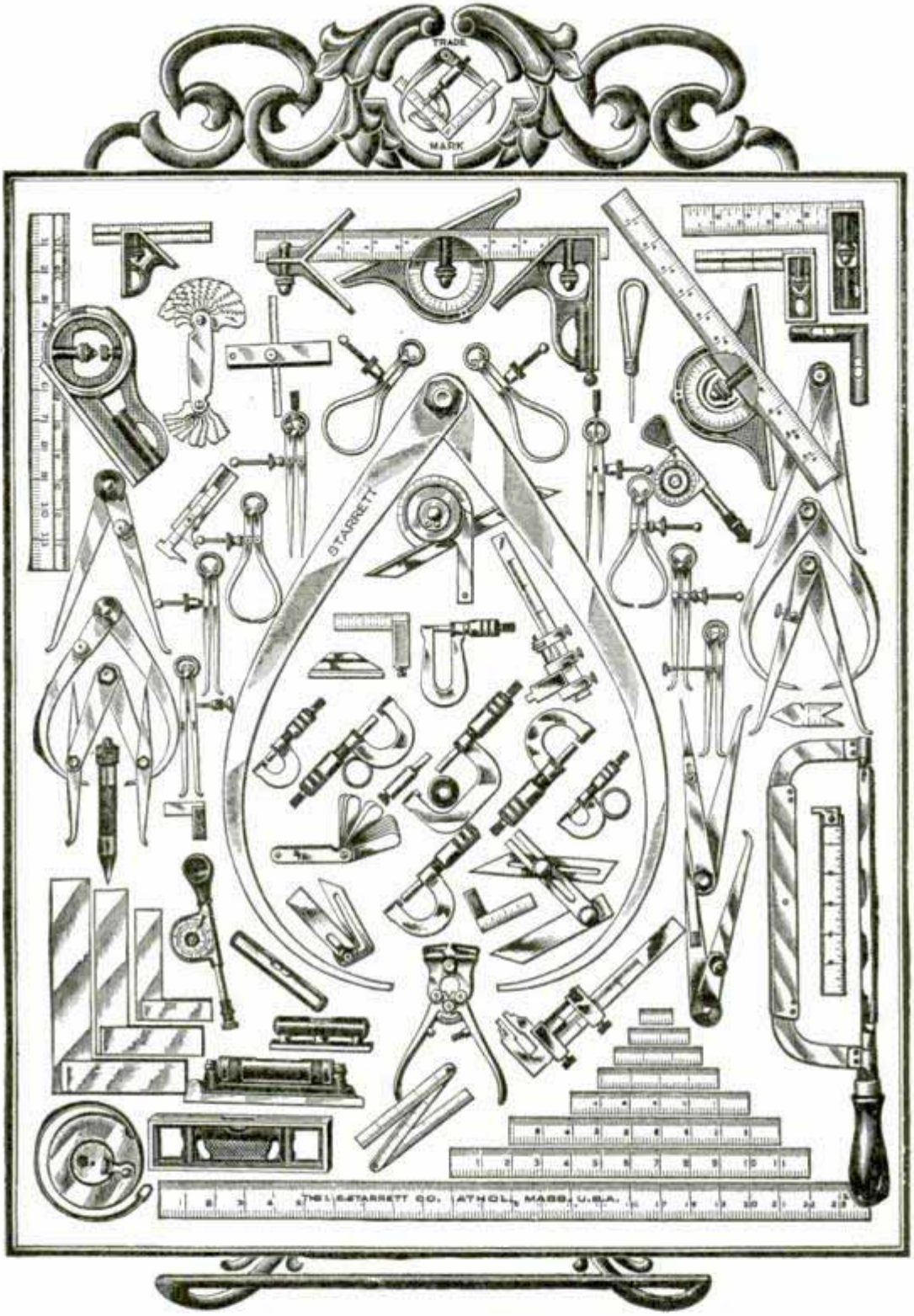

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The Earning Power of Money

In a recent article in "Success," Henry Clews says: "Money represents the efforts of man." If one has a million dollars, he can, for a day, control a force equal to a million men. Every dollar one saves gives him practical control of the services of one man for one day. The man who has the ability and strength to save money can make these moneys work for him as if they were men. The question is, HOW and WHERE can it be used to the greatest advantage? If you invest it at small rate of interest, you simply give some one else the opportunity of making your money earn money for THEM; if you spend it, all possibility of making it work for you is lost.

One hundred dollars invested at 16 per cent. interest will earn in a year as much as sixteen men working for you one day. It is, however, possible to make one hundred dollars do the work of ten, fifty or even one hundred men; it depends on how and WHERE you invest it.

Every man is desirous of securing for himself a competency which will enable him to enjoy the fruits of his labor at as early a period in his life as possible. This is a problem, however, which is becoming more difficult and more complex each year.

Consider these facts seriously, and decide if it is not wise to invest at once in THE KORNIT MANUFACTURING COMPANY, and draw a handsome yearly income from its enormous earnings.

THE STORY OF KORNIT

By President Chas. E. Ellis.

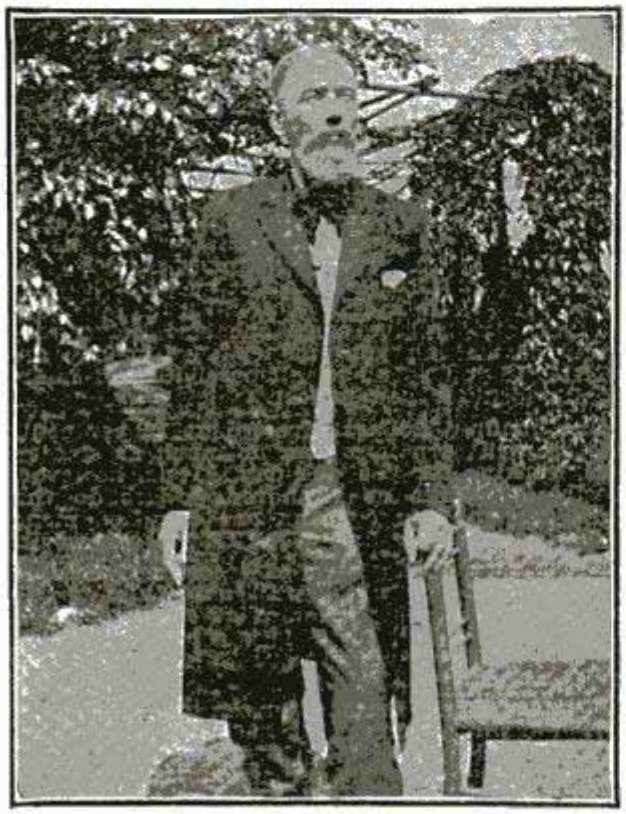
KORNIT was invented by JOHANN GUSTAV BIERICH, a subject of the Czar of Russia, residing at Menkenhof, near Livenhof, Russia, and is a Homogeneous Horn or Hoof substance. Kornit is produced by grinding horn and hoof shavings and waste into a palpable powder and then pressing under heavy hydraulic pressure with heat into a homogeneous slab. This slab produces a substance which can be sawed or turned the same as ordinary wood. It is of a beautiful black consistency and Is EXTREMELY VALUABLE as a NON-CONDUCTOR FOR ELECTRICAL SUPPLIES. It is a matter of record that the electrical industry in this country AT THIS TIME DOES NOT HAVE a satisfactory material for heavy or high insulating purposes. A slab of Kornit one inch thick was tested in Trenton, New Jersey, by the Imperial Porcelain Works and was FOUND TO HAVE RESISTED 96,000 VOLTS OF ELECTRICITY. It may be interesting to note here that the heaviest voltage which is transmitted in this country is between Niagara, Buffalo and Lockport, New York. The voltage transmitted by this company is between 40,000 and 50,000 volts. Kornit is equally as good as a non-conductor for electrical purposes and supplies as is hard rubber.

The average price of hard vulcanized rubber for electrical purposes is to-day considerably over one dollar per pound—at the present writing something like $1.25 per pound.

KORNIT CAN BE SOLD AT TWENTY-FIVE CENTS PER POUND and AN ENORMOUS profit can be made at this price, so that it CAN EASILY BE SEEN that where KORNIT is EQUALLY AS GOOD and AS A MATTER OF FACT, in many instances, a BETTER non-conductor than hard rubber, it can compete in every case where it can be used with great success on account of its price. For electrical panel boards, switchboards, fuse boxes, cut-outs, etc., there are other materials used, such as vulcanized paper fibre, slate, marble, etc. A piece of vulcanized paper fibre, 3x4x1 inch, in lots of 1,000, brings 20 cents per piece. A piece of Kornit of the SAME DIMENSIONS could be sold with the ENORMOUS PROFIT OF OVER 100 PER CENT, at ten cents. The absorptive qualities of Kornit render it such that IT IS FAR PREFERABLE to that of vulcanized fibre. It will not maintain a flame. Of all the materials which are now in the electrical market for supplies and insulators there is, as we have stated above, none that are satisfactory. Kornit will fill

this place. Its tensile strength per square inch averages from 1,358 pounds to 1,811 pounds, which the reader can readily see Is More Than Satisfactory. This test was made by a well-known electrical engineer, who is now acting in that capacity for the United States Government with a Standard Riehle Bros. testing machine.

Waste horn and whole hoofs are being sold by the ton to-day principally only for fertilizing purposes. There is one town alone, Leominster, Mass., where they have an average of eight tons of horn shavings



MR. JOHANN GUSTAV BIERICH, THE INVENTOR OF KORNIT, IN HIS SUMMER GARDEN AT MENKENHOF, RUSSIA.

every day. These waste horn shavings are now only being sold for fertilizing material. These eight tons of horn shavings manufactured into Kornit and sold for electrical purposes would easily bring $3,000. At this price it would be selling for less than one-fifth of what hard rubber would cost, and about one-half what other competitive materials would sell for, even though they would not be as satisfactory as Kornit.

Kornit has been in use in Russia about four years. In Riga, Russia, which is the largest seaport town of Western Russia, the Electrical Unions there are using Kornit with the greatest satisfaction, finding it preferable to any other insulating material.

The expense of manufacturing Kornit from the horn shavings is not large, as the patentee, Mr. Bierich, has invented an economical and satisfactory process which produces an article that, in the near future, will be used in the construction of almost every building in this country.

Besides electrical insulators, Kornit can be used for the manufacturing of furniture, buttons, door handles, umbrella, cane, knife and fork handles, brush and sword handles, revolver handles, mirror backs, picture frames, toilet accessories, such as fancy glove boxes, jewel cases, glove stretchers, shoe lifts, etc.; office utensils, such as paper knife and pen holders, ink stands, pen racks; medical instruments, such as syringes, ear trumpets, etc., etc.; pieces for games, such as draughts, chessmen, dominoes, checkers, counters, chips, cribbage boards, etc.; telephone ear pieces, stands, etc.; piano keys, typewriter keys, adding machine and cash register keys, tea trays, ash trays, scoops, mustard and other spoons, salad sets, cigar and cigarette cases, cigar and cigarette holders, match boxes, and hundreds of other useful and ornamental articles, all at a large and remunerative profit.

THE GREAT DEMAND FOR KORNIT IN THIS COUNTRY

THERE is one manufacturer ALONE here in New York that uses 60,000 square feet of insulating material for panel boards every year. He is now using slate and marble, but IT IS NOT SATISFACTORY, for the reason that in boring and transportation It Breaks so Easily. Kornit will Answer the Purpose of Manufacturing Panel Boards Very Much More Satisfactorily. On 60,000 square feet of Kornit there would be a net profit of over $30,000, or 50 cents for every square foot used. This One Example is cited to show you The Enormous Profits which can be made. There are a great many other panel and switchboard manufacturers in this county. You may be interested to know that a panel board is a small switchboard. There is one or more n every floor of all large buildings where electricity is used. They each have a number of switches mounted on them, so that those in charge can turn certain lights on or off, and by these panel boards all the electrical power in the building is controlled. They must be of a reliable non-conducting material. Kornit can be used for this purpose almost exclusively. The largest electrical manufacturing concerns in Riga, Russia, are Using Kornit Only for this Purpose, after having tried all other so-called non-conducting compositions. The electrical trades alone can consume a great many tons of Kornit every day in the year. If only two tons of Kornit is manufactured and sold every working day in the year it will Enable the Kornit Manufacturing Company to Pay 16 Per Cent Dividends Every Year. Of course, if four tons a day are sold the dividends would be over 32 per cent. per year. This is Not Improbable. An Expert Electrical Engineer who holds one of the most responsible positions here in New York City made the statement, after thoroughly examining and testing Kornit for electrical purposes, that in his most conservative estimation there can be ten tons of manufactured Kornit sold every working day in the first year. This would mean that the Kornit Manufacturing Company would pay a dividend out of its earnings the first year of over seventy-five per cent. (75%). This is probably more than will be paid the first year, but there certainly seems to be a good prospect of paying a large dividend the first year.

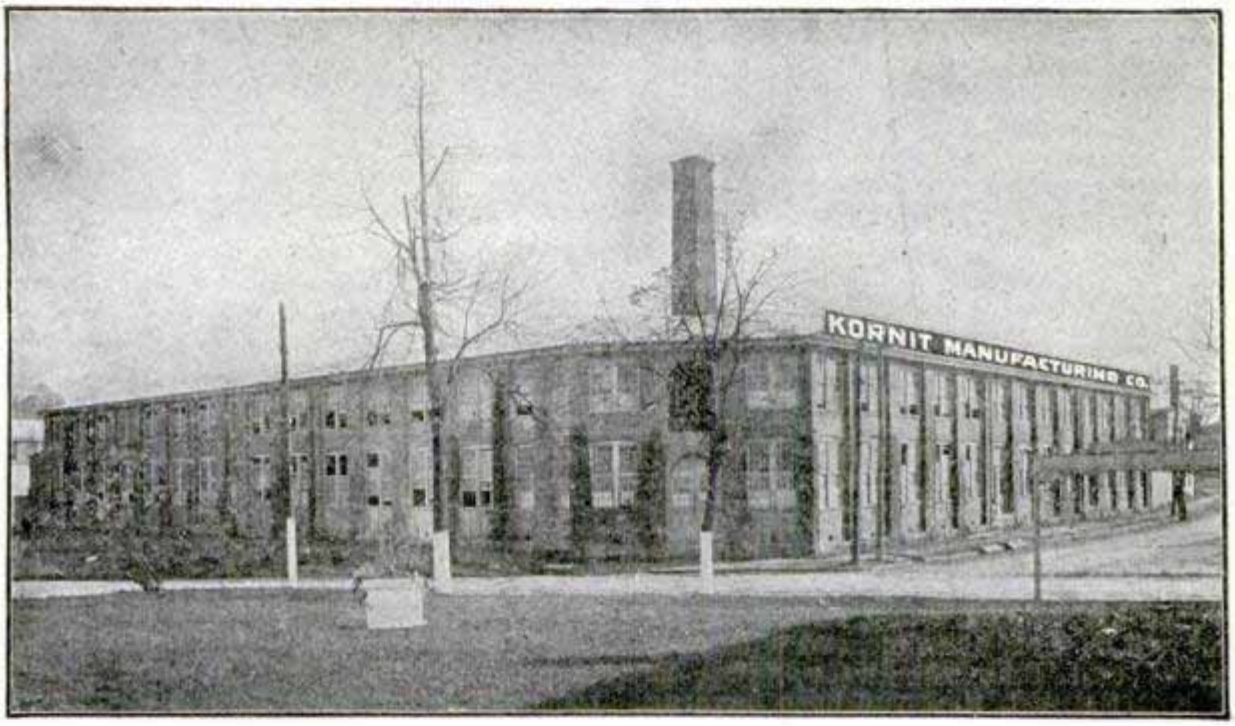
There will be Such an Enormous Demand for Kornit after it Becomes Intro-

DUCED THAT FROM YEAR TO YEAR THE DIVIDENDS EARNED WILL BECOME LARGER. THIS IS THE BEST OPPORTUNITY TO MAKE AN INVESTMENT THAT YOU HAVE EVER HAD.

It is a well-known fact that THE MOST LEGITIMATE AND PROFITABLE way to MAKE MONEY is by manufacturing some product that is "NECESSARY" and ONE THAT CAN BE FULLY CONTROLLED so that nobody else can manufacture the same article. Look at Sugar (which is protected by a high tariff); at Standard Oil, the Telephone, the Telegraph, and we might go on and enumerate many more monopolies. THEY ARE THE BIG MONEY MAKERS OF TO-DAY. KORNIT CANNOT BE MANUFACTURED BY ANYBODY IN THIS COUNTRY EXCEPT OURSELVES OR OUR AGENTS. We own all the patents issued by the UNITED STATES GOVERNMENT to the inventor, MR. JOHANN GUSTAV BIERICH, IN RUSSIA. These patents HAVE BEEN BOUGHT from Mr. Bierich and ARE DULY TRANSFERRED TO THE KORNIT MANUFACTURING COMPANY, and the same is DULY RECORDED IN THE PATENT OFFICE OF THE UNITED STATES.

WE HAVE A FINE FACTORY

OUR factory is located in Newark, N. J. (Belleville Station). The machinery is now being assembled. To this end the services of the son of the inventor, MR. KURT BIERICH, who is a graduate of FREIBURG UNIVERSITY GERMANY, has been retained. He will arrive in this country in the near future to take full charge of the scientific construction of the factory. MR. KURT BIERICH spent two years in his father's factory at MENKENHOF, RUSSIA, and six months at the workshops in RIGA, RUSSIA, mastering every minute detail of the manufacturing and working departments. MR. BIERICH, JR., has been employed for six months recently in superintending the erection of a Kornit factory for the English company at Stoke Newington, N., London, WHICH HE HAS JUST BROUGHT TO COMPLETION IN THE MOST SATISFACTORY MANNER. MR. BIERICH, JR., will have full charge of erecting and maintaining the KORNIT FACTORY IN THIS COUNTRY. It is planned that OUR FACTORY WILL BE COMPLETED BY FEBRUARY 1ST AND THAT KORNIT SHALL BE A WELL-KNOWN AND UNIVERSALLY USED ARTICLE IN THE ELECTRICAL AND OTHER TRADES OF THIS COUNTRY EARNING AND PAYING LARGE AND SATISFACTORY DIVIDENDS EACH AND EVERY SIX MONTHS. A few shares obtained now may be the foundation for a fortune or the much-desired income for support in the unknown years that are to come. We leave it to you if it would not seem good judgment to take immediate advantage of this opportunity. Anyway, please write me at once and let me know just what you will do. If it is not possible for you to take shares now, write and tell me how many you would like and how soon it will be convenient for you to do so, provided I will reserve them for you. As soon as I receive your letter I will answer it WITH A PERSONAL LETTER AND WILL ARRANGE MATTERS AS YOU WISH TO THE BEST OF MY ABILITY.



KORNIT FACTORY, NEWARK, N. J. BELLEVILLE STATION).

REMEMBER, I HAVE A GREAT MANY THOUSAND DOLLARS INVESTED IN THE KORNIT MANUFACTURING COMPANY, and the minute you buy a share or more in this Company we become CO-PARTNERS as CO-SHAREHOLDERS. It is for our mutual benefit to watch and guard each others' interests. I WILL BE GRATEFUL IF YOU WILL WRITE ME TO-DAY, so that I may know just what you will do.

I know you will agree with me that you have never had presented to your notice a better opportunity to make an investment where such large profits can be made because of the exclusiveness of control, and the great demand and the low cost of the raw material, which is now almost practi-

carly thrown away. Join me in this investment, and I assure you it is my sincere belief that in the future you will say: "That is the day I made the most successful move in my whole life."

MY OFFER TO YOU TO-DAY

THE KORNIT MANUFACTURING COMPANY is incorporated under the laws of New Jersey and is capitalized with 50,000 FULLY PAID NON-ASSESSABLE shares at $10 each. It is my intention to sell A LIMITED NUMBER ONLY OF THESE SHARES at the par value of $10 each. TEN DOLLARS WILL BUY ONE SHARE. TWENTY DOLLARS WILL BUY TWO SHARES. FIFTY DOLLARS WILL BUY FIVE SHARES. ONE HUNDRED DOLLARS WILL BUY TEN SHARES. ONE THOUSAND DOLLARS ONE HUNDRED SHARES, AND SO ON. After you have bought one or more shares in THE KORNIT MANUFACTURING COMPANY you may feel as I do, that you have placed your savings WHERE THEY WILL DRAW REGULAR and SATISFACTORY LARGE DIVIDENDS.

I SHOULD NOT BE A BIT SURPRISED if these shares paid dividends as high as one hundred per cent. in the not far distant future. Consequently, a few dollars invested now in the shares of the KORNIT MANUFACTURING COMPANY will enable you in the future to draw a REGULAR INCOME from the large profits of the Company as they are earned. THE DIVIDENDS will be paid semi-annually, every six months, the first of May and November of each year. THIS IS ONE OF THE BEST OPPORTUNITIES YOU WILL EVER HAVE PRESENTED TO YOU IN YOUR WHOLE LIFE-TIME. I HAVE INVESTED A GREAT MANY THOUSAND DOLLARS IN THE KORNIT MANUFACTURING COMPANY, AND I FEEL SURE IT IS ONE OF THE BEST INVESTMENTS I HAVE EVER MADE. I can TRUTHFULLY say to you that I FULLY BELIEVE that you will be more than pleased with your investment and that YOU WILL NEVER BE SORRY. REMEMBER, that you here have an opportunity to become interested in a large industrial manufacturing concern manufacturing a product, with an exclusive monopoly, which HAS NEVER BEFORE been manufactured or sold in this country.

Remember, that it is by no means an experiment, as IT HAS BEEN SUCCESSFULLY MANUFACTURED AND SOLD FOR OVER FOUR YEARS IN RUSSIA AT A LARGE PROFIT, and the manufacturer and inventor recently wrote that the DEMAND IS INCREASING EVERY DAY, beyond the capacity of their manufacturing facilities.

Now is the time for you to take advantage of this magnificent opportunity to make an investment in these shares. I EARNESTLY BELIEVE that in a few years THESE SHARES WILL BE WORTH FROM FIFTY DOLLARS TO ONE HUNDRED DOLLARS each on account of the LARGE DIVIDENDS which the company will earn and regularly pay each and every six months. It is a well-known fact that $10 shares that pay fifty (50) to one hundred (100) per cent. dividends will readily sell in the open market for $50 to $100. THE OUTLOOK FOR THE KORNIT MANUFACTURING COMPANY is such that it seems impossible for the earnings to fall far short of these figures. If the company only makes and sells

PRESIDENT CHARLES E. ELLIS.

two tons of Kornit a day for the first year, and makes a profit of only two hundred dollars per ton, it would mean a profit of over sixteen per cent. (16%) the first year. If this business were doubled the second year, of course the earning capacity would double and the dividends would be over thirty-two per cent. (32%). Prominent and well-known Electrical Engineers assure me that this product cannot help and is bound to make enormous profits. I would recommend that you send for as many as you may wish at once. You, in my conservative opinion, can safely count on the large earning capacity of these shares. I will at once write you a personal letter with full information, and send you our illustrated book, "A Financial Opportunity," containing a score of photographs of the KORNIT industry, taken in Russia.

Please let me hear from you.

Yours very truly,

CHARLES E. ELLIS,
PRESIDENT.

717B Temple Court,
New York City, New York

[Mr. Ellis besides being President of this company is also President of two other large and successful companies, owning shares therein valued conservatively at over $250,000.00. Mr. Ellis has other investments in New York City real estate, bonds, stocks and mortgages to the amount of many more hundreds of thousands of dollars. Any bank or mercantile agency will tell you his guarantee is as good as gold. THIS is a successful man who wishes you for a Co-partner as a Shareholder and Dividend Receiver in this Company. Remember, you will do business personally with Mr. Ellis in this matter.]

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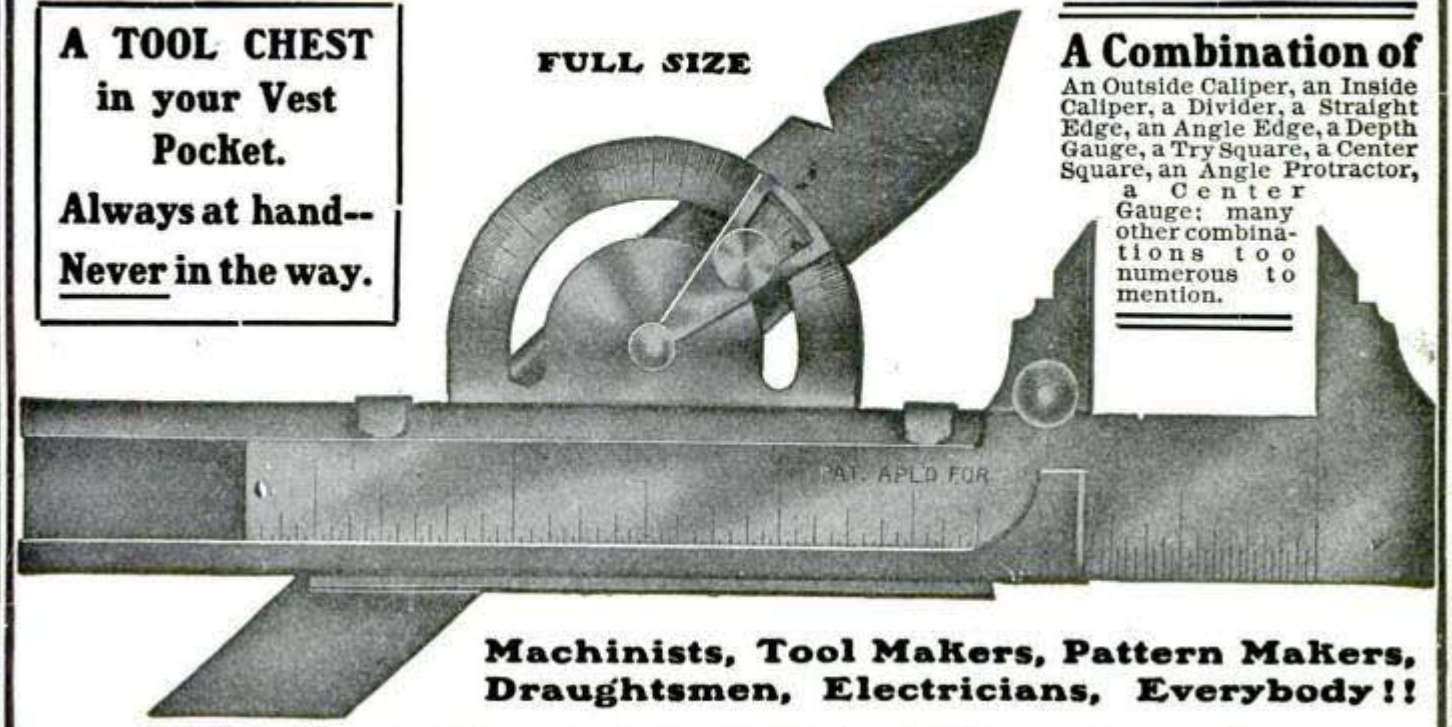

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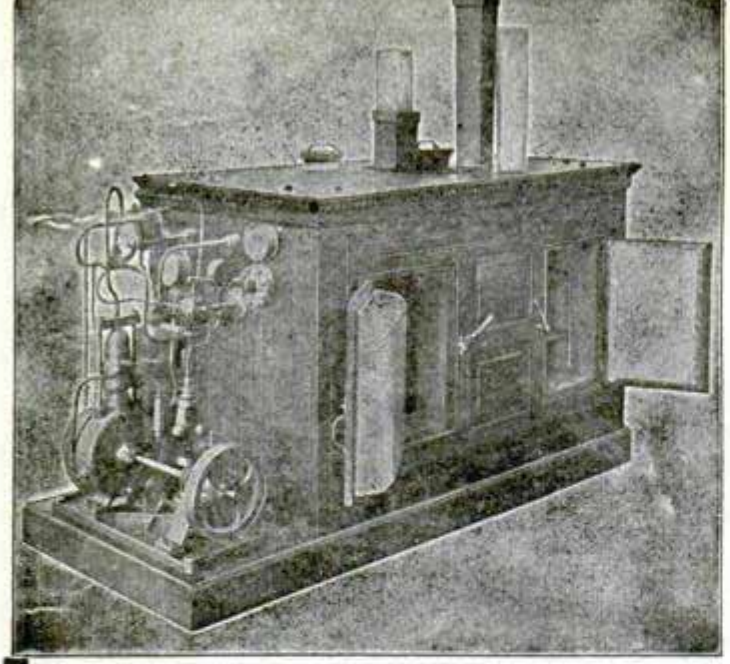

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SOMETHING OF A NOVELTY in the way of a small electrically operated refrigerating machine for the household which may be used for supplying a refrigerator box with dry cold air, and also for the purpose of manufacturing ice from sterilized or otherwise purified water. The machine has a **refrigerating capacity** equal to the melting or the use of **200 pounds of ice a day.** It is **automatic** and is as **free from complications** as it is possible to make a machine of this character. It is **installed** on the same base as the refrigerator, becoming part of it, so that the **entire plant** is shipped as a unit, it being only necessary to connect the power and water when it is ready to operate.

The machine is **especially adapted** to motor drive, and may be operated by a **one-half horse-power electric motor,** any motive power however may be employed. When operated for 10 or 12 hours each day it will manufacture **10 pounds of hygienic ice,** besides refrigerating two storage compartments to a temperature of thirty-five to thirty-eight degrees Fahrenheit. You secure **lower** and more **even temperatures** at **less** cost than using ice.

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Western Representative
40 Dearborn St., CHICAGO

Manufactured by the
BRUNSWICK REFRIGERATING COMPANY
NEW BRUNSWICK, N. J.

How to Sell Goods in Mexico

The manufacturers of the United States can largely increase their trade with Mexico by proper presentation and representation.

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POPULAR MECHANICS

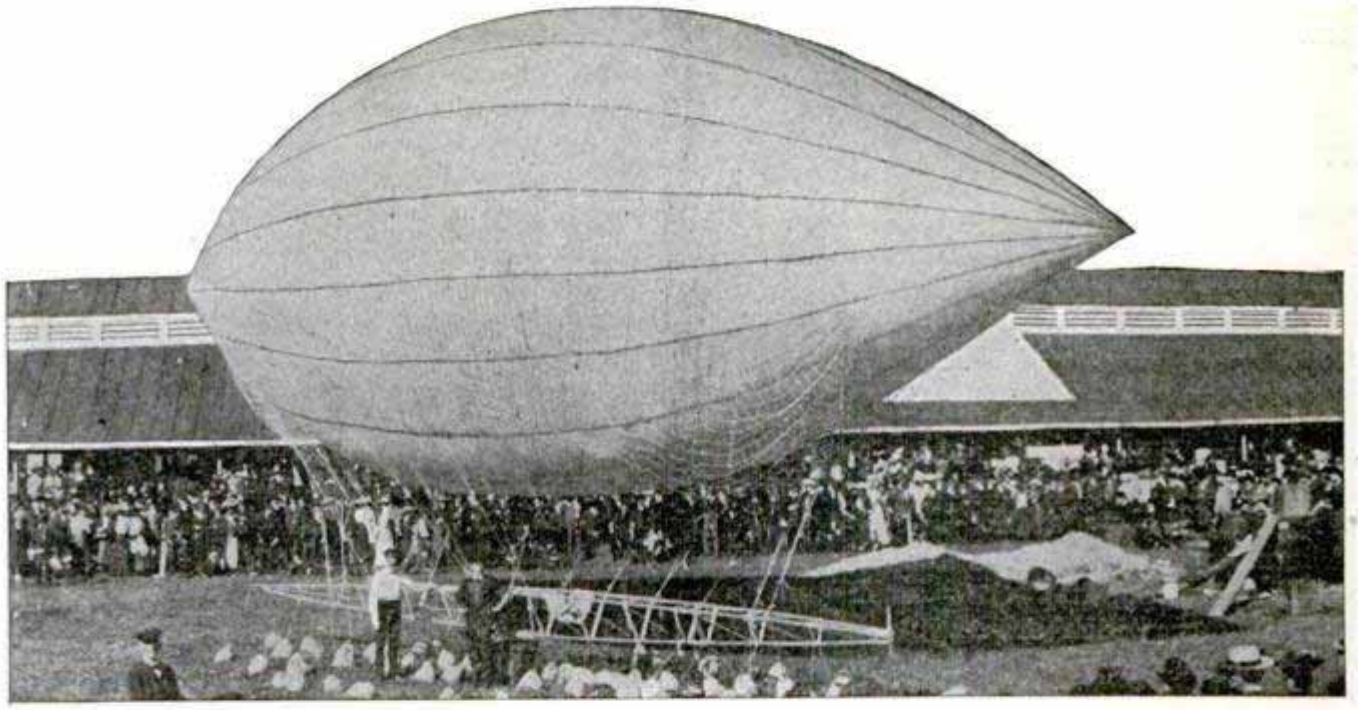
Vol. 8. No. 2. CHICAGO, FEBRUARY, 1906. 10 Cents a copy $1.00 a year

THE NEW MOTOR SKYCYCLE No. 19

Contains Features Absolutely Unique in Airship Construction-- Sensations When Skysailing

By Carl E. Myers

[Prof. Myers is the leading scientific balloon maker in this country, and has provided facilities found nowhere else, at his Balloon Farm, near Frankfort, N. Y. Here the balloons used by the U. S. Army are constructed, and tests and experiments of a military character are made —Editor's Note.]

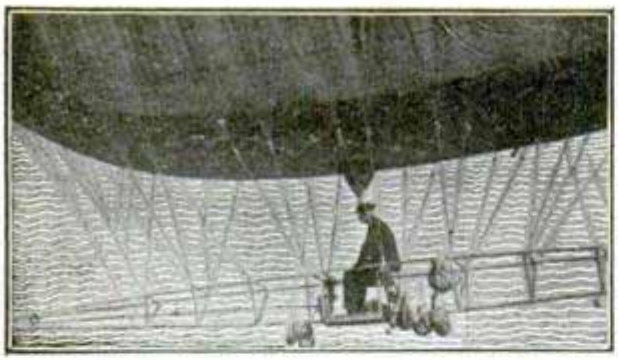


At Anchor, Before Flight

I consider my new high speed motor airship which has been in successful operation during the past three months the nearest approach thus far made to the commercial airship, either here or abroad. In addition to a large number of flights made by myself at the Balloon Farm, it has been demonstrated in public at Syracuse and other cities in New York, and operated during the two weeks exposition at San Antonio, Tex. It is the only airship which can be easily packed and shipped on short notice, and that will endure exposure to all kinds of weather. It presents quite a wide departure from the typical airships abroad and which have been generally copied in this country.

This is my nineteenth airship and is a distinct improvement on all others I have built, the first of which, 24 years ago, was the earliest airship to be raised above the earth and navigated by the efforts of the rider aided by the wind. Later I made and sailed the first airship known to return to its place of departure, and in each successive ship I have been able to make some desirable change with a steady, though gradual, improvement.

Balloons have not given the same opportunity for progress, having retained the same general features of many years ago. My nineteenth airship, however, differs in many distinct features from all other airships whatsoever.



Rising Above Obstacles

Its chief feature is its portability and convenience in transportation and its ready assemblage for use upon arrival at any point, which should make it especially useful as a war airship, operative anywhere at short notice. It consists first of a motor car just large enough to seat its rider, and at the front end of which, like a dashboard, is the complete gasoline motor and all parts in position, ready for instant movement. Attached to this car in front is a boat-like frame consisting of a boat's keel and gunwales, arranged to telescope compactly within itself, or to extend forward 18 ft. This supports the screw shaft and propeller blades, and altogether weighs only 18 lbs. At the rear of the motor car a similar frame work attaches, also 18 ft. long. This supports a shaft, terminating with a double bladed aeroplane, tilting at any angle and revolving in any plane, as a universal balanced rudder or guide to flight right or left, up or down. This double rudder remains always balanced and immovable when not changed by the operator.

The motor weighs 32 lbs. and runs at such terrific speed that its screw shaft and propeller blades, which are connected, are invisible to the eye when in flight. The power of this motor I have not yet definitely measured, but it has been run up to 3,000 revolutions in 60 seconds.

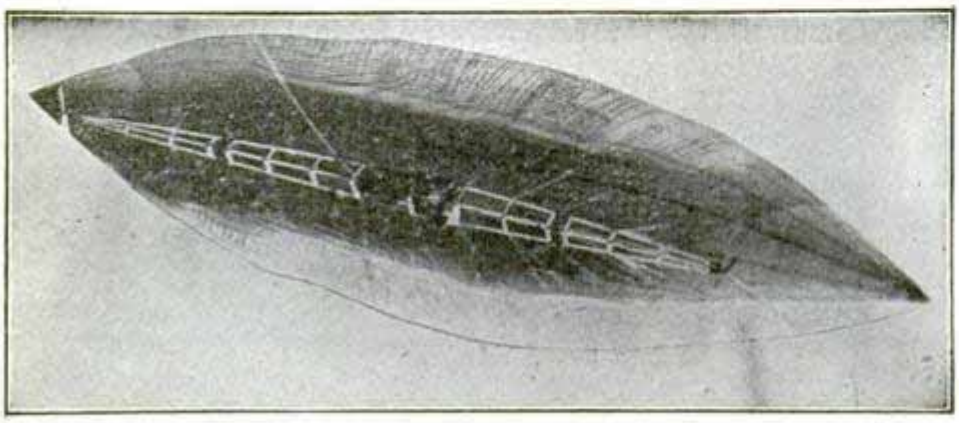
The propeller is reversible by a lever in the car, and will run the airship backward or forward, the rudder aeroplane working equally well in either direction, and enabling the vessel to describe very small circles, or spin upon its own center within its own length.

All of these features are absolutely unique in airship construction or airship sailing.

The entire frame with motor and steering features and rider, with about 100 lbs. of baggage or ballast, is buoyed exactly by a hydrogen-proof chamber 54 ft. long and 16 ft. diameter, whose enclosing netting attaches to the gunwales of the motor boat frame. This gas chamber is in shape unlike any of the so-called airships in use, being a symmetrical sharp-pointed spindle which pierces the wind without experiencing opposing resistance or change in form either at high speed in the air or when anchored in the wind storms on the ground without shelter of any kind, as has been its fortune during an entire season's exposure to whatever weather appeared during its engagements from week to week.

This new motor airship seems to do all that any other airship has done and do it easier, quicker and at much less expense for gas and transportation and operation, while its plan and construction are such that it is adapted to enlargement upon the same lines to great advantage; thus the doubling of its dimensions would give it eight times its present buoyancy, permitting vast increase in power and in speed.

There is literally no peace on earth like the peaceful glide of an airship in a storm, which merely lifts it along, in perfect quiet. Meanwhile you make such headway as you may, while the wind takes possession of the airship and bears it as the wind blows, according to the speed of the wind. If the airship is headed against the wind current and has about the same speed as the wind, then the vessel remains over the same spot of earth. If the airship is steered in the same direction that the wind is going, and at the same speed, then the airship flies twice as swiftly as the wind over the same spot of earth.



Directly Overhead 500 Ft.

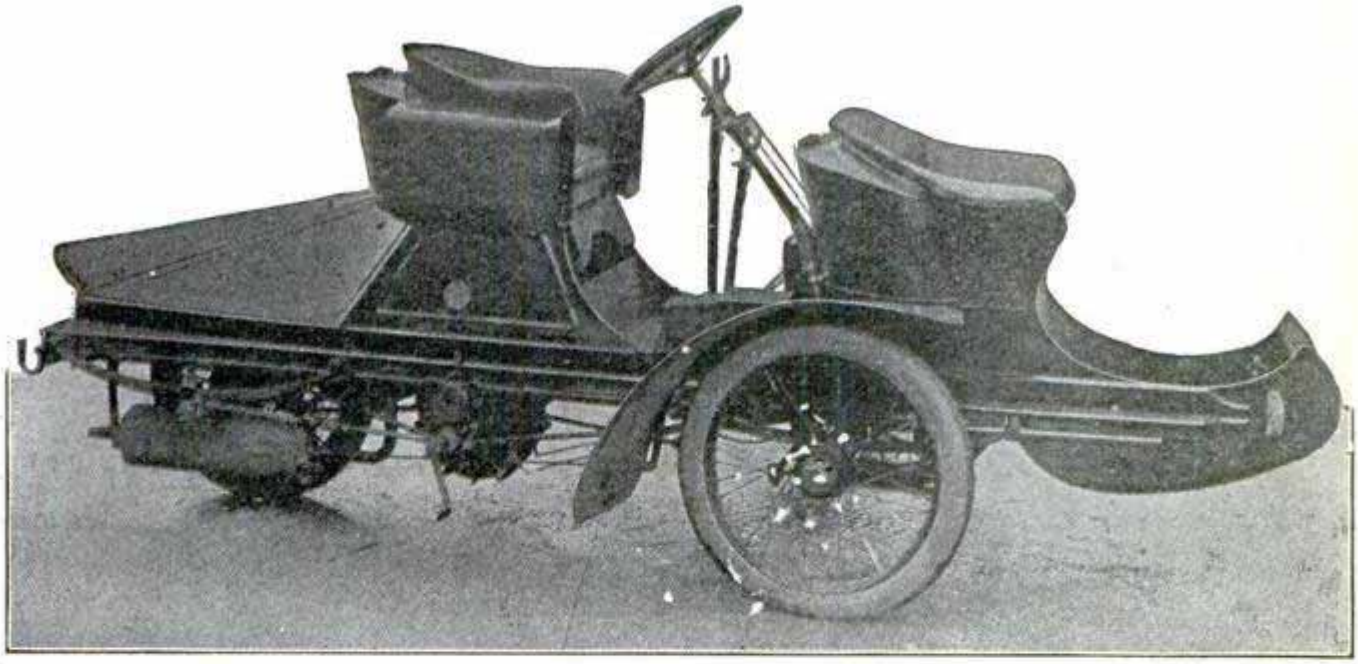
The airship may be steered readily to the right or left of this course, either with the wind or against the wind, at a moderate angle. If steered

straight across the wind current it drifts down stream or with the tide, so to speak, like a boat drifting broadside along. An airship can stem a light wind or sail against it slowly, but if at the same time it attempts cutting circles like a skater on ice, it immediately drifts away whenever its broad side faces the current and soon passes out of sight of spectators at the place of ascent. On the other hand it may find regions of absolute calm above, or stratified currents or air having various directions, some one of which may be favorable for reaching a particular locality. The prevailing air current in Texas seems to be a steady drift of air, of unknown thickness from the ground up.

During my airship flight one Friday at San Antonio, I found this current 2,000 ft. thick, surrounded by a calm layer 200 ft. thick, and this overlaid by a still ample current immediately above. Two days later it was in an opposite direction and extended to 3,000 ft., very highest elevation that day. Had an airship remained constantly above, it could have traveled in the Friday current and returned by the other, aided by motive power and steering. If airships were making voyages for business or pleasure only, they would rise in the quiet early morning, and travel all day and becalm or anchor at night low down or seek and retain the same current higher up for a long all-night voyage, if wind near the ground fail, as it usually does outside of Texas.

Accidents with any form of motor airship have been comparatively rare, and have only occurred when experimenters have been inexperienced, or have attempted feats or experiments regarded hazardous or positively dangerous from the standpoint of experience or common sense. This progress will not be stayed, or go backwards. The basis of the progress is the lightweight motor, and a gas vessel absolutely impregnable to hydrogen gas. My new motor airship No. 19, I consider the nearest approach to the commercial airship thus far secured, and there unquestionably is a constant and growing demand for airships for exhibition and advertising purposes, and for recreation. Sailing the ocean does not compare with navigating the air.

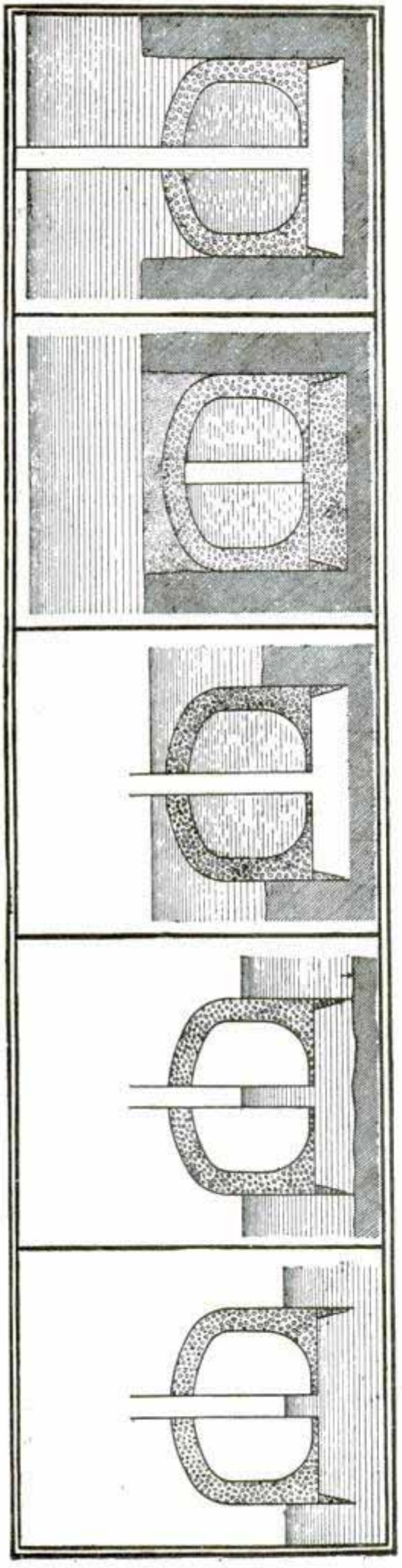
"TRI-CARS" POPULAR IN ENGLAND



English "Tri-Car" With 8-Hp., Two-Cylinder Engine

The English "tri-car" has become popular. It has two wheels in front and a third, the driving wheel, behind. The car is an evolution of the motor tricycle. These cars weigh from 400 lbs. to 500 lbs., carry one or two passengers, travel rapidly on level ground and are good hill climbers. The motor is 8 hp. and the cars cost from $250 up to $575. In some of the two-seat cars the seats are placed tandem as in the illustration from the Automobile; in others side by side.

If you want any machine or device and do not know where to get it, ask Popular Mechanics. Information free.

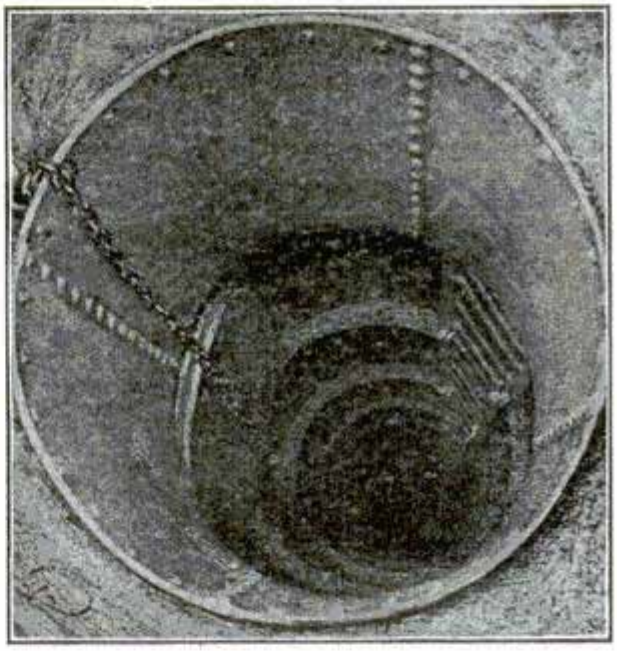


SINKING THE TUNNEL SECTION BENEATH THE BED OF THE SEINE—The section is floated to position alongside guide posts; water rises up through the central connecting tube. The lattice girdering of the section is then filled with rubble, which sinks it to the bed of the river. The space between the flanges at the bottom of the section is used as a working chamber. The water is expelled from it and compressed air is used to keep the water out. As the men work, the section sinks gradually until at last it is beneath the surface of the river bed.

SINKING THE PORTABLE TUNNEL

The novel method of constructing the new tunnel under the Seine for carrying the lines of the Metropolitan Railway of Paris has previously been treated in these pages; a graphic portrayal of some of the interesting features of the work will be found in the accompanying illustrations. The tunnel is built in sections—huge caissons of steel—which are floated to position and sunk.

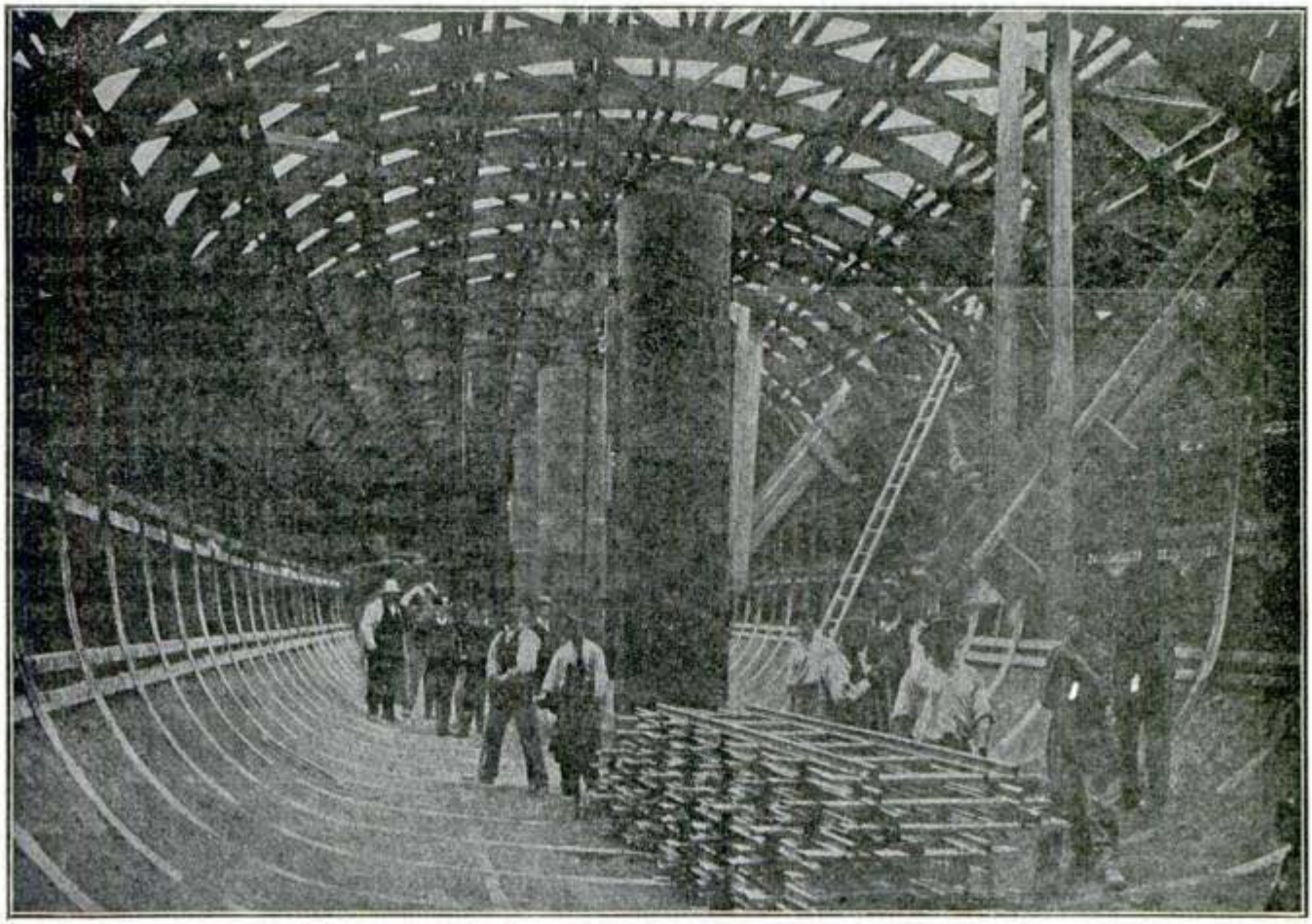
The walls of each section are filled with rubble when it is sunk and the flanges on its bottom hold it away from the river bed and form a space from which the water is expelled. This space is used as a working chamber where the work of excavation is carried on with only a moderate degree of compressed air. Connecting tubes in the tunnel sections, provided with ladders, are



Looking down one of the steel connecting tubes up which workmen and material pass

used for passing in and out of the working chamber. As the bed of the river is excavated, the section sinks lower and lower until it is at last beneath the surface. All hollow spaces are filled in with rubble as the work proceeds and the tunnel is finally covered over.

Conditions in the working chamber are of the best. Electric lights are used and telephones afford communication facilities. For dealing with the rock strata a special powder which gives off little fumes is used, and excavated material is rapidly removed. This material passes up the connecting tubes in steel buckets which, on reaching the top, are tilted to precipitate the material into barges on the surface of the Seine.



INSIDE ONE SECTION OF THE "PORTABLE TUNNEL"--These sections or caissons are about 110 ft. long and are oval in form. The steel connecting tubes are seen at the center. This view was taken before the caisson was submerged and while the top was open to the daylight. The tunnel will carry two tracks and will form a link in the greatest underground system in the world.

EXCAVATING THE BOTTOM OF THE SEINE--The working chamber is under the tunnel section and is formed by the flanges on the bottom of the same. Compressed air keeps the water from seeping in between the river bed and flanges. The man on the left is stopping a leak with clay. The tunnel sinks gradually into the excavation until it rests below the surface of the river bed.

TRAVELING AUTO REPAIR SHOP

If it is not convenient to take your auto to the repair shop, send in a telephone call and the machine shop will come to you. This is the latest improvement in doctoring sick automobiles.

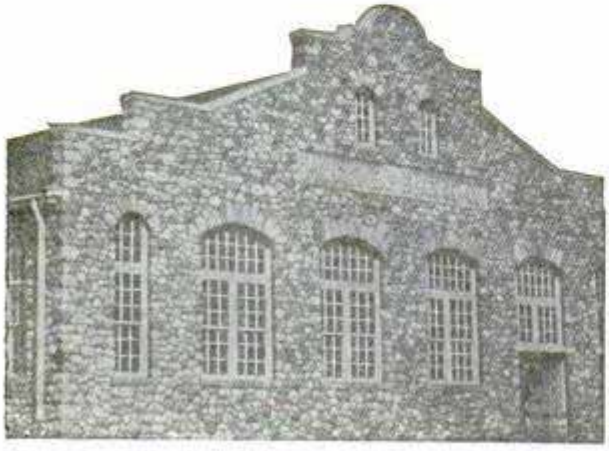
Courtesy Motor Way.

Traveling Repair Shop

The repair shop is itself a motor car, and contains a full assortment of the tools necessary to make all ordinary repairs, and a supply of parts to replace broken pieces of machinery. Skilled machinists accompany the traveling shop.

COBBLESTONE POWER HOUSE

An electric power house has been completed at Mt. Clemens, Mich., constructed of ordinary cobblestones, laid in cement. Still more unusual, in these days is the stack which is 65 ft. high, and 9 ft. square at the base, also built of the same materials.

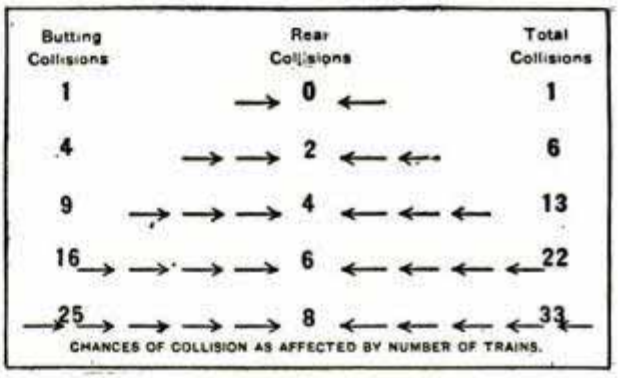


Built of Round Stone

STRENUOUS LIFE OF THE TRAIN DISPATCHER

The position of train dispatcher calls for a man of great physical endurance and absolutely steady nerves. No other occupation carries with it an equal responsibility, and it is no wonder that a few years at this work makes a young man gray. The remarkable thing is that collisions are so few. The Railway Age presents an unusual and graphic illustration of the possibilities of collision on a single track road, and says in explanation:

Let us assume a single track with two trains running in opposite directions at the same time; here, evidently, there is but one meeting point. But if we have two trains running in each direction, each of one pair must meet each of the other pair, and we have four meeting points; with three trains



in each direction we have nine meeting points; with four trains in each direction there are 16 meeting points, and we have derived thus the fact that on single track the possibility of head collisions increases as the square of the number of trains. The accompanying diagram illustrates this very forcibly and also serves to bring forth the increased possibility of rear collisions from any growth in the traffic.

It is evident that there is no chance of a rear collision with only one train in each direction, but with two trains in each direction it is equally evident that there are chances for two rear collisions, and with three trains in each direction four chances of rear collision follow, increasing one chance of rear collision with the addition of each train. Or, in other words, the possibility of rear collisions is directly as the number of trains.

Steel rails not only wear faster, but break more often on bridges than in ordinary track.

FIRE DEPARTMENT BUT NO FIRE ENGINES

Racine, Wis., with 35,000 people and many large manufactories, some of the most inflammable character, has no fire engines. It has, however, a fire department, and more than ordinary protection from the flames.

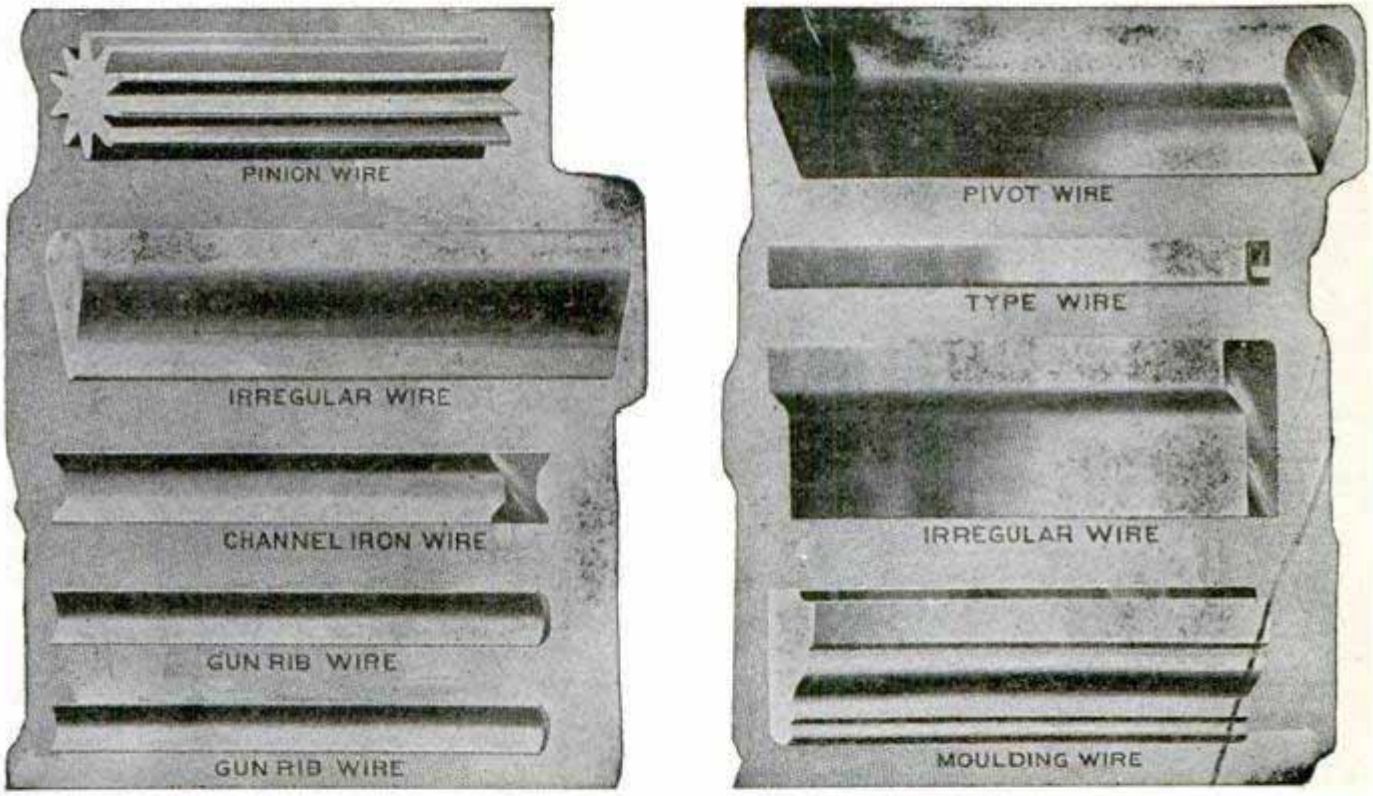
A high pressure water system explains this unusual condition. On the highest point of land in the city rises a great steel column 25 ft. in diameter and 90 ft. high, holding 330,000 gallons of water. Under normal conditions this gives a pressure of 60 lbs., but when an alarm sounds the touching of a button instantly opens the gates and allows the full pressure to enter the 56 miles of mains, with a pressure of 125 lbs. at all the hydrants; a pressure that cleans the shingles off a roof like a whirlwind. During a recent fire 26 streams were played on a fire.

As the hose carts can make better time to a fire than steamers and get water on a fire the instant hydrant connection is made, the system is found a great improvement on the fire engine service.

An eastern firm has built some submarine boats which, it claims, can be operated from the vessel from which they were launched by wireless telegraphy. It is reported that the five boats built have been sold to an eastern government.

DIFFERENT SHAPES OF WIRE

Square wire, flat wire, oval or star-shaped wire; in fact, wire of any shape desired can be had out of stock or will be made to order. To most people the mention of "wire" means the small, round piece of metal that is stretched on poles, or holds the barbs for a fence, or a thing that breaks and lets the stove-pipe fall. Modern demands, and an endless variety of automatic machines forming a still greater assortment of pieces, has resulted in the perfection of the art of wire drawing. A piece of soft steel is fed into one end of these machines, and in passing through comes out at the other end a finished bicycle hub, a knife blade, hair-pin or some one of thousands of other small articles.

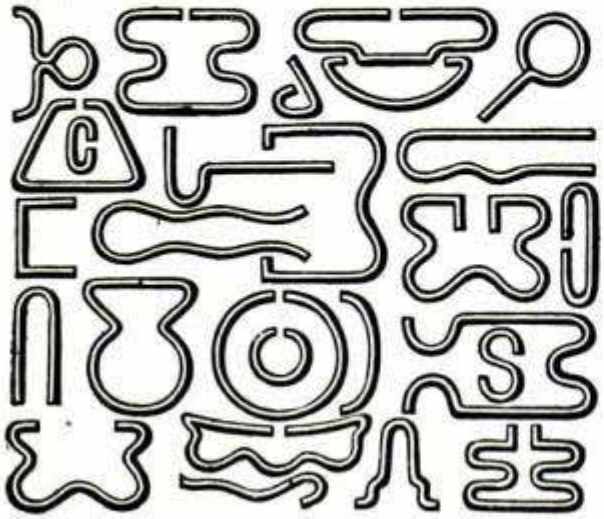


A Few of the Many Varieties of Wire

To operate these automatic machines for the best results, the shape that is fed into them should be the nearest possible to the final form wanted. It is up to the wire-maker to do this and an idea of the result is shown in the first illustration which gives a section of pinion wire. This is drawn into star shape just about the same way as drawing wire plain round. This star-shaped wire is then sawn into slices, thus making cog wheels.

Great progress in this form of manufacture has been made in the past few years, so that it is now possible to put on the market many articles at an easy-selling cost

that were previously too costly to sell. Where a great deal of shaping has to be done on the lathe, in order to put the "raw" material in form for final cutting in an automatic machine, the cost of production is considerable. Wire-drawing is the cheapest method of reducing to the net shape.



Made from Wire on Machines

The shapes that are covered by the term "wire" are, therefore, many and varied, from a flat knife blade, a piece of shafting or a moulding wire to a small, round wire that calipers as fine as a hair. Tensile strength, of course, does not figure materially in this odd-shaped wire, as it is only needed to be of soft steel to readily cut into shape in the automatic machines. Wire that has the greatest tensile strength is piano wire, which is made to sustain tremendous loads with the least stretch; but such a wire would be impracticable for cutting and shaping machines on account of its great hardness. Rope wire has to be made of great tensile strength, but soft enough to be flexible, thus standing the greatest amount of bending, and at the same time hard enough not to yield readily to abrasion. Telegraph and telephone wire must be of a quality to carry electricity the quickest, and at the same time strong enough to bear itself from pole to pole against wind pressure and ice. And so on through the vast list of different kinds of wire, most every one of which has to be made for the specific use it is to be put to.

MYSTERIOUS BAGGAGE LOSSES EXPLAINED

For two years past the railroads between Chicago, St. Louis and Denver have been trying to explain a mysterious disappearance of valuable trunks, the loss of which has cost the roads thousands of dollars. The thieves, a man and woman have at last been detected and arrested. Their scheme was simple. They checked satchels and when on the train would go to the baggage car, show their check and ask permission to get something from their baggage. While doing so they would change the check on satchel to some valuable looking trunk and at destination would immediately surrender their check and receive the trunk, and when the real owner called he would get the satchel.

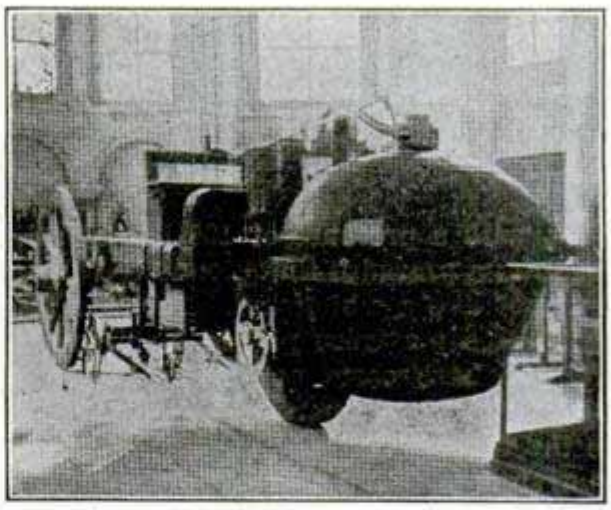
LIGHTSHIP SERVICE HARD

Service on our lightships is hard and strangely unprovided for. These ships are anchored in the most exposed and dangerous points on the coast where it is either impossible, or impractical, to build a lighthouse. The recent rescue of the crew of the Nantucket Shoal Lightship No. 58 was sensational in the extreme.

But note the strange policy of the government. These people who escaped with their lives lost all their personal effects, and their pay ceased the moment the ship went down. Dark lines to write about a lightship.

AUTOMOBILES 135 YEARS AGO

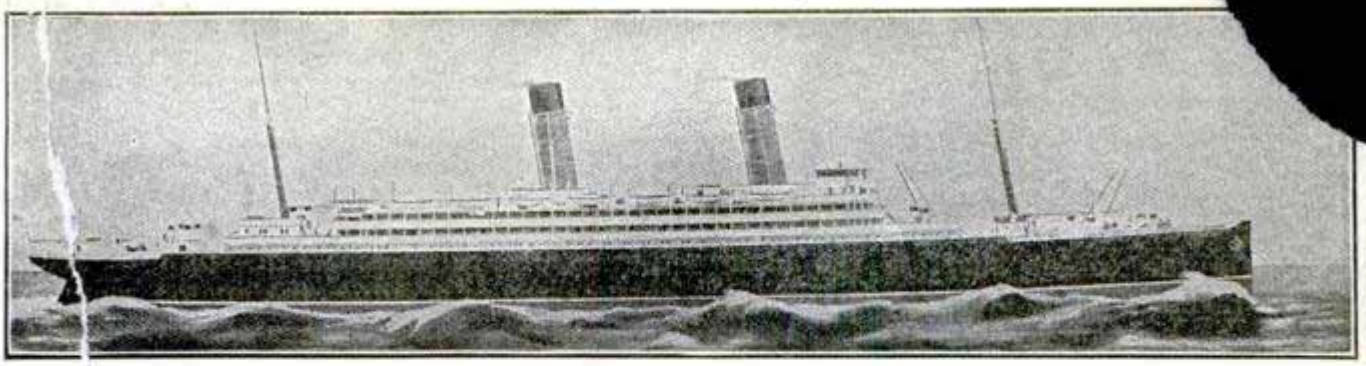
A curious vehicle has just been placed in the Museum of Arts and Industries at Paris. It is a steam automobile—a monstrosity as



An Early Auto

compared with *many* of the modern machines—which was built in 1770 by the French military engineer, Cugnot, and for a time was in actual use on the roads.

Our April edition will be 100,000.



"CARMANIA" LARGEST TURBINE STEAMER

Her Record Will Decide the Future as to Marine Engines--Finest Vessel Afloat--Absence of Vibration an Important Feature

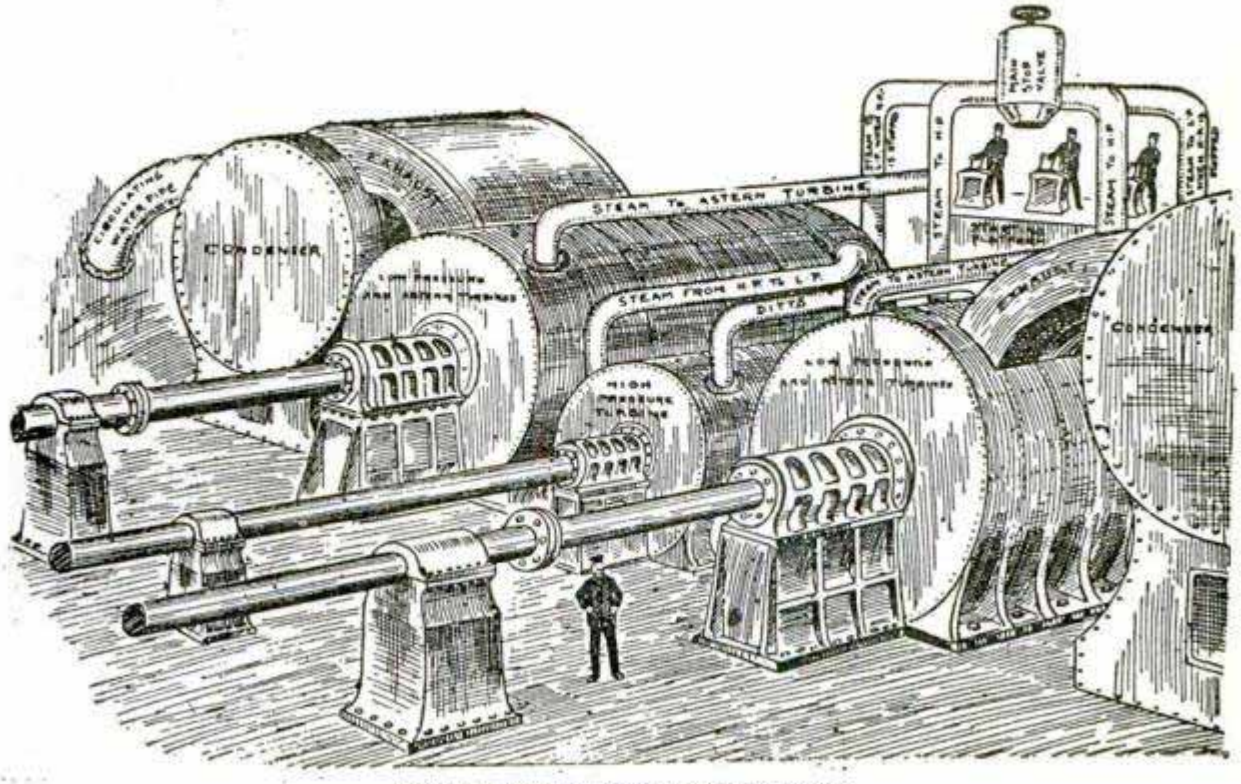
The "Carmania," the latest Cunarder, finest ship afloat, and the largest turbine steamer ever built is now in service. Direct comparisons will be carefully made with her twin, the "Caronia," of which she is a counterpart with the one exception of her propelling power. Though large, she is not the largest ship afloat, dimensions being: length, 676 ft.; breadth, 72 ft. 6 in.; from keel to boat deck, 80 ft.; gross tonnage, 20,000.

There are accommodations for 3,000 people; the main dining-room seats 500 at one time; the cooking facilities are the largest ever provided on a ship. Staterooms are to be had from the individual room for one passenger to the suite for an entire family. Wide berths, which let down like the upper berth in a sleeping car is a feature; and ample closets in each room is something new. Wireless telegraph and submarine signal telephones are among the many electrical improvements.

Chief interest in the ship centers in the turbine equipment. The importance of this step is evidenced in the character of the guests on the trial trip on the Cylde, the entire shipbuilding and marine engineering world being represented in the large party. The ship made 20 knots an hour on the trial trip, with complete absence of vibration, from which no vessel driven by reciprocating engines is free. Hon. C. A. Parsons, inventor of the turbine was present.

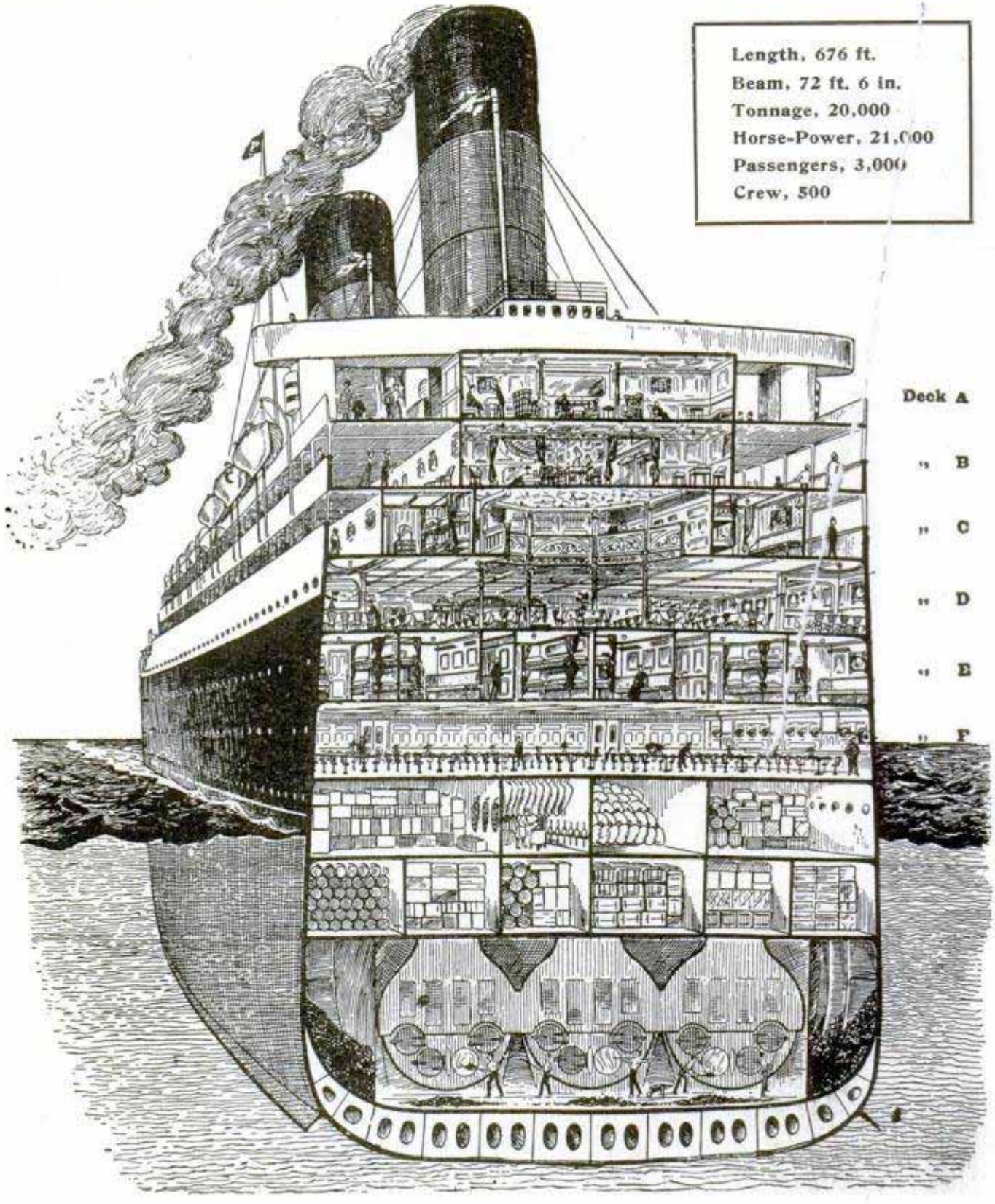
A naval engineer of international reputation who made the trip is quoted by the Shipping World, London, as follows:

"The place of greatest interest, however, on this trial was the engine room, and



General Arrangement of Turbines

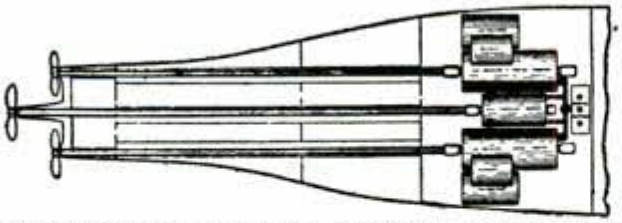
...lore unlike an engine room it is ...to imagine. No whirling masses ...nxious greasers are here, but a num... of cylinders with great steam pipes and condensers, all boxed in and giving no hint of the rotating turbines within. It will be seen from the plans that there are three shafts. On the center shaft is the high-pressure turbine. The steam then passes to the low pressure turbines on the side shafts and thence to the condensers. To go astern the side condensers only are employed, and the steam goes from the main steam pipe to the after ends of these turbines. All the engineer on watch has to do is to manipulate the valves which regulate the supply of steam. In spite of great thicknesses of lagging, the engine rooms of



Transverse Section of the "Carmania"

Deck A.—Promenades and Lounge.
Deck B.—Promenades, Drawing-Rooms and Staterooms *en suite.*
Deck C.—Promenades, Staterooms and Dome of Saloon,
Deck D.—Dining Saloon.
Deck E.—Second-Class Staterooms.
Deck F.—Third-Class Accommodation.

turbine ships are dreadfully hot, and special methods of ventilation become necessary. This has received special consideration in the "Carmania." It will be noticed that there is some overlapping of the screws, although not so much as would ap-



Plan Showing Turbines, Shafts and Propellers

pear from the plan, because the side shafts are somewhat higher than the center shaft, as is seen by the view of the after bulkhead of the engine room."

The hull has been built of great strength in accordance with the requirements of the British Admiralty for an armed cruiser. She is fitted for 12 large quick-firing guns.

The turbine installation gives every indication of being a great success; should it prove otherwise there would be a loss to the company of more than a million dollars in changing the machinery, but fears of this contingency are no longer entertained.

On her maiden trip the "Carmania" was demonstrated to be remarkably free from vibration, even during fierce gales; faster than her sister ship, the "Caronia," and comparatively as economical in the expenditure of fuel. Her steering gear, which has several new features, did not work to complete satisfaction—but, it is believed, can be improved. There are two sets of steering gear, one located in a house on the shelter deck and the other so far below that it is below the water line. The lower gear is very heavy, the rudder alone weighing 35 tons; this rudder can be put over in 30 seconds, and the rudder of the upper gear in 50 seconds.

TELEGRAPH OPERATORS' SIGNS

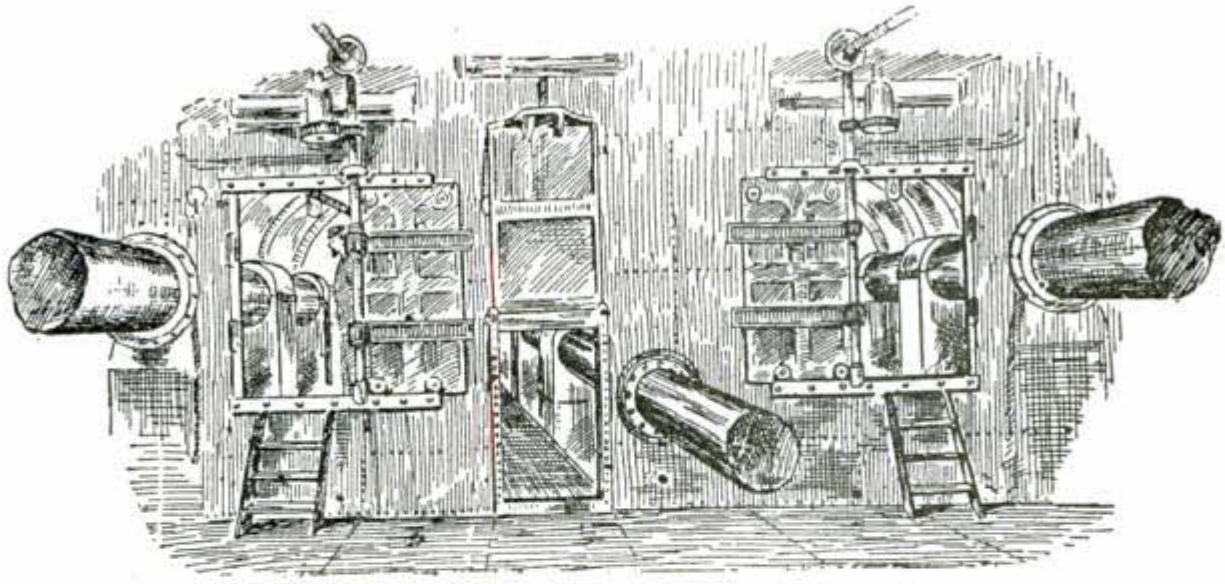
Each telegraph operator has his private sign which he places on all messages he handles. Two letters, usually initials of his name are generally used; Frank Brown would be likely to use "FB" as his sign.

Occasionally an operator gets "funny" as, for instance, one signs "PS" because he says he gets a poor salary; another with red hair signs his "RT," and "SH" for "Shorty" is common.

"KQ" is a hoodoo. Hundreds of operators know this but do not know why. Some years ago in an eastern office the man who used it was killed by a train; his successor adopted the same initials and died of typhoid; and a third, who followed, went crazy. That settled it, "KQ" is a hoodoo everywhere.

GERMANY ORDERS 20,000 CARS

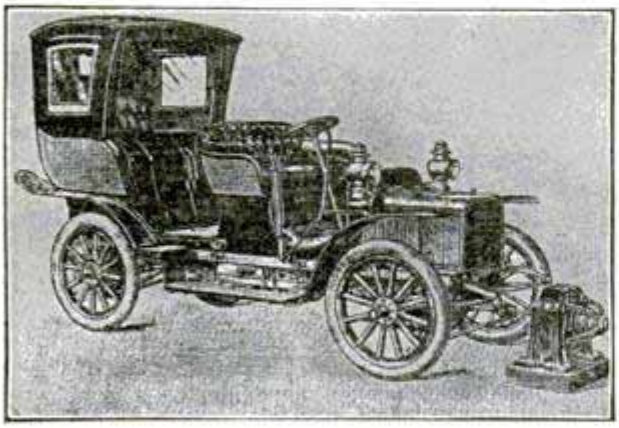
The last week in December the railway administration of the German government placed orders for 20,000 freight cars to cost $5,000,000. These cars are to be delivered in six weeks, and in order to do this large contracts were placed in Belgium, Holland, Switzerland and Italy. Each car would accommodate 40 soldiers, and the circumstances of the rush order are taken to indicate military preparations, which are explained as being caused by the recent movement of French troops toward the German frontier.



Entrances to Shaft Tunnels, Looking Aft, Showing Safety Bulkhead Doors

LIGHTS HOUSE AND PUMPS WATER WITH AUTOMOBILE

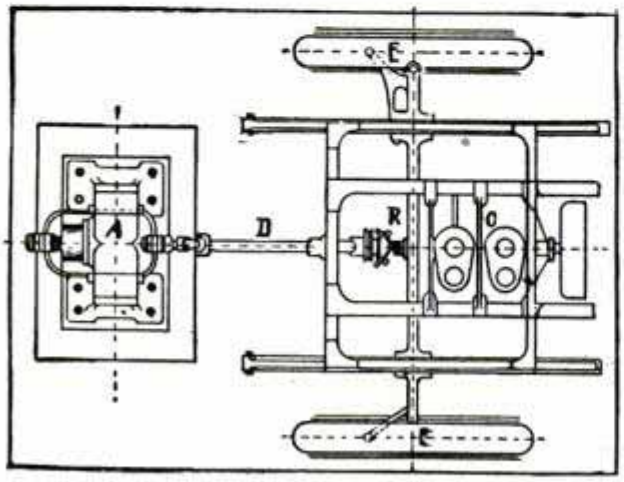
A concern in Paris is making an attachment for automobiles for transmitting power to run an electric light generator, pump water and do other useful work when the



Driving a Generator

automobile is not in ordinary use. An extension shaft is carried forward between the front wheels for connection to the generator, pump, etc.

There is little occasion for this in city houses, but at summer homes at lakes and for other isolated residences the power may be found extremely convenient. Lighting may be done direct from the generator to the lamps, but in this case there would be no light if the auto were taken out for an evening ride. By using storage batteries which can be charged night or day at times when the auto is not wanted, current can be stored to supply the lights at all hours. The Electrical Review, London, says: "The arrangement will be found especially useful in small country houses, distant from a gas or electricity supply, and where not utilized for electric lighting purposes, the dynamo may be replaced by a pump to ensure a good water supply, or the motor may be connected up to a sewing machine or other domestic machine."

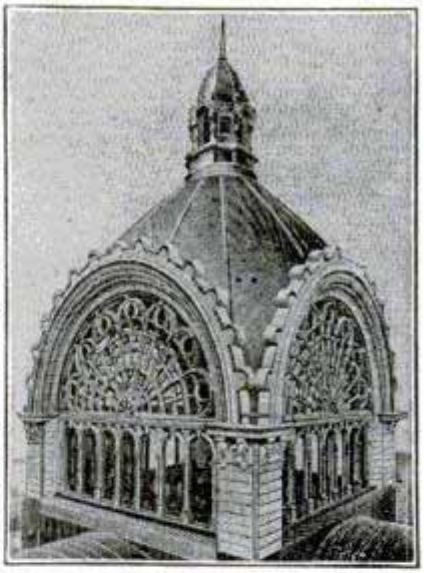


Plan of Connections

The plan view of the arrangement will be readily understood: A is the generator, fastened to the floor; D the extension shaft connecting the direct-driven generator to the engine C, by means of a screw coupling R. The wheels E are blocked firmly.

SCULPTURED CONCRETE DOME

A very curious application of reinforced concrete construction is used in the dome of the central station in Anvers, Belgium. Here, as is shown in the accompanying picture, we find the front of this building or at least a portion of it, resembling on account of its slenderness the sculptured roses of French cathedrals; in this case, however, the difficult stone cutting is avoided. This structure, of beautiful dimensions, reaches to the level of the other portion of the building, a height of 160 ft., the dome proper rising above this an equal distance. It would have been impossible to erect this cupola of stone as was at first intended, even though of the lightest construction compatible with the material in question, for if carried to the same height the weight would have been too great for the foundations; hence recourse was had to concrete, yet without deviating in the least from the stone design. We need not go into the details of the construction of the upper portion of the dome, nor of the glass windows, for the engraving shows them in a very satisfactory manner. The entire weight of the structure, 1,800 tons, rests on four square pillars.



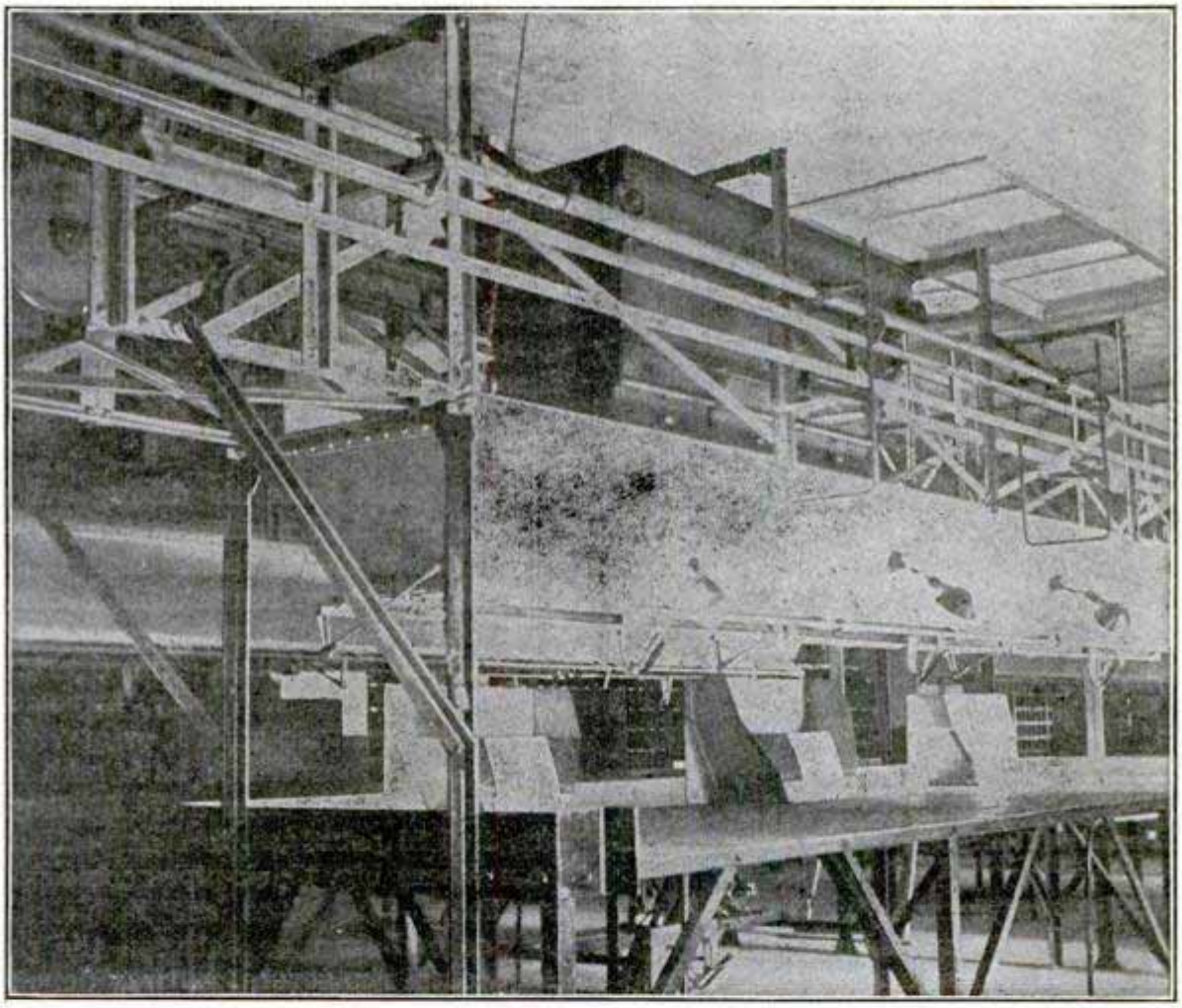
Concrete Dome

A good black oak stain consists of 1 oz. migrocene to ½ gal. of water. Put on one coat and fill with a black filler. Add one coat of shellac and three coats of varnish. Rub with pumice stone and water, then oil and wipe off clean.

CHICAGO'S NEW MECHANICAL POSTOFFICE

Only One of Its Kind in the World--Electricity and Compressed Air the Moving Powers--Marvelous Conveyers with Almost Human Precision

The first mechanical postoffice in the world is now in successful operation in Chicago. Hundreds of tons of conveying machinery give the place the appearance of some great manufacturing plant. The building cost $5,000,000, but the architect failed to anticipate the growth of postal work, with the result that when the building was occupied recently, its facilities would have been utterly inadequate had not a vast system of labor-saving machinery been installed. Much of this machinery was invented, and all was built for the express purpose of handling mail.



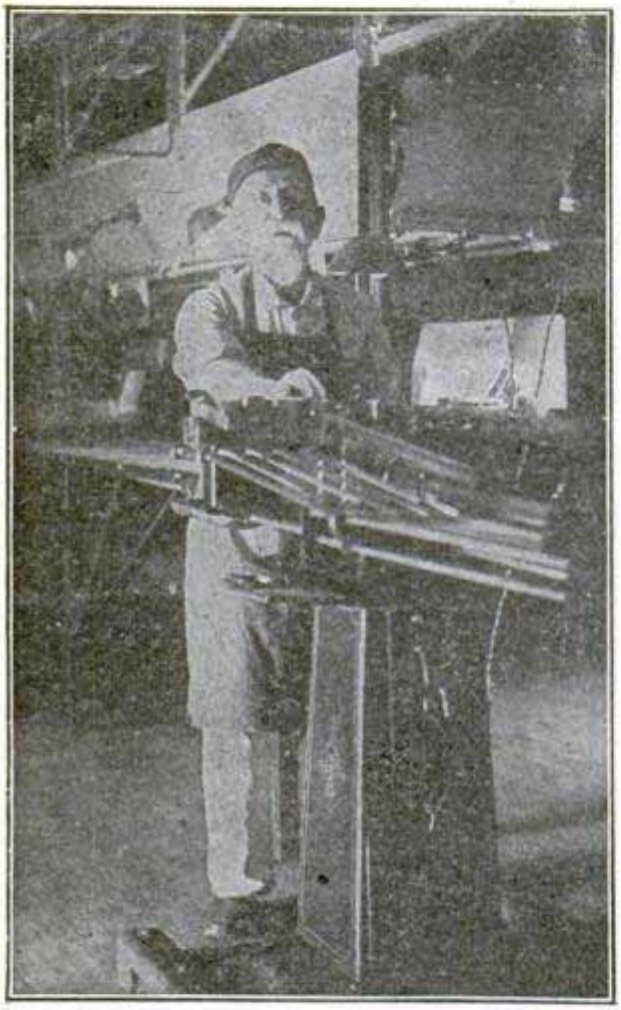
Overhead 3-Section Car which Delivers Letters by the Bushel where Sent

The volume of mail handled will be better understood from the report for the year 1905, in which 2,751,695 pouches and sacks were received, and 4,597,051 were dispatched. The number of pieces of mail handled was 1,203,145,741, while of newspapers and periodicals there were mailed 68,071,302 lbs., requiring the services of 4,602 employes. The mail originating in Chicago may be divided into three classes: the letter mail, first class; newspapers and magazines from publishers, second class; and the third and fourth-class mail which include books, merchandise, etc.

When a letter, postal card or sealed package is brought in by the collectors or is mailed through a letter drop in the building, it is placed or falls upon a wide, endless belt which rapidly carries it up to the second floor. Here the belt empties into cars divided into three sections and open at the top. As fast as a car is filled the operator, who is stationed where he can see to advantage, sets an automatic device, which will open either one or all of the compartments at any table desired when the car has reached a line of tables where the letters are "faced." The facing process consists

in arranging the letters so the stamps are facing and at the upper right-hand corner. The letters are then loaded into tin trays and sent to the cancelling machines by means of a conveyer which is constantly in motion. There is a long row of the cancelling machines, each driven by its own electric motor.

Forty thousand letters or 60,000 postal cards are cancelled in one hour by each machine, which not only cancels the stamp,



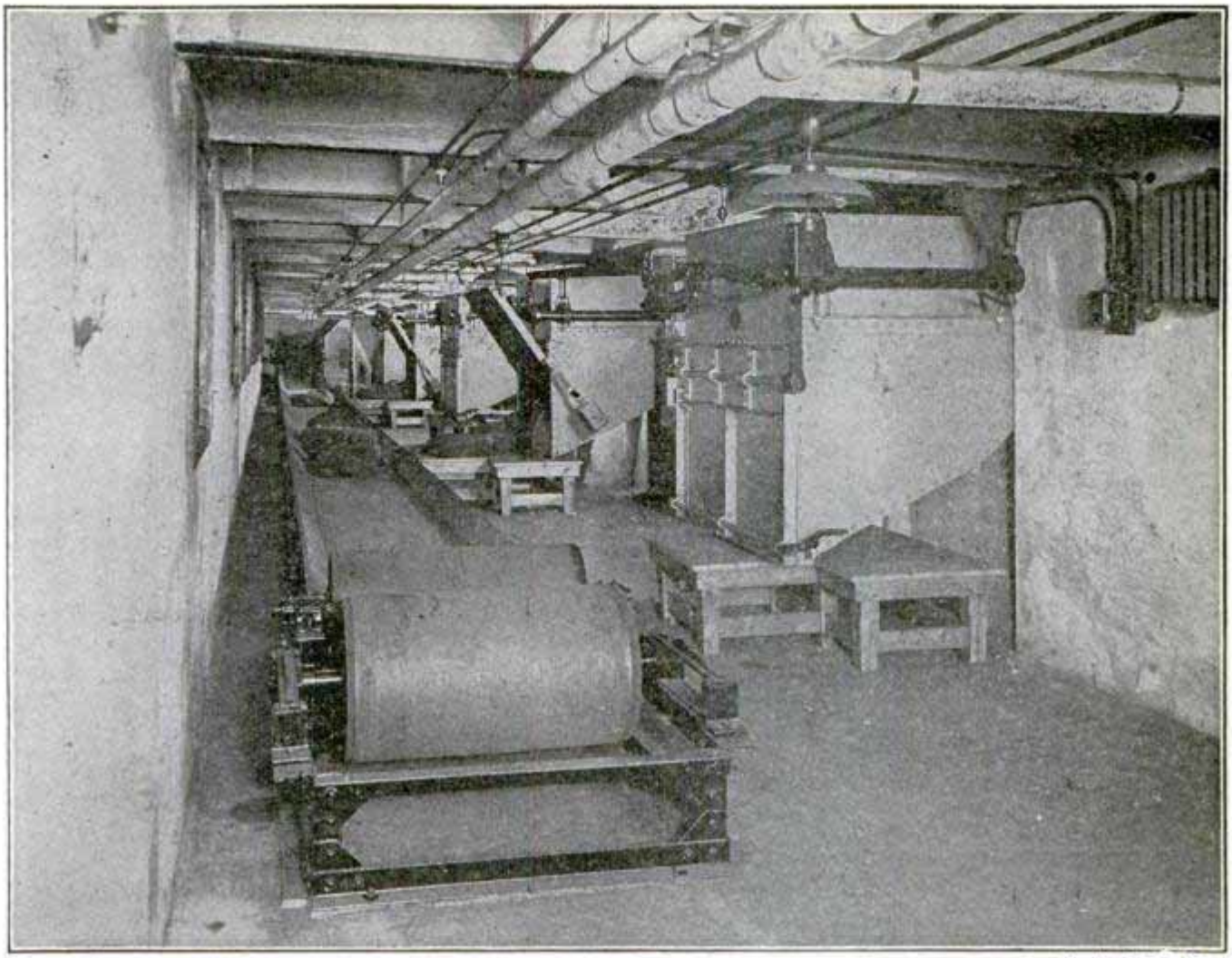
One of the Electric Daters which Cancels 60,000 Postal Cards an Hour--The Operator Has Worked 40 Years for Uncle Sam

but postmarks with the word "Chicago," together with the day, month, year, hour and minute. Five men are required to supply, feed and remove the letters from each machine. The letters are again placed in the trays.

These trays are 28 in. long, 7 in. wide inside and 4 in. deep. They are made of sheet metal, tinned. They always travel "head end" first. Several thousand feet of small conveyers bearing hundreds of the bright trays are constantly traveling to and from all parts of the room, which is the size of a full city block. By an ingenious arrangement in setting a combination at the head end of the tray, the tray will travel any desired distance, run onto a side track and stop, just where it was sent. It is really wonderful to watch a tray of letters for, say, the Texas division, travel religiously in its narrow path, passing without hesitation Ohio, Pennsylvania and perhaps twenty other states, but the instant it reaches the section where it was sent it automatically turns from the main line and stops, while the never-ending procession goes on to other state sections still beyond.

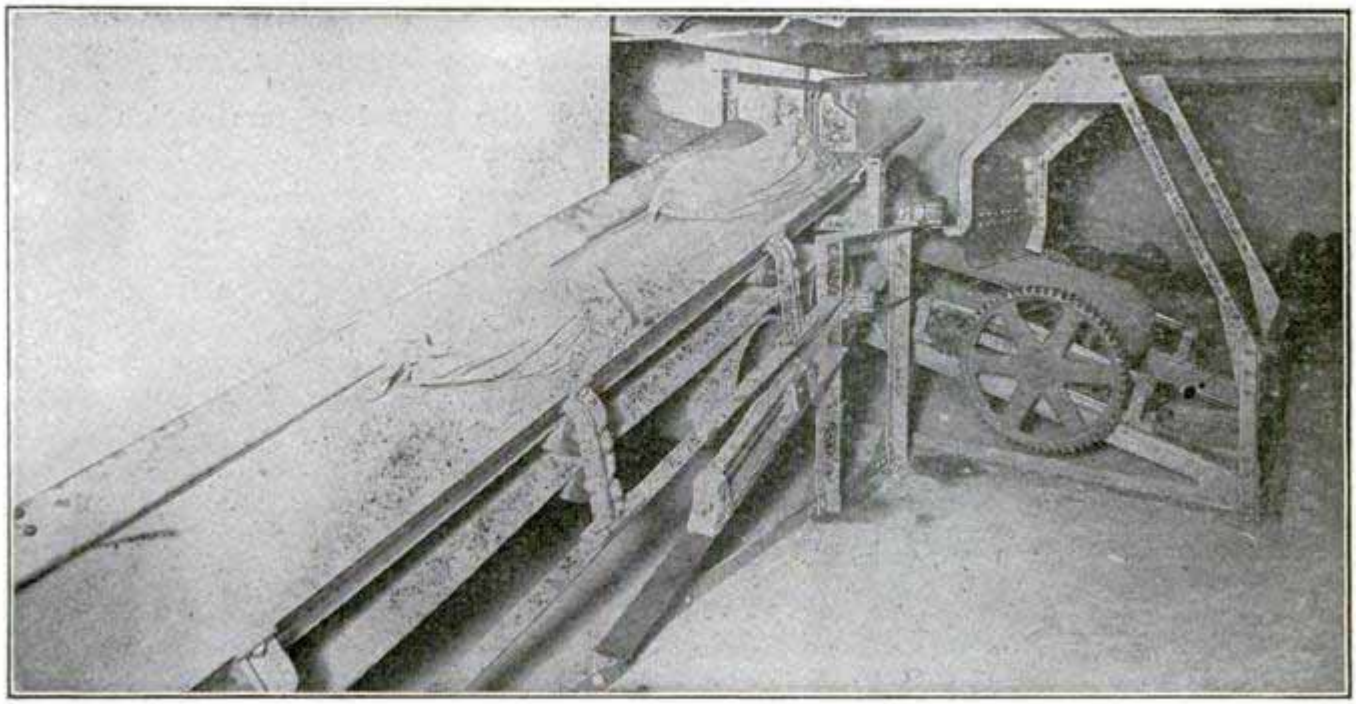
To return to the cancelling machine: As the letters are removed they are put in trays and dispatched to whichever sorting section is running low. In these sections the letters are sorted into the states for which they are destined, again placed in trays, and sent to seek out their own state section. At these state sections are clerks who are experts on their special state, knowing every postoffice and all the mail routes, railroad, star, rural, stage, etc., and just where to send a letter in order to reach some little out-of-the-way place with least delay. The empty tray is returned for a fresh supply by being placed in the upper story of the conveyer, which has a double track, one above the other, and running in opposite directions between the same points. There are other tray conveyer systems for the interchange of mail, all working on the same plan.

At frequent intervals during every hour of each day and night some mail will be dispatched to every state. And this brings us to a still more remarkable performance, of which a single illustration will apply to all outgoing letter mail. The Overland limited on the C. & N. W. Ry. leaves at 8:02 p. m. Ten minutes before, or at 7:52 p. m., the state sections which have mail for that train are sending their trays filled with letters, tied in packages, to that portion of the room where big, black pipes come up out of the floor. The pipes are in pairs, forming one endless pipe between the postoffice and each of the several railway depots, some of them a mile or more away. The trays with packages of letters for the Overland are being emptied on a big table and packed into "carriers." The carrier is made of tinned sheet iron, with a felt buffer at one end and an annular canvas gasket at either end to make it tight in the tube; that is, it fits within 1/32 of an inch when it is new. A carrier will easily contain 500 letters, but the average is much less, owing to packages and newspapers. A hinged lid is clamped in an instant and the carrier set in position to be drawn into the tube. An



Courtesy Jeffrey Mfg. Co.

UNDER THE STREET -- Steel boxes at right receive mail from street chutes, and weigh it, then the belt conveyer (No. 1) starts it on a rapid journey. When the door of the chute above is opened an electric bell sounds and a signal lamp is lighted to show which chute is being used. The main belt shown is one of several, each 90 ft. long and 48 in. wide, traveling 55 ft. per minute. The chutes were originally intended to be used for sacks containing second-class matter mailed by publishers.



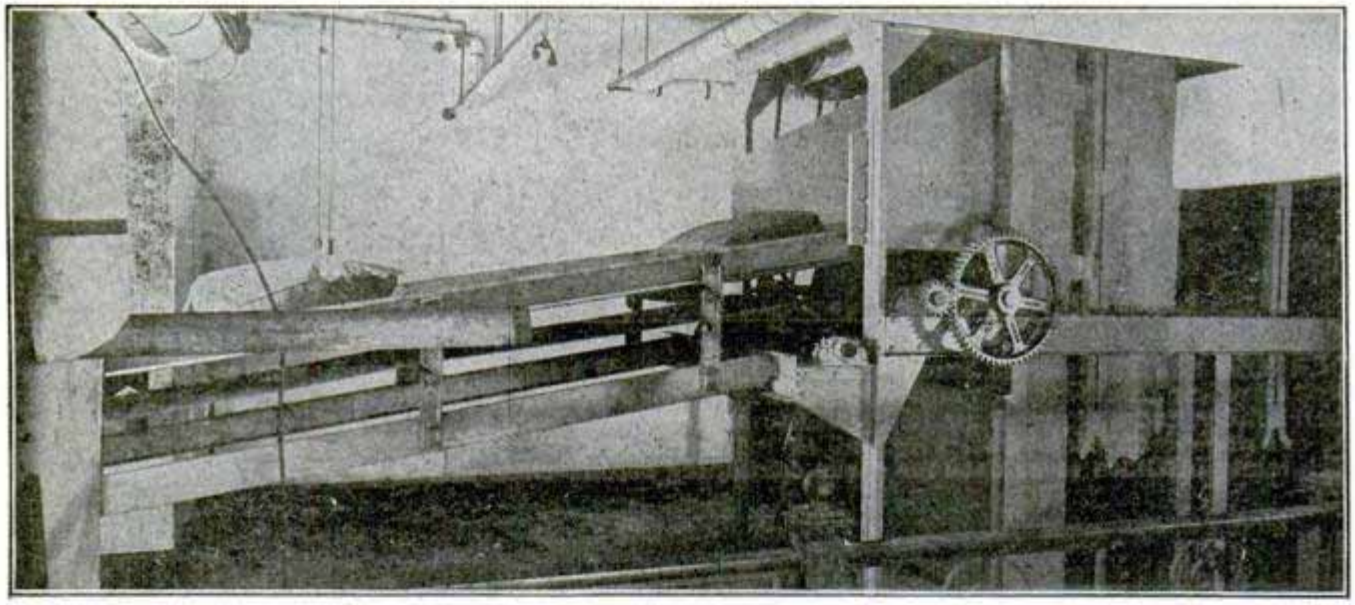
A SHORT "HIGH-SPEED" CONVEYER (No. 2) which throws the mail on to the ascending cross belt conveyer shown at the upper right hand portion of the picture. The cross belt empties into the buckets of one of the lifts.

automatic release once each 10 seconds opens the tube and the carrier disappears in the tube. Down it goes at a speed of 30 miles an hour, turns out under the street, flies along beneath skyscrapers, dives under the Chicago river and in two and a half minutes emerges in the postal room at the Northwestern depot. The carrier shoots out upon a table, is opened and contents transferred to a lock pouch. Every 10 seconds a carrier arrives with its load of mail, rapidly filling pouch after pouch, which are locked and hurried into the mail car.

The engine is blowing off steam, all the passengers are on board, the conductor stands watch in hand, and even as he gives the signal and steps upon the slowly moving train, one more last pouch is thrown into the mail car. It contains letters which were in a man's pocket who was entering the postoffice more than a mile distant eight minutes before. Then the postal clerk shuts the door of the mail car, but not until then was the Overland mail "closed."

The pneumatic tube system includes six trunk lines with nearly 20 miles of pipe. The nominal diameter of the inside of the pipe is 8 in. The tube is of cast iron, with bell and spigot joints, which are made tight in the same way as the ordinary water mains; that is, with lead calked into the bell. The pipe, as a rule, follows the street and the depth depends largely on the local condition, from 2 to 10 ft. It crosses the Chicago river in two places. The air pressure varies with the load carried and the length of the line, and is direct pressure, from 6 to 12 lbs. There are four sets of compressors operated by steam engines in the basement of the Federal building. At present 75 h.p. does all the work. Should a carrier become lodged in a tube the air pressure can be increased, and if this does not start it, the air current is reversed. Such accidents are of very rare occurrence, and of short duration. When a carrier reaches its destination its speed is checked by compression, and its course diverted from the main line to reduce what would otherwise be a cannon-ball effect. Even with this precaution the arrival and departure of a carrier is a decidedly strenuous affair.

Incoming letter mail is taken from the trains into the depot postal room and transferred to carriers and sent through the tubes to the main office. In fact, none of the letter mail is now carried in wagons, which haul only newspapers and merchandise. Even these will soon forsake the wagons and travel in small cars, securely locked, through the tunnel system which honeycombs the business district of Chicago. The pneumatic tube system described is like the brass tube cash conveyers seen in large retail stores, only on a much larger and stronger scale.



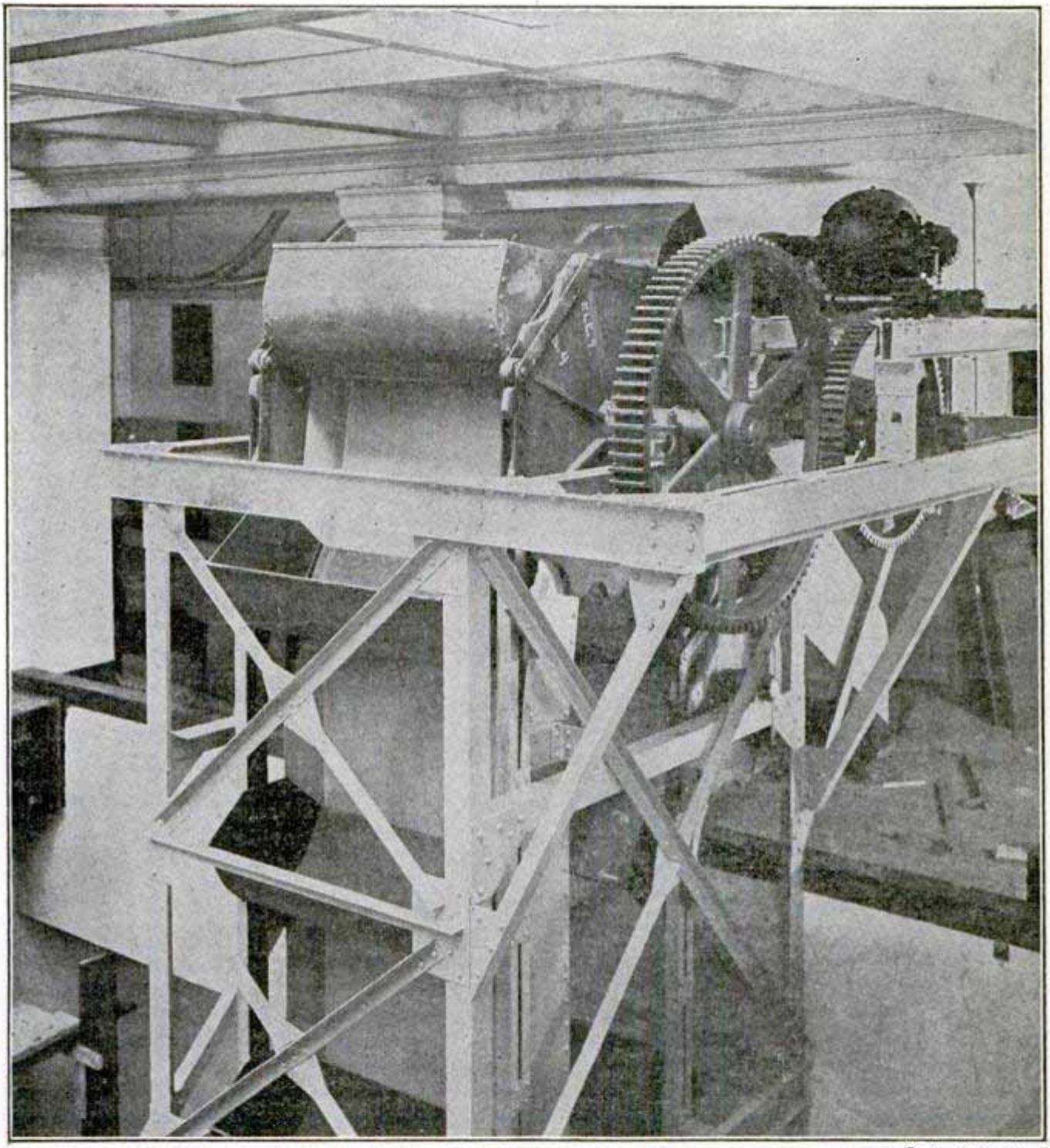
Upper End of No. 3 Conveyor, which Delivers Into the Steel Buckets of a Lift

Periodicals and newspapers are mail matter of the second class. One hundred tons are mailed by Chicago publishers every day. This mail in sacks, tagged for each state, comes to the postoffice in the publishers' wagons, which enter the building through a large subway and unload on long platforms. Here a small army of men, after weighing, throw the sacks into a "lift," which carries them up into the sorting room. These lifts are so called to distinguish them from the freight and passenger elevators which do not handle mail.

From the sidewalk on the Dearborn street

side of the building, next the curb, rise 15 ornamental iron mailing boxes, 10 ft. high and 6 ft. by 3 ft. A hanging door opens near the top on the street side. These boxes are for mailing catalogues and merchandise which come in wagon loads from large es-

locked by a lever from below, and the weight taken. The box, which is hinged, discharges by dumping forward onto a wide horizontal belt moving at a speed of 55 ft. per minute, driven by an 8-h.p. electric motor. This belt delivers the mail to another



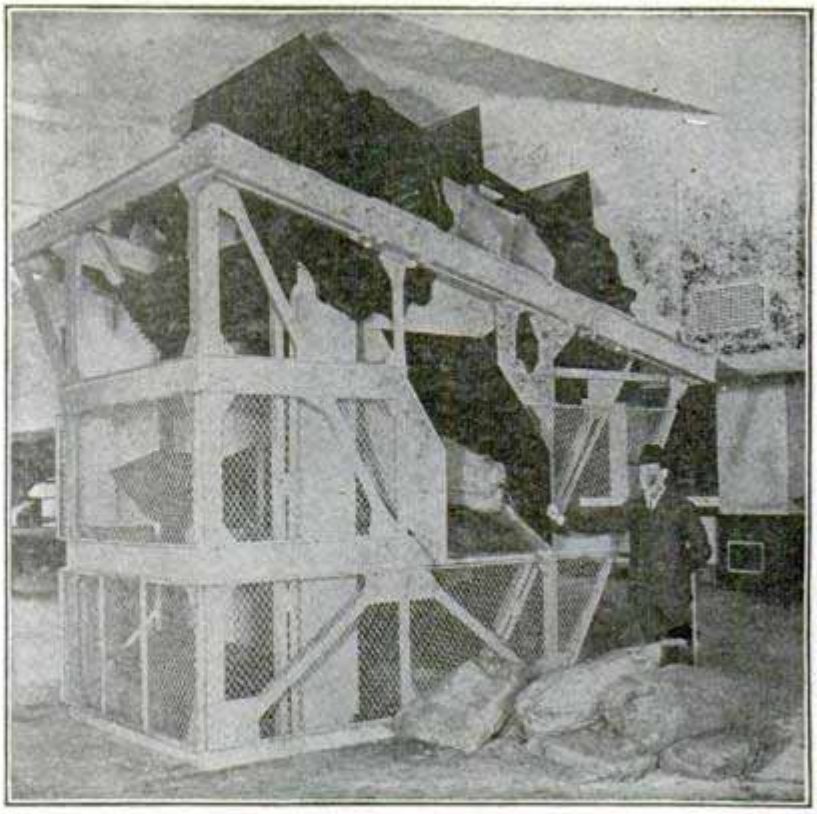
Courtesy Jeffrey Mfg. Co.

Top of One of the Lifts 60 Ft. in Height--Electric Motor Shown at Upper Right--Screen Removed to Take Photograph

tablishments. It is all third and fourth-class mail, with stamps affixed. Below, in the basement under the sidewalk, each chute terminates in a boiler iron box which serves as a weighing scale, and capable of holding a ton. All the mail entering the postoffice, of whatever character, is weighed, hence these scales. When a box receives a sufficient load the door in the chute above is

similar belt moving in the same direction at 65 ft. per minute and which is elevated at the farther end. The fast belt throws the mail against a smooth wall, from which it drops to a cross-conveying belt running 55 ft. per minute at right angles, and which in turn delivers the mail into the buckets of a lift. These buckets are huge affairs, capable of holding 1,000 lbs., and are attached to

endless chains which rise vertically and discharge the contents of the buckets as they turn to descend from the floors above. Those of our readers who have visited a grain elevator or flouring mill and observed the little iron buckets holding about a pint of grain going up the wooden spout, will recognize in these mammoth lifts a greatly enlarged example of the very same mechanical system. Reference to the illustrations will make the operation clear to every one. There are 10 sets of belt conveyers and 9 sets of lifts already in operation. Each conveyer and lift has its own individual electric motor, and, what will occasion some surprise, all the electric current for the light and power of the great building is not made in the building nor by the government, but purchased from an illuminating company.



Upper End of Lift, Showing Mail Sacks Coming Out of Lift

In the money order division the clerks who issue the orders to the public are ranged in a long row with windows opening into the corridor. In the top of the built-in desk there is a small trap door, one for each clerk, which is held shut by a spring. The moment a money order is issued the duplicate is dropped through this door into a conveyer, which carries them all to the other end of the big room. All the offices in the building are connected with a pneumatic tube service and private telephone exchange. The system of ventilation by which the incoming air is cleaned, cooled and sterilized and then carried to all parts of the building is extremely interesting.

The conveying and lift systems are large affairs, the lifts being ponderous machines; the illustrations, which are made from photographs, fail to give anything like a proper idea of their size. The success attending the use of machinery is expected to lead to similar installations in other large offices where a great bulk of mail is handled.

The Chicago postoffice building is the finest in the country. It was eleven years in construction. In addition to the several floors devoted to postal business, all the other government offices are provided for, including the United States courts. There are 650,000 sq. ft. of floor space, or about 15 acres; from the street level to top of dome is 280 ft. The mechanical appliances for handling the mail cost $250,000.

PROGRESS OF THE RECLAMATION WORK

The government has, in all, 24 reclamation projects on hand, two new ones having recently been approved. These are the Rio Grande and Carlsbad projects, the first being partly in Texas and partly in New Mexico, and the other wholly in New Mexico. Eleven of these schemes are now well under way. They provide for the reclamation of 1,303,600 acres of arid lands at a cost of $37,028,571.

Since this work began 77 miles of main canals, 54 miles of distributing canals, 186 miles of ditches and 147 bridges have been constructed. Over 9,350,000 cu. yds. of earth have been excavated, 3½ miles of tunnels driven, 250 miles of telephone lines installed, and 126 miles of roads built; also a cement mill, which has produced 50,000 bbls. to date.

The great difficulty is to secure enough workmen. Even where contractors fail and the government steps in to offer exceptionally good wages, the men can not be secured. A spirit of unrest seems to be the only tangible difficulty. The eight-hour day, too, gives the men idle hours in which to become discontented, and usually they spend the time in drinking. Numbers have expressed a preference for the longer period of occupation. Workmen who go out to engage in the construction work will have the best opportunities to secure valuable lands.

WHAT OCCUPATION SHALL I FOLLOW?

A Symposium on the Necessary Qualifications for, and the Inducements Offered by the many Mechanical, Engineering, and Industrial Lines of Work and Business. These Articles are Contributed by the Managing Editors of Publications which are Recognized as Leading Papers in their Respective Fields.

The Old Professions are Overcrowded; the Whole World is Calling for Educated Mechanics and Engineers.

WHY A YOUNG MAN SHOULD BECOME A LOCOMOTIVE ENGINEER

By Angus Sinclair, Editor Railway and Locomotive Engineering, New York City

In the prevailing struggle for existence it is no easy task for a young man having no special training or technical education to decide upon a calling which is likely to give him permanent employment with fair remuneration. In surveying the field of available occupations, I do not find one which is equal to that of locomotive engineer for providing a good income and congenial employment for the right man. "The right man" is a very important factor in deciding who shall be accepted among the numerous candidates for the positions that lead to the position of locomotive engineer.

Angus Sinclair

The average man who offers himself as a fireman with a view to becoming a locomotive engineer, gives himself no self-examination to ascertain if he has the attributes that will make a successful engineer; and therefore the officials controlling the employment have to be keen inquisitors to prevent the wrong man from taking a place in the line that leads to the cab of a locomotive. This exercise of judgment is not always successful for some men become engineers who have not the natural capacity to care for any appliance as complicated as a wheel barrow, and their incompetence becomes a continual source of annoyance and danger, when the holder is privileged to perform the duties of a locomotive engineer.

The first requisite of a would-be locomotive engineer is the possession of a good constitution and an estimable character with steady habits. He ought to be naturally industrious and have a good common school education, be of observing habits, have good eyesight and hearing and be free from nervousness. He must also be courageous without being reckless and he must have the capacity of keeping cool under danger or difficulties.

If a man possesses these characteristics and knows that he has them, he can safely offer himself as a fireman, for his progress towards the right hand side of the engine is assured.

The locomotive engine which reaches nearest perfection, is one which performs the greatest amount of work at the least cost for fuel, lubricants, wear and tear of machinery and of the track traversed; the nearest approach to perfection in an engineer, is the man who can work the engine so as to develop its best capabilities at the least cost. Poets are said to be born, not made. The same may be said of engineers. One man may have charge of an engine for only a few months, and yet exhibit thorough knowledge of his business, displaying sagacity resembling instinct concerning the treatment necessary to secure the best performance from his engine; another man, who appears equally intelligent in matters not pertaining to the locomotive, never develops a thorough understanding of the machine.

There are few lines of work where the faculty of concentrating the mind to the work on hand is so valuable as in that of running a locomotive. A man may be highly intelligent and be well endowed with general knowledge, but on a locomotive he will make a failure, unless his whole attention, while on duty, is devoted to the duties of taking the locomotive and train over the division safely on time. The man who lets outside hobbies or interests take much of his thoughts while running a locomotive, is likely to get into many scrapes.

People of a serious disposition are generally regarded with favor for responsible railroad employment, but I did not find that decidedly religious men made such good engineers as others less regenerate. Ahaziah Sims had drifted from the oil room at

Springfield to firing, then by force of staying became engineer. He was a pious man and not only he, but others, imagined that his religious capital made up for no end of occupation shortcomings.

One morning Ziah walked smilingly into the roundhouse office from a night run and remarked: "Had splendid run. Engine all the way kept saying: 'Bless the Lord, Bless the Lord.'"

"I know vat vas de matter vid your engine, Zi," remarked Joe Dietz. "Your valves vas oud and you did not know id. Hims odt say: 'Bress de Good Lord' and den you haf four exhausts."

Ahaziah was less than a good average engineer, for he permitted his mind to praise the Lord in psalms when he ought to have been fondling his engine. Glorifying the Lord and his works is all right in its place, but it is better for an engineer on duty to be keeping a keen ear on the deterioration of the pistons and valves or main rods, or air pump, or other part that is getting demoralized. Which of these pistons is beginning to blow? What is the matter with that injector that needs help, etc., etc.? The man who cannot devote his mind exclusively to the working of the engine and looking out for signals, when on duty, will not make a first-class engineer.

I was a locomotive engineer between breaks for about twenty years, but I was in some respects a better engineer in the first five years of service than in the last five years. The cause of this degeneracy, so to speak, was, that latterly distractions had come into my life and I was not able to concentrate my attention upon the working of the engine with the same interest that I could apply when younger. My mind would wander to studying of scientific problems that required too much attention.

Many hardships have to be endured by nearly all locomotive engineers, but the life has its compensations. A man who knows his business and performs his duties properly holds a very independent position. As to the attractions that might induce a young man to choose the business of a locomotive engineer, I testify that with all its drawbacks I do not know of a pleasanter business. It has been my good fortune to engage in many occupations—some of them of high grade—some of them of very honorable standing—but I never enjoyed any work so much as that of running a locomotive.

WHY A YOUNG MAN SHOULD BECOME A BAKER

By H. R. Clissold, Editor The Baker's Helper, Chicago

1. THE USEFULNESS OF THE BAKING INDUSTRY. No man can engage in a more useful business than the manufacture of good food. The baker's chief product is bread; and bread is the chief food of mankind. Its production demands and deserves the best there is in any man—the best training of heart, head and hand, and the best application of that training. A soulless man will not have the best success as a baker, for he will yield to the temptation to do inferior work, and so fail to grow. In none of the myriad commercial activities of our busy time more than in the making of food is it important that a man be dominated by high moral purpose. A short-minded man can never have the best success as a baker. The industry offers a field for the exercise of the best brand of gray matter, and the modern baker has abundant occasion to use the highest mental training it is possible to secure. An unskillful man is not likely to have the best success as a baker. He may not need to work at the bench or at the oven; but he has added leverage if he knows how to do things, as well as what to do and why.

H. R. Clissold

2. THE BROAD FIELD FOR ENTERPRISE. Bakers are doing only about one-half the business that should naturally come to them. Baker-made bread ought to have, at least, as good a place in public esteem as tailor-made clothes now hold. It is reaching out for that place, and advancing toward it more rapidly than at any previous time; but there is much land yet to be possessed. The realization of this ideal is worthy of any man's ambition; its achievement will come only through the exercise of high purpose, clear thinking, wise

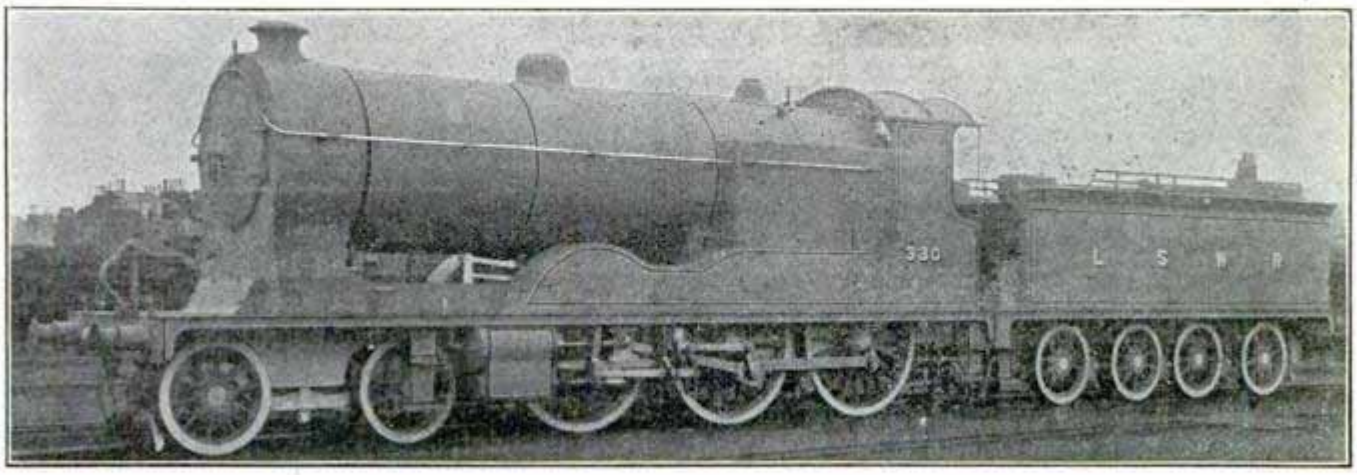
planning, persistent effort. In the last score of years a quiet but radical transformation has been going on in the baking business; the next score of years will witness the general recognition of the change. The baker is steadily coming to his own, and soon he will not (as at present) be generally thought of as a man of low ideals, of little ambition, of mean capacity for large affairs. A better chance was never presented to young men of character, of enterprise, of energy, to take advantage of a rising tide.

3. THE IMPROVED EQUIPMENT OF BAKERIES. Neither time nor space here permit details of the revolution in the baking business referred to above. It may suffice to say that the dark, ill-smelling cellar shop is fast giving way to the specially-designed and carefully built bakery, with plenty of light and fresh air, with cement floors and white-tiled walls, with lockers, shower baths and linen suits for workmen, with system and cleanliness prevalent everywhere. The science as well as the art of bread-making is now studied; the microscope, the thermometer, the testing tubes and scales of the bakery chemist have an assured place; luck and chance in baking operations have given way to intelligent and accurate control of conditions. Hand-mixing of dough is fast becoming obsolete; hand-labor in the weighing and moulding of loaves is being displaced by automatic mechanical devices. And the great improvements already made are but suggestions of still further improvements in equipment. The baker has developed a new respect for the inventor and the machinist, and this trinity are working together for good today and for greater good tomorrow. The baker's traditional conservatism has given way to an almost feverish desire for better methods, better appliances, better results. The atmosphere of the bakery world is such as to spur any intelligent, ambitious young man to do his best. The rewards are plenty, and sure, and in sight.

4. THE OPPORTUNITY FOR MONEY-MAKING. This is not the chief reason why a young man should be a baker; yet in the minds of some men it will outweigh all others. The bakery is not a mint; but for all that, it is a good place to make money. The baker is not likely to clear many thousands in a day, as in some fortunate speculative ventures; but neither is he subject to sudden and sweeping losses. The baking business affords a fine opportunity for intelligent methods, sane enterprise, steady habits, hard work, economical management, and plain, common, business sense, to tell in regular and reasonable profits. In every town and city in the country are to be found ordinary illustrations of its money-making possibilities, with notable illustrations in sufficient number to stir lagging ambition and encourage a firm belief in the financial value of the industry. Its principal product is universally and constantly used, all the year round, in good times and bad. The business fluctuates little, as it deals for the most part with a necessity. With every year there is an increase in the number of people who demand the best in food, and who are willing to pay the best prices for food that suits them.

(Series to be continued.)

GREAT BRITAIN'S LARGEST LOCOMOTIVE



The above picture shows a monster locomotive recently built for the London and South Western Railway. It has four high-pressure cylinders, each 16 in. by 24 in. and six coupled drivers, 6 ft. diameter; 2,727 sq. ft. of heating surface, and weighs about 120 tons.

ON THE ROAD TO TONTO

Geo. Bond Ellison in Journal of Electricity

Bang!
"There he goes!"
Bang! Bang!
"There he comes!"
Bang! Bang! Bang!
"I got 'im! I got 'im!"

"Yah! and yu nearly got me, too," another voice chimes in and then continues with an accent of vindicative personal grievance—"Now, of all th' pizen fools that wuz ever let loose in this here sufferin' country of Arizony yu'er certn'ly th' double cinched limit."

A broad shaft of moonlight wedged itself between the cottonwood trees that fringed the river bank and six feet of angular humanity, bedecked in flaming scarlet underwear, slowly rose from the ground and stood clearly outlined with a diabolical suggestiveness.

"Look at ol' Ajax defyin' th' lightnin'."

The man in red grimly flung a boot at the roll of blankets from which the last voice emanated and solemnly waving one long arm again delivered himself.

"I'm agoin' to tell th' boss, sez I—I kaint skin mules all day an' layin' down here, peaceful an' tired like, meanin' no harm to nobody, an' hev some rawhide squirt with a popgun a shootin' me up every night fer a target."

His voice rose a tone in pitch.

"Sez I, every time one o' these here bloomin' galoots sees a shadder on th' rocks he jes' naterally lets loose permiscus like—what? Hyderfoby skunks, sez he—now what d'ye think o' thet? It's my humble opinyun thet this little ol' Gov'ment 'sted o' surveyin' fer roads 'n canals 'n dam sites hed damsite better be stakin' out a claim fer a bug-house, 'n this here camp kin furnish a gosh-a'mighty good start fer th' institooshun—why, yu! why, yu!—"

His vocabulary failed and the writer pulled his head out of the sand, where, like the ostrich, he had hidden it for safety from the sudden fusillade of shots, in time to see the long man, still grumbling, slide himself into his blankets—and peace again reigned in Mormon Flat.

We were a party of government men—engineers, transit men, plane table men, rod and chain men, and the omnipresent packers—working on various sections of the great Tonto Basin project, Reclamation Service, U. S. G. S. A number of the engineers were new, just out from the East, filled to the brim with stories of the dangers of Arizona life,and every new arrival was quietly taken to one side by some one of the older hands and especially warned against "hydrophobia" skunks.

"It would not be so bad," the story usually ran, "if you could see them, or in the day time, but they have a habit of wandering at night, and they are mad and vicious, and they crawl on you while you sleep. Their favorite trick is biting the nose; and, my boy, if one of 'em ever gets you it's all off—you for Chicago and the Pasteur; even the treatment only lasts seven years; you'll go mad sooner or later—of course, I don't want to worry you, but it's just as well to be careful."

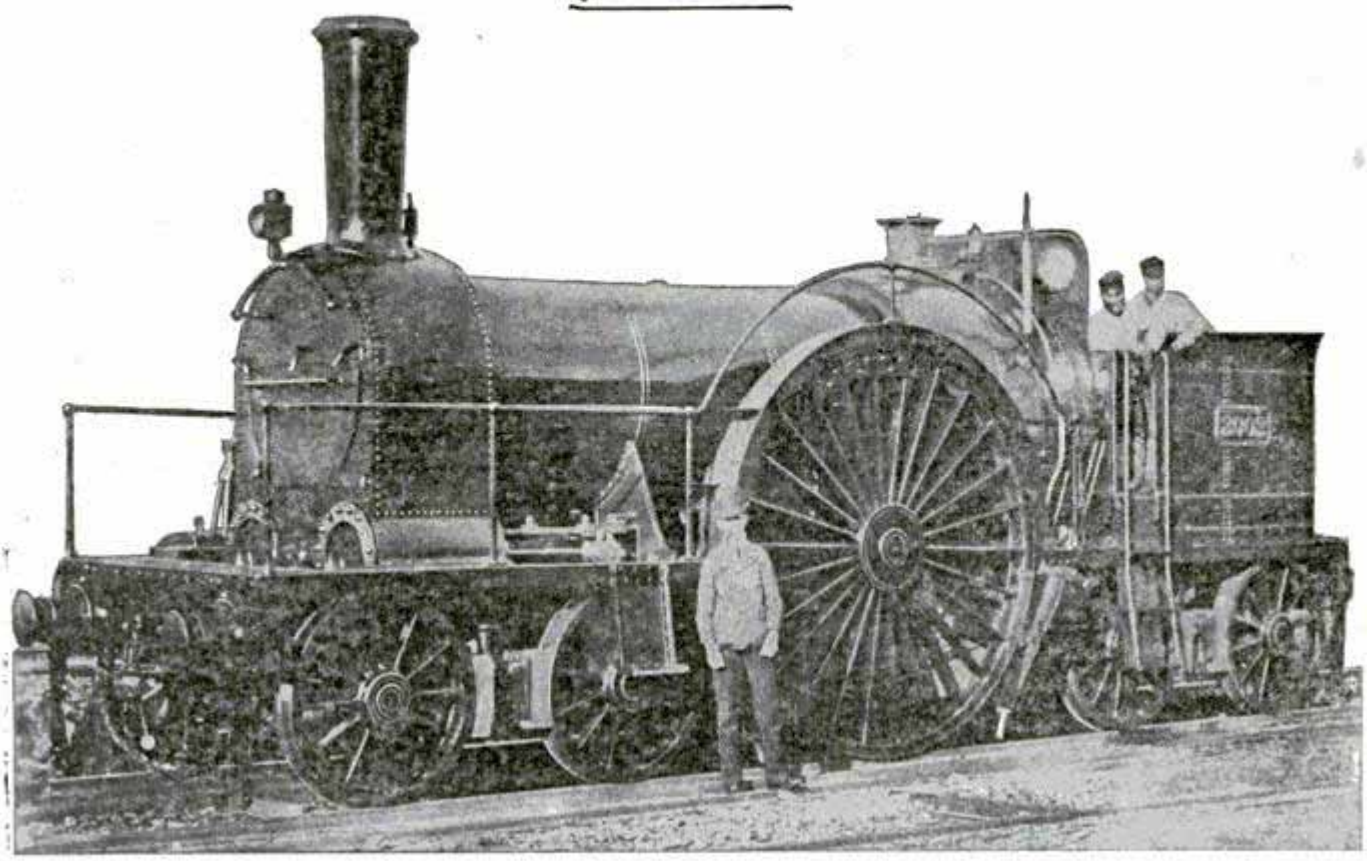
And the kindly informant would wander away with a solemn, worried face, leaving the new recruit in a state bordering on collapse. The consequences were that every last one of the new men would bunk down with apprehension filling his soul and lay awake half the night nervously fingering his six-shooter and "seeing things," and if he dozed off for a brief spell he generally awoke with a jump, and a "shadder" on the rocks would evolve itself into a skunk to his sleepy eyes and he would open up regardless. We all voted, time and again, that we would take chances with a skunk rather than a scared, half awake man "turnin' loose permiscus like."

Add to this a few choice tales, told around the camp fire, of rattlesnakes seeking the warmth of the body and coiling on your chest at night, centipedes and tarantulas crawling up your trousers, and the finishing touch was the story of the man that lay down one night and neglected to cover up his head, and a Gila monster fastened his curved tooth in his right ear and it could not be pried loose, so they had to cut off his ear with a hunting knife. Truly the first ten days or so in the hills were a veritable nightmare to the new man.

Australia's first iron and steel plant is soon to be established in New South Wales. The plant is to be an extensive one and will be operated by an Australian firm, but the equipment, involving an expenditure of $1,000,000, will be purchased in the Pittsburg district.

With the automobile man it's a case of "oily to bed and oily to rise."

NOTABLE ENGLISH LOCOMOTIVES--No. 1



A LOCOMOTIVE WITH 9-FT. DRIVING WHEELS--This engine was built in about the year 1850, for the Bristol and Exeter railway, now part of the Great Western railway. It was constructed for the broad gauge, viz., 7 ft., and it will be noticed that all wheels had brakes.

TROLLEY CAR AS AMBULANCE

A head-on collision occurred in the outskirts of Chicago recently, at a point where a trolley line crosses the steam railway. A big trolley car filled with passengers had just cleared the crossing when the accident occurred. Several trainmen were injured. The trolley car conductor realized the situation in an instant. Requesting his passengers to leave the car, he had the injured men brought in, and dashed away to the nearest hospital some three miles distant.

SLOT MACHINE GIVES OUT PENNIES

A resident of Croydon, England, has had placed in front of his house a machine that gives out pennies to the poor. It is stated on the face of a dial that anyone who will turn the handle of the machine a hundred times will receive a penny from the slot. Hoboes look at the charity grinder in wonder and think it is a fake game. Few have faith enough to try it. Some object to turning the handle so long.

CAR LOST FROM MOVING TRAIN

Stories of cars mysteriously disappearing from a train of freight cars between stations have been told, but the public have supposed they were stories. One of our readers, a railway man, vouches for the truth of this one, which is an actual fact.

Not long ago a night freight pulled into Gurdon, Ark., and the conductor turned his train over to the yardmaster and went home to bed. He had just fallen asleep when the caller pounded on the door and said the train was short one car in the report. The conductor insisted he had checked it into the train, and it must be there. On going to the yard, however, he had to admit it wasn't there.

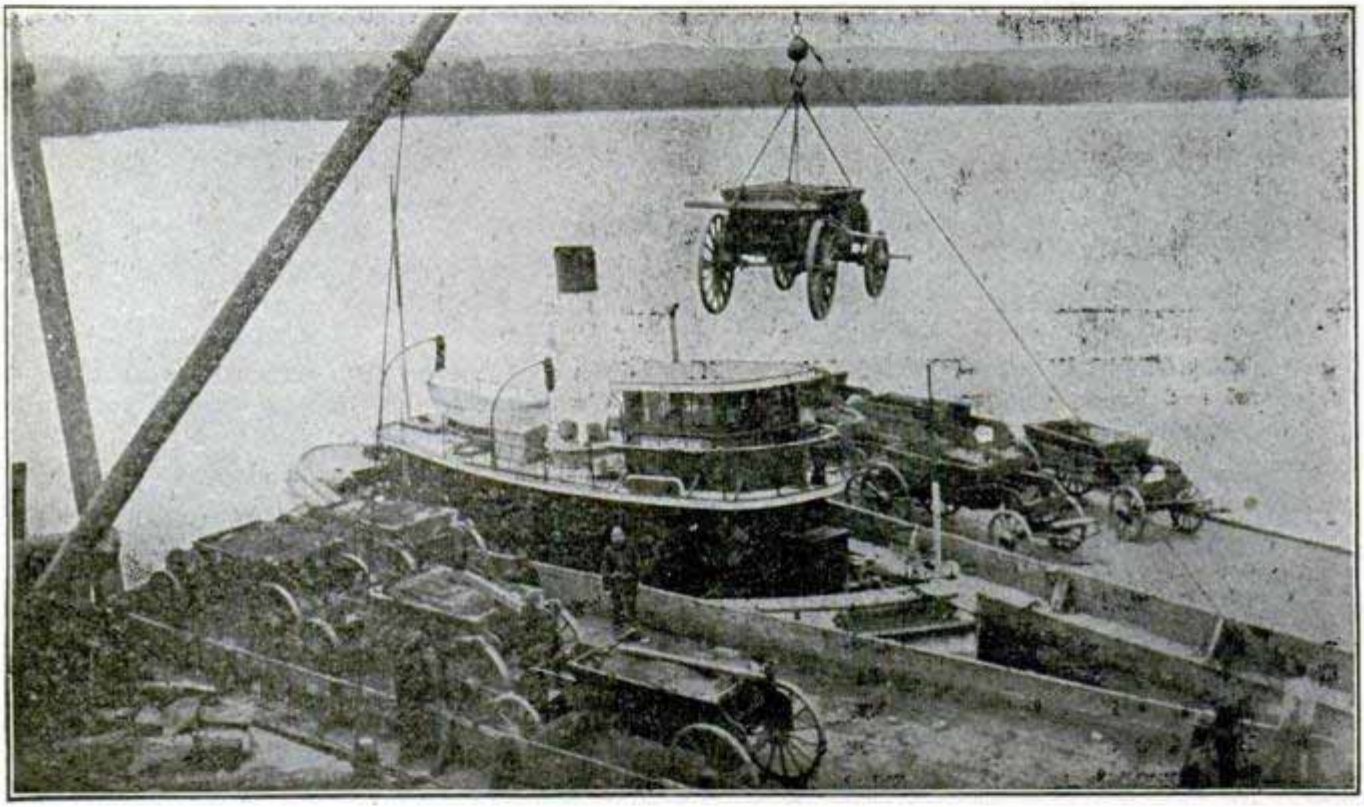
The next morning the missing car was discovered in the ditch a few miles out of Gurdon. The train had parted, the box car had jumped the track and the next car, which was the caboose, had caught up with the train and automatically coupled.

NOVEL SOLUTION OF A BRIDGE TROUBLE

The residents of Washington, D. C., recently witnessed what appeared to be an optical illusion. Out in the middle of the Potomac, poised in mid-air without any visible support would be plainly seen a large black wagon. This wagon would at intervals appear and disappear. There proved to be little romance in the explanation of a very practical, mechanical performance.

A highway bridge was being built across the river, the roadway of which called for an asphalt paving 4½ in. thick. In preparing asphalt for paving the mixing and heating process requires quite a plant. From this plant it is customary to haul the asphalt in wagons to whatever points about a city work is being done.

The draw span of the Potomac bridge had to be kept open practically until the completion of the whole work. In order to finish the asphalt work within contract time the company chartered tugs and scows to carry the loaded wagons out to the draw, and erected hoisting machinery which lifted the wagon with its contents and swung it gracefully through the air up to its lofty destination. The big draw was turned around by hand long enough to run a steam roller on for rolling the paving. The draw was then opened and remained so until the bridge was opened for traffic.



"A Bridge Was Being Built Across the River"

PENSIONS TO RAILROAD MEN

While the railroads are constantly insisting on a higher grade of men, made necessary by the ever increasing details of operation, they are also adopting a pension system for the benefit of those who grow old in their service.

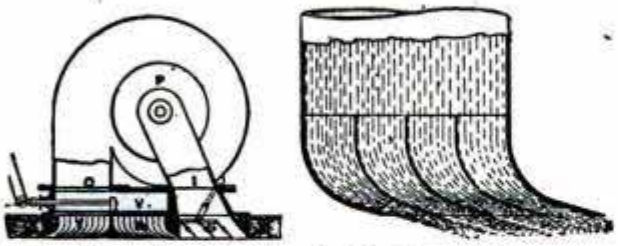
Already a pension system is in operation on 75,000 miles of road, with 500,000 employes, and early this year a benefit system will go into effect on some 12,000 miles additional, bringing joy to 75,000 men. The Railway Age says:

The usual plan is that of an allowance to every employe at the age of 70, of 1 per cent for each year of service, based upon the average monthly pay received for the 10 preceding years. Thus, if an employe who has been 40 years in service has averaged $100 a month for the last 10 years he will have a life pension of $40 a month. The experiment appears to have worked well with the companies trying it during the last six years, and to have done much good without noticeably impoverishing the railways which have made the experiment.

Good indications of oil have been found in Portuguese East Africa. Extensive drilling is being done, and any day may announce the discovery of another great world's supply.

JET BOAT PROPELLER

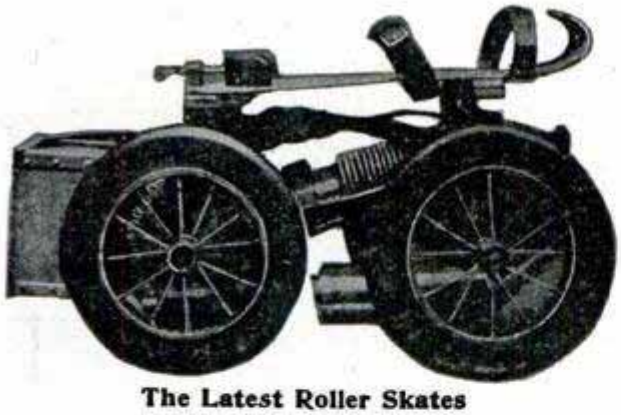
A Scotch engineer has brought out a new type of jet boat propeller for use in shallow water or where weeds and grass interfere with the use of a screw propeller. A centrifugal pump is directly connected to a gasoline engine, and the water discharged in a series of jets, as shown in the illustration. Gas Power says: "By the movement of a lever the flow can be directed either ahead or astern, or by placing in neutral position the boat remains at rest with engine running."



Propeller for Use in Shallow Water

THE MOTOR SKATE

The newspaper reports from Paris of a motor skate prove to be true, so far as the skate itself is concerned. A small gasoline motor is attached to a miniature chassis, and a speed of 25 miles an hour is claimed. The motor is directly connected to the rear axle. The gasoline tank is strapped to the body of the operator. Just what would happen if the skater should chance to "interfere" can be imagined. The device is claimed to be a great thing for messenger boys.



The Latest Roller Skates

MACHINE SMOKES CIGARS

A machine that will smoke several cigars at a time is being used by the department of agriculture for testing the burning qualities of different tobaccos. The cigars are fitted into glass tubes and draft is produced by a vacuum arrangement caused by a jet of water. The purpose of the experiments is to select seed of the best quality for future tobacco crops. The samples of tobacco are kept at an even temperature and moisture in a specially constructed room, where they are made up into cigars and then fed to the machine. Tobacco that burns evenly without flaking or other objectionable features is reported favorably, while the seed from that which does not burn freely, known as "asbestos leaf," is sent to the furnace.

THE AUTOMOBILE HAT

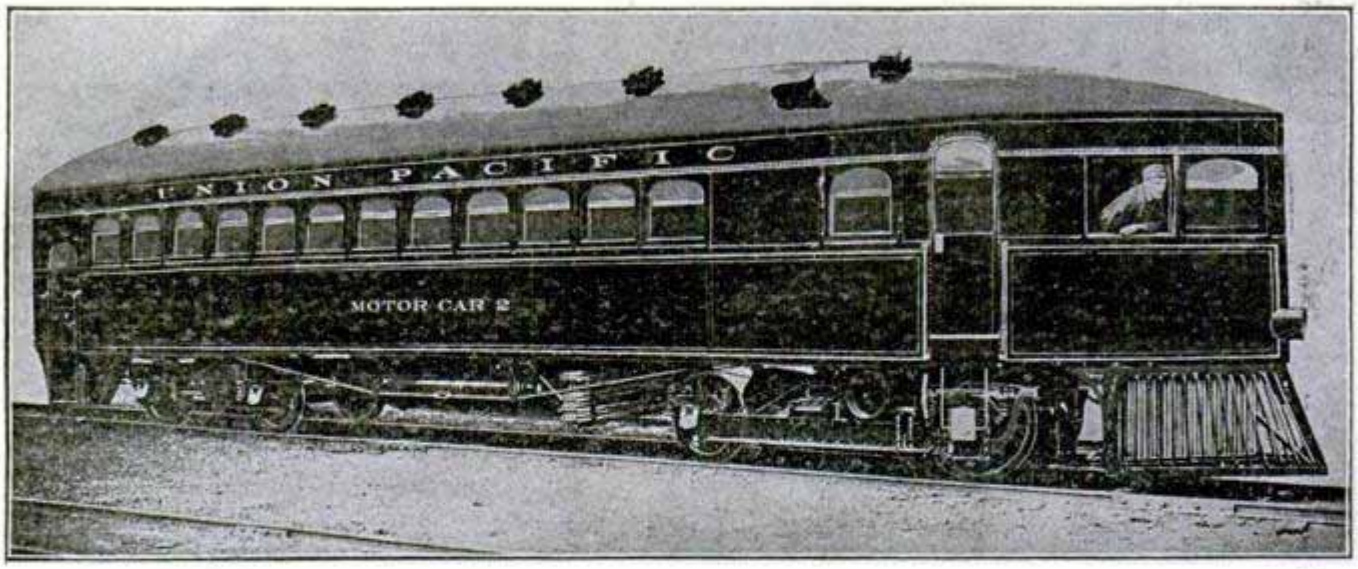
Millinery has not heretofore been considered sufficiently mechanical to find mention in these columns. But the latest Parisian conception, worn at the recent auto show in that city, seems to deserve an illustration.

Motor Millinery

COST OF REPAIRING LOCOMOTIVES

On some railroads the cost of repairs during a single year amounts to nearly one-third the first cost of the locomotive. Here are some of the reports: Average repairs to each locomotive on the Northern Pacific was $2,075; on the Union Pacific, $3,565; Santa Fe, $4,165; Southern Pacific, $3,473; Chicago & Northwestern, $1,563; Chicago, Milwaukee & St. Paul, $1,493.

GASOLINE MOTOR CAR FOR STEAM ROADS



Gasoline Motor Car No. 2--Union Pacific R. R.

"Motor car No. 1, in actual operation has thoroughly demonstrated the practicability of the gasoline motor as a transportation medium." So said W. R. McKeen, Jr., superintendent of motive power and machinery of the Union Pacific railroad.

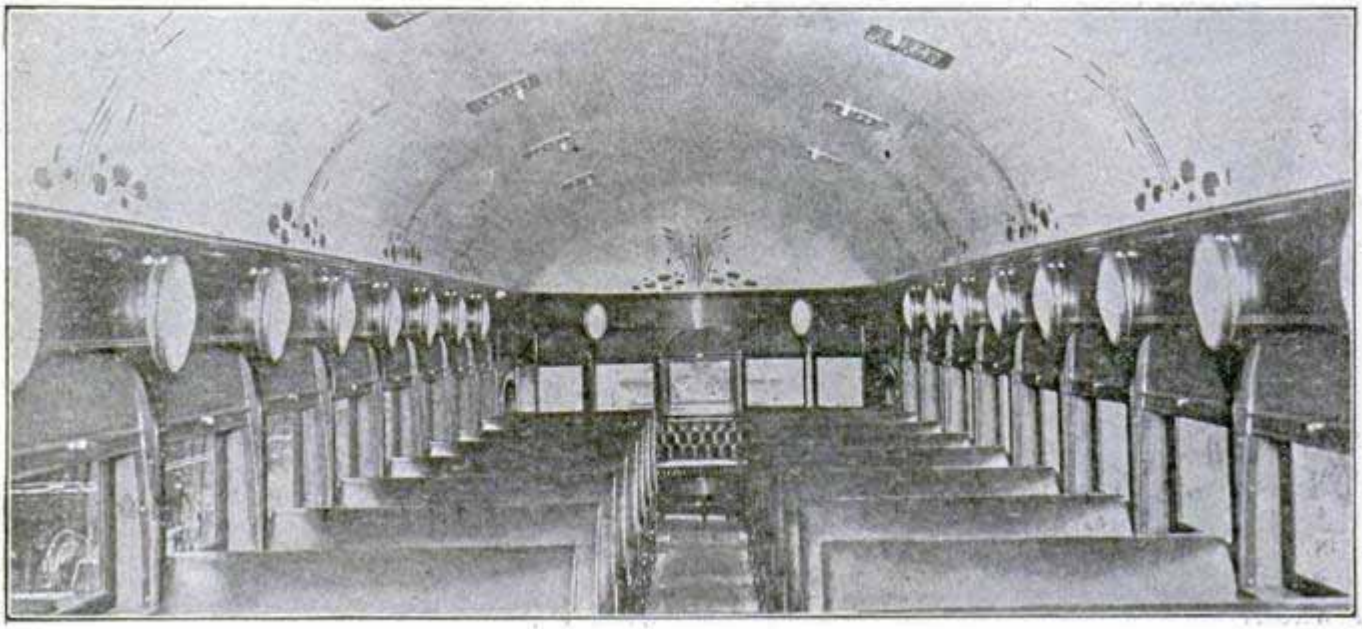
With the satisfactory progress made here and abroad with motor vehicles for all kinds of traffic on city streets and country roads, it was to be expected the steam roads would reach out for something of the same kind. Many of the large roads are already building and experimenting in out of the way places, with gasoline cars. The Union Pacific is the first to make a notable record.

Motor car No. 1 is a single truck, four-wheel car, 31 ft. long, on 42-in. wheels, weighs 20 tons, seats 25 passengers. Its air-brakes effect a stop in 115 ft. when moving at 20 miles an hour. Power is a 6-cylinder gasoline engine of 100 h.p. This car went into service in March, 1905, when under test it hauled a standard coach weighing 60,000 lbs., and a standard mail car weighing 52,000 lbs., up a one-third per cent grade.

Short runs of from 30 to 150 miles were made during April.

On April 16 it started west reaching Salt Lake City May 4th, having made numerous round trips over the various divisions, and on May 19 reached Portland, Ore., where it went into regular suburban service. On August 21 it was returned to daily service between Kearney and Callaway, Neb.

Motor car No. 2 is of the same general design and larger, being 55 ft. long and seating 57 people, and is built of steel. The forward end is pointed; the rear end rounded and



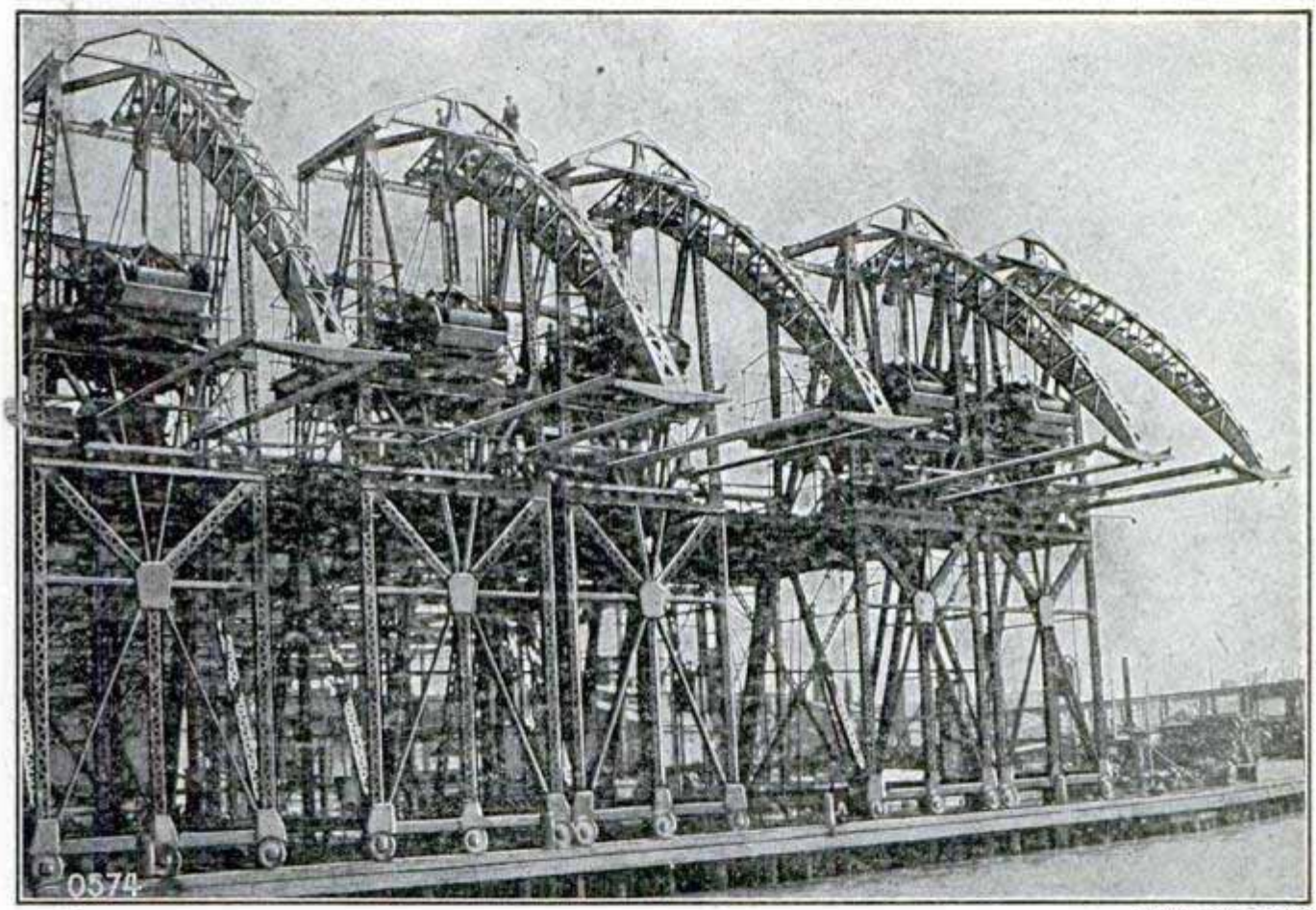
Interior of Gasoline Motor Car No. 2

closed. It is double truck and weighs 56,000 lbs. Power is a 100-h.p. 6-cylinder gasoline engine. This car has repeatedly done better than a mile a minute. Ventilation is excellent; light, acetylene gas.

If the continued use of these cars meets the expectations of the company, it is reasonable to suppose that the gasoline car will be the coming medium of transportation for suburban and short line traffic where frequent service is required; and will save the very much greater expense of an electric system. The car is built to a ⊳-shape in front.

A GREAT COAL HANDLING EQUIPMENT

Largest on the Great Lakes--Covers Five Acres--Holds 600,000 Tons



Courtesy C. W. Hunt Co.

Mammoth Coal Conveying Equipment

Six hundred thousand tons of coal; a supply sufficient to keep 60,000 families warm all winter, are constantly stored under one great roof at South Lake Linden, Mich. This great mass of fuel, however, is not for domestic use, but for the ever-hungry boilers of the Calumet & Hecla Mining Co. The coal handling equipment is the most complete on the great lakes, and one of the best in the world.

The coal storage covers an area of five acres, and includes two sheds, each holding about 300,000 tons. During the working months the supply for current use is drawn from one shed, the other being kept filled for emergencies, such as strikes, tie-ups on the railroad, or any combination of circumstances which might bring about a coal famine. When the season closes both sheds are full, the storage containing sufficient coal to supply during the remaining months the copper mines, blast furnaces, smelting works, etc., controlled by the company in the district.

The coal is received alongside the wharves in steamers of about 5,000 tons capacity. Each steamer will tow a barge of equal capacity, and two such steamers and barges may be moored and unloaded at the same time. On the wharf front there are eleven 2-ton parabolic boom towers, steam driven, each operating a 2-ton grab bucket. The coal is hoisted in these buckets and dumped into a hopper, through which it passes into

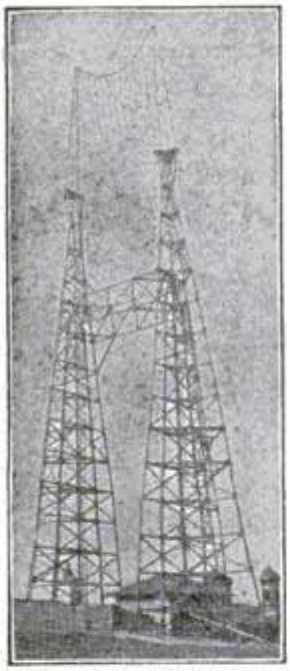
a self-dumping car, is weighed, and sent down on the automatic railway tracks and dumped into the coal storage.

Coal is piled to a height of 22 ft. in the coal storage buildings, the floors of which are fitted with air ducts and ventilators, and the steel columns supporting the roof of the building also being equipped with perforated plates for ventilation. The roof trusses and purlins are of steel, and the roof of white pine covered with galvanized corrugated iron, felted and tarred. These coal storage buildings are 325 ft. wide and 750 ft. long.

The coal is reclaimed from the storage sheds by a steam shovel, operating on a standard-gauge track. The shovel closes on the coal, hoists and dumps it into cars, which are drawn to the different points of consumption.

MURGAS WIRELESS TELEGRAPH

The Murgas system of wireless telegraph is one of the recent candidates for public favor and differs radically from others in that tones of different pitch are employed instead of the Morse alphabet, with its dots and dashes. The Electrical Review, which contains a detailed account of the system, written by Joseph Murgas, says: "This is accomplished by causing different spark-gap frequencies at the sending station corresponding to the different tones, and these frequencies are produced by a plurality of interrupters, any one of which may be included at will in the circuit of a source of direct current."



Station at Wilkesbarre

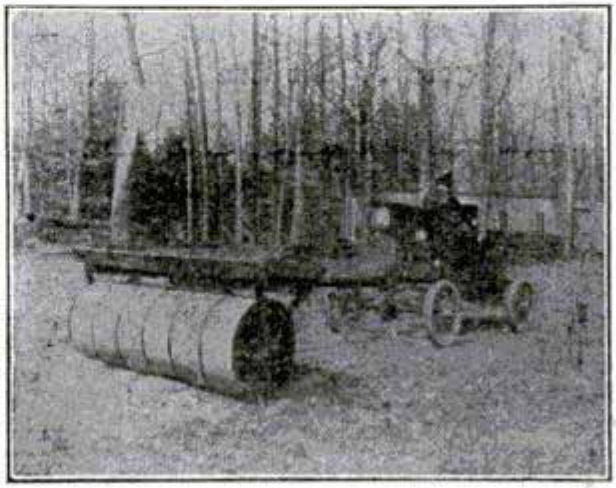
The advantage claimed for the new system is greater speed in sending and receiving messages.

Collangol, a form of pure silver, soluble in water, is stated to be a successful remedy for appendicitis, obviating the necessity for an operation. The cure in severe cases is extremely slow, it is said, but has been a success in 70 cases out of 72.

AUTO DRAWS ROAD ROLLER

In a town in New York the roads leading out into the country needed mending and the appropriation for hiring teams to pull the road roller was exhausted.

An automobile manufacturer whose factory was in the town offered to furnish motor cars to do the work free. There was some question as to the ability of an auto to pull so unwieldy a thing as a big road roller, but the demonstration proved it to be highly satisfactory.



Auto-Propelled Road Roller

NEW GERMAN CANAL MOTOR BOAT

A new steam canal boat constructed in France for use on German canals promises to revive canal traffic. The boat is built of steel, is 126 ft. long, 16 ft. wide and carries 280 tons. It is propelled by paddle wheels which are arranged to be raised or lowered according to the draft of the boat when light or loaded.

BIG YEAR IN IRON EXPECTED

The indications are that this year will record the largest operations in iron ever known. The Lake Superior region predicts an output of 40,000,000 tons of ore and the furnaces are preparing to turn out 28,000,000 tons of steel. The rail mills already have contracts for nearly all they can produce, and structural iron will be used in greater quantities than ever before.

Several wagons 40 ft. long were built by an eastern concern. They are believed to be the longest wagons ever made; will be used to haul theatrical scenery.

POPULAR CHEMISTRY

By Max D. Slimmer, M. A., Ph. D.

This department will appear regularly in the future and will contain talks on chemical subjects of general interest written in unscientific language "so that you can understand it." It is hoped that the readers of Popular Mechanics will assist us in making this section of the magazine as helpful as possible and with this end in view suggestions as to articles of interest or inquiries on chemical subjects will always be appreciated. In this connection its editor will be pleased to answer for our readers all questions that may be addressed to him, only stipulating that the answer must not require the expenditure on his part of any expense for analytical work or extended research. Address all inquiries with self-addressed and stamped envelope to Dr. Max D. Slimmer, 357 Dearborn Street, Chicago.

FEED WATER TROUBLES

Water is an almost universal solvent. Pure water, free from traces of minerals or gases in solution, is never found. It is, therefore, not surprising that all feed waters contain dissolved substances which, in time, cause trouble in the boilers. The difficulties which are encountered, arise from three sources: first, incrustation, or scale formation; second, corrosion, or pitting; and third, foaming. All of these actions may take place simultaneously. Of the three, incrustation is the commonest. It is due to the presence in the water of various substances which are deposited on the tubes of the boiler, and which cause what is known as scale. Scale-forming substances in water are either carried in suspension, or are in solution with the water. Of the dissolved substances, the salts of calcium, or lime, and magnesium are the most injurious.

In the first discussion on the subject of "Popular Chemistry," it was shown that lime water treated with carbon dioxide gas forms an insoluble salt of lime, known as carbonate of lime. This substance is the same as ordinary lime stone and, though practically insoluble in pure water, it is readily soluble in water containing carbon dioxide in solution. If we had blown into the lime water longer, in our former experiment, we should have seen that the turbidity which appeared in the solution at first would have disappeared upon the addition of more carbon dioxide. If the clear solution, which now contains bicarbonate of lime, is heated, the excess of carbonic acid will be driven off and carbonate of lime will again be formed.

All natural waters contain free carbon dioxide and, in flowing over lime stone, dissolve some of it. Natural waters are the waters used in boilers. When this is heated, the calcium carbonate which it contains separates out, and, being heavy, falls to the sides of the boilers and remains there as a scale which, from day to day, becomes heavier. Magnesium carbonate acts precisely in the same manner as calcium carbonate.

Waters which contain the carbonates of lime and magnisium which are deposited upon boiling are said to have the property known as temporary hardness. Calcium and magnesium salts which are not precipitated upon boiling give rise to what is known as the permanent hardness of water. Hardness in water is not a commendable feature. Of the two mentioned permanent hardness causes the greater amount of trouble, as the temporarily hard water causes the formation of only a muddy scale, while the calcium sulphate, which is one of the injurious substances in permanently hard water, forms a very hard, stony scale. The magnesium salts, present in permanently hard waters are supposed to decompose at higher temperatures in the boilers, giving rise to acids which have a corrosive effect upon the walls of the boiler.

Boiler scale is, undoubtedly, a source of great danger as well as loss of power. It is said that one-sixteenth of an inch of scale on the tubes of a boiler necessitates an increase of 15 per cent in the fuel used; one-fourth of an inch increases the amount of fuel needed 60 per cent. Boiler tubes covered with a thick coating of scale, often become red hot, and are, in this way, weakened. It sometimes happens that, on account of uneven heating, portions of scale are detached from red hot tubes which then break upon coming in contact with the cold water in the boiler.

Corrosion of boiler plates is due to air or acids present in the water. Pure water is without effect upon iron. Corrosion due to acid waters is particularly common in regions containing coal deposits. Mine waters generally contain some free sulphuric acid.

In marine boilers, where distilled water is used, corrosion is a very commonly occurring difficulty. This can be overcome by introducing plates of zinc into the boilers in such a manner as to produce an electric contact with the iron. In practice, about a half pound of zinc is used for every square foot of grate surface. Under these circumstances, the zinc is attacked in preference to the iron.

The foaming, or priming of boilers, as it is sometimes called, is due to a number of different causes. In the western alkali countries, and in places where sea water is used for boiler purposes it is a frequent occurrence. Foaming boilers cause the hot water to be carried into the cylinder of the engine and produce loss of power. The use of dirty water which contains organic matter, or the excessive use of boiler compounds, is also apt to produce foaming. Many of the so-called anti-foaming boiler compounds contain sodium acetate which is said to partially alleviate this difficulty.

There is no doubt in the minds of all engineers that something must be done to remedy the evils of scale formation. The most common method consists in allowing the scale to form until it has attained a thickness sufficient to seriously affect the efficiency of the boiler, and then removing the same by mechanical means. The objection to this methd is that it necessitates putting the boiler out of service and the removal of the scale by mechanical means often results in serious injury to the tubes of the boiler.

"Boiler Compounds" are chemical substances which when put into the boiler produce changes in the water so that only soft, muddy scale and soluble salts are formed. They can be very highly recommended in most cases, as they undoubtedly are of great value when properly used, adding both to the life and to the efficiency of the boiler. Mr. A. A. Casy, in an article on Corrosion and Scale from Feed Waters in The Engineering Magazine of 1897, says of boiler compounds: "Never use a boiler compound unless you know positively what it is composed of, and how it will affect the impurities in your boiler and the boiler itself. In the treatment of boiler water, always start with a careful analysis of the water, made by a competent chemist who has had experience in this line. Next, if you are thinking of using any chemical that has been offered for treatment of your boiler water, let your chemist analyze it. If you are dealing with straightforward people, they will tell you the exact composition of their material which your chemist can easily verify after which he will be prepared to advise you properly."

The following extract from the report of The Bavarian Steam Boiler Inspection Association (1885) is also of interest in this connection: "All secret compounds for removing scale should be avoided. Such secret preparations are either nonsensical or fraudulent and usually contain one of two substances (soda or lime), recommended by the association for removing scale; generally soda, which is colored to conceal its presence and often adulterated with useless or even injurious substances. These additions are used to give the compound some fanciful name and serve to deceive the purchaser and to conceal from him the fact that he is buying simply colored soda or similar substances for which he is paying an exorbitant price."

Although boiler compounds tend in a great measure to obviate the difficulties due to bad water, still, boilers were never intended to serve as chemical laboratories, and the proper place for the treatment of the water is outside of the boiler. Mechanical plants, designed for this purpose, are now being sold by many firms. If the saving of boiler compound and the added efficiency of the steam plant is taken into account, they will be found to be, in most cases, profitable investments.

(To be continued.)

PEAT FOR PRODUCER GAS

Peat is being used to make producer gas for three 100-hp. gas engines at Helsingborg, Sweden, reports United States Consul Bergh, of Gothenburg. Numerous short railways in Sweden are changing from steam to electric power and the government will erect a mammoth electric power station to run by water power.

AUTO MAIL SERVICE IN NEW MEXICO

What is said to be the first direct contract from the postal department for the transportation of mails in motor cars has been let on a route 111 miles long, between Roswell and Torrence, N. M. Three motor cars are stipulated, one trip each way daily being required; the third car is for use in case of accident to the others. The contract is for five years.

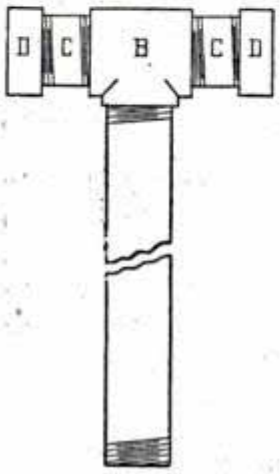
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

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

HAMMER MADE OF PIPE

A very handy hammer can be made for little or nothing, provided one has a few old materials on hand.

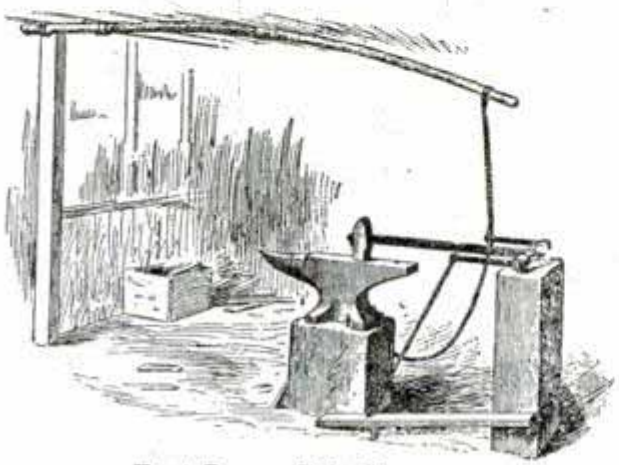


Into a ½-in. tee (B) screw a piece of ½-in. pipe (A) about 8 in. long with threads on one end and two pieces of ½-in. pipe (CC) 2½-in. long with threads on both ends. On the ends DD put ½-in. caps.

A larger hammer can be made by using pipe of larger dimensions, and the hammer can be made heavier by stopping up the tee and filling the head with lead.—Contributed by H. G. Stiebel, Jr., 3207A Olive street, St. Louis, Mo.

A HOME-MADE TRIP-HAMMER

A trip-hammer like the one shown in the illustration was used for eleven years, turning horseshoes, laying plowshares and other work without a break, says a correspondent of the Blacksmith and Wheelwright. A good sapling with considerable spring in it is secured in the wall to make the spring and the striking hammer is of 16 or 18 lb. It is operated by foot-power. One man and his helper can rig the device up in one day.

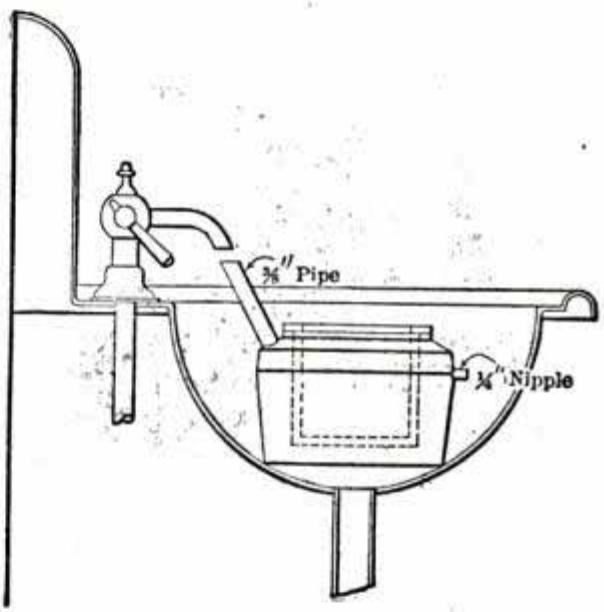


Foot-Power Trip-Hammer

GLUE-MELTING DEVICE

A handy device for melting glue is made as follows:

Tap a hole at one side in the top of an ordinary glue pot and put in a piece of ⅜-in. pipe about 4 in. long. At the opposite side drill a hole and tap it out for a ¼-in. nipple. In case it be desired to use the pot in any other way, a plug may be substituted for this nipple, says a correspondent of Power. All that is necessary to heat the



For Melting Glue

glue is to set the pot in the wash basin and turn the hot water into the ⅜-in. pipe. The hot water supply in many plants comes from the feed-water heater, which is an excellent arrangement. This is a neat and speedy method of getting hot glue.

TO REMOVE CAN COVERS

To remove a tight fitting screw cover to a can rub a little chalk on the top and wrap a piece of sandpaper around the cover with the sand side next the can. The top can then be removed without trouble.—Contributed by J. C. Fox, Sabetha, Kan.

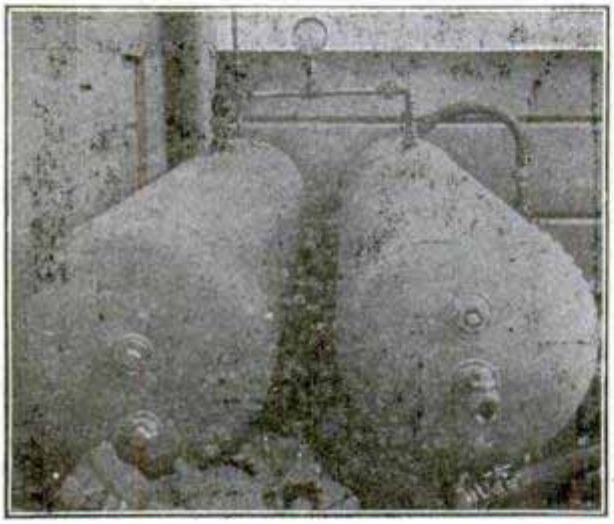
Linseed oil and benzine, half and half, with burnt umber or Vandyke brown incorporated with the mixture, makes a good brown stain for oak or ash. Apply in the usual manner and finish as desired.

AIR SUPPLY FOR PYROGRAPHIC OUTFITS

Some time ago I purchased a wood-burning outfit such as are on the market for scorching fancy designs on wood. The outfit consists of a small bottle for benzine, a squeezing bulb for supplying air at a low pressure and a needle with a hollow platinum point, this needle is kept red hot by means of the mixture of air and the fumes from the benzine.

After using the outfit for a short time I hit upon the following arrangement for giving a steady supply of air and at a higher pressure, and so doing away with the hand bulb, leaving both hands free to hold the work and apply the needle.

The engraving shows two 30 gallon tanks,



Tank Arrangement for Air Supply

the kind ordinarily used for hot water heating. They need not be new as they are costly. They can usually be had at any plumbing shop second-hand. I paid 50 cents apiece for mine and had any leaks soldered tight.

These tanks, as will be seen by the illustration, are connected across the top by ¼-in. pipe with ¼-in. globe valves on each one and the pressure gauge placed in the middle, thus making one gauge show the pressure on either tank, independently, or on both of them.

At the rear of the right hand tank a connection is made by means of a piece of hose to the city water supply, being controlled by a ¾-in. globe valve; at the front end will be seen a ½-in. check valve, while above it is a bushing and plug to stop up the opening as this hole is not required. At the bottom of the tank is placed a ¾-in. globe valve to drain off the water.

At the rear end of the left hand tank will be seen a length of ¼-in. pipe which is carried around on to the front porch where it terminates with a ⅛-in. globe valve and a short nipple for attaching the rubber tube and needle, the benzine bottle, of course, being connected in between the valve and needle.

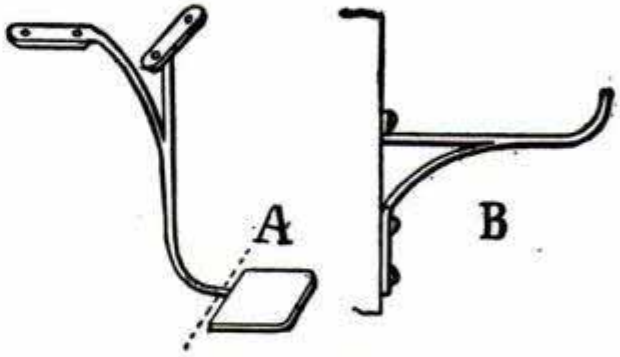
The method of obtaining a supply of air is to allow the water to run into the right hand tank, the valve at the left of the gauge being closed. The water is allowed to run in until the gauge shows the pressure of the water main, in this case about 55 lbs. The resulting supply of compressed air is then admitted to the other tank, the water supply is cut off and the water drained away, being assisted by a slight pressure of air still left in the tank and then by means of the check valve which opens up, admitting air to the tank.

It will of course be understood that only enough air will pass over to the air tank to make the pressure equal in both of them. In this case, the first charge nets me a supply at 10 lbs. pressure; by repeating the process five times more I get a supply at about 40 lbs. which is the limit with the pressure available.

The waste water I use to irrigate the flower beds; the tank when charged at 40 lbs. will last for three or four days, as the supply required in burning is very small.—Contributed by Everett E. Pomeroy, Los Gatos, Cal.

HARNESS HOOKS OF OLD BUGGY STEPS

Old buggy steps make good harness hooks, much stronger than the harness hooks one gets at the stores, writes Henry J. Heaton,



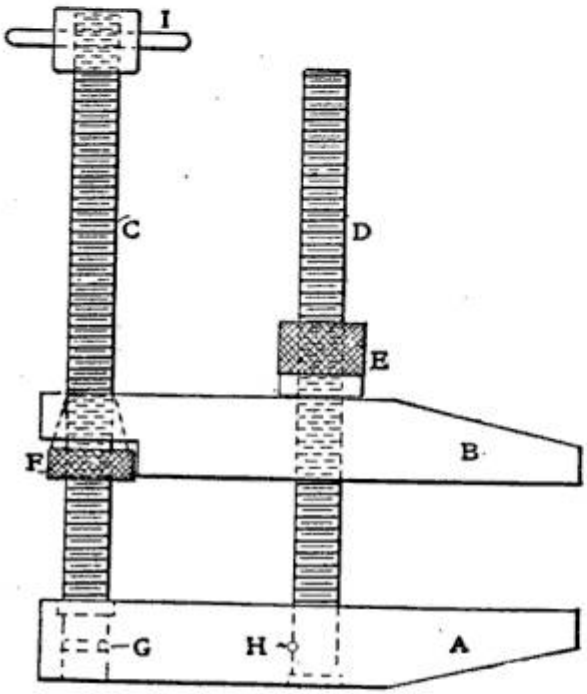
Strong Harness Hooks

of Sidney, Iowa. Cut off the step at the dotted line, A, and nail the hooked part up as shown at B.

"Mechanics for Young America," an interesting book for boys. Price, 25 cents.

HOW TO MAKE A PARALLEL CLAMP

A handy tool-maker's clamp which is self-contained and does not need a wrench is described by a correspondent of the American Machinist. The jaw A is counterbored for screws C and D—the latter a running fit, the former a driving—secured by the steady pins, G and H. The jaw B is recessed, bored and counterbored for the tapered nut F and a rather loose fit for the screw, D.

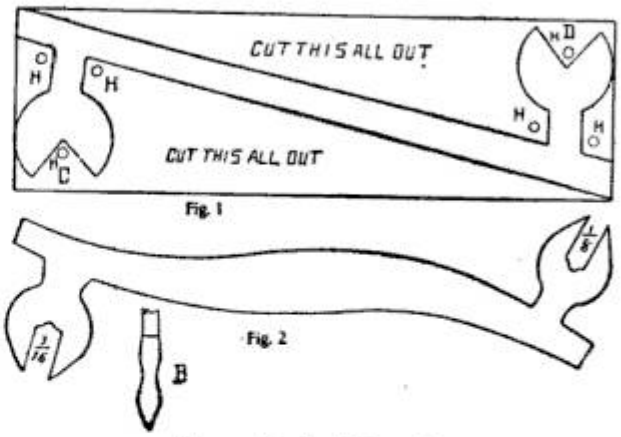


Tool-Maker's Parallel Clamp

In operation, adjust both the knurled nuts to your work and tighten up by the handle, I, and the screw, C. The tapered nut, F, grips the jaw, B, firmly without further aid while tightening by the handle. Both knurled nuts are slightly smaller than the jaws of the clamp, which lies flat with the work. All parts are drawn to scale.

MAKING A WRENCH

It is just as important that a wrench should be balanced as that a hammer should be. In making an S-wrench, do not give it too much hook, as you can not handle it so fast. The illustrations show how to make a tire-bolt wrench, called a side wrench. It is made of a piece of spring plate 1¾ in. by 6 in. Parts C and D are worked over the hardy, having care not to punch the holes at these points too far back. H indicates holes punched in material to be cut away. Part A, Fig. 1, should be beveled from the center and made as wide as the material will allow. B, Fig. 2, shows the pointed jaw and how it is beveled on the handle. This wrench will work in places that other

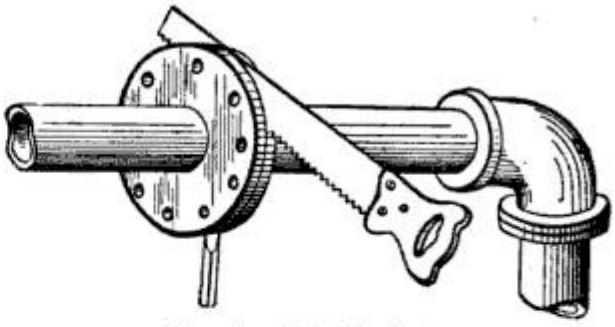


Home-Made Wrench

wrenches will not.—Contributed by James N. Keach, 803 Clay street, Bloomington, Ill.

TO REMOVE PACKING FROM A FLANGE JOINT

When the pipe can be sprung apart far enough to allow a scraper to work between the two flange faces, it is easy enough to remove old packing from flange joints, but often this is impossible. A correspondent of the Engineers' Review had a pipe running from a head which was anchored solid across the room and running down along the wall as shown in the illustration. When the flange connection in this pipe began to leak, he drove a cold chisel in at the bottom between the flanges to keep them from



Sawing Out Gaskets

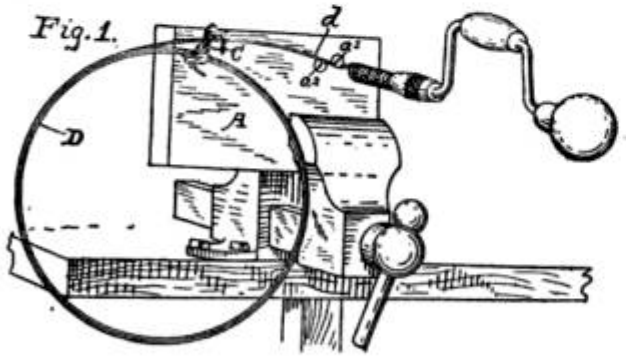
springing together, then sawed out the packing with an old hand saw. When he had sawed half way through, a chisel was driven in from the top and the rest of the gasket cleaned out. A new gasket was then inserted and the flange bolted together.

Red lead and glycerin, equal parts, kneaded to the consistency of putty is said to make an excellent cement for iron on iron. Mix fresh as needed and use quickly.

Index to Vol. VII, January to December, inclusive, 1905, is ready for distribution and will be sent free upon request.

TOOL FOR MAKING WIRE SPRINGS WITH A BRACE

Get a hardwood board (A) about 12 in. long, 6 in. wide and ⅞ in thick. At one corner bore a hole (a, Fig. 2) of the size that the inside diameter of the spring is to be. Set two flathead screws (a^1 and a^2) in the board in the positions in relation to the hole indicated in Fig. 2. At the opposite end of the board, near the upper corner, place a hook (C, Fig. 1) to receive the reel of wire (D) of which the springs are to be made. Then fasten the board in a vise or other convenient place.



Making Wire Springs

Secure a rod (B) the size of the hole and 12 to 18 in. long (sufficiently long to make the length of spring desired, or several springs may be made in one coil and then cut to length). Fasten one end of the rod and one end of the wire (d) in the chuck of the brace (see Fig. 3), hooking the wire under screw head a^1 and over a^2 and hanging reel D on hook C. Proceed to turn the brace handle the same as in boring a hole, slightly pressing against board A and backing the brace out as the wire is wound on rod B. Continue this operation until the desired amount of spring is wound on the rod.—Contributed by Chas. N. Leonard, 1319 Barth avenue, Indianapolis, Ind.

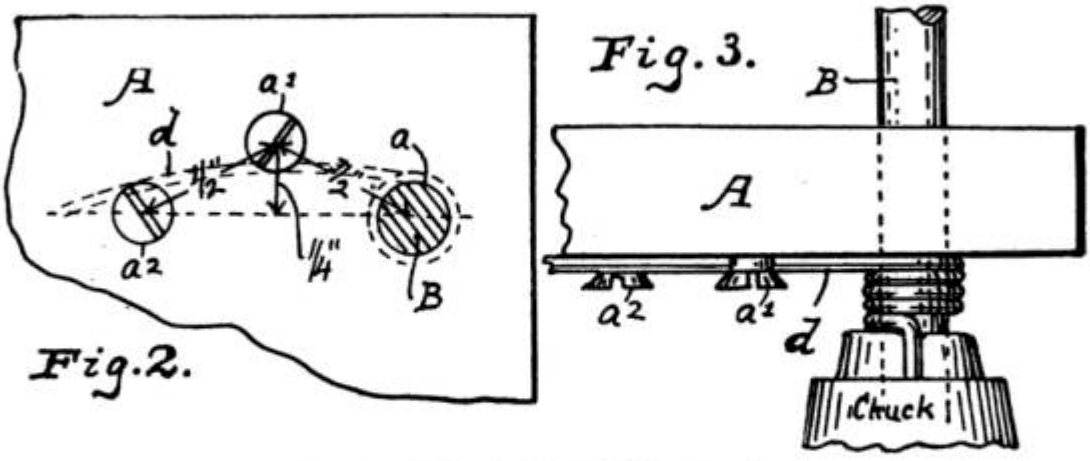
HOW TO ATTACH ENAMEL LETTERS TO GLASS

Not all sign painters know how to attach enamel letters, though it is a simple matter when once learned. Clean the glass and draw the lines of the lettering with chalk. If it is to be a curve use a string in the usual way. Space the lines off and you are ready for the lettering.

For this purpose a reliable cement will be required. Plaster the cement on the letters with a knife, being careful to have the part around the edge full, then place each letter in turn on the glass and press it up and down gently and firmly to get all the air out, then push to place. Be very careful not to bend the letters, says the Master Painter. Give large letters a second coat before putting them in place. It is only necessary to fill the edges of concave letters with cement; the flat letters must be pasted all over the back. Hold large letters in place, until the cement has time to set, by a bit of wax. When the cement has set remove any that may be around the edges of the letters and clean up the glass.

White lead in oil, thickened with dry lead, thinned properly with copal varnish and worked well on the stone with a spatula or elastic blade putty knife, makes a good cement.

A pocket knife and wood alcohol will remove old letters. They nearly always break, and the enterprising painter will always have a number on hand for supplying the need, at a neat profit to himself.



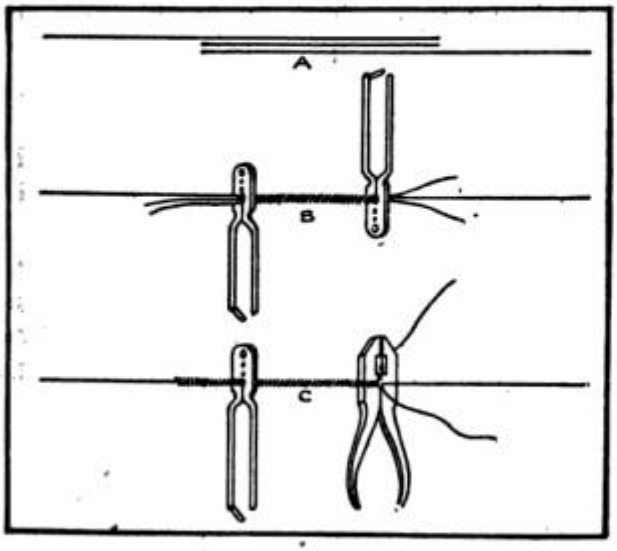
Details of the Spring-Making Device

REPAIRING A LEAKY GUTTER

To repair a leaky gutter, put putty in the hole, smooth it off with a putty knife and paint over the spot with a mineral or an oil paint.—Contributed by Gordon M. Backus, 32 Euclid avenue, Hackensack, N. J.

HOW A THREE-WIRE SPLICE IS MADE

Two pairs of connectors are required to properly make a three-wire splice in order to have the joints long in the "neck" and



Making a Three-Wire Splice

not mar the galvanizing at that part of the joint. In iron line construction the skilfully made three-wire splice will eliminate the necessity for soldering, says the American Telephone Journal, and insure freedom from high resistance joints. The superior conductivity of these joints consists not in the cross turns at the ends, but in the spiral twist at the neck. To make the splice proceed as follows:

Overlap the ends to be spliced about 18 in. and cut a third wire 18 in. long of same gauge and lay it with the ends to be spliced (Fig. a). Clamp two pairs of connectors over all towards the center and about 5 in. apart and revolve connectors in opposite directions, slowly, so as not to "burn" the wire (Fig. b). Care should be taken to revolve connectors evenly and at the same speed. Turning one pair faster than the other will result in a "humped" joint. When the wires have been twisted to a tight lay, remove the connectors and clamping one pair on the neck to hold the work, use pliers and finish the end with six or seven cross turns the same as in an ordinary W. U. splice (Fig. c).

CLEANING WINDOW GLASS

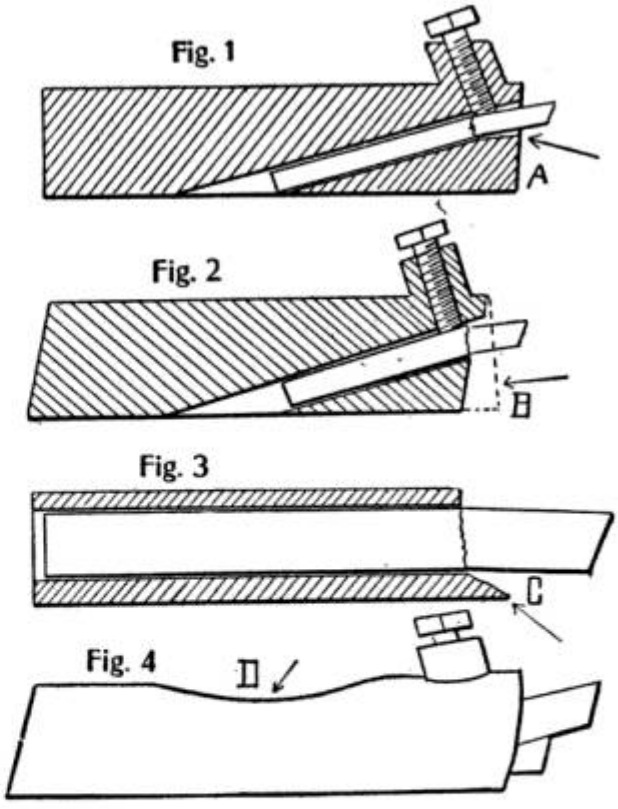
To thoroughly clean window glass pass diluted sulphuric acid, about as strong as vinegar, over it, and let it act a moment; then throw on just enough pulverized whiting to give off a hissing sound, directs the Master Painter. Rub both over the pane with the hand and polish with a dry rag. Rinse with clean water and a little alcohol, polish dry and clean. Treat both sides of the glass in the same way.

THE READY-MADE LATHE TOOL

Old mechanics looking back over their history as such can remember the days before the patent lathe tools. In those days they were obliged to forge their own tools into the desired shape. Modern improved tools can be ground to any desired shape and used in most any position, their use, however, requires a certain amount of judgment.

Figure 1 shows the effects on a small tool used for too heavy duty. This tool was made for a 12- or 15-in. lathe, but was used in a 30-in. lathe. The bottom at A is worn away until the pressure of the screw breaks the steel.

Figure 2 shows the effect of grinding without removing the steel. The under support is completely ground away at B. Figure 3 shows a cutting-off tool allowed to hog in and break, battering down the support, C. Figure 4 shows the effect on a small tool which was used in a large lathe. The powerful screw mashed the tool at D.



I recently looked over a number of patent tools of different makes. They had been used about one year and were a sad looking pile of junk. A lack of good judgment had sent them to the scrap heap.—Contributed by Paul S. Baker, Muscatine, Ia.

CONTINUOUS MIXING OF CONCRETE

[Extract from a paper by E. N. Trump, read before the American Society of Mechanical Engineers.]

Of the methods mentioned the revolving table, with a stationary spout above its center, has been considered the most accurate, and is much used in cement manufacture for feeding mills, etc. Its defect is the change in the natural slope of the material, which varies the amount cut off by the diverting blade as indicated by dotted lines in Fig. 1.

If we make the table of relatively large size and distribute the material in a uniform layer upon it, as shown in Fig. 2, the stationary knife, or diverting blade, may be pivoted so as to take off a predetermined quantity in one revolution, and if the layer is thin, variations in the natural slope on the edge will affect the accuracy very little. As the table revolves the stationary knife will divert the material in front of it over the edge of the table and it will fall in a continuous stream into the chute. If the material is replenished on the table so that the layer taken off by the knife is restored to exactly the same shape as before, and is continuously removed by the knife, an accurately measured quantity will be diverted.

By adding to the table a bottomless storage cylinder, somewhat smaller in diameter, with its lower edge spaced a distance above the table sufficient to clear the knife and yet near enough to the table so that the material flows out from under the edge of the cylinder and takes its natural slope, we shall have the condition represented by Fig. 3.

The cylinder being supported by arms from the central spindle may be filled to the top by means of the chute, and as the knife removes the section represented by its path over the table, the material from the cylinder above will take the place left vacant, and will come out under the edge of the cylinder to the extent of its natural slope. While this slope may vary a little this variation is a very small part of the amount diverted by the knife, and as the material composing nearly the whole base of the cylinder is cut away the space behind the knife is filled from above with nearly uniform pressure, and in practice the natural slope angle is almost exactly the same, in spite of considerable differences in height and material within the cylinder.

After deciding on the distance between the bottom of the cylinder and the table, and the width of the knife, the other factors, which determine the amount of material measured off in a given time, are the speed and rotation and the depth of the cut of the knife, and these are both adjustable.

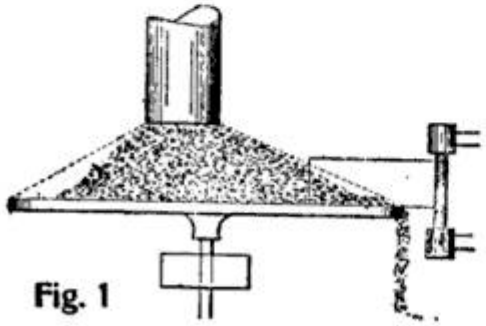


Fig. 1

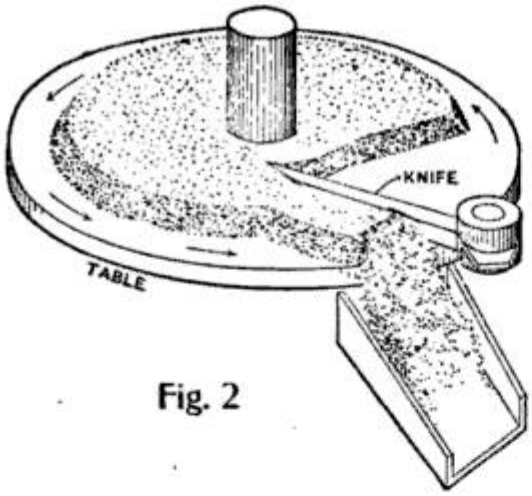


Fig. 2

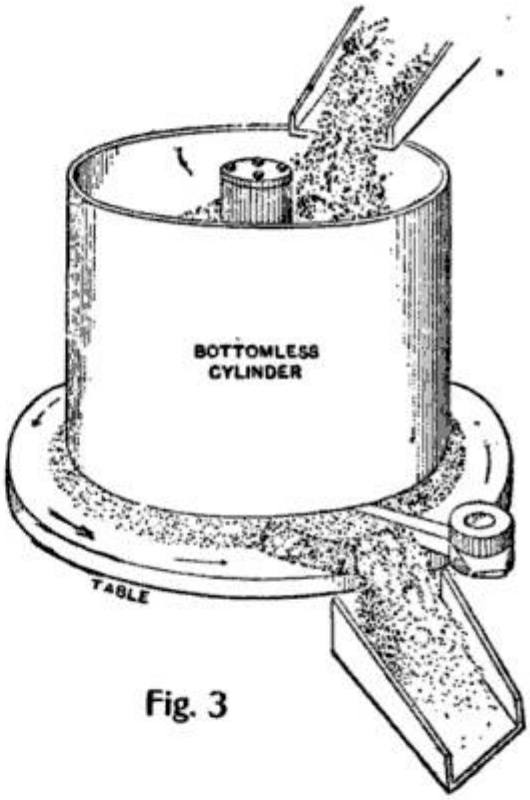


Fig. 3

The depth of cut of the knife is adjusted by swinging the knife around on its pivot so that it extends a greater or less

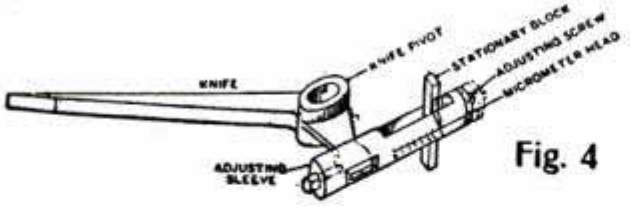


Fig. 4

distance into the material. This swing is controlled by a screw attached to an arm, east as part of the knife, and a micrometer scale with pointer shows the amount of movement. This is shown in Fig. 4.

The mechanism described above may be employed for the feeding of a great variety of materials, varying considerably in size and consistency, and if the size of the table, the shape of the cylinder and the size of the knife and space between the cylinder and the table are properly adjusted, almost any kind of crushed material may be fed.

The variations in size may extend from fine powders, like cement, to rocks of 6 in. cube. In the case of the larger sizes the

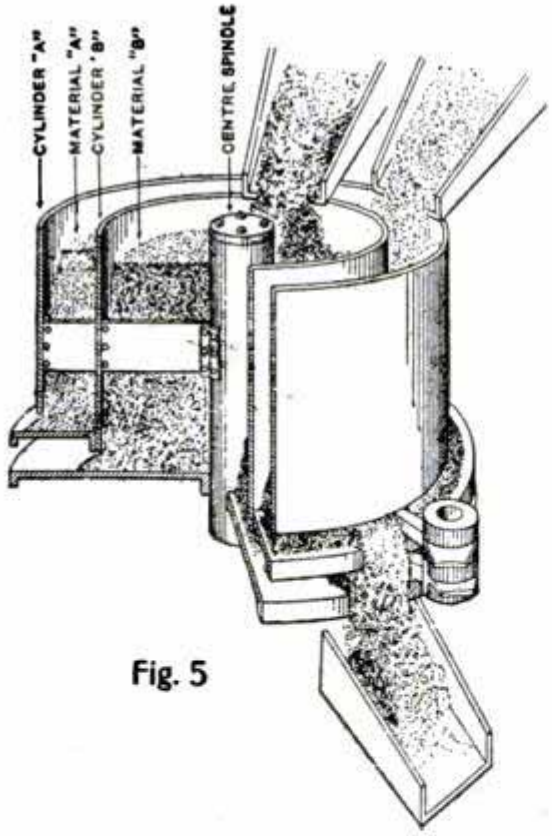
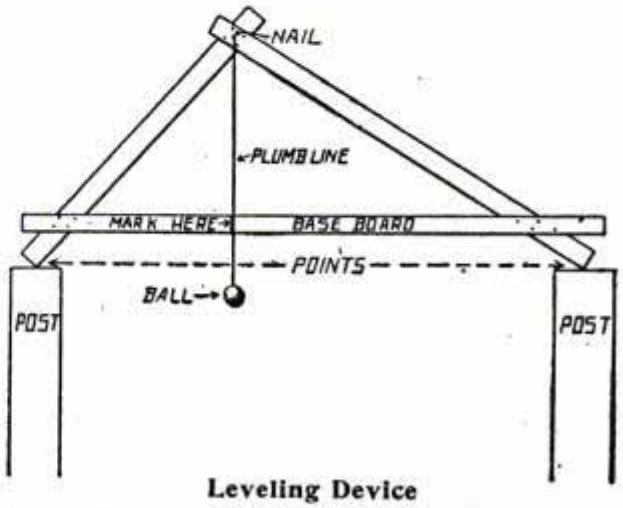


Fig. 5

space between the bottom of the cylinder and the table is made considerably higher than the height of the knife, as the space between the bottom of the cylinder and the top of the knife must be sufficient to let the largest pieces pass through without catching. The amount diverted by the knife is not dependent upon its height, but on the height of the space under the cylinder.

LEVELING TWO POINTS WITHOUT TOOLS

To level up two or more points which are far apart, as posts, etc., without a level, straightedge or square, all that is required is a few nails, three pieces of old board, a



Leveling Device

piece of cord and a small weight, to be used as a plumb bob. Nail the boards together as shown in the illustration at any angle, place the two points of the boards on top of the posts and mark where the line crosses the baseboard. Turn the device about, end for end, and mark the baseboard again. Then raise or lower one of the posts until the plumb line hangs midway between the two marked lines and the posts will be level.—Contributed by Thos. McIntyre, 407 Root street, Chicago, Ill.

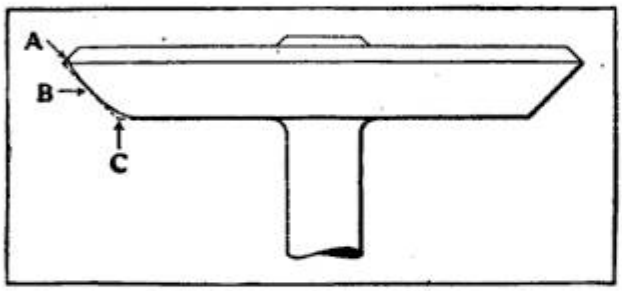
COUPLING A TANK-HOSE

Every engineer knows what a moist job it is to couple up a tank-hose after disconnecting it for the purpose of cleaning the strainer, says Locomotive Engineering. Very few tank valves will shut down perfectly tight; and the leakage, when attempting to connect the hose, is not appreciated by the man who is doing the coupling. Here is a simple remedy: When all ready to couple the hose, start the primer of the injector, when all of the leakage will be drawn into the suction pipe by the strong vacuum so created.

Contributions to the Shop Notes department are invited. Your experience and handy devices are valuable to others, also. Pass it on.

LAST RESORT REMEDY FOR A LEAKY VALVE

When every other remedy for a leaky inlet or exhaust valve has failed, try this: Chuck the stem of the valve in a high-speed lathe, and with as fine a flat file as



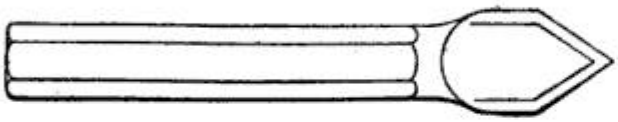
Repairing a Leaky Valve

can be obtained, while the valve is revolving in the lathe at a high rate of speed, touch lightly at A (See sketch), skip B and take off the corner C, leaving the valve with a slightly rounded instead of a flat seating surface. It has been found that this method is sure when others fail, says Motor Way, and that a valve so dressed will hold well for months afterward. It does not matter which way the stem wabbles, for the valve always finds a perfect seat, on account of its spherical shape, the action being similar to that of a ball check valve.

HANDY MARKING CHISEL

A marking chisel is a convenient tool about the engine room. One of the instances in which it can be used to advantage is in marking the eccentric so that it can be readily reset should it slip on the engine shaft.

It is often difficult to mark the eccentric and the shaft so that the lines come exactly opposite. With the tool illustrated this is



Chisel for Marking

made easy, says a correspondent of the Engineers' Review. The cutting edge is made as shown and not at right angles with the side. The point strikes first and makes a true mark on the eccentric hub. By turning the chisel in the opposite direction a mark is made on the engine shaft.

A freshly painted room should not be closed up tight, but opened to the air and light. Paint with driers in it will not dry if corked up tight in a bottle.

KEEPING SOLUTIONS IN BOTTLES

It is well known that solutions of easily oxidized substances do not keep so well in bottles which are partially empty as when they are full and The Photogram suggests the following as an excellent method of overcoming the difficulty. Keep on hand a quantity of small glass marbles, and whenever any of the solution is poured from the bottle add sufficient to bring the solution again up to the neck.

NOTES ON SOLDERING

I had not been long out of college when I was first sent out as a road engineer, so it was not to be expected that I would know very much. In those days, I even throught that a soldering iron was made of iron, writes a contributor in the Electric Journal.

When I first used a soldering iron on wire joints, I held a dry iron under a joint and waited for the wire to heat enough to melt the solder placed upon it. After floundering around at that awhile and making a bad job of it, I began to remember how I had seen others do it, and then I placed some solder on the iron and held the iron with the molten solder against the joint, which soon began to sizzle, and as it was clean and well fluxed, the solder flowed at once all through and over it.

In college, I had taken a course in physics under Professor N. and had heard all about conduction, convection and other things concerning heat, and also knew that copper is a good conductor of heat. But it did not occur to me, in the present instance that those principles had anything to do with the work in hand. After I had mastered the job, I began to see their connection with it.

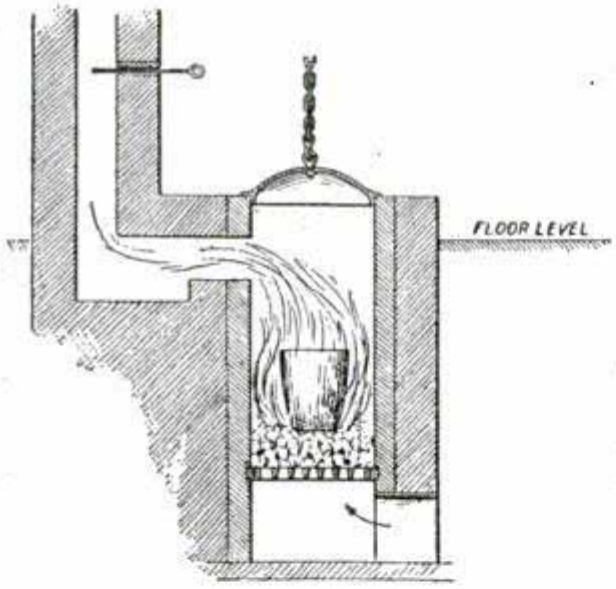
A soldering iron, when in use, may be considered a reservoir of heat and the object in view is to get as much of the heat as possible into the wire. When the iron is held against the joint it touches only the high spots and there is a thin film of air between, no matter how smooth the surfaces may be. This air is a very good heat insulator, though when solder is run into this space, it unites with both iron and wire and acts as a bridge over which by the principle of conduction heat flows rapidly into the wire from the reservoir.

Clean and hot are the two essentials. One trouble with some novices is that they only

half appreciate that statement and seem to have an idea that the solder is the only thing requiring heat, whereas all surfaces to be joined must be brought to the temperature of molten solder before union can take place. This mistaken idea does not lead to much difficulty when the work is confined to joining small wires, for in that case, a small quantity of molten solder contains sufficient heat to quickly raise all parts of the joint to the required temperature. But when large wires or any bulky pieces of metal are to be soldered, this idea leads to trouble.

BRASS-MELTING FURNACE

A good furnace for melting brass is built with a cylindrical fire space, lined with fire brick set in clay and provided with a grate that can be dumped, says the Blacksmith and Wheelwright. The chimney is of sufficient height to insure a good draft and is



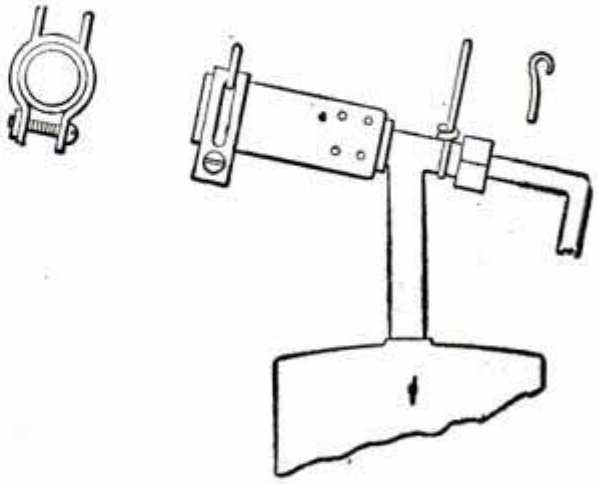
Furnace for Melting Brass

supplied with a damper to regulate the draft. Dome-shaped cast iron covers are used for the tops of the furnace and these may be raised or lowered by means of a chain passing over a pulley. The furnace may be built below the surface of the floor or ground, with a pit for removing the ashes and supplying draft, or entirely above the ground. In the latter case steps and a platform must be used to reach the crucible in which the metal is melted.

A very small furnace may be built of heavy sheet iron, shaped like a cylinder stove and lined with fire brick. Coke or coal that will burn without smoke may be used for fuel.

HOLDER FOR SOLDERING-IRON ON GASOLINE TORCH

Many gasoline torches are not fitted with a holder for soldering irons. To such torches this convenience can be attached in the shop. The illustration, from Power,

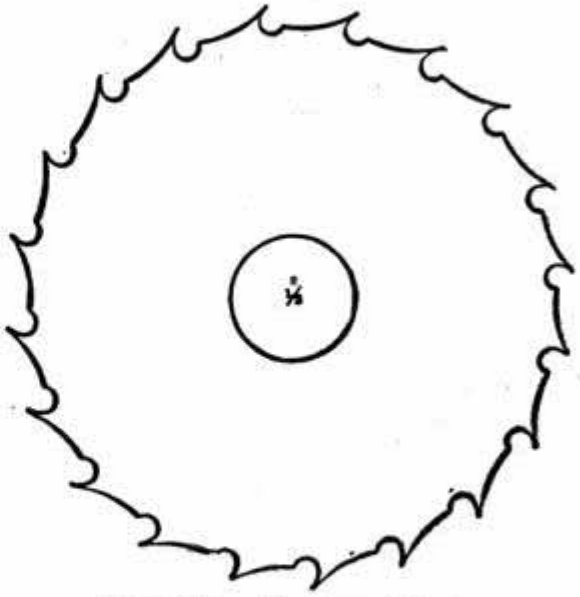


Home-Made Soldering-Iron Holder

shows how this is done. An old hose-clamp, taken from ¾-in. garden hose and two pieces of wire are the materials used.

SAW FOR MILLING GERMAN SILVER

German silver in almost any form is very hard to work, but the cutter shown in the illustration will cut it satisfactorily and outwear the ordinary cutter, says a correspondent of the American Machinist. An



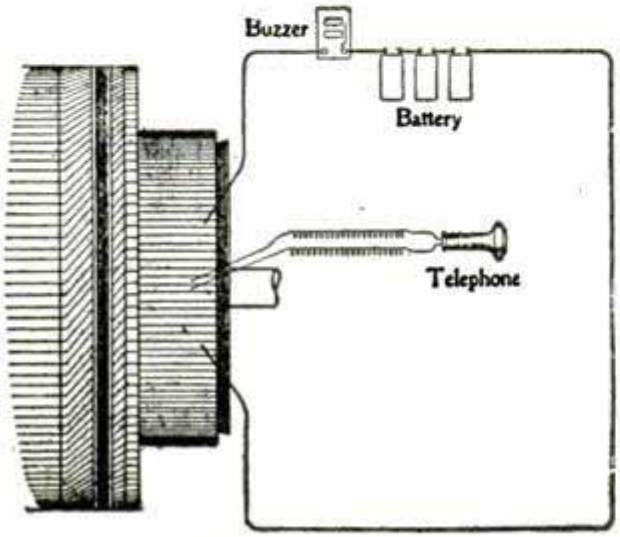
For Milling German Silver

ordinary stock cutter is used and every other tooth is ground down. The grooves are made with a narrow wheel with the periphery made round. One of these saws has cut over 2,000 pieces and is still sharp.

TESTING A CLOSED WINDING WITHOUT DISCONNECTING

A convenient device for testing a closed winding without disconnecting the winding from the commutator consists of three dry battery cells, a buzzer for interrupting the current and a telephone receiver.

To locate a short circuit, says the Electric Journal, pass the interrupted current



To Test a Closed Winding

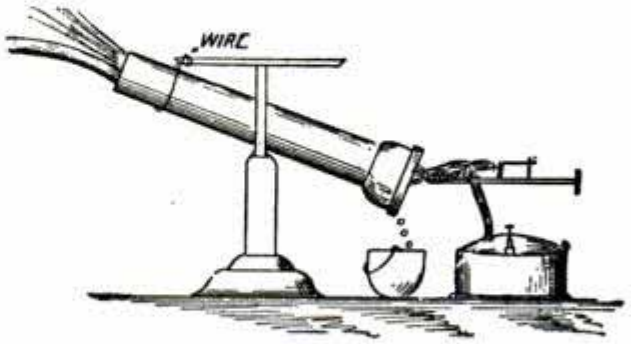
from this apparatus through the winding (see sketch) and move the leads from the receiver from bar to bar on the commutator. There will be no audible vibration in the receiver if there is a short circuit between the bars of the commutator or winding; if these, however, are clear of short circuit at the point tested there will be a distinct vibration or buzzing. The vibration will be more distinct if an alternating circuit of 200 or 100 volts is handy and after attaching the leads of this circuit to almost any part of the commutator of the armature to be tested, the same method as before is followed.

CRIMSON TONES FOR SILVER PRINTS

Silver prints may be toned to a crimson or carmine color by the following process: Make a bath by dissolving 75 gr. ammonium sulphocyanide with 20 gr. iodide of potassium in 3 oz. water. Add 4 gr. gold chloride dissolved in a little water, making up as much of the bath as necessary for immediate use. Carry the printing only to the depth required when finished, then wash the prints well and immerse them in the toning solution. After which fix, wash and dry them. Let them remain in the fixing bath not less than fifteen minutes, says the journal of the Photographic Society of India. The bath described above will produce pictures of a bright crimson by toning from a half to three-quarters of an hour.

TO MELT OLD LEAD PIPE

Having occasion to melt up a lot of old lead pipe I prepared the device illustrated.



Lead-Melting Device

It consists of a boiler stand, a piece of 3-in. soil pipe about 2 ft. long and a firepot of the type shown with the burner reversed. The dross and most of the dirt are burned up in the pipe, only clear lead dropping out. It is surprising how fast lead pipe will melt in this way.—Contributed by R. Stanton, Portland, Ore.

A PIPE-THREADING KINK

Often when threading pipe with a solid die from 1 inch down, it requires considerable muscular exertion with the ordinary small stock. To save strength, make a square of wood to fit any larger stock with larger handles, or have the piece made of iron if preferred. Use the proper bushings and it will work to perfection.—Contributed by H. B. Heineman, Sheboygan, Wis.

HOISTING WITH AN AUTO

An auto which is used for passengers on Sundays and as a hoisting machine on other days, is described by a correspondent in the Automobile. He says:

The machine is a steamer with a cylindrical gasoline fired boiler and an ordinary double cylinder link motion engine developing about 4 hp. The windless attachment is carried on a special frame which is firmly clamped to the rear axle and driven by the sprocket chain which for the time being is removed from the driving sprocket of the car. The gear on the windlass gives a reduction of about 70 to 1 from the driving sprocket to the carved spool for

the hoisting rope. I use the rig chiefly for installing elevators. The windlass is jacked down from the elevator entrance, or it may be fastened in any convenient place to withstand the strain. The tackle I use is about 800 ft. of 1¼-in. manila rope with a three-sheave 10-in. pulley block and a two-sheave 10-in. block, giving a leverage of 5 to 1. We generally run the engine with a boiler pressure of 50 lbs. per square inch. The boiler is tested to 300 lbs. The boiler is fired with gasoline, and one man operates the entire affair.

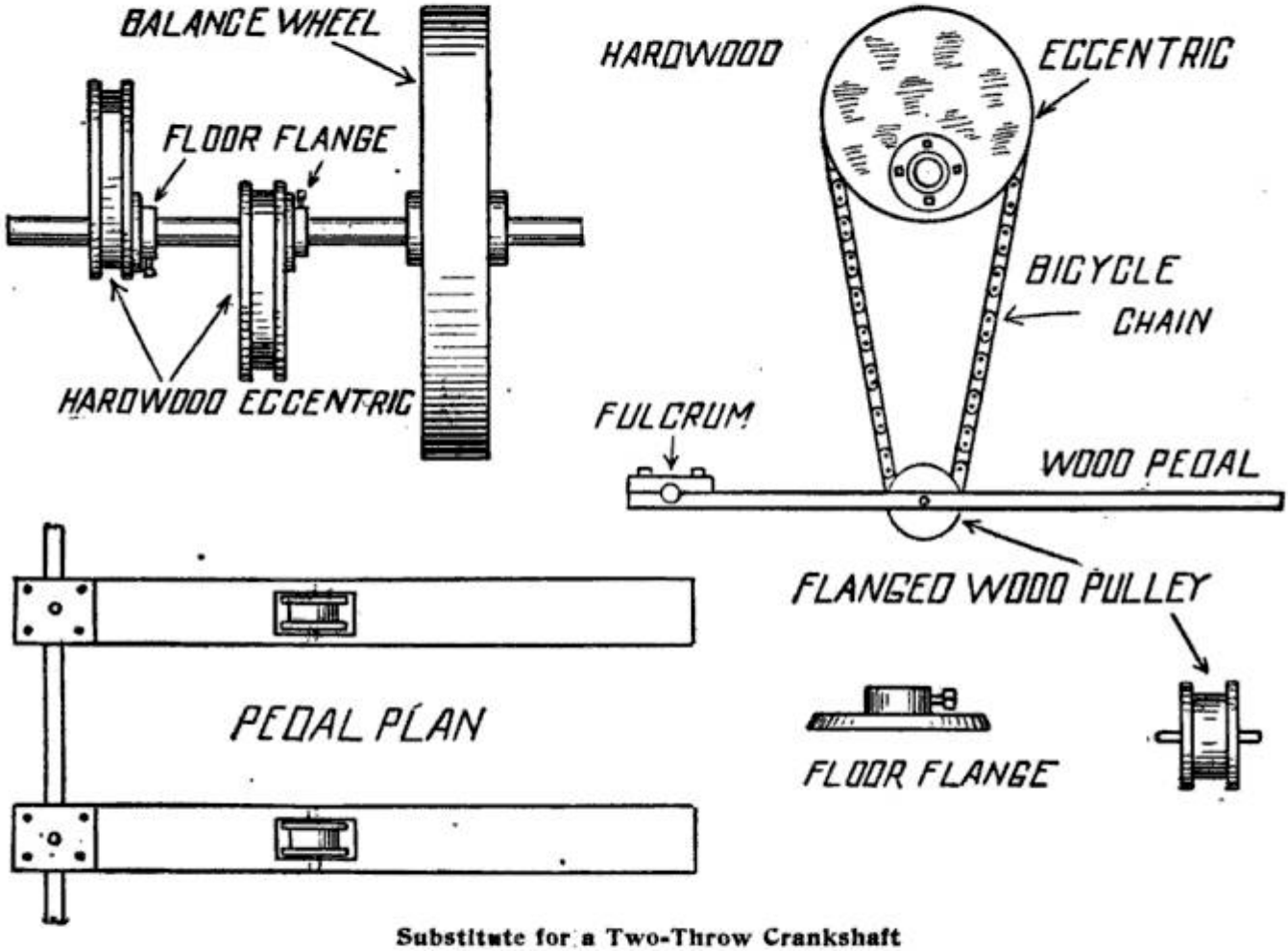
With this auto hoist we have lifted 5,000 lbs. 100 feet in forty minutes. In a recent installation of elevators at the John Deere Plow Works here, we lifted all the parts of two freight elevators—one a freight elevator of 5,000 lbs. capacity and the other a passenger elevator of 2,000 lbs. capacity—to the roof of a new eight-story building.

With the old hand method, it would take six men about six days to do the amount of work that one man can do in two days with the auto hoister.

When going out to a job, we load all the tackle and the windlass on the car, and it will carry the load to any part of St. Louis under its own steam. The fuel consumption in hoisting will average about five gallons of gasoline for 1½ days' work.

SUBSTITUTE FOR A TWO-THROW CRANKSHAFT

A substitute for a two-throw crankshaft which costs about 50 cents is shown in the illustration. The shaft costs about 40 cents and the floor flanges 10 cents, and the device takes the place of a crankshaft 1 in. in diameter with two cranks in center of shaft which would cost not less than $5. The outfit need not be made double and a leather strap or rope can replace the bike chain, but the chain is better. A makeshift like this has been used by Stoke Richards, of Santa Clara, Cal., on an emery grinding rig for many years, satisfactorily and he recommends it to others.



Substitute for a Two-Throw Crankshaft

PECULIARITY OF MANILA ROPE

Manila rope does not show, from the outside, the actual amount of wear that really must be present. In ropes of this character, says the Engineering and Mining Journal, the principal effect of use is shown in the grinding up of the fibres comprising the core, wearing it into short pieces, or even into powder. This is especially noticeable with ropes that pass over sheaves or pulleys of small diameter.

BREAKING STRAIN OF WIRE ROPE IN FREIGHT ELEVATOR SERVICE

The maximum safety load of a wire rope should never be exceeded even in freight service. The National Engineer gives a table showing the breaking strain of several diameters.

DIAMETER	CIRCUMFERENCE IN INCHES	WEIGHT PER FT POUNDS	BREAKING STRAIN TONS OF 2000 LBS	SAFE LOAD IN TONS OF 2000 LBS
3/8	1 1/4	023	2·50	1/4
7/16	1 3/8	029	3·00	3/8
1/2	1 1/2	039	3·48	1/2
9/16	1 5/8	048	4·27	3/4
5/8	2	060	5·13	1 1/4
3/4	2 1/4	088	8·64	1 3/4
7/8	2 3/4	1·20	11·50	2 1/2
1	3 1/8	1·58	16·00	3
1 1/8	3 1/2	2·00	20·00	4
1 1/4	4	2·50	27·00	5 1/2
1 3/8	4 3/8	3·00	33·00	6 1/2
1 1/2	4 3/4	3·65	39·00	8

TO KEEP A WINDOW FROM RATTLING

To stop a window from rattling when the wind is high, procure some leather washers, about 1 in. in diameter, from the hardware store and nail them with one nail only, through the side (not center) to the board that fits against the window sash. When you wish to raise the sash, slide the washers around on their axes to the front; or when you wish to keep the sash from rattling, crowd the washers between it and the board.—Contributed by Gordon M. Backus, Hackensack, N. J.

A good formula for violet-colored bronze is 50 parts copper and 50 parts antimony.

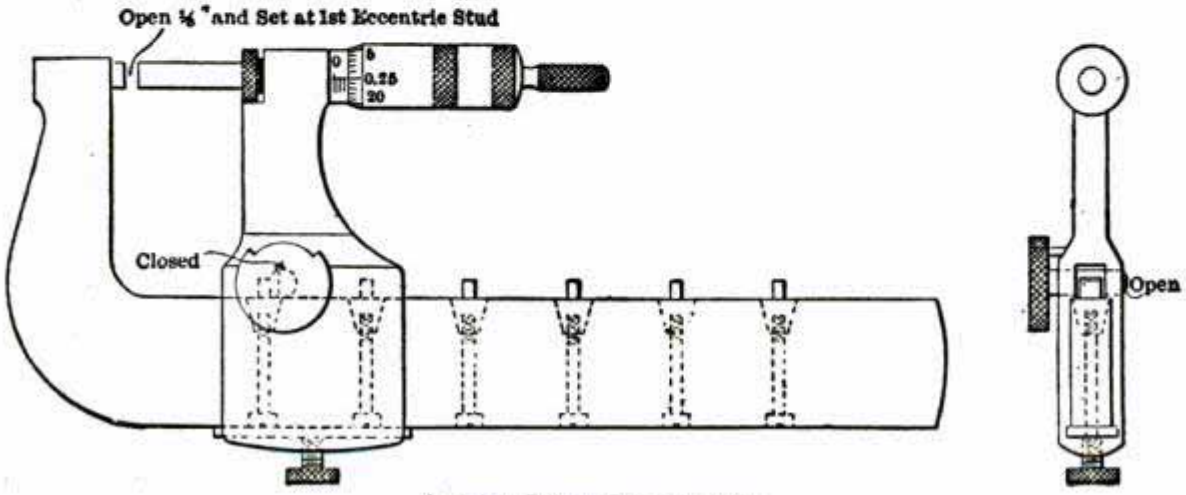
STANDARD UNIT OF REFRIGERATION

F. E. Matthews, in a paper on the "Standard Unit of Refrigeration," presented at the meeting of the American Society of Mechanical Engineers, gave the following proposed equivalent standard units:

"On a basis similar to that of the present boiler horsepower of 30 pounds of water evaporated per hour from feed water at a temperature of 100 degrees Fahrenheit into saturated steam at 70 pounds gauge pressure, which requires 33,306 British thermal units of heat or 34.5 units of evaporation, each of which is equal to 965.7 British thermal units—the amount of heat required to evaporate one pound of water from and at 212 degrees and atmospheric pressure—may be established a standard ton of refrigeration, equivalent to 27 pounds of anhydrous ammonia evaporated per hour from liquid at a temperature of 90 degrees Fahrenheit into saturated vapor at 15.67 pounds gauge pressure (0 degree Fahrenheit), which requires 12,000 British thermal units of heat or 20,950 units of evaporation, each of which is equal to 572.78 British thermal units—the amount of heat required to evaporate one pound of ammonia from a temperature of 28½ degrees into saturated vapor at atmospheric pressure."

TO MAKE A 6-IN. BEAM MICROMETER

Any mechanic can make the 6-in. beam micrometer illustrated, says the American Machinist. After the forgings are shaped out holes are drilled and reamed approximately 1 in. apart, and taper eccentric pieces to fit held in position by screws as shown. The pins can easily be adjusted 1 in. apart by turning the eccentric studs.



A 6-in. Beam Micrometer

PAINTING AN OLD HOUSE

In painting an old house much depends on the condition of the old paint on its walls. If pure white lead was used it can be brushed off; but if the old paint still clings here and there in scales it will have to be scraped off or have wire brushes used on it, says the Metal Worker. Then give it a coat of oil, using one gallon of turpentine and a pint of good drier to four gallons of oil. After this any remaining paint may be scraped off. Let the oil dry, then put on two coats of paint in the regular way.

INDUCTION COIL TESTING

The most accurate method for testing induction coils is to first take terminal No. 1 and put on binding post No. 1, then to fasten one side of the head telephone to the ground binding post and to touch terminal No. 3 with the other side. If you do not get the battery you will know the coil is open.

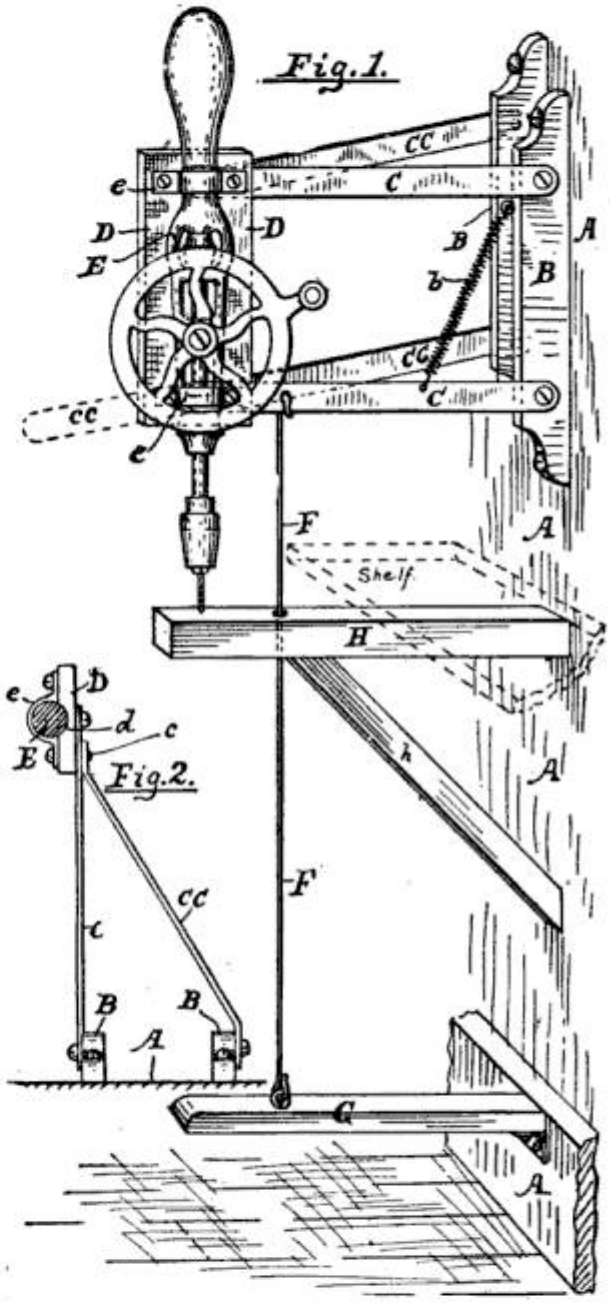
Then touch the receiver cord to terminal No. 2. If you get the battery the coil is crossed; if you do not get the battery the coil is not crossed. The other part of the coil may be tested in the same way. Bear in mind that if you are testing terminal No. 1 you must touch terminal No. 3, but if you do get the battery on either terminal No. 2 or No. 4 the coil is crossed.—Contributed by James M. Cleveland, Chicago.

(The value of this method is that a head telephone receiver is more sensitive than some test instruments. With a good test instrument the results are practically the same.—Editor.)

TO CONVERT A HAND DRILL INTO A DRILL PRESS

Secure blocks B B, Fig. 1, to wall A or some other convenient support. With screws and clips (e) fasten the drill frame (E) to block D (see Fig. 2). In order that block D be in parallel with the drill shaft, it will be necessary to let portions of the drill into the block, as shown at d, Fig. 2. Make parallel bars (C and CC) and rivet them in position so that they meet at c (Fig. 2). The drilling in these parallel bars should be equal distances apart (8 or 10 in.) and on block BB and D it should be equal distances apart, also, but nearer together, owing to the size of the drill.

To the lower bar (C) attach one end of spring b, about midway from the ends, and attach the other end to a screw eye on block B. (Spring b can be attached at one end to the upper bar, C, near the drill and at the other end, by a link, to the ceiling, bracket or any other convenient support, if preferred.) This spring should be strong enough to lift and hold the drill off bracket H. Near the drill in the lower bar (C) attach the treadle rod (F), passing it through bracket H to treadle G.



Home-Made Drill Press

Foot pressure on treadle G will force the drill through the metal, leaving both hands free to handle the drill and the articles being drilled. If the treadle is not desired, or it is preferred to have both lever and treadles, the lower bar (C) may be extended as indicated by the dotted lines cc, Fig. 1, and hand lever force may be used. The two pairs of bars (C and CC) will give almost vertical travel of the drill.—Contributed by Chas. N. Leonard, 1319 Barth avenue, Indianapolis, Ind.

SUPPORTING HANGERS FROM I-BEAMS

There are a number of methods of hanging shafting from structural shapes in use. Figs. 3 and 4 show hangers fastened to the lower flanges of I-beams. The method shown in Fig. 3 is common, but that shown in Fig. 4 is an improvement on it. In this a gray-iron clip (Fig. 5) with a square hole in the top of it to keep the nut from turning is used. For suspending hangers or motors from I-beams, or for eyebolts for chain blocks, the beam fastening shown in Fig. 1 is good, says a correspondent of the American Machinist.

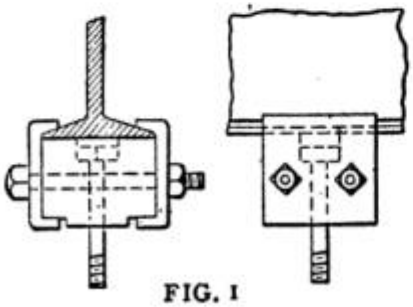


FIG. 1

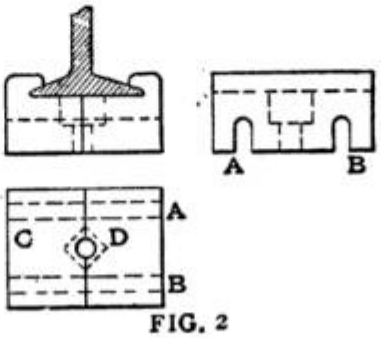


FIG. 2

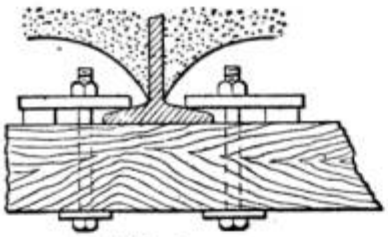


FIG. 3

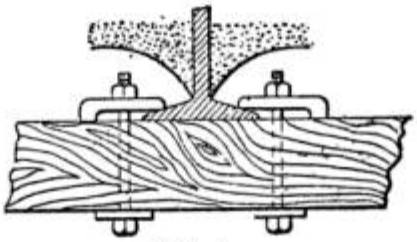


FIG. 4

FIG. 5

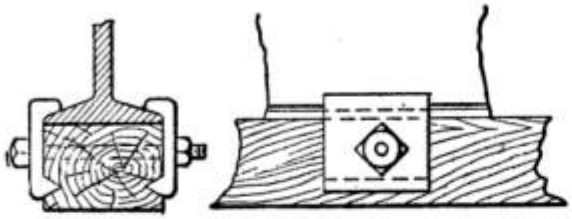


FIG. 6

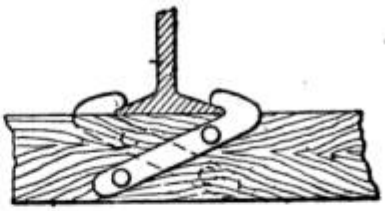


FIG. 7

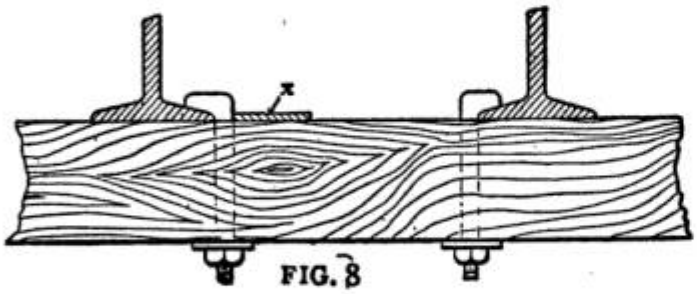


FIG. 8

FIG. 9

A clamp for hangers or timber is shown in Fig. 2. Bolts are slipped in at A and B, holding C and D together, and cannot drop out after the hanger or timber is in place. Fig. 6 explains itself. Fig. 7 shows a method of holding a strip of wood to beams for fastening electric wires. The clip is about ¼-in. thick and made of gray iron. Fig. 8 is not a good method unless a plate, x, is secured to the timber, as the bolt has a tendency to split the timber. Fig. 9 shows a method of supporting piping. If an insulator is put in the eye, x, it makes a good electric light wire supporter.

PAINT FOR WIREWORK

Boil good linseed oil with sufficient litharge to make it of a consistency to be laid on with a brush. Add 1 part of lampblack to every 10 parts (by weight) of litharge. Boil over a gentle fire for three hours. Let the first coat be thinner than the others.

RECIPE FOR ALGERIAN LUTE

Pass through a sieve: 2 parts wood ashes, 3 parts lime and 1 part sand. Moisten with water and oil and beat up with a wooden mallet until the compound is of the right consistency.

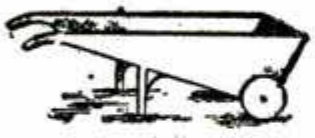
Frieze Design--London Decorator

STEAM FITTERS' CEMENT

The following formula for steam fitters' cement was presented by S. S. Sadtler in a paper read recently before the Engineers' Club of Philadelphia. The body of the cement consists of either red or white lead. The red lead is often diluted with an equal bulk of silica or other inert substances, so as to make it less powdery. The best way that I have found to do this, however, is to add rubber or gutta-percha to the oil as follows: Linseed oil, 6 parts by weight; rubber or gutta-percha, 1 part by weight. The rubber or gutta-percha is dissolved in sufficient carbon disulphide to give it the consistency of molasses, mixed with the oil, and left exposed to the air for about 24 hours. The red lead is then mixed to a putty. Oxide of iron makes a less brittle cement than red lead. Probably fish oils and red lead would make good cements of the class for joining pipes, as the fish oils are not such strong drying oils as linseed, and their use might be a case of permissible substitution rather than adulteration.

FEEDING BARROW FOR THE BARN

For the distribution of food, either wet or dry, to the stalls on the barn floor, a feeding barrow is convenient, says the Farm Journal. The barrow is shaped so that the food can be shoveled up easily and the sides extend to form the handles. The wheels are cut from a hardwood board. A shovel is carried along with the barrow.

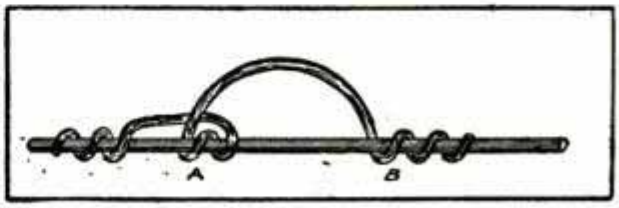


A CORRECTION

On page 1239, December, 1905, issue, is an account of welding aluminum with oxygen gas which is incorrect as to the gas used. Oxygen gas alone cannot be used in this way.

NEW METHOD OF TYING LINE WIRE TO INSULATOR

An improved method for tying line wires to insulators is shown in the illustration and is suggested by a correspondent of the

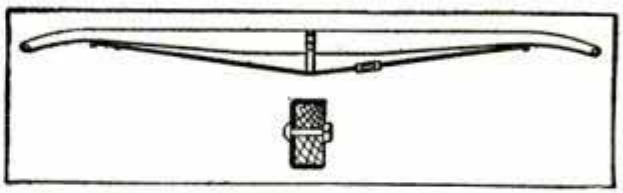


Good Method of Tying

American Telephone Journal. The wire is turned back over the loop formed around the insulator after three turns made around the wire and is then secured by three additional turns outside of the first lashing.

REINFORCING A BENT AUTOMOBILE FRAME

When the frame of your automobile begins to sag in the middle, try reinforcing the side-members of the frame by filling them with wood, recommends the Motor Way. Either ash or elm will answer the purpose. Bed the wood in a coat of white



Repair for Automobile Frame

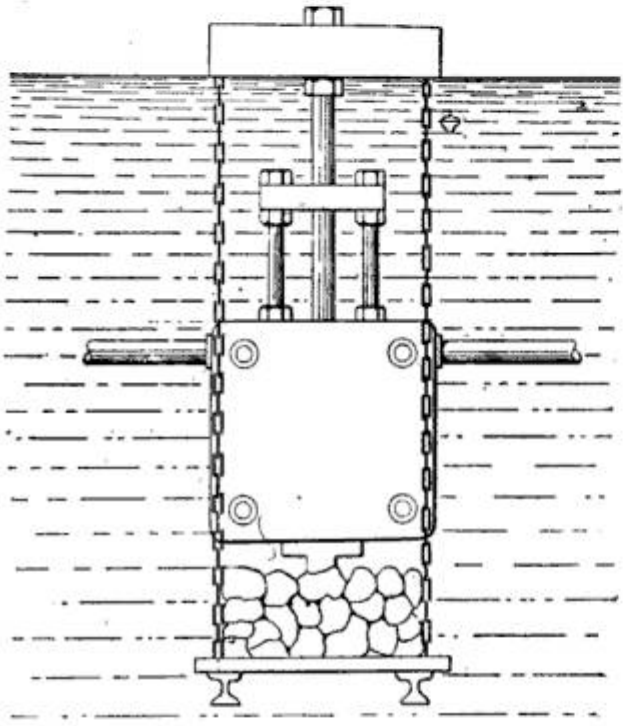
lead as a precaution against the moisture rusting the steel or rotting the wood. Fasten the wood in place with carriage bolts. In doing this you will probably be obliged to strip everything out of the frame and take the side-members off.

Another method is to put on a truss rod to support the frame where it sags. Use a ⅜-in. rod and have a turnbuckle to draw it in place. This is a cheaper and quicker way, but will not look so well.

OPERATING A STEAM PUMP BY WAVE POWER

A steam pump used for filling a tank was operated by a correspondent of the Engineers' Review without the aid of steam, compressed air or other ordinary power, but by the action of the waves of Lake Michigan.

A platform was built to fit around the top of the base of an upright pump, and then the pump was set upon a flat stone at the



Wave Motor

bottom of the lake. Two lengths of railroad rail were placed on the base as weights, and the platform was laid on the rails; this in turn was loaded down with rock to secure the pump in place. Chains were then run from the rails to a float fitted to the plunger. These chains were of the right length to keep the motion of the float less than the stroke of the pump. With this arrangement, when the lake was calm, the float was partly submerged. Connections were then made to the tank.

The waves operated the pump successfully, supplying all the water required for the tank.

EGG-SHELL GLOSS ON REDWOOD

Put on one coat of orange shellac, sandpaper it to a smooth surface and follow with three coats of white hard oil finish. Rub the first coat with hair-cloth and the last coats with pulverized pumice stone and raw linseed oil.

INTERESTING ACCIDENTS IN THE SHOP

An accident happened in our shop a short time ago while we were getting out a hurry-up job (a job that is done in a hurry without the proper amount of thought applied to it). We had a wrought-iron eccentric yoke, hardly large enough to fit the eccentric we wished to use it on (Fig. 1). It was taken to the blacksmith to be made larger, therefore the rod, B, was left screwed fast to handle it by when hot. It had not been in the fire long until, with a loud report, it burst, forcing two great swells and parting the wrought iron marked A-A in two places.

Fortunately for the blacksmith, the rod did not blow out. He was standing squarely in front of it. The wrought iron was ⅝ in. thick around the rod and, considering the diameter of the hole, it required a very high pressure to burst. The accident was caused by oil or dampness generating steam under the intense heat.

Another accident that came near resulting fatally occurred while removing a cylinder head without due care. Before removing the head, the two valves, C C (Fig. 2), and the two cocks, D D ,were opened, creating a vacuum within the cylinder when the bolts were out and the head loosened a little. The inrush of air through valves,

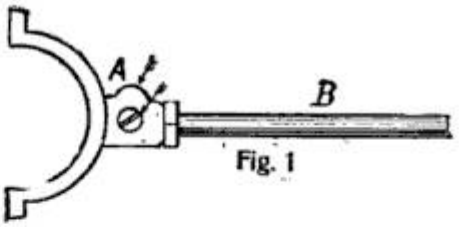


Fig. 1

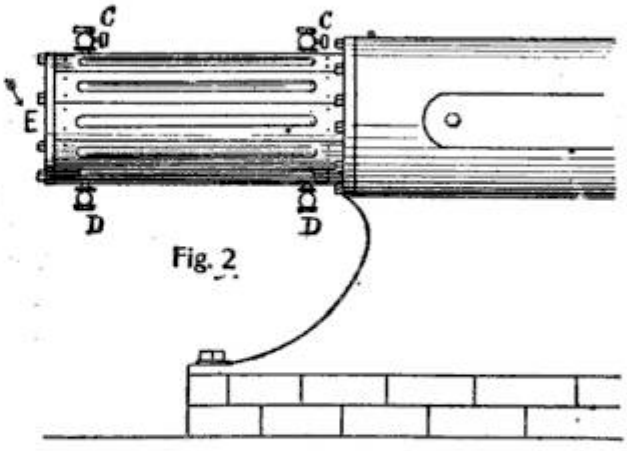


Fig. 2

C C and D D, blew out the head with such force as to break a 2 x 12 plank.—Contributed by Paul S. Baker, Muscatine, Ia.

HOME-MADE WINDMILLS FOR PUMPING AND POWER

[The editor is indebted to the State Agricultural Experiment Station, of Nebraska, for much of the data used in the preparation of this series of articles.]

PART I.

The important problem of irrigation has been solved in several of our western states, notably Kansas and Nebraska, by the construction of home-made windmills. These pumping engines are in many cases built of scrap material lying about the farm, by home labor and at a cost of but a few dollars. And by this little expenditure farms are irrigated, stock is watered, homes are made more convenient, hand labor is spared, and the truck gardeners, in particular, are enabled to flourish and prosper.


Fig. 1

These home-made windmills are not the makeshift of the poor landowner, though indeed they have proven his salvation. But on the finest farms, equipped with modern machinery and with several handsome shop-made windmills in operation, the improvised windmill will be found supplying some particular tract or herd with water, or even serving as luxuries, running the grindstone, the churn, the feed grinder, the wood saw or the corn sheller.


Fig. 2

The home-made mill need not cost exceeding $5, provided it is built by the farm hands or the owner himself, and many mills built at a cost no greater than $1.50 are doing good work in Nebraska. One of these waters a market garden; another that cost $1.75 waters all the stock on a quarter section. Old farm machinery supplies the turned bearings required, and sufficient scrap lumber is usually available.


Fig. 3

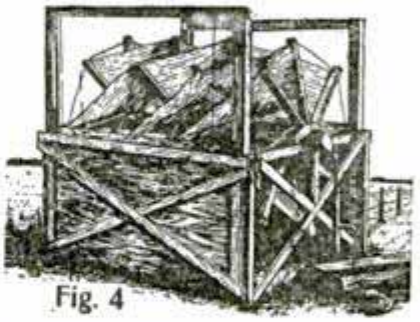


Fig. 4

THE JUMBO WINDMILL.

The Jumbo windmill is one of the simplest and most easily constructed of mills. This mill is sometimes called the "Go-devil," and in form resembles an overshot water wheel. Personal preference probably figures in the matter, but where experts place the Jumbo in the lowest class of mills for efficiency, an owner of a Jumbo mill will defend it above all other types. Almost any material can be utilized in building them, laths, shingles, barrel staves, coffee sacks and even old tin cans. One enterprising Nebraska farmer built a fire of straw around several hundred old tomato cans, and thus unsoldered them and secured pieces of flat tin, of which he build his mill—and it did the work as well as any of its type.

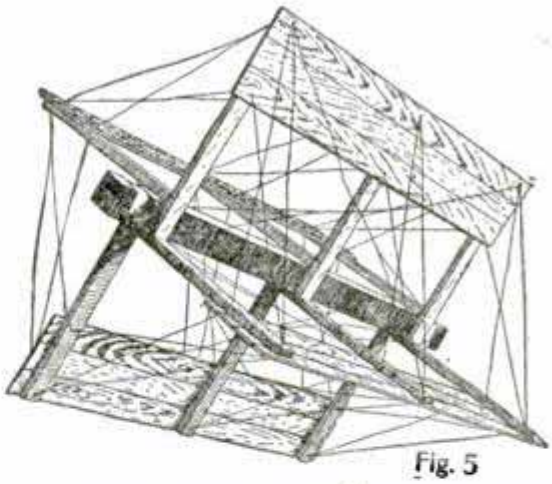


Fig. 5

The Jumbo may, also, be built of any size and strength, and some farmers are securing good results by building a number at as little expense as possible and locating them at various points where the water supply is required.

The baby Jumbo is a small structure

usually found mounted upon buildings and securely anchored there. The one shown in Fig. 1 is located at Havelock, Neb. It is mounted on a 16-ft. tower and has four

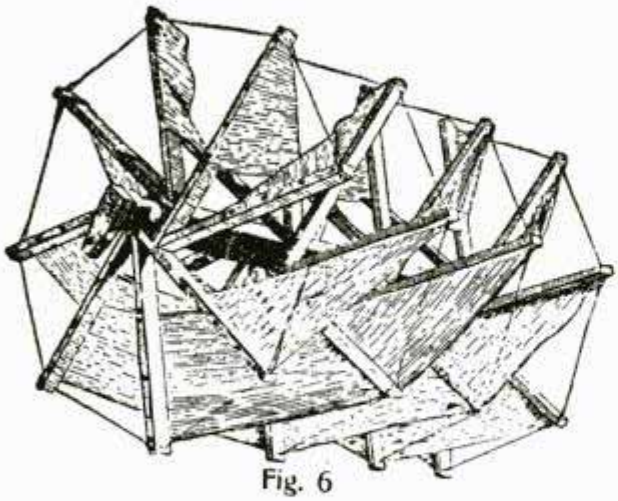


Fig. 6

fans, each 3 ft. long, with arms 2½ ft. long attached to an iron shaft. A 16-in. crank connects it direct to the pump handle. This mill cost $3.70; it pumps all the water from a 60-ft. well for the stock and a boarding house with 30 guests.

Fig. 2 shows another little Jumbo, this one costing but $1.50. The box is 3 ft. wide, 9 ft. long and 6 ft. high. There are eight fans, 3 ft. wide by 4½ ft. long, supported on a gaspipe shaft. This windmill irrigates the truck garden, strawberry patch and small fruit during the dry season. The sides and ends of old grocery boxes were used for building the fans and box. The pump is connected with the mill by means of a lever in the ratio of six to one.

Fig. 7

In building a Jumbo it is better to put the boards well to the extremity of the fans, rather than to cover the fans solidly.

A much larger and more efficient mill is shown in Fig. 3. This one cost $8, and irrigates a 5-acre garden. The box is 9 ft. wide, 13 ft. long and 8 ft. high. The fans are made of burlap or coffee-sacking and are 9 ft. by 4 ft. This mill keeps a reservoir 150 ft. long, 4 ft. wide and 2 ft. deep full all the time. The reservoir was built in this shape because the ground was too valuable to permit using a square space. At each corner of this mill there is an upright support carrying a pulley and cleat, and the box has sliding doors which may be raised and lowered to regulate the fans to the varying velocities of the wind.

The screw Jumbo is a rare form of this type of mill, but is efficient with wind from any direction. One of these is shown at Fig. 4. Canvas stretched on diagonally opposite arms is used for the fans.

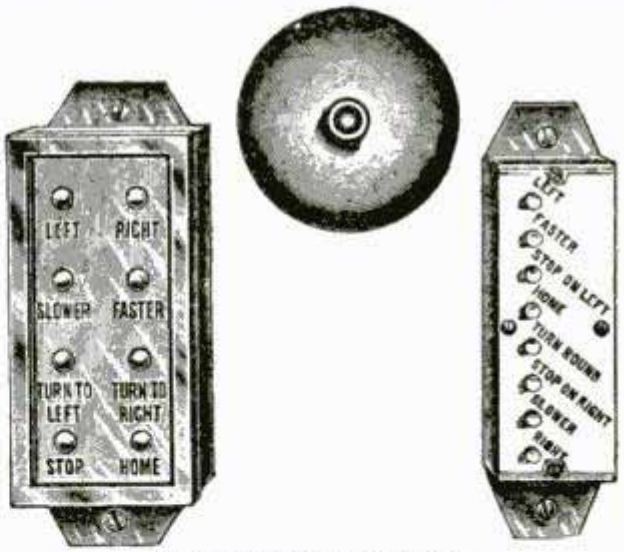
A good method of attaching arms is shown at Fig. 5. The whole is tied together and cross-braced by twisted fence wire. Fig. 6 shows the construction of screw Jumbos. The sails are of canvas and the arms are braced and tied together with twisted wire.

An arrangement of Jumbos in gangs and mounted in any convenient place is proposed for efficiency. Fig. 7 shows this idea carried out, the Jumbo being supported between two corn cribs.

Next month we will describe merry-go-round mills and their construction.

ELECTRIC COMMUNICATOR FOR INSTRUCTING DRIVERS

A new feature of touring car and brougham equipment is the electric communicator for giving directions and instructions to chauffeur or driver. The apparatus shown at the left is for the use of the driver



Electric Communicator

and the other for the occupant of the vehicle. When the passenger pushes a button, a bell rings to attract the driver's attention to his part of the apparatus where the corresponding button is pushed out for an instant.

A submarine boat in order to steer easily up and down should not exceed a length more than five times its diameter. Twelve feet is about the limit in diameter to be able to work in 30 ft. and still have necessary water above and below.

MECHANICS FOR YOUNG AMERICA

HOW TO MAKE A COMBINATION LOCK

A locking device which a boy can easily attach to a slide bolt on any door is made of wood or of metal as preferred.

The device consists of two discs with an

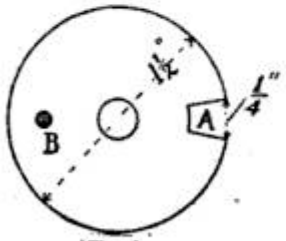


Fig. 1

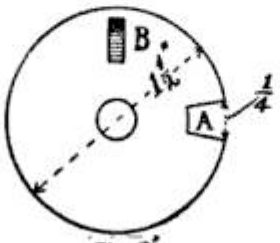


Fig. 2

indent in each, as shown in Figs. 1 and 2, which are to be held in place on the inside of the door in such position that the slide bolt cannot be opened, excepting when both discs are turned, so that the bolt may fit into the two indents, as indicated in Fig. 3.

The discs should be, say, 1½ in. in diameter; the indents in their edges ¼ in. deep and ¼ in. wide. The indents may extend clear through the thickness of the discs; or, if the discs be made of thick wood, only deep enough to allow the slide bolt to penetrate the opening formed by the indents of both discs coming together. A ¼-in. hole should be bored in the center of each disc.

In the first disc, diametrically opposite the indent and about ½ in. from the center of the disc, a small pin ¼ in. long should be driven, driving it 3/16 in. into the disc, and allowing 1/16 in. to clear, as shown at B, Fig. 1.

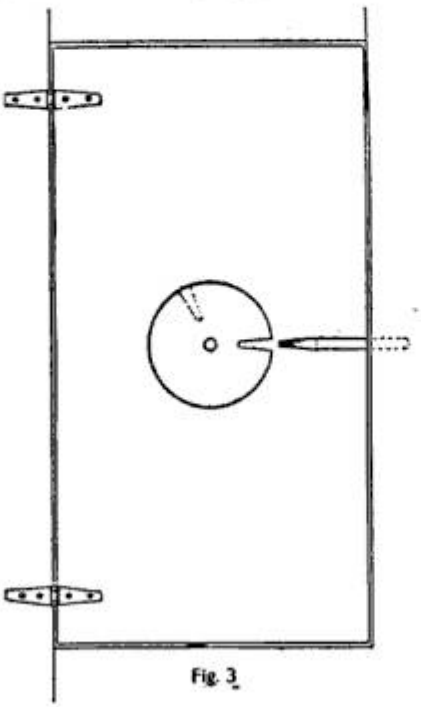


Fig. 3

On the face of the second disc, Fig. 2, at the location shown by B, a piece of leather, wood or metal, ¼ in. long, ⅛ in. wide and 1/16 in. thick, should be tacked, using very small nails. When the discs are placed in position (Fig. 4) they must be faced together with a 1/16-in. washer between them, so that the pin driven in the first disc (which disc must be allowed to turn loosely on a shaft) will be caught by the bit of leather fastened on the second disc (which disc must be keyed securely to the shaft); this will cause the second disc to be turned by the first disc—after the first has revolved far enough for the piece of leather to come in contact with the pin.

The slide bolt, as well as the disc device, should be on the inside of the door; but a knob attached to the slide bolt should extend through a slot in the door, so that the bolt may be slid back and forth from the outside of the door, when the discs are in the right position to allow it to slide. Fig. 5 shows two views of the slide bolt, with a head made to fit the indents in the disc.

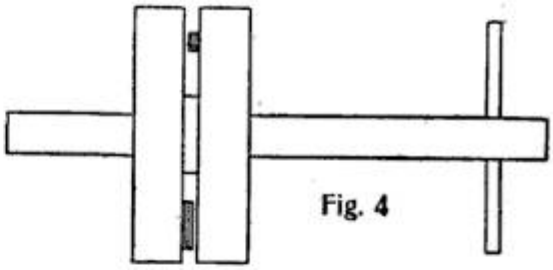


Fig. 4

Fig. 6 shows how a block may be attached to the inside of the door as a support for the pin or shaft on which the discs revolve, and leaving room between the block and the door for the discs. Fig. 7 shows the shaft, ¼ in. in diameter, with a cross handle on the end which is to be on the outside of the door. This handle serves not only to turn the shaft, but also as an indicator on the dial face. The dial face may be painted on the door, showing figures from 1 to 12.

When you have put the device together, go on the inside of the door and then turn the shaft to the left until the piece of leather on the second disc catches the pin driven into the first disc and carries the disc around until the indent in it is in the proper position to allow the slide bolt to

open. Go to the outside of the door now, and note at what figure on the dial face the indicator rests. This figure is the first figure in your combination. The slide bolt will not open as yet, however, as the second disc is

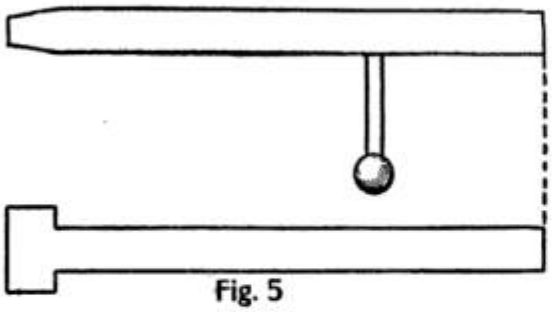


Fig. 5

not in position. To keep the first, or loose, disc in position while the second disc is being turned, a steel spring should be made to rest on its surface, acting as a "brake."

The shaft must not be turned in the opposite direction, or to the right, until the indent in the second disc comes into position alongside the first. The point at which

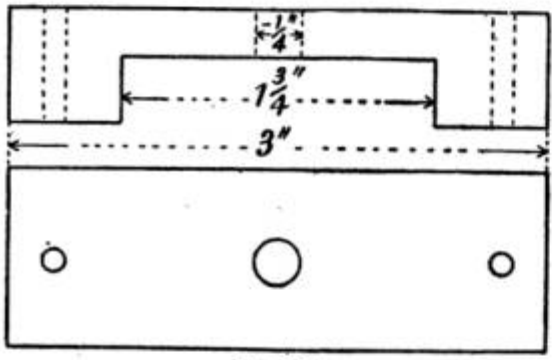


Fig. 6

the indicator rests now is the second number in your combination.

To open the lock, turn the shaft several revolutions to the left and let the indicator rest at the first number in your combination. Then turn to the right until the indicator rests at the second number of the combination; draw back the slide bolt and

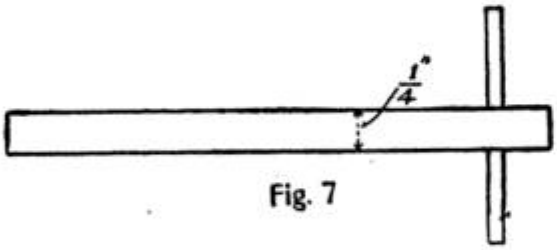


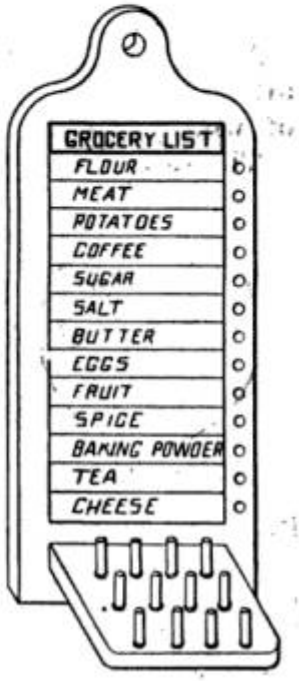
Fig. 7

open the door. The combination can be easily and frequently changed.—Contributed by A. L. Burkhart, Morton Park, Ill.

HOW TO MAKE A GROCERY MEMORANDUM

A handy device for the kitchen is a grocery memorandum by which the housewife can remind herself of what she wishes from the store when the order boy makes his morning call.

Procure a piece of white wood, 9 in. long by 3 in. wide, and plane off the edges and surface. Then, with the aid of a scroll saw, saw out the top as shown in the illustration. This done, file it even with a wood file, then sandpaper it.



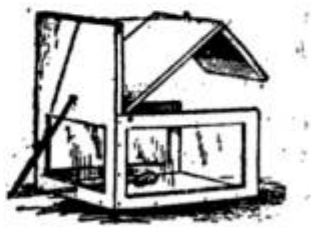
With a medium pencil, not too hard, draw the lines for the names. These lines should be about ⅜ in. apart. At the right hand side of each name make a hole for a peg.

Make the peg board or shelf 2¼ in. long and 1½ in. wide and round off the corners. At the bottom of the list board chisel out a hole 3/16 in. deep for the shelf. Glue the shelf in and make the pegs of a size to fit in the holes. Finish with two coats of shellac.

When the housekeeper thinks of something she must order, she puts a peg opposite the name of that article, and thus has no trouble in remembering it. The board would be very pretty done in burnt wood. —Contributed by Walter A. Springborg, Elgin, Ill.

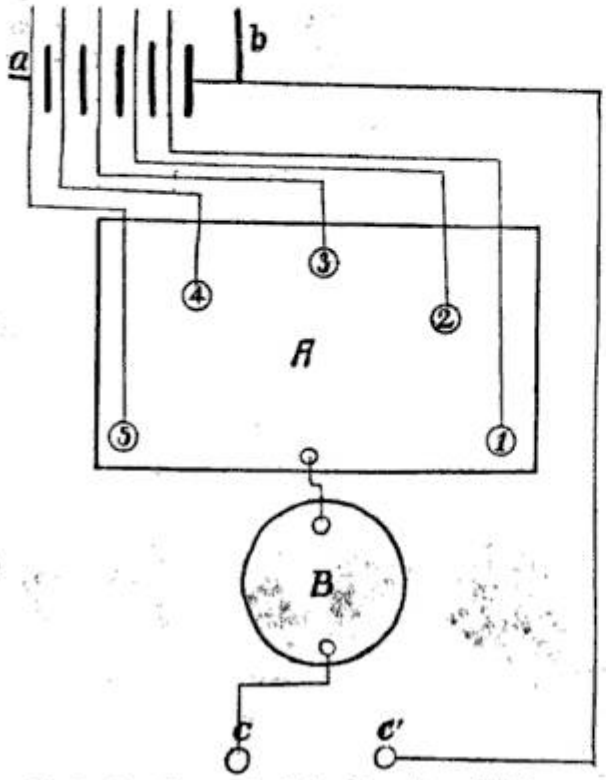
TRAP FOR SMALL ANIMALS

This is a box trap with glass sides and back, the panes of glass being held in place by brads placed on both sides. The animal does not fear to enter the box, because he can see through it; when he enters, however, and touches the bait the lid is released and, dropping, shuts him in. This is one of the easiest traps to build and is usually successful.



CONNECTING UP BATTERIES TO GIVE ANY VOLTAGE

Referring to the illustration: A is a five-point switch (can be home-made); B is a one-point switch and C and C¹ are binding



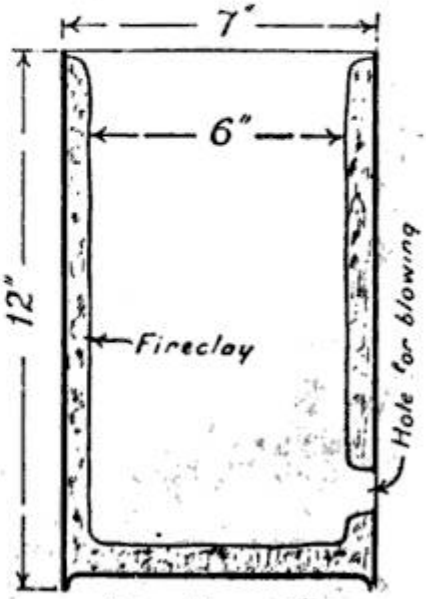
Batteries Connected to Give Any Voltage

posts. When switch B is closed and A is on No. 1, you have the current of one battery; when A is on No. 2 you receive the current from two batteries; when on No. 3 from three batteries; when on No. 4 from four batteries, and when on No. 5 from five batteries. More batteries may be connected to each point of switch B.

I have been using the same method for my water rheostat (home-made). I have the jars of water where the batteries are and the current coming in at a and b.—**Contributed by Eugene F. Tuttle, Jr., Newark, Ohio.**

TO BUILD A SMALL BRASS FURNACE

Bend a piece of stout sheet iron 23 in. by 12 in. round so that the inside diameter is 7 in. and then rivet the seam. Fit in a round piece of sheet iron for the bottom. Make a hole about the size of a shilling in the side 2 in. from the bottom. This is for the purpose of blowing.

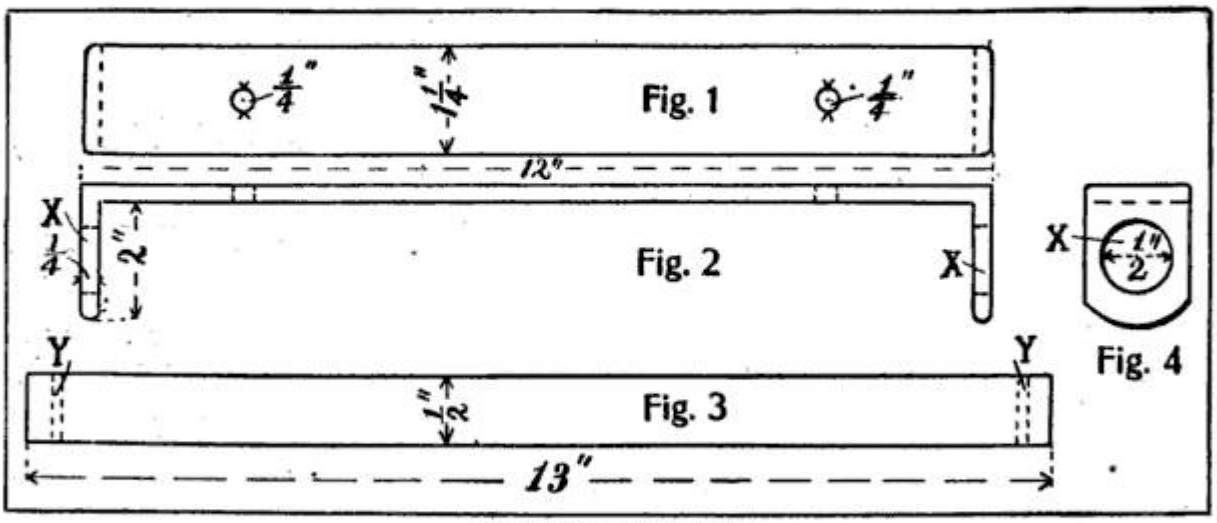


Brass Furnace

Line the furnace, bottom and sides, with fireclay to a depth of ½ in. Use charcoal to burn and an ordinary bellows for blowing, says the Model Engineer, London. The best blast is obtained by holding the nozzle of the bellows about an inch from the hole, instead of close to it.

BOB-SLED HINGE

The illustrations show how to make a good bob-sled hinge which will hold the sled very firmly, but allow it to move up and down. The hinge should be made of iron and of the dimensions indicated in the sketches. Fig. 3 passes through the hole, X.

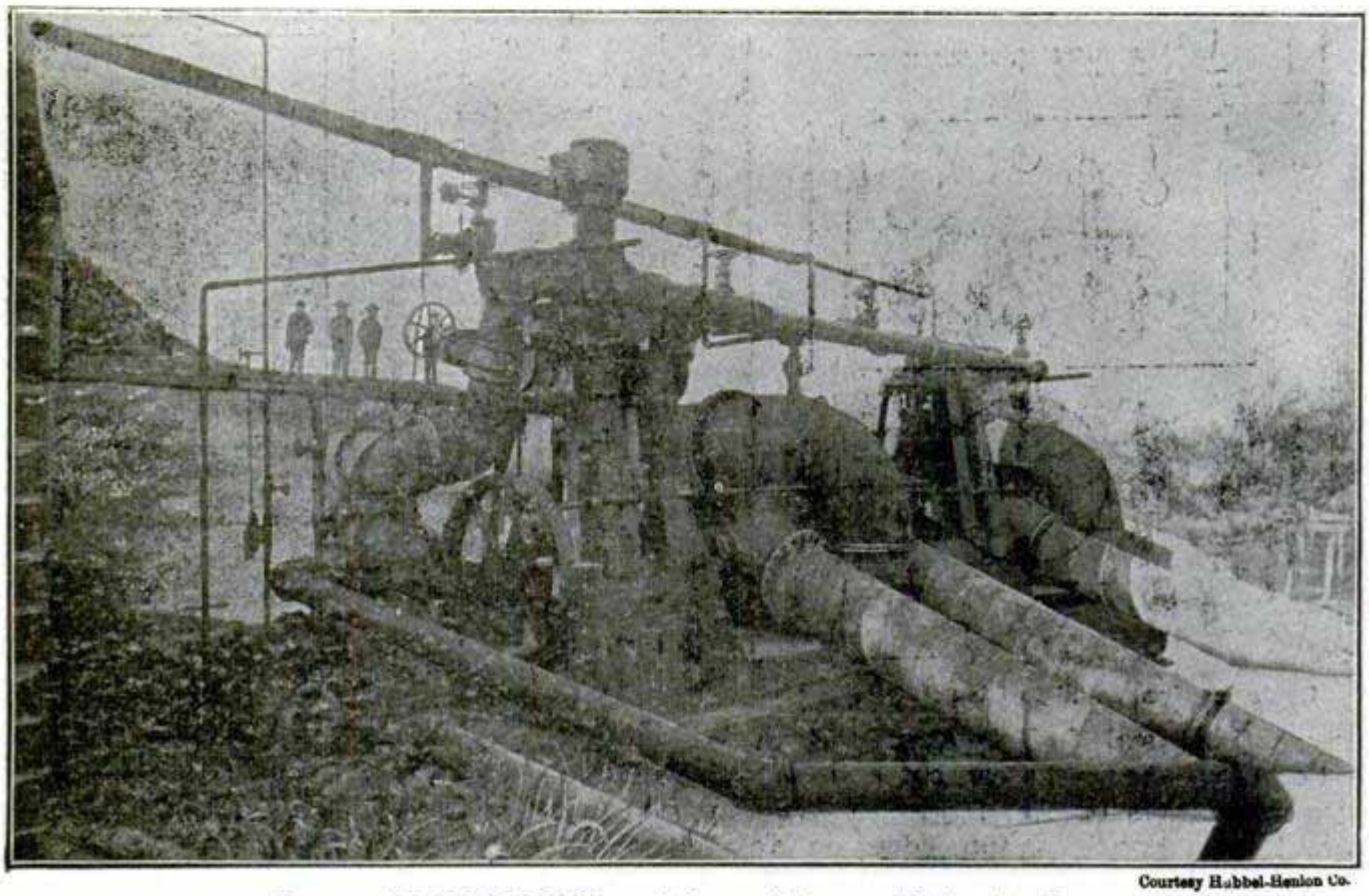


Hinge for a Bob-Sled

Y is a hole to bend a nail through. This hinge can be made for 30 or 40 cents.—**Contributed by Harold R. Bullock, 983 Richmond street, Appleton, Wis.**

SWAMP LANDS TRANSFORMED INTO GRAIN FIELDS

Twelve thousand acres of hitherto unprofitable swamp lands bordering the Mississippi river at a point not far from Quincy, Ill., are being transformed into arable fields. Up to the present time between 4,000 and 5,000 acres of this land have been constantly inundated; the rest was tillable only in very dry seasons, but at those times the richness of the soil was demonstrated by the remarkable crops that matured there.



Courtesy Hubbel-Henion Co.

Pumps 100,000,000 Million Gallons of Swamp Water Per Day

At various times expedients for draining the soil were tried, but nothing on a scale great enough to be successful was attempted. Now, however, two 36-in. compound condensing centrifugal pumps are pumping off the water at the rate of from 32,000 to 42,000 gallons per minute from each pump, or a total of 100,000,000 gallons per day, delivering against a maximum elevation of 15 ft. This much water is equal to a mountain stream 10 ft. wide, 4 ft. deep and with a 3-mile current.

In installing the pumps 40 piles were driven down to hard pan and upon these was constructed a heavy, deep concrete foundation, made continuous under both outfits. Each engine and pump is erected on a heavy cast-iron bed plate, which rests on the concrete foundation.

In the illustration the four suction pipes are seen in the middle ground, with the 36-in discharge pipes going out at the top of the pump shells toward the elevated ground in the rear, which is the levee.

The pumps are directly connected to two vertical compound engines, cylinders 15½ in. and 26 in. with 14-in. stroke. The combined h.p. is 400. A large part of the land, which is along the Mississippi river, is below the level of the river, being protected by a strong levee. The water is discharged into the river. Should a dry season come on, the land can be "irrigated" by simply stopping the pumps, when sufficient water will ooze up through the ground. The soil is doubtless the richest in the world, being a black, loamy deposit left by overflow from the river.

PAINT FOR DEAL FLOORS.

Dissolve 15 dr. good glue by boiling with thickish milk of lime containing 1 lb. caustic lime. Add linseed oil, sufficient to form a soap with the lime. Use for making up any color that the lime will not alter. For brown-red or brown-yellow colors, add a solution of shellac in borax. A fine lustre will be obtained by a coating of varnish or lake. To polish, use linseed oil or turpentine.

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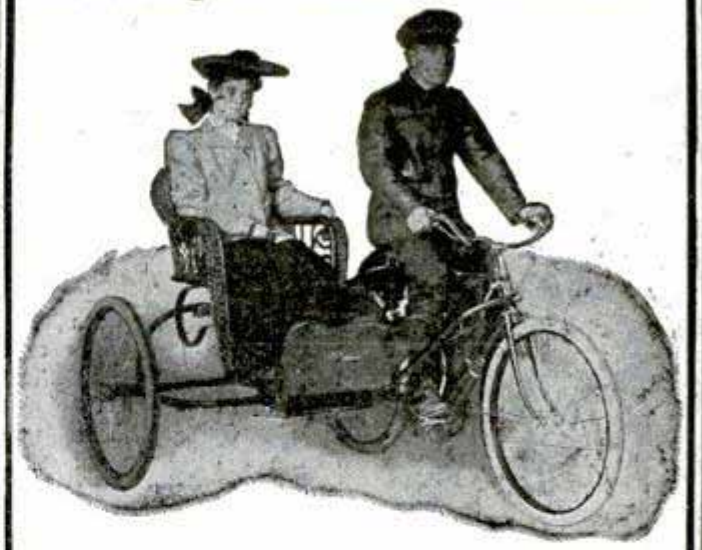

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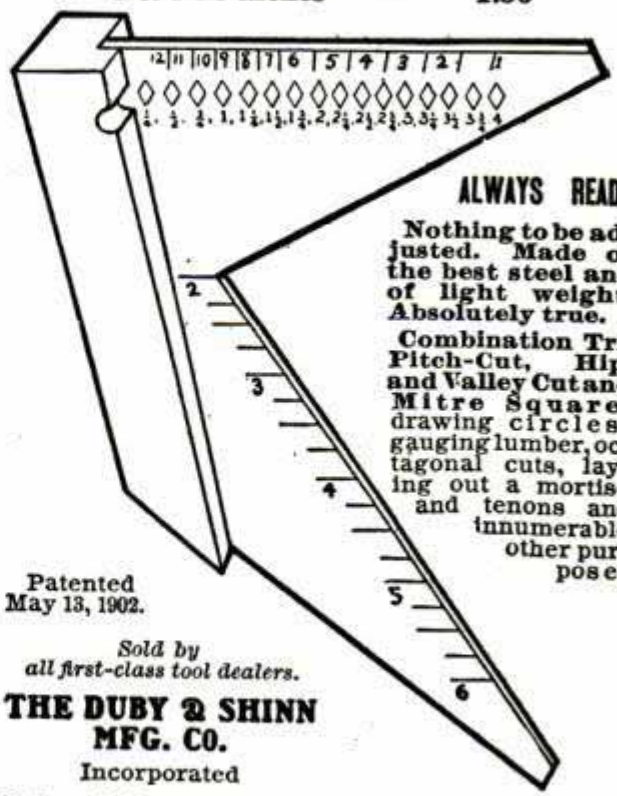

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CARBORUNDUM GRINDER.—A high-speed carborundum grinder which can be easily carried to the work, is a recent invention. The machine weighs only 6 lbs., and preferably uses a carborundum wheel, 4 in. diameter by 1 in., with ⅜ in. hole. Other sizes with same size hole may be used. Is very serviceable on outside work where drills are used and frequently broken.

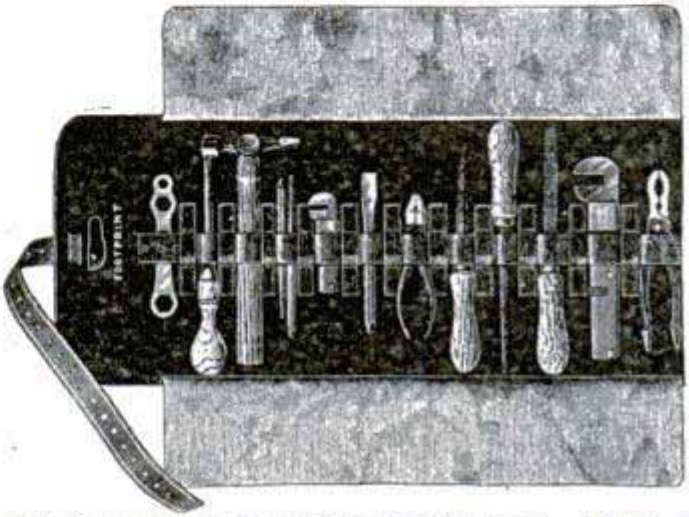
CASKS DRIFT FROM POLAR SEA.

Two casks set adrift in the Arctic ocean years ago at the suggestion of Rear Admiral Melville, have been found, and the fact is believed to be a proof that the Polar Sea is open. One cask was placed on an ice floe, northwest of Point Barrow, Alaska, Sept. 13, 1899, and was found on the northern coast of Iceland June 17, 1905. The other was thrown overboard from a revenue cutter 85 miles northwest of Wrangel Island, Aug. 21, 1901, and was recovered on the coast of Siberia, Aug. 17, 1905. Thirty-five other casks were set adrift about the same time.

CONCRETE-METAL RAILROAD TIE.—The Big Four has laid a short section with a new tie which is composed of a cast iron top bolted to two concrete bases connected in the middle with a broad strip of galvanized spring steel. The cost per tie is about $2, but it is expected to last 30 years, which would mean a saving of $9,000 over wood ties in that period.

ZORENE, said to preserve metals from the effect of oxygen, to double the density of many kinds of stone and to be a long distance germ killer, looks like red syrup and smells of sulphur and rubber. All of which has the regulation sensational scientific sound.

TOOL ROLL FOR MOTORISTS—An English firm has placed on the market a handy tool set for motorists, including such tools as are most essential for emergency repairs on the road. There are 13 tools in a leather case, which rolls up to measure 5 in. diameter by 12 in. long, and weighs 7 lbs.



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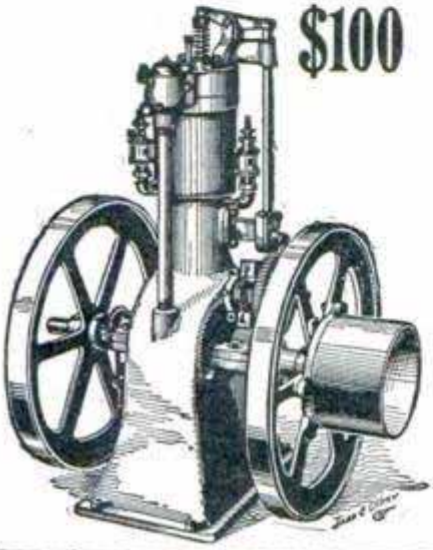

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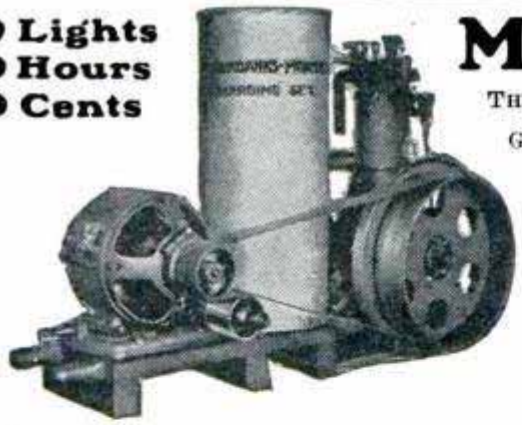

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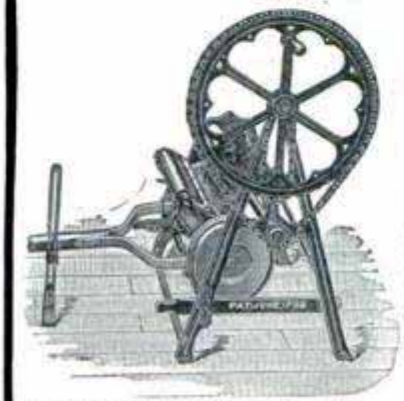

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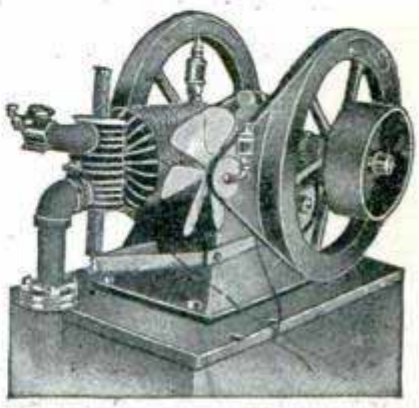

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Who has ever seen an engineer lift the lid to the dust covered wooden box placed on every tender, without a desire to climb up on the footboard and see for himself just what the box contained? If you ever get a chance to examine for yourself you will be surprised at the number and variety of the collection. Oil cans, hammers, wrenches, chisels, punches, files, glass and mica chimneys, wicks, waste, brasses, balls, nuts, jacks, chain, bars, axes, saws, record books and scores of other equipment are found on a well supplied locomotive.

The supplies differ on many roads and range in value from $20 for the cheapest outfit to $150 for a complete one for a passenger engine. A very satisfactory outfit can be bought at wholesale for $65, and some roads are now furnishing a standard outfit to each locomotive. It will cost a road having 1,000 locomotives $65,000 for this item of tools alone.

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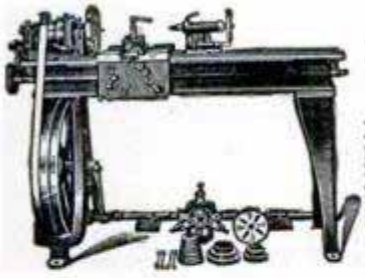

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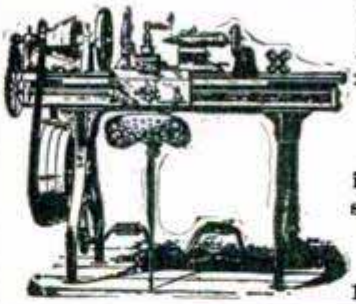

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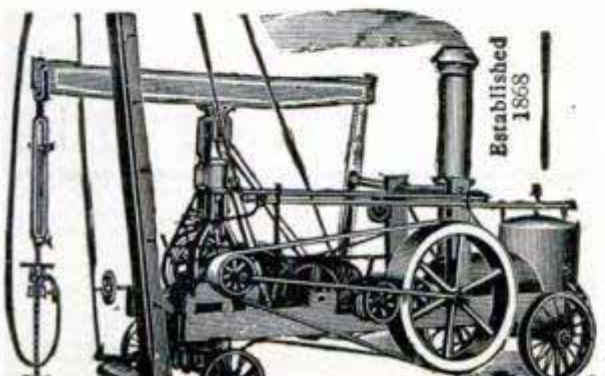

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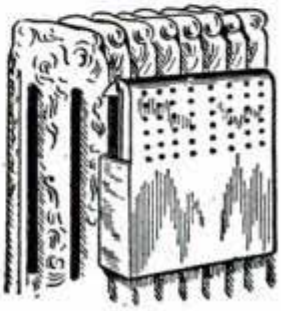

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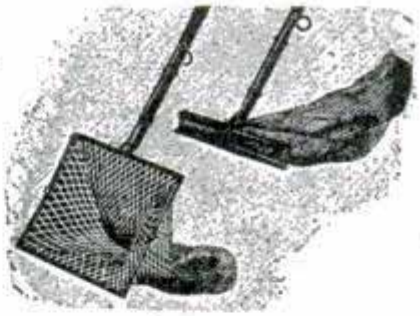

DUPLEX FISH HOOKS.—Where live bait is used this hook is more humane than the old method. Any bait, frogs, minnows, crawfish, grasshoppers, etc., may be used in the hook without injuring it. The points of the hooks are always up and hook the fish in the upper jaw, where the barbed steel is not apt to tear out its hold. The tong-like holder is opened by a slight pressure.

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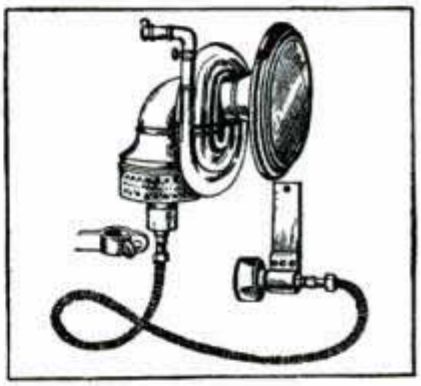

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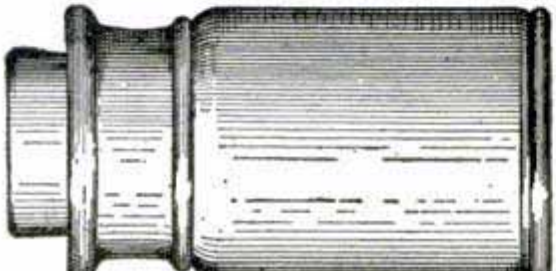

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LONG DISTANCE JANE.—Justice of the Peace Smeck of Indianapolis, Ind., tells the following telephone story: An old farmer was skeptical about alleged conversations over a wire between persons several miles apart. One day his wife went to make a visit to a friend ten miles distant, and the farmer's neighbor called him in later in the day and asked him if he would not like to see if he could hear his wife talk on the telephone. Following instructions he put the receiver to his ear and shouted: "Hello, Jane." Just then lightning struck the wire and he fell sprawling to the floor. The neighbor was chagrined that the old man should meet with such an accident on his first trial of a telephone, and assured him such a thing would not happen again. He refused to risk it, however, but said: "It's wonderful; that was Jane all right."—American Telephone Journal.

BUILT THE FIRST PULLMAN CAR.—Leonard Seibert, the man who, under the supervision of George M. Pullman, built the first Pullman sleeping-car, passed away at his home in Bloomington, Ill., recently. The cars were remodeled from two Chicago & Alton coaches during the spring and summer of 1858, and cost between $1,000 and $2,000 apiece. When they were finished Mr. Pullman still owed the builder $60, which he paid some time later. Mr. Seibert was for many years in the employ of the Alton, and was held in high esteem by the management.

MECHANICAL TRAVELING MEN WANTED.—Manufacturing concerns report difficulty in securing enough high grade traveling salesmen—men who have a mechanical experience or education as well as ability to sell goods. A good knowledge of mechanics is a valuable stock in trade, in whatever occupation a man finds himself.

RETURN OF JAPANESE SOLDIERS.—The Japanese armies are being brought home and disbanding, the soldiers immediately returning to the peaceful occupations they left to go to war. The Japanese Times says: The real point of excellence about a Japanese soldier or sailor, is the fact that, be he a high officer or be he a common private or blue-jacket, he is always modest about his personal achievements; and the real secret of the greatness of Japan's navy and army is that every son of the land becomes a fighter in time of emergency. This quality and the system combined save the Empire from disgraceful sights often seen in other countries, where the army forms a profession, and where the military element grows haughty and arrogant after a successful campaign. Every recruit and reservist now disbanded goes home as an ordinary citizen, with no airs about him of fire and blood, but he is a valiant hero in his way, who has come through the great war, and the villages and hamlets that receive him home should do so (as they are doing) with great eclat and with the deepest sense of gratitude.

HANCOCK MADE MILLIONS.—M. T. Hancock, who was recently killed in an automobile accident in California, made his millions from a simple invention—the disk plow. He thought out his idea while driving mules on his father's plantation in Georgia, twenty-five years ago. He perfected the invention ten years later, taking out his first patent in 1901. His device is now used in all parts of the world.

INDUSTRIAL OPPORTUNITIES.—A list of "industrial opportunities not yet utilized in Massachusetts," has been issued, details of which can be obtained by addressing Chas. F. Pidgin, Chief of Bureau of S. and L., Room 250, State House, Boston.

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When you've got a job to do,
Do it now!
If it's one you wish was through,
Do it now;
If you're sure the job's your own,
Don't hem and haw and groan—
Do it now!
Don't put off a bit of work,
Do it now!
It doesn't pay to shirk,
Do it now!
If you want to fill a place
And be useful to the race,
Just get up and take a brace,
Do it now!
Don't linger by the way,
Do it now!
You'll lose if you delay,
Do it now!
If the other fellows wait,
Or postpone until it's late,
You hit up a faster gait—
Do it now!

—Frank Farrington in New York Sun.

PRACTICAL HANDRAILING. By Paul N. Hasluck. Illustrated; 160 pages. Cloth; price $1.00. David McKay, Philadelphia.

A comprehensive digest of the subject, giving the experience of practical craftsmen. Contains information on handrails for stone stairs, wreathed handrails on the cylindrical system, setting out scrolls for handrails, and many other pertinent subjects.

MODERN LOCOMOTIVE ENGINEERING, WITH QUESTIONS AND ANSWERS. By Calvin F. Swingle, M. E. Contains over 600 pages; illustrated with line drawings and half-tone engravings. Size 5x6¾. Pocket-book style. Full seal grain leather with gold stampings and gold edges. Price, $3.00. Frederick J. Drake & Co., Chicago.

A modern and practical work, treating upon the construction and management of modern locomotives, both simple and compound. The subject-matter is arranged in such a manner that the fireman just entering upon his apprenticeship may, by beginning with chapter I, learn of his duties as a fireman and then, by closely following the make-up of the book in the succeeding pages, will be able to gain a thorough knowledge of the construction, maintenance and operation of all types of engines.

Breakdown, and what to do in cases of emergency, are given a conspicuous place in the book, including engine running and all its varied details. Particular attention is also paid to the air brake, including all new and improved devices for the safe handling of trains. Boiler construction as applied to locomotives is dealt with in detail, all the leading types of valves and valve-gear are fully described and an entire chapter is devoted to the study of the indicator and its application to the locomotive. A fine plate of a Pacific Type Balanced Compound Locomotive and another of a Vertical Longitudinal Section of Locomotive Boiler are included in a pocket at the back of the book.

A COURSE IN TINTING By W. D. Browning, M. E. Price, paper, 30 cents; cloth, 50 cents. The Browning Press, Cleveland, Ohio.

The outlines of five plates with suggestions for the finishing in color, for a course in tinting are presented in this work. The book contains chapters on materials to be used, shrinking the paper, outline of borders and title, outlines of objects on plates I, II, III and outlines of plates IV and V.

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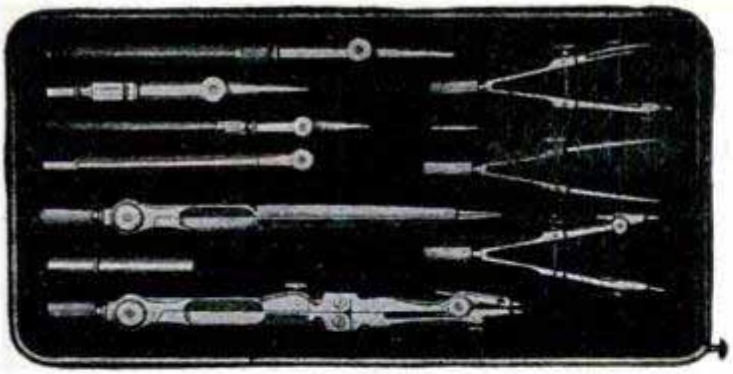

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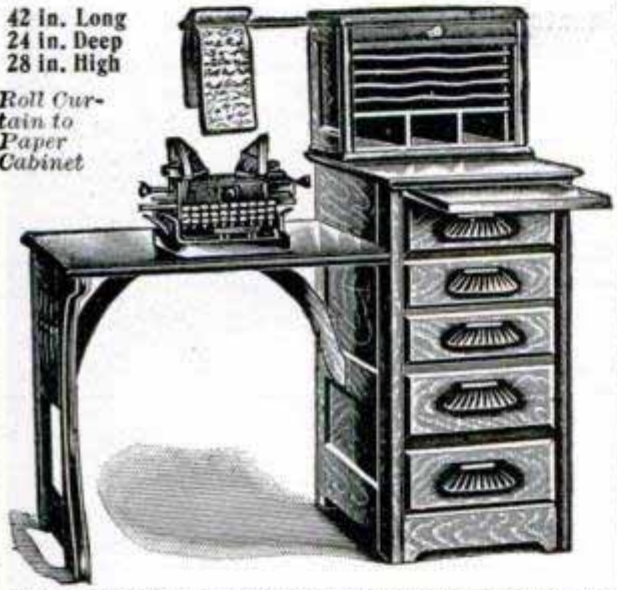

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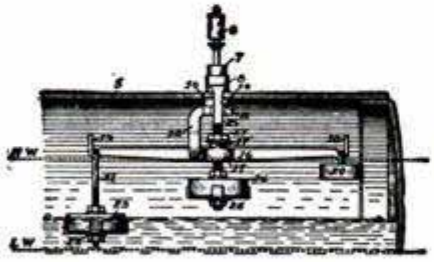

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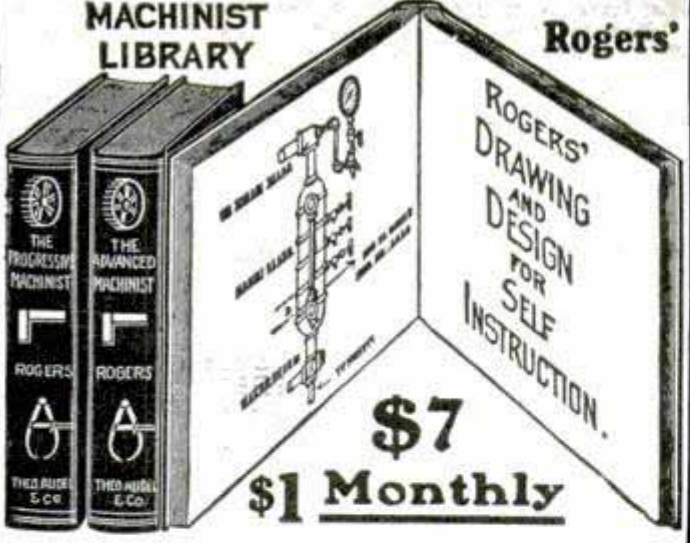

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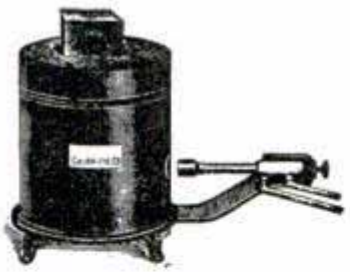
POPULAR MECHANICS PATENT BUREAU,

Journal Bldg. - - Chicago, Ill.

LAWN MOWER GRINDER.—The most difficult of all cutting knives to sharpen are doubtless the knives of the lawn mower. Any one who has ever tried to sharpen one with a file knows what an unsatisfactory job it is, and the average repair shop man would rather see almost anything else come into the shop than a lawn mower. At last a satisfactorily working grinder has appeared on the market. The hand-power grinder weighs 80 lbs., and the power grinder 95 lbs. They take knives of the largest hand mowers made; it is not necessary to remove the blades from the mower. Grinding is done with a 6-in. emery wheel of 1½-in. face. We believe this is the only machine of the kind on the market and will be a welcome and profitable addition to repair shops, although its operation is so simple any person of ordinary intelligence can operate it.

HIGH TEMPERATURE ACETYLENE FURNACE.—These furnaces are made in small sizes for chemists, assayers, jewelers and dentists, etc. Temperatures nearly equal to that of the small electric furnace, costing twenty times as much, are secured with the acetylene furnace. Will bronze, weld, melt and vulcanize. Produces heat far in excess of that possible with commercial gases. Cost of operation small. A great variety of burners for blow pipe work are obtainable.

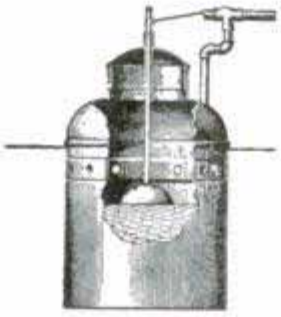


sioner of Patents reports for the fiscal year ending June 30, 1905, as follows: There were received during that year 52,323 applications for letters patent, 749 applications for designs, 174 applications for reissues, 1,846 caveats, 11,298 applications for trade-marks, 1,236 applications for labels, and 448 applications for prints. There were 30,266 patents granted, including reissues and designs; and 1,426 trade-marks, 1,028 labels, and 345 prints were registered. The number of patents that expired was 19,567. The number of allowed applications which were, by operation of law, forfeited for non-payment of the final fees was 5,154.

The total receipts of the office were $1,737,334.44, the total expenditures were $1,472,467.51, and the surplus of receipts over expenditures, being the amount turned into the treasury, was $264,866.93.

TRADE MARKS.—The Commissioner of Patents states that the new trade-mark law of February 20, 1905, which took effect April 1, has caused an enormous increase in the trade-mark work of the Patent Office. The first three months that the law was in operation 9,710 applications for registration of trade-marks were filed, and it is apparent that the office will need to increase largely the force engaged on this work. Already the division of trade-marks has required the assistance of examiners and clerks detailed from other divisions from which they could ill be spared.

AIR MOISTENER FOR FURNACE.—The man who has to put water in his furnace night and morning will hail with joy this new device, which requires no attention whatever, and is always in working condition. The moistener is installed in the furnace, and as long as there is any heat will discharge vapor direct into the hot air chamber. A float automatically opens and closes the water pipe which supplies the moistener.



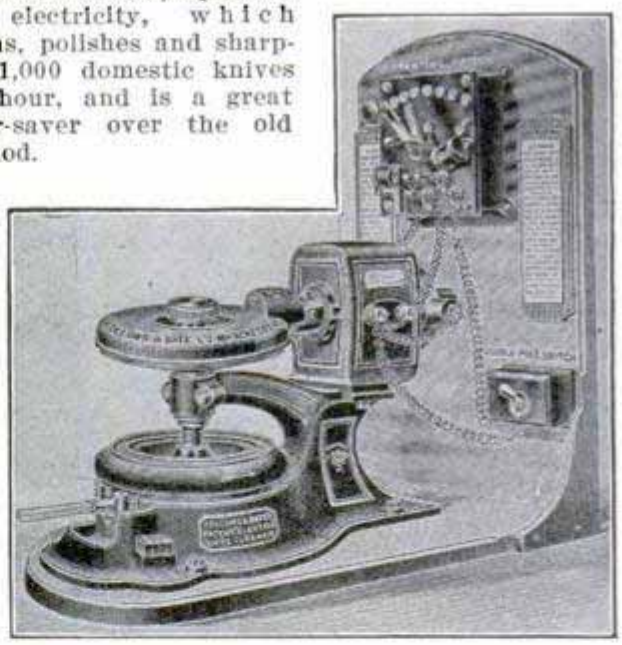
NOT REMARKABLE.—The Sunset, Iowa, Progress records that a horse in that city did a very remarkable thing, when it "pulled a plug out of the bunghole of a barrel for the purpose of slaking its thirst." Commenting on this assertion, the cynical scribe of the Buck Hill, Ark., Conservative remarks: "We do not see anything extraordinary in the occurrence. Now, if the horse had pulled the barrel out of the bunghole and slaked its thirst with the plug, or if the barrel had pulled the bunghole out of the plug and slaked its thirst with the horse, or if the plug had pulled the horse out of the barrel and slaked its thirst with the bunghole, or if the bunghole had pulled the thirst out of the horse and slaked the plug with the barrel, or if the barrel had pulled the horse out of the bunghole and plugged its thirst with a slake, it might be worth while to make some fuss over it."

BALLOON TRIP TO NORTH POLE.—Walter Wellman, newspaper correspondent, who has had some arctic experience, announces plans for a dash to the north pole in an airship, under the auspices of the Chicago Record-Herald. Santos Dumont is expected to go in the capacity of airship operator. A special motor airship is to be built and taken as far north as possible, and then inflated and launched for a trip which may occupy several weeks. The attempt is to be made in the summer when daylight is continuous in the Arctics. Scientific men and Arctic explorers are divided in their opinions as to the possibility of success. Gen. Greeley, U. S. A., makes the eminently practical suggestion that until the contemplated airship has made some successful trip, such as New York to Leavenworth, it would be wise to keep this side the Arctic circle with balloon cruising.

200,000 PIANOS IN 1905.—The reports from American manufacturers show that the output during the past year was 200,000 pianos. Thirty years ago, 1875, only 12,000 pianos were made in this country.

NOT A MACHINIST.—A machinist's helper, a native of the Green Island, was promoted to the position of foreman of laborers, and, full of importance, he looked around to discover an opportunity of showing his authority. The shop sweeper happened to come along. "F'wat are yez doin'?" inquired the newly appointed superior officer. "I'm wheeling a barrow," replied the sweeper. "Put it down," said the boss laborer, "and go and get a shovel. F'wat does the likes o' you know about machinery?"—Ry. & Locomotive Engineering.

ELECTRIC KNIFE CLEANER.—This is an English machine, operated by electricity, which cleans, polishes and sharpens 1,000 domestic knives per hour, and is a great labor-saver over the old method.



The public library of Chicago is delivering books by a motor car at one-third the cost of the former horse service.

MARINE TURBINES A SUCCESS.—It is announced that the Cunard company is so well satisfied with the performance of the Carmania, that the order has been signed for a turbine equipment for the two steamers now building. Each vessel will have 75,000 h.p. consisting of four units of 18,000 h.p. each.

PATENT PAID $1,000,000.—Joseph F. Glidden recently celebrated his 97th birthday at his home in De Kalb, Ill. He secured a patent on barbed wire which netted him, before the patent expired, more than $1,000,000 in royalties. He had a desperate struggle to get the business started. The first attempt was a small wooden block with brads driven in, which was fastened to the wire by means of staples. One day while putting up a section of fence two wires became twisted, which suggested the holding of the block in that way and doing away with the staples. A man named Rose patented the sharp, bevel-pointed barb and received $60,000 for his idea. Glidden then twisted this barb into two long wires and the barbed wire fence was born. Long and discouraging efforts were made before $5,000 was raised to build the first factory. After some months the first big order came in by telegraph from Texas, for a carload. It was thought a mistake had been made. But in confirming the order the customer increased it to three carloads. Since then millions of dollars have been made out of barbed wire, which is in use all over the world.

As showing the protection afforded by the patent laws to an inventor who has a strong patent, several United States courts of appeal have recently decided that an inventor can control the manner of using his patented device or machine even after he has sold it. For instance, the patentee of a machine for fastening buttons on shoes sold the machine under contract by which the purchaser agreed to buy all the staples used in the machine from the patentee. There was no patent on the staples, but nevertheless the court held that unless the purchaser of the patented machine bought the staples used in the machine from the patentee he infringed the patent rights of the inventor.

In another case, the owner of a store bought a certain number of patented machines under contract that he was not to sell the machines for less than a stipulated price. After getting the machines he violated the contract and sold them at cut prices, and the United States court held that this was not only a violation of the contract, but it was an infringement of the patent rights of the manufacturer of the machine.

A friend is a person who knows all about you and likes you all the same.

THINGS A BOY SHOULD KNOW ABOUT ELECTRICITY. By Thomas M. St. John. Size, 12 mo.; 179 pages; 259 illustrations; cloth. Price, $1.00. Thomas M. St. John.

Any boy interested in electricity will be delighted with this book which gives a great deal of information on the subject in an interesting manner, and so that a boy can easily understand it. Many interesting experiments are given and the book is attractively and profusely illustrated.

THE STUDY OF ELEMENTARY ELECTRICITY AND MAGNETISM BY EXPERIMENT. By Thomas M. St. John. Size, 12 mo.; 220 pages; 168 illustrations; cloth. Price $1.25. Thomas M. St. John.

Amateurs, students and others who wish to take up a systematic course of elementary electrical experiments at home or in school, will find this book admirably adapted to their purpose. Inexpensive apparatus is required for some of the experiments, remembering that the individual is not liable to buy such apparatus as an institution would provide. Much of the apparatus the student can make himself with additional benefit.

SIMPLE REMEDY FOR SNAKE BITE.—Permanganate of potassium has been discovered by Dr. Leonard Rogers of India to be an efficacious remedy for snake bite where it is used in less than four or five hours after the person is bitten. Twelve cases were treated; ten successfully. Five of those cured were bitten by cobras and two by vipers; in three cases the snake was not identified. In the fatal cases treatment was not given until nine and eleven hours after the person was bitten.

Anyone can apply this remedy. Permanganate of potassium can be procured at any drug store and a pound would cure 750 people, or more. A ligature is applied above the wound and an incision made over the snake bite with any clean, sharp-cutting instrument. Then a few grains of the permanganate is rubbed on.

PRACTICAL PATTERN MAKING. By F. W. Barrows. Illustrated; 300 pages; cloth. Price $2.00. The Norman W. Henley Publishing Co., New York.

This is a very complete and entirely practical treatise on the subject of pattern making, both in wood and metal. The book is made up of material gathered from the personal experience of the writer, and is full of useful hints and original ideas. The work is profusely illustrated with actual working drawings, and the explanations show how to avoid many of the difficulties which beset the path of the pattern maker.

A section is devoted to rules, formulas and tables, containing simple and original methods for finding the weight of castings, both from the pattern itself and from the drawings. This section contains some new and practical formulas, which will be found very useful in estimating weights, with the accuracy required for quotations to prospective customers. All of these rules are simple, and can be put to practical use by the ordinary, every-day man, and they have been proved by years of actual use.

The final section gives some very plain rules for keeping down the cost of patterns; with a complete system for checking the cost of and marking the patterns; and a card record showing what the pattern is, material used, where located in safe, with its cost and date of production. This section concludes with an original and practical method for the inventory and valuation of patterns.

A BLIND COUNTERFEITER.—One of the most skillful counterfeiters ever arrested is a blind man who was captured by government officers a few weeks ago. He is known as the "man with the velvet touch," and could engrave a die for making counterfeit coins by passing his fingers over a good coin and thus securing the mental impression of its details.

Before going to the expense of applying for a patent, every inventor should have his invention compared with all patents in the line of his invention with a view of determining whether or not there is sufficient novelty in his invention to warrant taking out a patent. Occasionally a very slight difference in construction or operation will render an invention valuable over other inventions of the same character, but as a rule unless the difference is sufficient to make the invention cheaper or better than the similar inventions which have been patented, it will not pay to take out a patent. A competent and reliable patent attorney can usually decide such questions for his client and will not advise taking out patents merely for the sake of getting the patent fees. It is, of course, difficult to know in advance of an actual test whether a certain device or machine will be commercially successful. Very much, of course, depends upon how the article is placed on the market. Some devices that appear to be unnecessary and not any better than similar devices previously patented, prove to be very profitable simply because they are introduced properly and in a business-like manner. Inventors as a rule do not know how to market their inventions and many times they defeat their own success by refusing to recognize the value of the service of the manufacturer or other person who has the means and ability to successfully introduce the invented article. The inventor who is ingenious and practical in his mechanical ideas and who has a fair amount of business ability is almost certain to succeed. It is a well-known fact that there is no way by which a poor man with brains can succeed more rapidly and surely than through a good invention covered by a strong patent.

CONSTANT ENGINE INDICATOR.—This instrument gives a constant reading of the load on the engine in plain figures, and also sounds an alarm when the load exceeds any predetermined maximum. The indicating finger travels over a graduated score. The indicator is calibrated to the engine at the time it is attached, after which a simple test will verify its correctness at any time.

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COMPRESSED AIR: ITS PRODUCTION, USES AND APPLICATIONS. By Gardner D. Hiscox, M. E. 4th edition, revised and enlarged; 820 pages; 545 illustrations; cloth. Price, $5. The most thorough and comprehensive treatise on the subject of compressed air that has ever been published. Well printed and substantial. No phase of the subject is omitted. Is a complete compendium in 36 chapters, valuable for reference and for study. Contents: The physical and operative properties of air from a vacuum to its liquid state; its thermo-dynamics; compression, transmission and uses as a motive power in operation of stationary and portable machinery in engineering, mining and manufacturing work; air tools; air lifts; pumping of water, acids and oils; the air blast for cleaning and painting; the sand blast and its work; and the numerous appliances in which compressed air is a most convenient and economical transmitter of power for mechanical work, railway propulsion, refrigeration and the various uses to which compressed air has been applied. Contains a list of patents on compressed air from 1875 to date, and 40 tables of the physical properties of air, its compression, expansion and the volumes required for various kinds of work.

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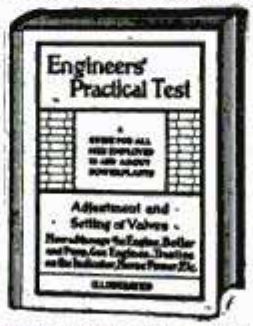

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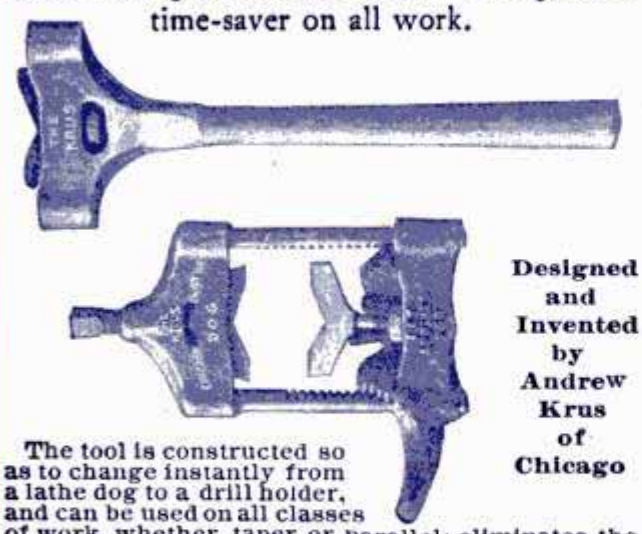

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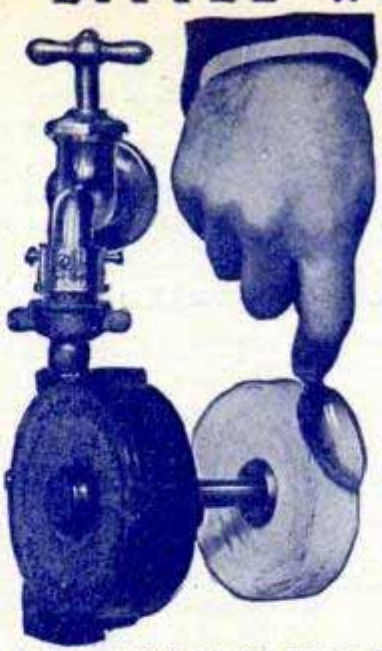

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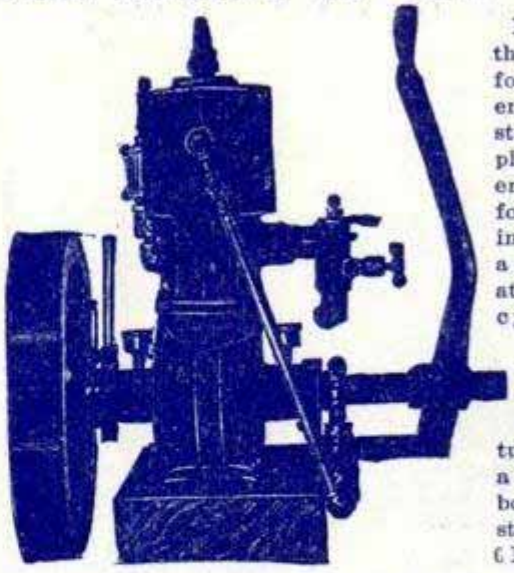

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