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This Issue
75,000

SEPTEMBER, 1906

VOL. VIII. NO. 9

Price
10 cts.

POPULAR MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT

LARGEST CIRCULATION OF ANY MECHANICAL PUBLICATION IN THE WORLD

SEPTEMBER, 1906

POPULAR MECHANICS

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

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

SUBSCRIPTION, $1.00 PER YEAR

MAILED POSTAGE FULLY PREPAID TO ANY ADDRESS IN THE WORLD

All subscriptions are discontinued at expiration
Please examine the date printed on your wrapper

Published Monthly by POPULAR MECHANICS COMPANY
Entered as mail matter of the second class at the postoffice at Chicago, Ill.

Eastern Advertising Office, : : : : 116 Nassau St., New York

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BIG PROFITS MAKE BIG ...DIVIDENDS...

The Kornit Manufacturing Company is receiving letters and calls by almost every mail from different manufacturers who wish to buy KORNIT to use in their business. One rubber manufacturer in Newark, where our factory is situated, told Mr. Emanuel, our factory manager, the other day, that he was just as anxious as we were to have the time come when we could sell him all the KORNIT he needed, for it would save him many thousands of dollars every year by using KORNIT instead of hard rubber. This is the reason we are advancing the price of shares from ten to twelve dollars on Sept. 1. I feel assured that we will have a market for KORNIT just as fast as we can produce it. Here is indeed what I consider one of the best opportunities to make an investment, which will pay enormous dividends, that will ever be presented to you. Buy now while you can at the present price.

A FINANCIAL OPPORTUNITY

By President CHARLES E. ELLIS

KORNIT was invented by JOHANN GUSTAV BIERICH, a subject of the Czar of Russia, residing at Menkenhof, near Lievenhof, 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 today 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, cutouts, 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 vul-

canized 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 today principally only for fertilizing purposes. There is one town alone, Leominster, Mass., where they have an average of eight tons

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

of horn shavings every day. The 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 of 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.

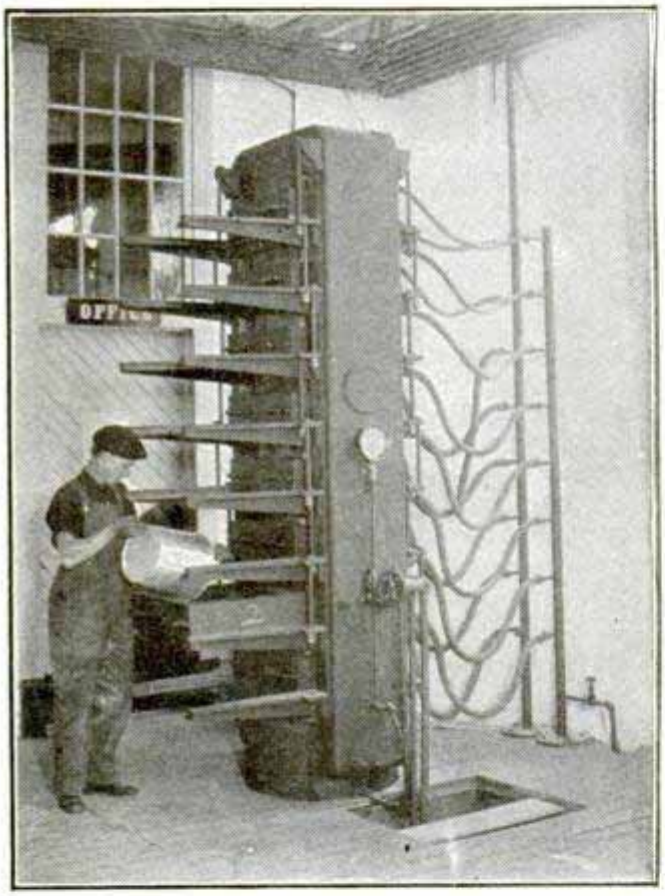
The Great Demand for Kornit in this Country

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 country. You may be interested to know that a panel board is a small switchboard. There is one or more on 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 are 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 will be 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 THAT, FROM YEAR TO YEAR, THE DIVIDENDS EARNED WILL BECOME LARGER AND 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



ONE OF THE HEAVY HYDRAULIC PRESSES IN KORNIT FACTORY WITH PRESSURE OF 720 TONS.

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 TODAY. 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 Complete in Every Detail

WE have a fine factory in Newark, N. J. (BELLEVILLE STATION), in a most excellent location, handy to the cars and also to the shipping. Our Factory is entirely completed and we are manufacturing perfect Kornit slabs.

This is one of the important epochs in *my life*, and I firmly believe in the history of the manufacturing business in this country.

MR. KURT BIERICH, the son of the inventor, who is a graduate of FREIBURG UNIVERSITY, GERMANY, arrived here from Russia on the 12th of May, to take full charge of the scientific conduct-

If you will carefully cast over in your mind and pick out twenty of the wealthiest people you personally know you will find in each case that it is a fact that years ago each one of these persons, or their ancestors, learned how to make a little money do a whole lot of work, and that now they and their children reap the benefit in a golden harvest.

You can do the same. Only you must make a beginning. Here is a financial opportunity. Take advantage of it now—not tomorrow, but right now, today. You are making money. Why not invest a little and later on reap the benefit. It is the wise thing to do, and the wise and thoughtful people who are doing it are the ones that live in ease.

ing of our 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 BROUGHT TO COMPLETION IN THE MOST SATISFACTORY MANNER. MR. BIERICH, JR., will have full charge of the KORNIT FACTORY IN THIS COUNTRY. KORNIT WILL QUICKLY BECOME A WELL KNOWN AND UNIVERSALLY USED ARTICLE IN ELECTRICAL AND OTHER TRADES OF THIS COUNTRY, EARNING AND PAYING LARGE AND SATISFACTORY DIVIDENDS EACH AND EVERY SIX MONTHS. A few shares obtained at the present price may be the foundation of 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 at the

present price. 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.

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 other's interests. I WILL BE GRATEFUL IF YOU WILL WRITE ME TODAY, so that I may know just what you will do. I predict that after *Kornit* has been on the market for a year that the *further advance* in price of the shares will be fully equal to that which occurred in Bell Telephone shares.

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 raw material, which is now almost practically thrown away. Join me in this investment at the present price of shares 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."

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

My Offer to You Today

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. 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 WILL BUY ONE HUNDRED SHARES, AND SO ON. *On and after September first the price of shares will advance to twelve dollars ($12.00) each.* 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 at the present price of $10 each 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 LIFETIME. 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, before the price advances, which will be the first of next month. 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 ten dollar 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 two tons of Kornit a day for the first year, and made a profit of only $200 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 more than 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 shares 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. All letters bearing postmark prior to September 1 will entitle writer to present price.

MR. KURT BIERICH, THE SON OF THE INVENTOR OF KORNIT WHO ARRIVED HERE DIRECT FROM RUSSIA MAY 12, AND WHO IS NOW DEVOTING HIS ENTIRE TIME AT THE KORNIT FACTORY AT NEWARK (BELLEVILLE STATION), N. J.

Please let me hear from you before the price advances to $12 per share.

Yours very truly,

CHARLES E. ELLIS

PRESIDENT

717B Temple Court, NEW YORK CITY

[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. 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.]

BUILT TO BAKE

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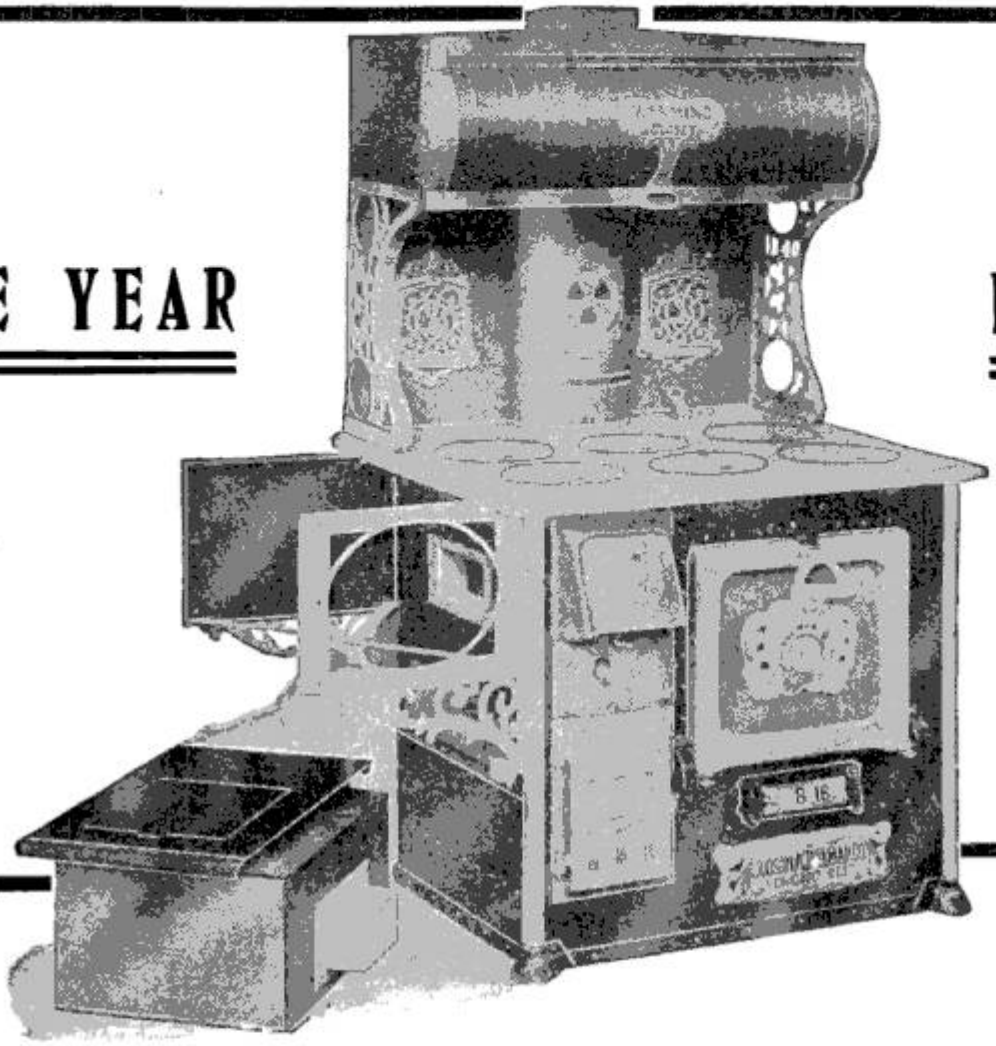

WE want to prove to you, at *our risk,* in *your own* home, without any obligation on your part *whatever,* that Tolman Ranges are *absolute range perfection* and that one in your home will cut the *fuel bill and housework in half.* Let us explain to you how we sell direct to you from our factory at

ACTUAL WHOLESALE PRICES

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

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1. The range that will bake, heat and endure.
2. The range that is REALLY economical.
3. The range which turns the gases and smoke into BAKING HEAT.
4. The range that has an OLD ESTABLISHED, REPUTABLE manufacturer behind it.
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The riveting, the mounting, the finishing are all done BY HAND, by skilled workmen, under the personal direction of our PRESIDENT. We guarantee that there is not a better range made today, and few AS GOOD.

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

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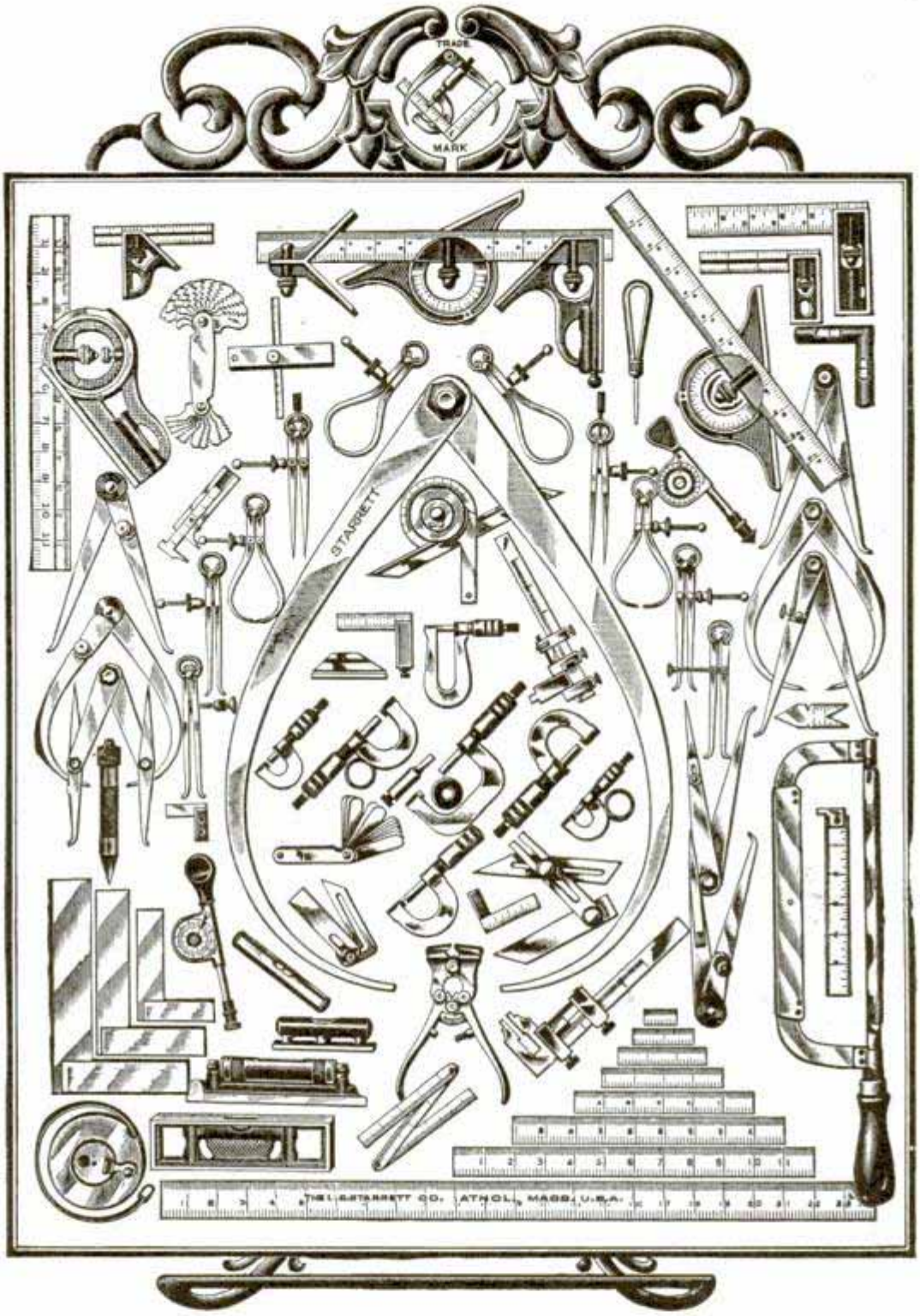

STARRETT TOOLS are accurate time and labor saving devices for meeting mechanical needs--short cuts through mechanical difficulties--they are recognized by amateur and professional mechanics as the standard for accuracy, workmanship, design and finish. Send for free Catalogue No. 17AP, of the largest line of fine mechanical tools.

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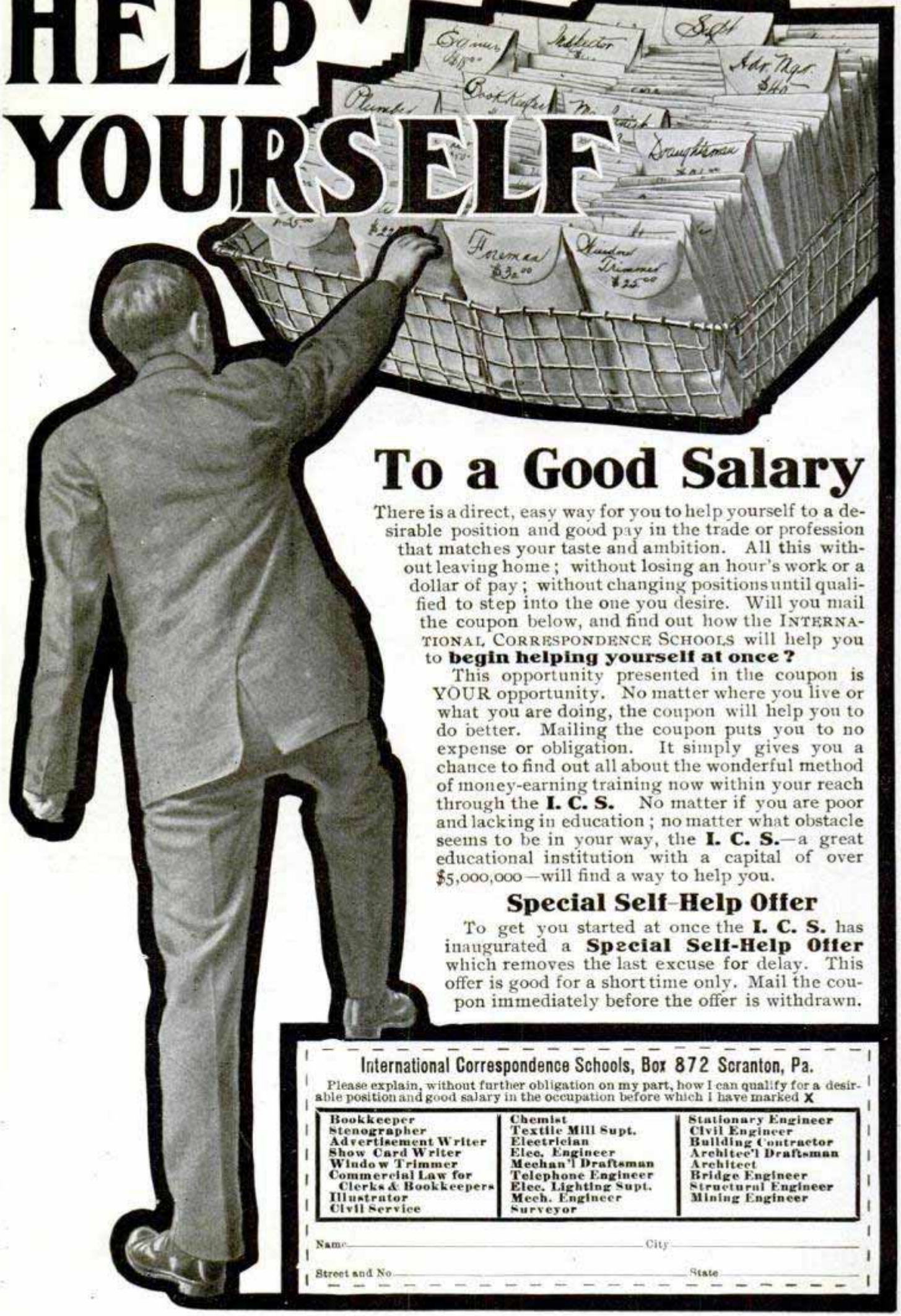
HELP YOURSELF



To a Good Salary

There is a direct, easy way for you to help yourself to a desirable position and good pay in the trade or profession that matches your taste and ambition. All this without leaving home; without losing an hour's work or a dollar of pay; without changing positions until qualified to step into the one you desire. Will you mail the coupon below, and find out how the INTERNATIONAL CORRESPONDENCE SCHOOLS will help you to **begin helping yourself at once?**

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Special Self-Help Offer

To get you started at once the **I. C. S.** has inaugurated a **Special Self-Help Offer** which removes the last excuse for delay. This offer is good for a short time only. Mail the coupon immediately before the offer is withdrawn.

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Please explain, without further obligation on my part, how I can qualify for a desirable position and good salary in the occupation before which I have marked X

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Commercial Law for Clerks & Bookkeepers	Telephone Engineer	Bridge Engineer
Illustrator	Elec. Lighting Supt.	Structural Engineer
Civil Service	Mech. Engineer	Mining Engineer
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Name _____ City _____

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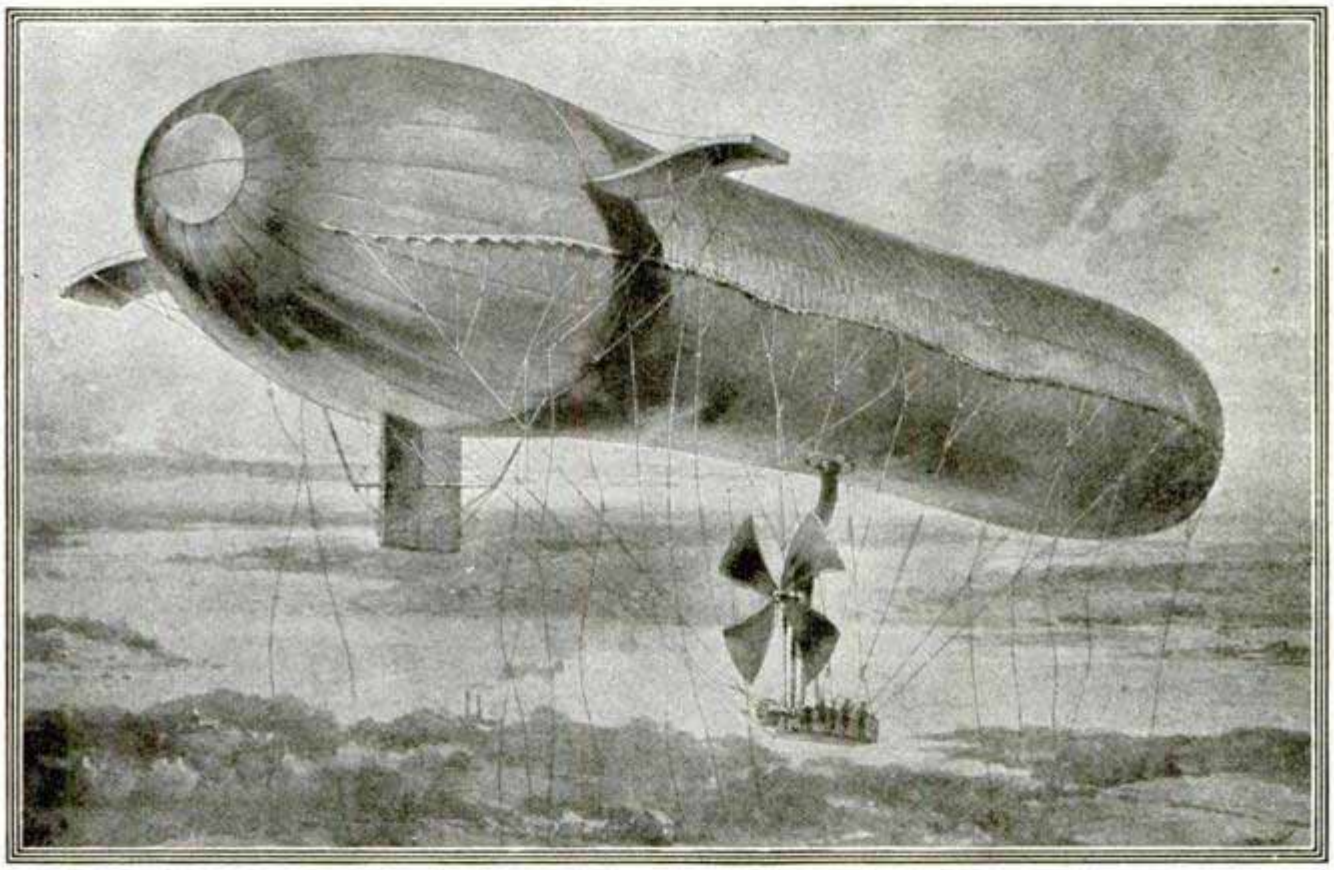
POPULAR MECHANICS

Vol. 8. No. 9 CHICAGO, SEPTEMBER, 1906. 10 Cents a copy $1.00 a year.

MAMMOTH MILITARY AIRSHIP

The Next War Between Great Powers Will Surely Include Conflicts in Mid-Air and Beneath the Sea

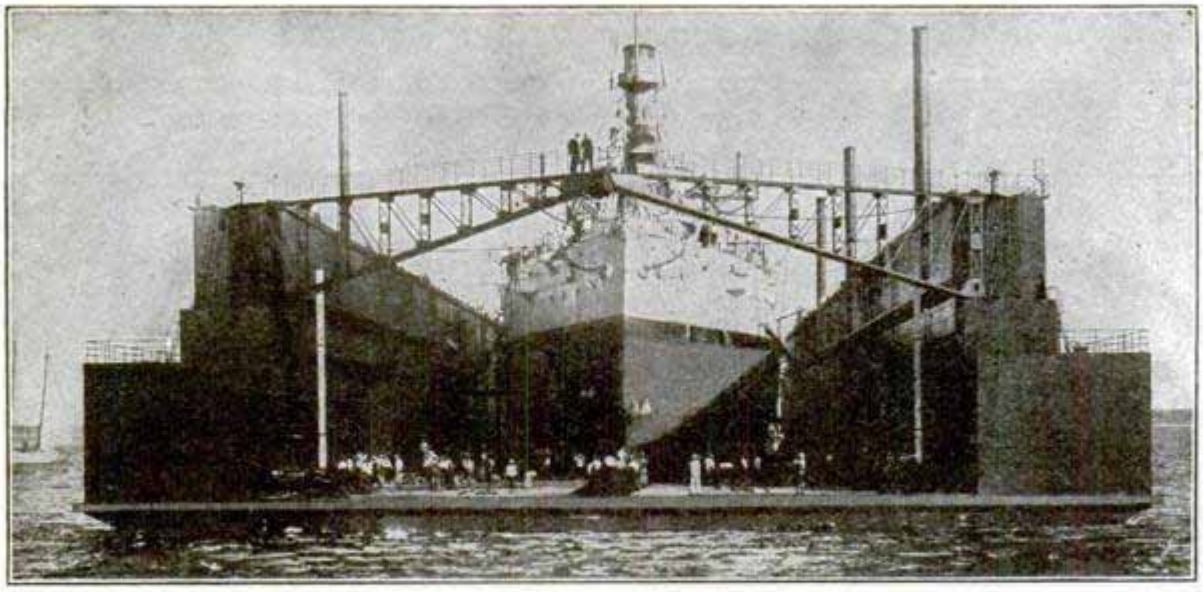


Latest Military Balloon--160 Ft. Long

Germany, ever foremost in military affairs, has added one of the strangest appearing air-craft ever constructed to her army equipment. The envelope of this new war-balloon is 160 ft. long, torpedo-shaped and fitted with a rudder underneath and two horizontal planes at the sides, forward, which serve to preserve equilibrium and give it the appearance of a sea monster out of its natural element. Within the gas envelope are two small balloons into which air is pumped by the motor and which are used instead of framework to hold the gas envelope rigid. The basket which is suspended from the middle, carries a 90-hp. motor which both keeps the small balloons inflated with air and drives the screw. The balloon was invented by Major von Perseval, who claims it can be deflated and packed up quicker than any other now in existence.

In maneuvers before the German Minister of War and a large number of military officers, it is said the balloon rose to a height of 300 yds. and was directed and controlled as desired. It was made to describe a figure eight eight times in succession and finally was landed easily and without a jerk. Those who made the ascent were the inventor, two chauffeurs to attend the motors and Captain von Krogh at the rudder.

DRY DOCK "DEWEY" COMPLETES LONG VOYAGE



A Great Floating Machine Shop

The dry dock "Dewey" has safely completed its long voyage of over 14,000 miles from Chesapeake Bay to the Philippine Islands, and is now anchored in 65 ft. of water off Rivera Point at Olongopo naval station. Four huge mushroom anchors are used at each end of the big dock and the depth of water enables all large vessels to reach it safely.

The "Dewey" left Baltimore on the 28th of December, 1905—several months later than had been expected—and was 196 days, or about six and one-half months, on her way, arriving at the Philippines July 11 of the present year. The trip was a matter of interest to naval officials of all the great powers. The dock is equipped with wireless apparatus, and by this means her progress and safety were reported from time to time. It was necessary to widen the Suez canal for the passage of the dock.

In rough water the old method of pouring oil on the waves to smooth them was resorted to, but not with the usual satisfactory results. The oil did destroy the crest of the waves and reduce the amount of water that came aboard, but it also came back on the decks of the tugs and made them so slippery that its use had to be discontinued.

The dry dock "Dewey" is an important factor in the new naval station now being established at Port Olongopo. At present all materials for repairs are brought from Cavite, but this will not be necessary for long. Elaborate coaling facilities are to be provided at Port Olongopo and eight big buildings, a city block in length and half as wide, are to be erected as shops. There will also be quarters for officers and men and a big recreation ground. The harbor will be heavily fortified and the total expenditure involved is about $10,000,000.

GLASGOW QUITS TELEPHONE BUSINESS

The city of Glasgow, where municipal ownership of public utilities is general, has given up its telephone department and sold the plant at a loss of $200,000.

The London Electrical Review says: "Notwithstanding all the clamor made by the municipal enthusiasts, all the talk about cheap and efficient service, all the ingeniously arranged figures in the accounts and statistics, it has been evident for a long time past that the Glasgow telephone venture has proved an ignominious failure. * * * That the Glasgow corporation would sell their telephone system if they saw the least hope of working it at a profit, or of maintaining their ground in the competition, is not to be imagined for a moment. The sale means that the corporation realize that the position is hopeless, and are glad of the opportunity of retiring—without the honors of war."

In rebuilding the electric line connecting Oakland, Cal., and a suburb, Mateo, it was found the two places had been moved 12 ft. nearer each other by the earthquake.

ALL-RAIL ROUTE, LONDON TO NEW YORK

Submarine Tunnel of 30 Miles to Connect England and France--Another Tunnel of 38 Miles Between Siberia and Alaska

From New York to London by 12 days' travel in a palace car without change is the dream of ambitious railway engineers. Moreover, the dream is likely to come true before many years, as the best expert engineering minds in the world, after exhaustive study, have pronounced the daring conception not only possible, but involving less serious problems in tunnel construction than others which are already built and in daily use.

The idea of a submarine tunnel between Siberia and Alaska has recently received much attention in Russia, in spite of the distractions that government has experienced of late. Neither is the plan as new as generally supposed, for it was discussed nearly 30 years ago, and in 1886 our own geological survey reported on the subject to the United States Senate. Mr. Powell, who made the report, stated the undertaking involved—at that time—no greater difficulties than those which existed during the construction of our first transcontinental railway, and since then great improvement has been made in tunnel work. The original idea was to bridge the straits, taking advantage of the several islands which are directly in the route selected.

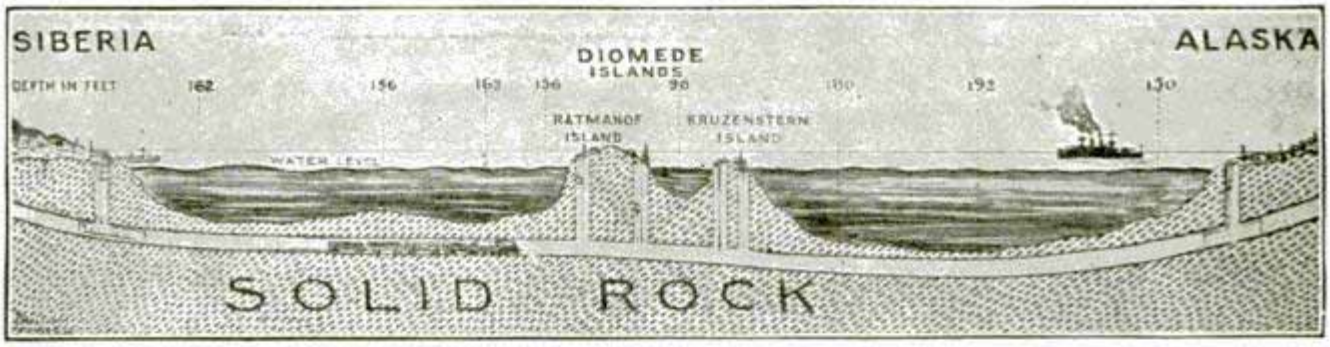
The advance in tunnel work has taken the bridge feature out of the conditions, and all engineers now agree on the tunnel as the only way.

From East Cape, Siberia, to Prince of Wales Cape, Alaska, is 38 miles, passing through the islands of Diomede and the island of Kruzenstern. The prime mover in the enterprise is a French engineer, M. de Lobel, who has studied the subject for years, and who only recently received an interested hearing at the Russian court.

The tunnel under the English channel would be about 30 miles long. This project also dates back 30 years and the company which has a concession from the French government some years ago bored 5,900 ft. of test tunnel and has spent over half a million dollars. Little work has been done since 1894, during which year the British government raised such strenuous objection to the work that boring was discontinued.

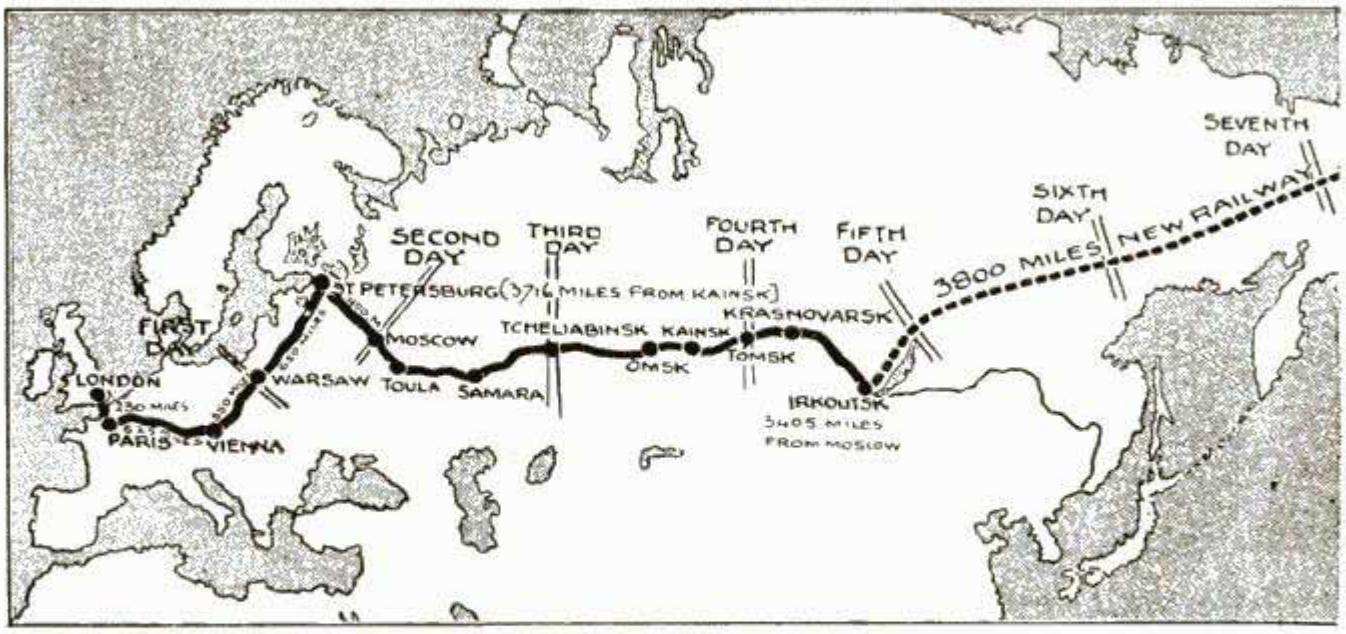
The proposed route and distances are:

	Miles.
London to Paris	230
Paris to Vienna	625
Vienna to Warsaw	350
Warsaw to St. Petersburg	650
St. Petersburg to Moscow	400
Moscow to Irkoutsk	3,405
Irkoutsk to East Cape (Behring Sts.), to be built	3,800
Across Behring Straits	38
Cape Prince of Wales, Alaska, to Vancouver, B. C., to be built	2,300
Vancouver to Montreal	2,209
Montreal to New York	310
Total	14,317



Plan of the Proposed Behring Strait Tunnel

For years past the English Channel has been to engineers as was an unconquered nation to Alexander. It offered a field for brilliant achievement; the lure of Progress rose like a sea siren out of its seething waters and beckoned them to dare great deeds. And again and again that weird call has stirred to restiveness the hearts of the English and the French peoples; but ever the cautious islanders, feeling themselves doubly fortified against foreign invasion because of their insular position, hesitated to link themselves by a land route with the



From London to New York

European continent, and in their trepidation the cause was lost. But the great achievements of the present age, the assurance given by the world's best engineers that the project is wholly feasible and the amicable relationship now existing between England and France have aroused a great enthusiasm for the enterprise on both sides of the channel waters, and the English government is taking measures to authorize its execution—the French government, with all the *sang-froid* of that race, has long been ready to take it up at a moment's notice.

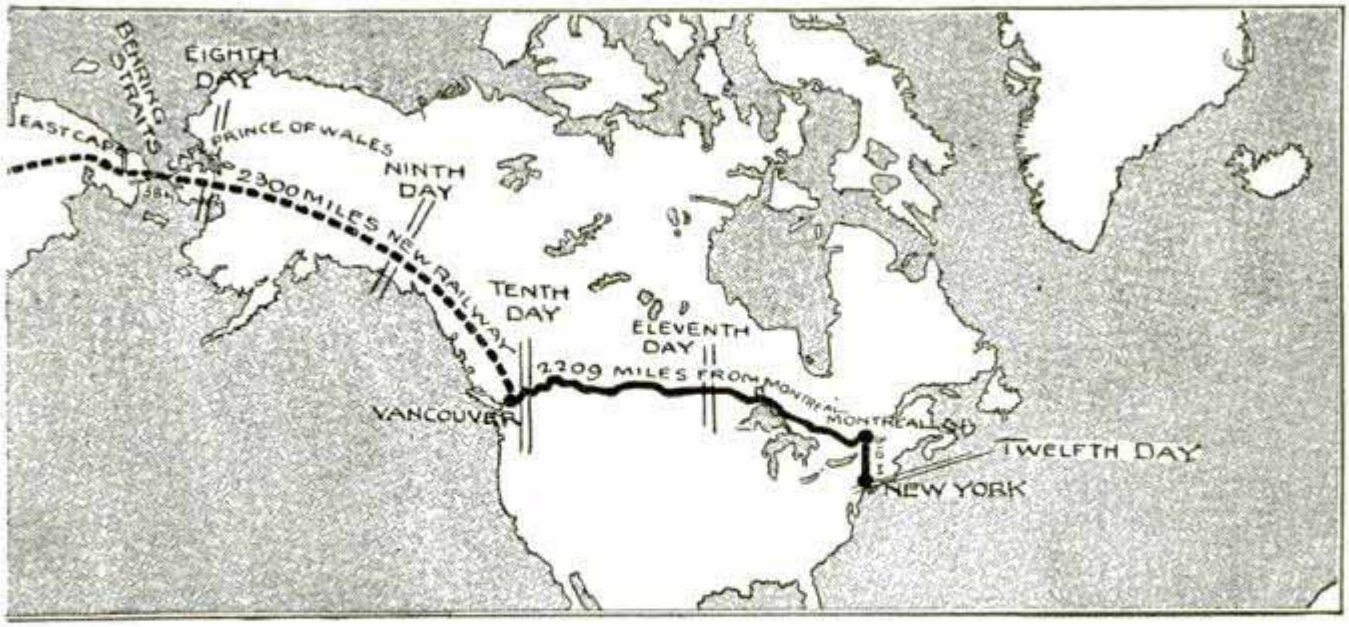
As an engineering enterprise, according to M. Albert Sartiaux, general manager of the Northern Railway of France, the construction of a channel tunnel presents no greater difficulties than did the construction of the Simplon tunnel. The channel tunnel would be longer, but there would be no danger from infiltration and no such high temperatures to be dealt with as there were in the Simplon. However, the difficulties of removal of waste would be greater. M. Sartiaux discusses the project at length:

"Soundings and borings made in 1876 and 1877 gave assurance of the regular succession of strata under the bed of the channel, as they are visible upon the opposite cliffs, that they were without 'fault' at any point, and these assurances were confirmed by the test boring. The several strata are superimposed in curves of large radius and without fissures. The thicknesses of the several strata are practically constant as they appear upon the exposed cliffs. The cenomanian stratum is clearly marked as suitable for tunnel construction. It is about 170 ft. thick and about 140 ft. of the upper part is impermeable. This depth is sufficient for a circular tunnel of from 15 to 20 ft. in diameter without danger from the pressure above and at a sufficient distance from the water bearing strata below. From the information afforded by the test galleries opened in 1883 at Sangatte and Folkstone it appears that the entrance of water would not exceed the capacity of a moderate pumping outfit. In the coal mines of the north of France the least inflow of water is found in this stratum.

"It is more difficult to lay out the course of the tunnel than to bore it. It must be done by feeling the way, keeping constantly at a certain distance from the treacherous strata above and below. The task is much facilitated by the fact that the use of electricity would permit the adoption of sharper curves and heavier grades than would be possible with other motive power.

"The tunnel should be built in two independent galleries. Even with the favorable conditions anticipated it might not be prudent to construct a single tunnel 27 to 30 ft. wide and 18 to 21 ft. high. It is infinitely preferable to adopt the plan of two passages 16 to 18 ft. in diameter each and perhaps 50 ft. apart, which would thus have no effect upon each other, while the tubular form would afford the greatest resistance to external pressure. However, the two passages should communicate every 300 ft., for example.

"For the longitudinal profile there are two possibilities: One assuring drainage by the double passage which will serve for two tracks; the other making the drainage gallery independent of the railway tunnels.



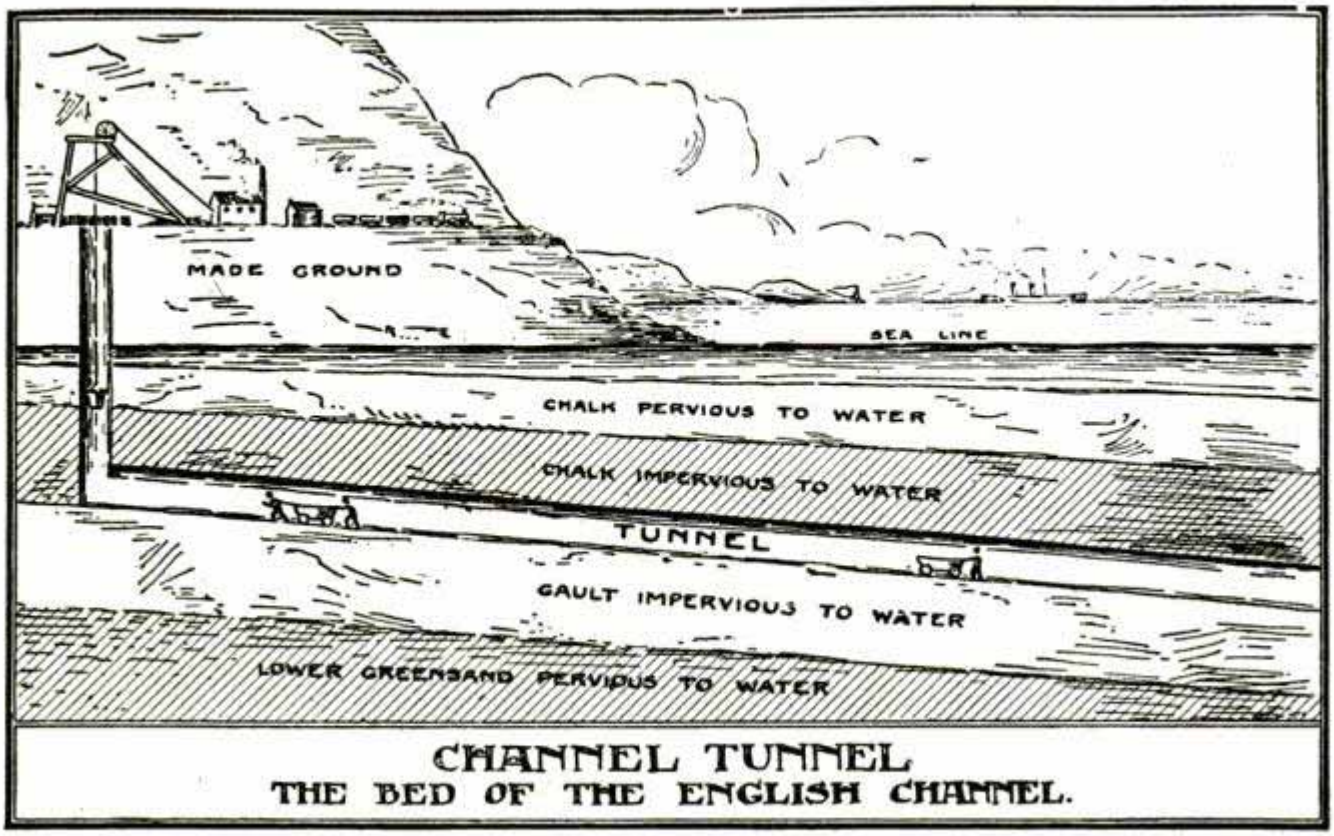
by Rail in 12 Days' Time

To the first plan there is a fatal objection. It forces the adoption of a hump profile; that is, making the highest point in the tunnel at the middle with the lowest points at the ends, whence the water would be pumped. These are precisely the points at which the level of the tunnel should rise or be subject to a material prolongation and grades which would reach the maximum compatible with the adoption of electric traction. The second plan is the one that has been considered from the first with all the more reason that the drainage gallery would serve during the construction of the tunnel for the removal of waste material. For this purpose this gallery should be made about 10 ft. in diameter, and from it would lead branches to the tunnel proper, as described further on.

"Once provided with a suitable passage for drainage the tunnel proper would require a hump profile only for its middle section of only a few thousand yards in length; from this section it would rise upon a gently increasing slope to the portals.

"The work would begin with the drainage passage, having its lowest point in and sloping toward a well or pit upon the bank from which waste material would be hoisted and water pumped. In brief, the course of the work would be as follows: The drainage tunnel having been constructed to approximately the middle of the channel, the boring of the tunnel proper would proceed from this point toward the shore. As the course of the latter inclines upwardly as it progresses, water of infiltration would flow back and into the drainage tunnel, and as the amount of water would increase with the progress of construction, this should be taken into consideration in estimating the capacity of the drainage tunnel. With a fixed section, the capacity can be varied by giving a greater inclination toward the point of discharge upon the shore. In order to follow closely the direction of the strata of gray chalk in which the work would be carried on, the line of the drainage tunnel and of the tunnel proper would diverge from the starting point in the middle of the channel.

"In the lack of absolute knowledge as to the conformation of the strata, the drainage tunnel would serve for test purposes, from which the thickness of the strata above and below could be ascertained at intervals of from 300 to 500 ft., or about once a week at the estimated progress of boring. If the result of any tests should prove unsatisfactory the actual course of the tunnel could be varied without departing from the theoretical profile, making the tunnel more or less sinuous. In this manner the actual character of the stratum through which the tunnel is to pass would be reconnoitered, and this knowledge would be further increased by the transverse passages which would be constructed to intersect the course of the tunnel proper at as many points as might be deemed necessary, and from each one of which work could be carried on independently, working in each case toward the shore. According to the number of these branches and consequently the number of points from which the work could be carried on consecutively, the time required for the piercing of the entire tunnel is estimated at from five to eight years.



CHANNEL TUNNEL
THE BED OF THE ENGLISH CHANNEL.

"From the traffic standpoint the relations between England and the continent are developed to a very slight extent. It amounts only to about 1,200,000 passengers by all routes, although there is upon one hand the population of 42 millions of Great Britain and upon the other over 100 millions, counting only France, Italy and Central Europe. This smallness of traffic is attributed almost wholly to objection to the water passage, since between France, with 40 millions of inhabitants, and Belgium, Holland and that part of Germany served by way of Cologne, with hardly 50 millions, the annual traffic amounts to over four millions.

"If the tunnel were ready for operation today, it is evident that it would divert nearly all passengers from the lines to Boulogne and Calais, but it is possible that it would have little effect upon the lines from Southampton to Saint Malo. If it is admitted that it would carry 90 per cent of those now traveling by way of Calais and Boulogne, 70 per cent of those by way of Dieppe, 50 per cent of those by Ostend, 20 per cent of those by Flessingue and 5 per cent of those by other lines, there would be at once a patronage of 900,000 passengers for the tunnel. But by the time within which the tunnel could be completed, this figure, with the proper allowance for natural increase based upon previous statistics, would amount to 1,200,000 passengers. This is the minimum. It is not a matter of doubt that the number would reach five to six millions in a very few years.

"In the matter of freight, estimates vary from 1,500,000 to 5,500,000 tons per year. This would include most of the merchandise denominated as fast freight, but there would probably be little effect upon slow freight. It is certain that the traffic would support the operation of the tunnel, but it is also certain that at least at first the traffic would be far from dense, amounting to 20 or 30 passenger trains and 30 to 40 freight trains per day in both directions."

The military objection so long raised by Great Britain would be met by keeping a considerable force of men at the tunnel entrance at all times, and it is far from probable that an enemy could succeed in sending troops through, even unexpectedly—as in times of profound peace.

The great advantages of unrestricted international intercourse involved in the question are hardly to be over-emphasized. The dread of seasickness has kept traffic at its lowest point; but with an electrically lighted tunnel and electric cars, the tourist and the Londoner and the Parisian will think nothing of the little ride between the two shores. Then, too, the shipment of merchandise now entails two additional handlings going in either direction which would be rendered unnecessary with a tunnel route at an estimated saving of $1.25 per ton.

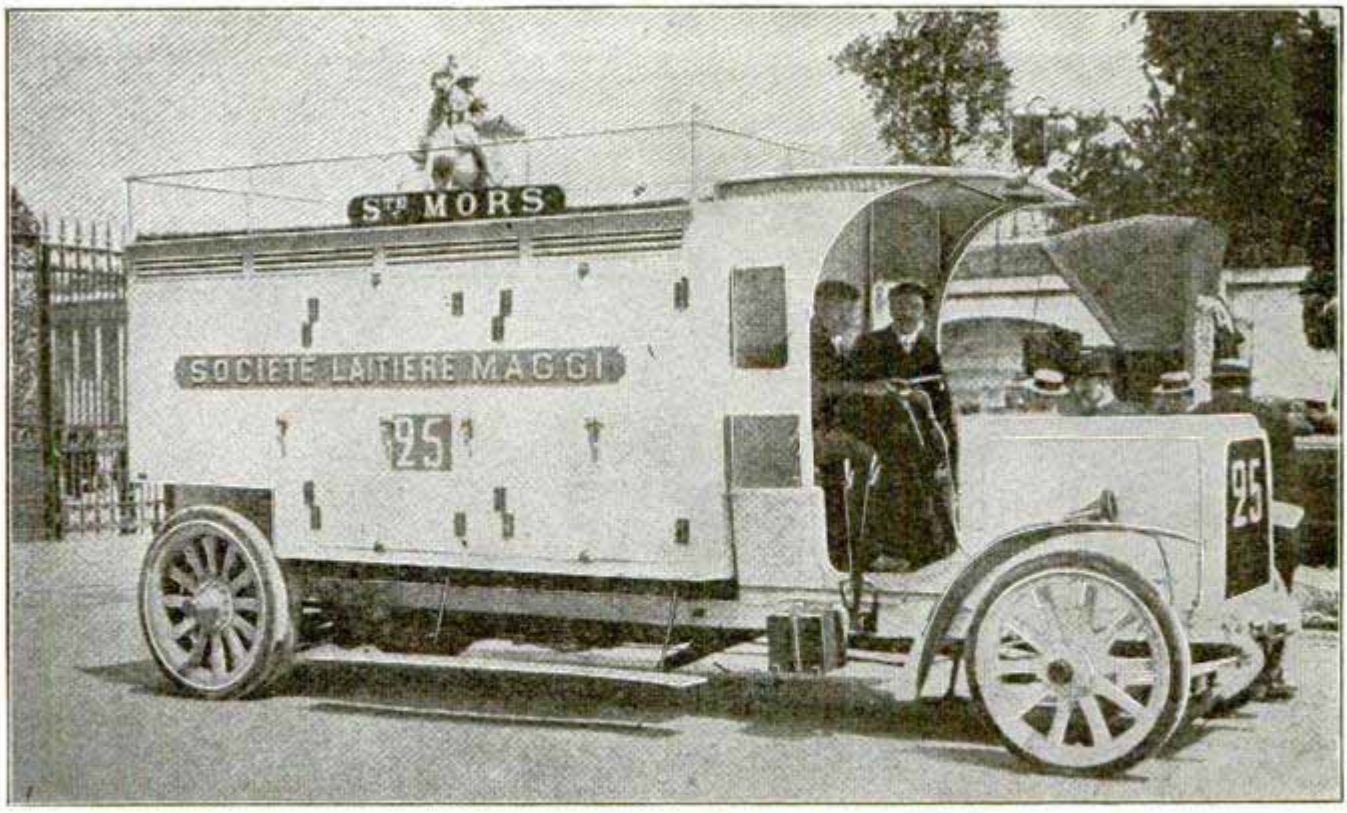
The next link to be forged in the international route is a 3,800-mile railway line across Siberia's frozen interior. That Russia in her time of stress and with her fear of political intrigue and her disapproval of

American independence should consider linking the two continents is, to say the least, unexpected. The new railway would be an extension of the Trans-Siberian line which now terminates at Irkoutsk. The difficulties of construction owing to rigorous climate and lack of facilities for transporting material would be great, but not prohibitively so. This part of the journey, probably the least enjoyable, would occupy only a little more than three days.

As stated previously, the old plan of bridging Behring strait, using the Diomede islands as central points of support, has been abandoned entirely with the improved methods of tunnel construction. This undersea tunnel would be 38 miles in length, pierced through solid rock and with a depth of 192 ft. of water above it at one point, yet the time required for construction is estimated at only four years and the cost would be about $250,000,000. It is said the excavated material would not exceed that taken out for the New York Underground. Naturally both Russia and the United States would establish military stations at their respective entrances to the tunnel.

From Behring strait to Vancouver, B. C., is a distance of 2,300 miles to be covered by a steam railway line which will connect with our transcontinental routes and make them a part of the international line. The advantages accruing to the United States from such a line are apparent to the American at a glance. The most northerly railway in Alaska at present is the Council City and Solomon River road which has been built over the frozen ground and serves the transit of gold-miners, but the new line will go far north of this, forming a trail of civilization through a now almost inaccessible region.

It is estimated that at a speed of 50 miles an hour, the distance of 14,317 miles between New York and London could be covered in just 12 days. One of the great difficulties is the carrying of supplies for the trip into the frozen interiors of Alaska and Siberia. Not only would it be necessary to provide for the round trip, as it would be impossible and prohibitively expensive to procure supplies in these regions, but it would also be necessary to establish supply stations for relief in case of protracted blockades from heavy snows. But as the lines would be operated independently, both the Russian and the American systems would share this burden.



THE FINEST MILK WAGON IN THE WORLD IS IN PARIS. IT IS A 24-HP. MOTOR WAGON, PAINTED PURE WHITE; IS VENTILATED AND COOLED, AND ATTRACTS ATTENTION WHEREVER IT GOES.

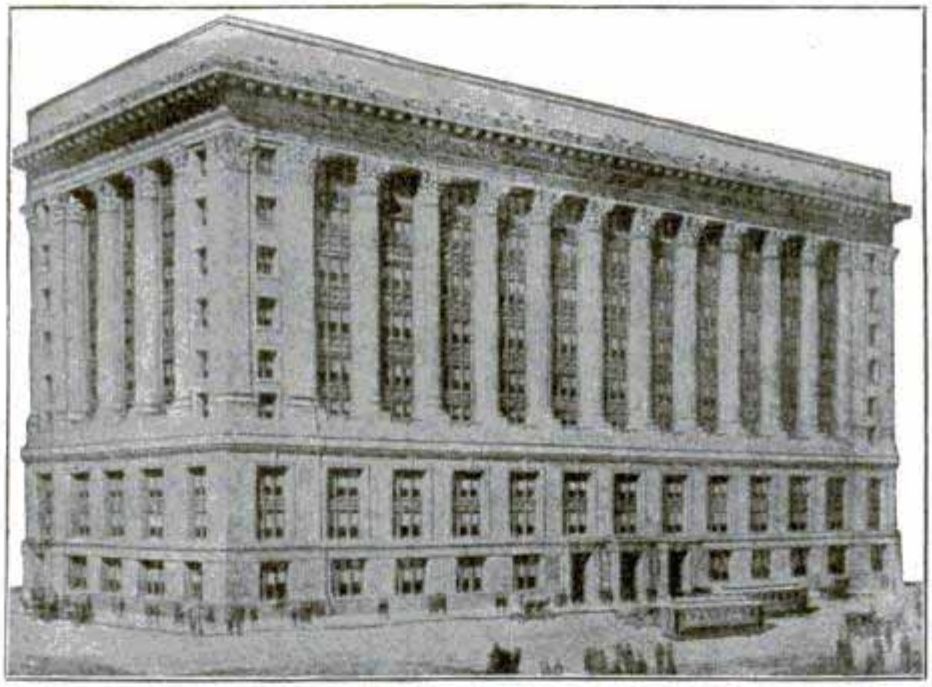
A SKYSCRAPER COURT HOUSE

First Public Building to Adopt Modern Office Construction

The new court house now under construction in Chicago marks the change from the heavy, super-ornate and extravagantly expensive type of public buildings which has characterized county and state buildings for years past. Hereafter structures of this kind are likely to be erected more in accordance with the best office buildings, and greater attention paid to light, ventilation, convenience and utility and less to producing simply an external exhibit of massiveness or ornament.

The Chicago court house will be steel frame construction, 12 stories high, faced with granite. It occupies half a block in the heart of the city, being 157 ft. by 374 ft. The concrete pillar foundations were described in the August issue of this magazine. They extend down 120 ft. to bedrock. The building will be 205 ft. high and cost $5,000,000. The columns form part of the walls, windows being placed between but not behind them.

Not only will there be a great gain in space but the light will be much superior to the old style public building.



New Type of Public Building

Wireless telegraphy is now ten years old. Marconi's first patent was taken out in England, June 2, 1896.

AIR PROPELLERS FOR BOATS

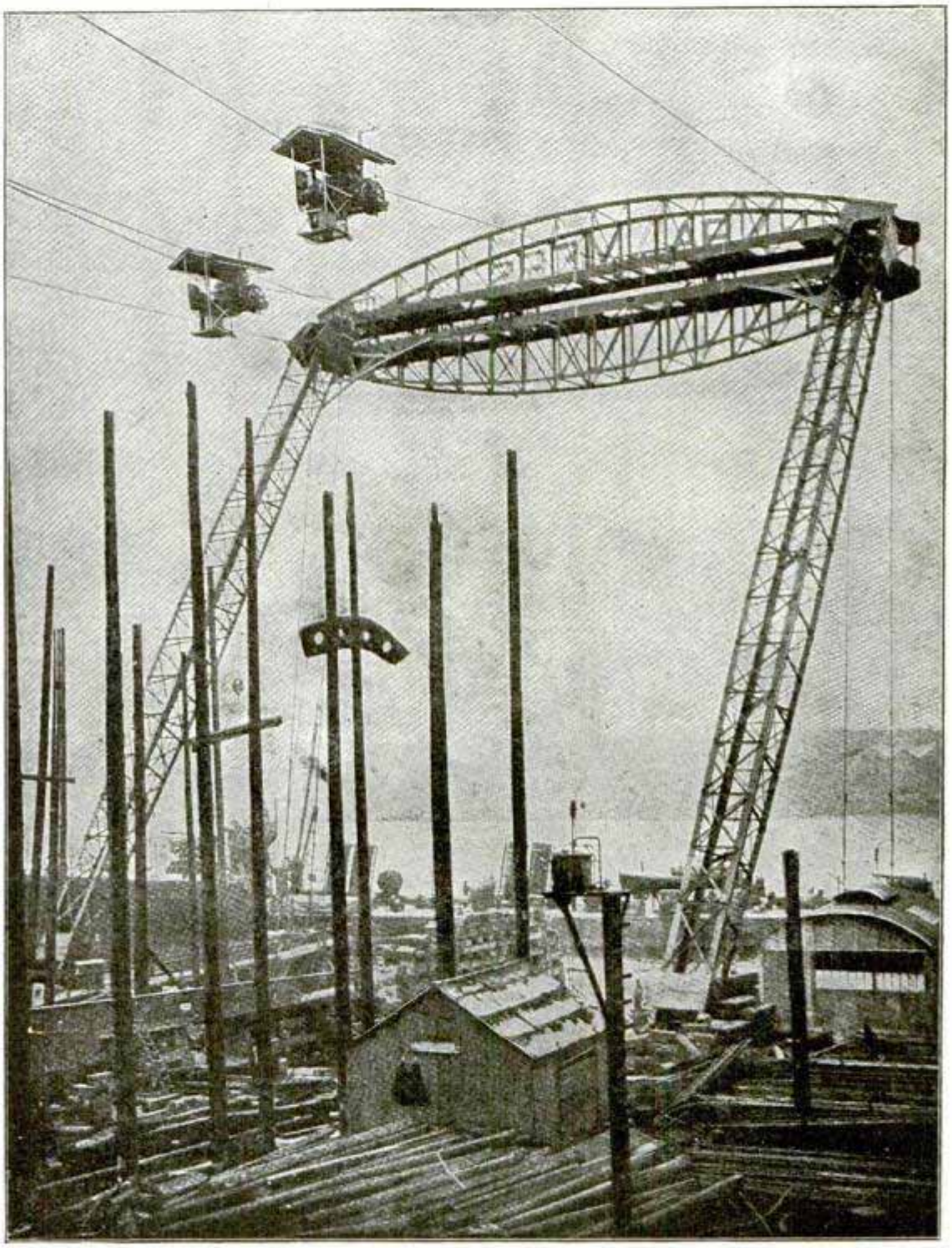
Not Considered Practicable as Motive Power

Discussing the subject of propelling a boat by means of an air propeller, a writer in the London Shipping World says: "Mr. Holzapfel's analogy to a sailing ship being driven along by the wind does not help matters, as the conditions are quite different. I did not understand that he wished to make an artificial wind by means of fans and set up sails to catch the pressure from such a wind, but that he wished to set up fans in the air to act in the same way as a propeller acts in water, viz., to get a forward thrust by projecting a stream of air astern. I still believe that the forward thrust obtainable in this way would be of small amount compared with the power that would be necessary. We have an exact analogy in the case of an airship, and here the propellers have to be of very large dimensions to do the work required, and for such a ship the resistance is very small, compared with that of a body in water. Mr. Holzapfel could readily put his ideas to the test by putting a table fan on to a model ship and observing the result. I do not think he can mean to put a propeller fan on board to drive air forward against a transverse sail or plane. This would be something like getting on a rowboat and pushing against one of the thwarts and expecting the boat to go along."

CABLEWAY USED IN SHIP CONSTRUCTION

For the transport of material on to the slip an English shipbuilding firm is using overhead cableways, which it claims are far superior to cantilever cranes in point of utility and also more economical.

says The Shipping World, London, "the trolley can move fore and aft at a speed of 60 ft. per minute and transverse travel 25 ft. per minute." All the movements and the lifting of the weight are controlled from the



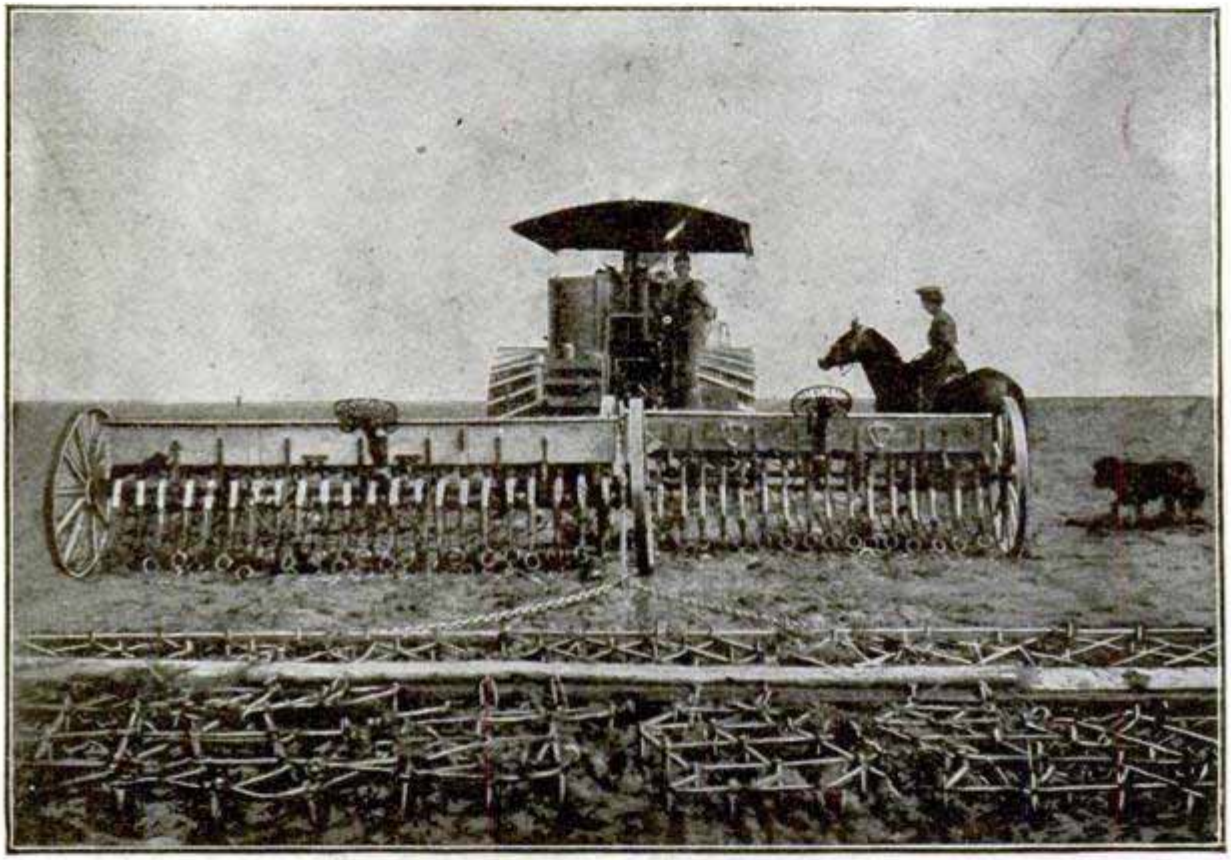
The Operators Ride in the Little Cabs

The installation consists of two structures hanging outwards at the head and foot of the slip, between which are strung cableways. A trolley capable of lifting 3 tons is hung on each cable. "With this weight,"

car on the trolley and when the 3-ton limit is exceeded all three trolleys can be used to lift the same weight. The apparatus is absolutely steady. It was used in the construction of the battleship "Lord Nelson."

SOWING WHEAT WITH GASOLINE TRACTION ENGINE

One of the bonanza farmers in the great Saskatchewan valley in Western Canada used a traction engine for plowing and disking, and afterwards employed the same power in planting. The Farm Implement News says: "The farm comprises several hundred acres on which wheat is raised. The traction engine was used in sowing the wheat, using two 12-ft. drills, followed by a 24-ft. steel harrow."



Courtesy Bart-Parr Co.

Sowing Wheat in Saskatchewan with Gasoline Traction Engine

The gasoline engine furnishes the power for the complete process of plowing, disking, planting, harrowing, reaping, threshing and hauling to market. During the winter it furnishes the power for running a mill where feed is ground.

AUTOS TO CARRY BOSTON MAIL

Almost every day some new application of the motor car decreases the number of horses in use in our cities. Plans are nearly completed for a motor car service in Boston to run between the main postoffice and the 25 substations in the city and nearby suburbs. Some of these stations are 8 miles from the postoffice.

FREE CLOTHES BAGS FOR LADY TRAVELERS

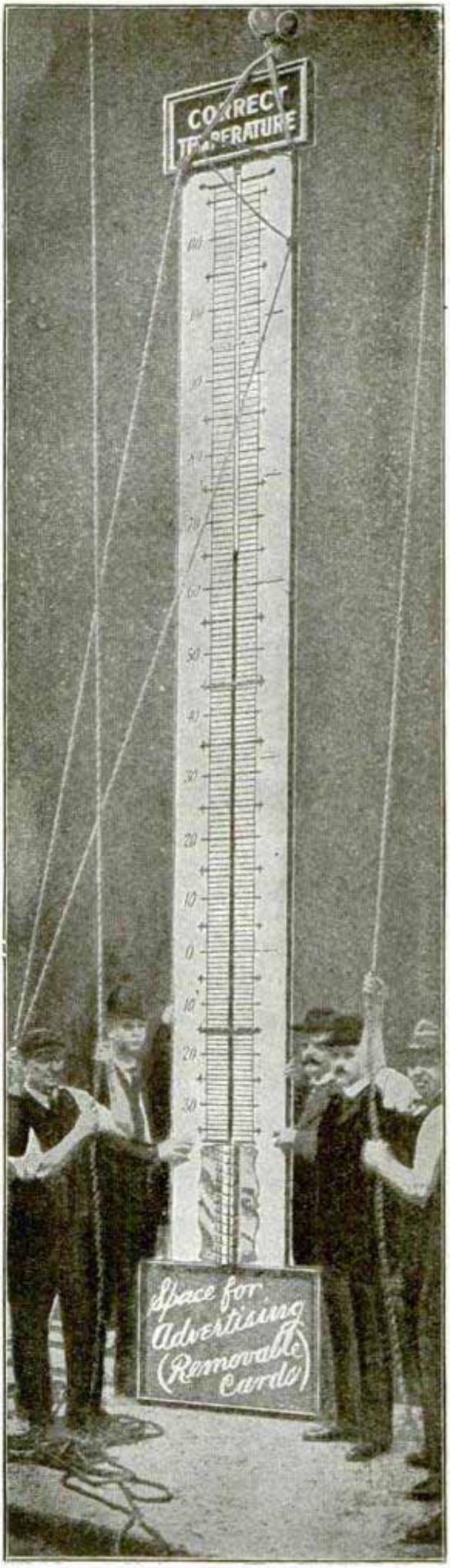
Here is an idea which will be instantly appreciated by the ladies who travel. The general passenger agent of the Northern Pacific railroad has invented a clothes bag made of tough paper, into which the traveler can put hats and such garments as are not in use on the car, or upon retiring for the night. When the articles are in the bag the top is closed with puckering strings, which keep out the dust. The bag can then be hung up out of the way and is strong enough to sustain the weight of several articles. At the end of the journey it folds up and can be put in the satchel for use another time. Now why didn't somebody think of this before?

GREAT INDUSTRIAL ACTIVITY

From one manufacturing town in Indiana comes the report that 5,000 men and boys could be employed in that place alone. All the factories are behind on their orders and cannot keep up with the demand on account of inability to secure enough workmen. The skilled mechanic was never in greater demand than now.

THERMOMETER 20 FEET HIGH

The largest thermometer in the world, 20 ft. high, with figures big enough to be read a block away, has been made in Rochester, N. Y., for a Boston druggist. The glass tube is 16 ft. long, and ten tubes were made and broken before a perfect one was secured. The instrument is very accurate and registers from 35° below zero to 115° above, says the Optical Journal.



CASTING HOUSES OF CONCRETE

Considerable interest has been aroused by the interviews with Thomas A. Edison, who has a plan to cast houses in moulds in one solid piece of concrete. In his enthusiasm the newspaper correspondent goes so far as to cast the house with fireplaces, mantles, bath tubs, and even cement pipes for water and gas. All this might be possible of accomplishment, but as improbable as it is unnecessary.

The idea is little more than an elaboration of things which are already well known in cement construction. Foundations for walls, smoke stacks, heavy machinery, bridge piers, etc., cast in one solid piece of concrete, are being made every day. The steam railroads are making culverts, retaining walls for track elevation and even large arch bridges in one piece, or very large pieces; much larger than the material required for an 8 or 10-room house.

Large buildings, including churches, theaters and office buildings, are now being erected of cement reinforced with iron rods or strips. In these cases the moulds are not made for the entire building but for a few feet at a time. Edison places the cost of a set of moulds for a house at $25,000, which can be used over and over again. Four days is allowed for the concrete pouring and setting.

In process and principle the casting of a concrete house is little different from that of making the 200-bbl. jugs for cisterns, described in our July number. The use of moulds for making the foundations, outside walls and partitions would seem to offer advantages for quick and cheap construction as the mixing and elevating of the concrete would be done by power and the tamping by comparatively unskilled labor. Moulds for making blocks, fence posts, water troughs, curbing, cisterns, and many other articles are already on the market. We may therefore expect the forms for a cottage in the near future.

RAILROADS IN JAPAN

Japan has completed 5,000 miles of steam railway. The event was the occasion of a great celebration held in Nagoya, in which prominent government officials and railway managers took part and inspiring patriotism was displayed.

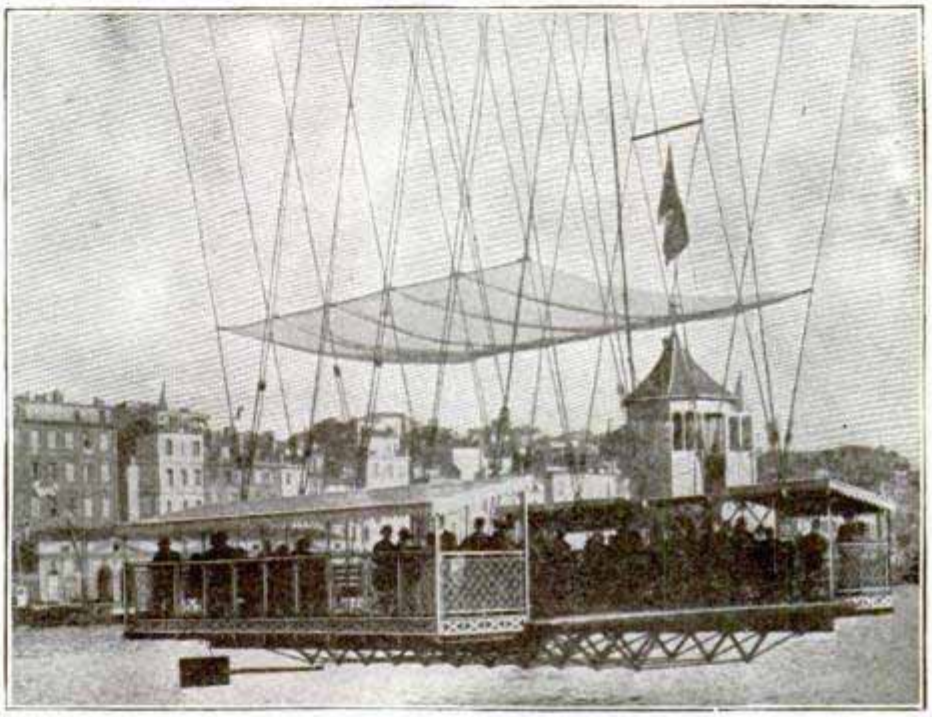
ELECTRICAL AERIAL FERRY AT MARSEILLES, FRANCE

An electrically operated aerial ferry nas been completed across the Dieux Port, at Marseilles, France, and is now in operation as a ferry for passengers, freight and vehicles. It is sufficiently high to permit the free passage of all shipping. The car is supported by steel cables suspended from a trolley running on rails on the cantilever.

The bridge is 805 ft. long and 164 ft. above the water. Height to top of towers, 284 ft. A winding stairway in each tower leads to observation houses, and foot passengers can cross the 12-ft. walk from one side to the other. Passengers and sheep, says the Western Electrician, pay 1 cent fare each; horses, mules, cows and vehicles, 10 cents each; automobiles, 50 cents.

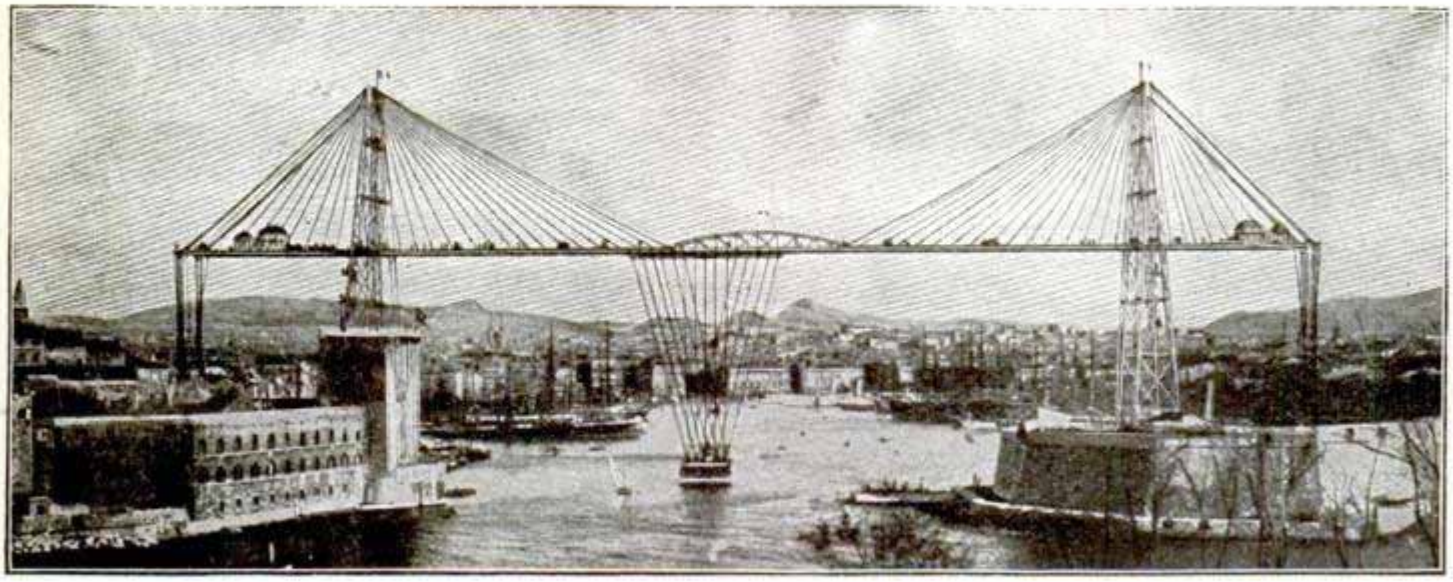
CLEARING LAND OF STUMPS

To clear stump land costs as high as $200 an acre. Where dynamite is used the cost for explosive is from 30 to 50 cents per stump. Stump pullers will work on soft woods. On the Pacific coast, where the stumps are of mammoth size, a donkey engine, blocks and steel cable are used. A method much used years ago was to fasten a big log 20 ft. long to the stump and hitch two teams of horses to the end.

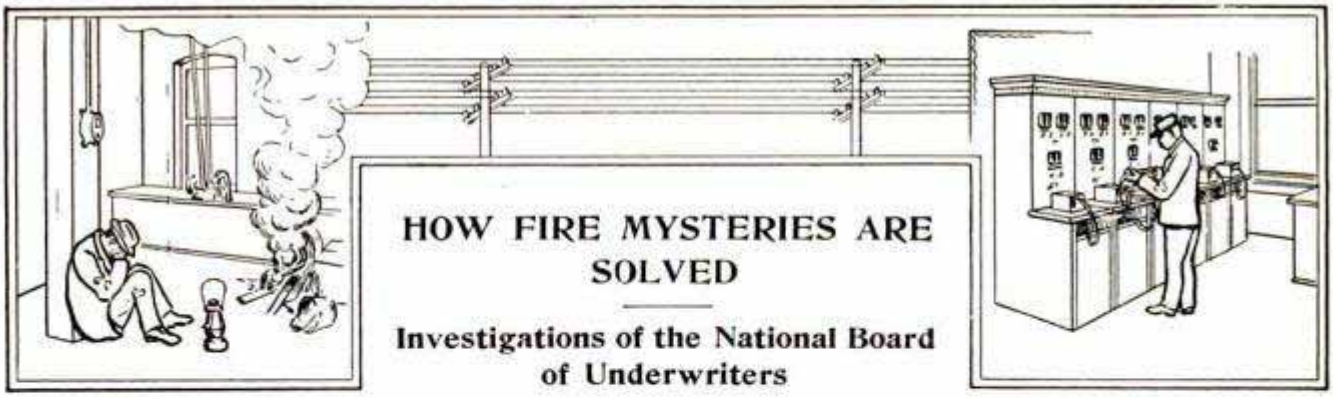


Ferry Car Crossing River

The fastest vessel of her class in the United States navy is the battleship "Georgia." Her record run was made at a speed of 19.26 knots per hour.



Electric Aerial Ferry at Marseilles



HOW FIRE MYSTERIES ARE SOLVED

Investigations of the National Board of Underwriters

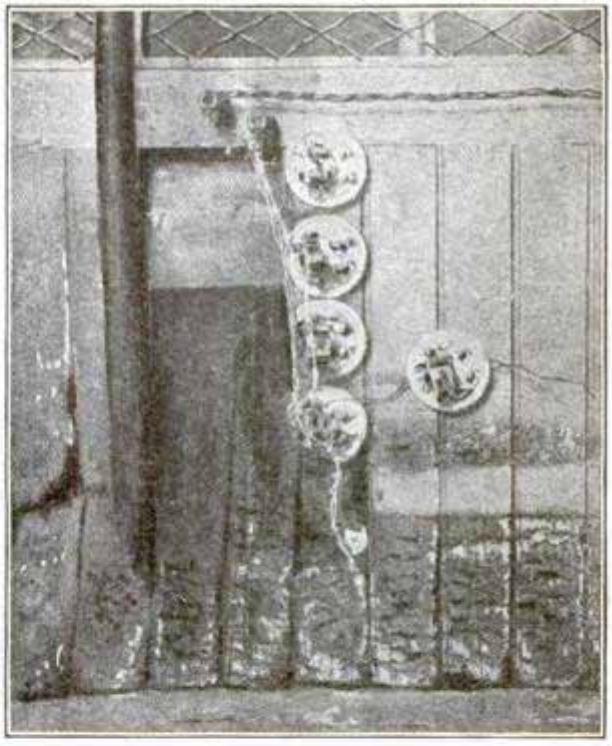
The fact that the danger of fire is less today than ever before is due chiefly to the requirements of the insurance underwriters. As the rates for fire insurance are based on the degree of risk from destruction by fire of the property insured, the fire insurance underwriters who make these rates must know what constitutes a safe risk. They must know the conditions that tend to make a building fireproof and must be able to determine the chances of fire in a building which is not fireproof. They must be able to judge correctly the degree of protection furnished by sprinkler systems and other extinguishing apparatus and must determine the reliability of all fire-alarm systems.

So great did the demand among insurance interests become for definite and accurate knowledge of these points that there was established a bureau of investigation known as the Fire Insurance Underwriters' Laboratories where experts study, test, investigate and report the degree of efficiency and safety of various materials, devices and methods which are claimed to make buildings immune against fire.

The building in which these tests are performed is a perfect model of fireproof construction. The floors are of tile and cement and the doors are made of sheet copper filled with noncombustible material. All the window, door and skylight frames, sash, etc., are made of sheet metal and all glass is wired. Even the office appliances are fireproof; the desks, filing cases, and shelves being made of sheet metal. It was deemed necessary to take all these precautions, as many of the experiments are of a very dangerous nature.

A careful record is kept of all fires that occur and whenever possible the cause of the fire is noted and filed away in a classified list. As the records extend over a period of many years, the risk arising from any given cause can be accurately determined.

It appears from these observations that electricity, which so effectually aids in preventing general conflagrations, is also a great source of danger. When two line wires become crossed, one of which is a very high voltage circuit and the other low voltage, the current travels along the low voltage wire and, entering a building, encounters some low voltage apparatus such as a switch, motor, fuse, or other device and forms an arc, which is very likely to start a fire. The accompanying illustration shows one of the many burnouts which have been



Results of Cross Between Trolley and Telephone Wires

caused by crossed wires. In this instance a telephone line a mile distant became crossed with a trolley wire and the telephone line, not being provided with fuses, brought the trolley current into the building where it fused the wires and started the fire as shown, the loss being in this case $3,300.

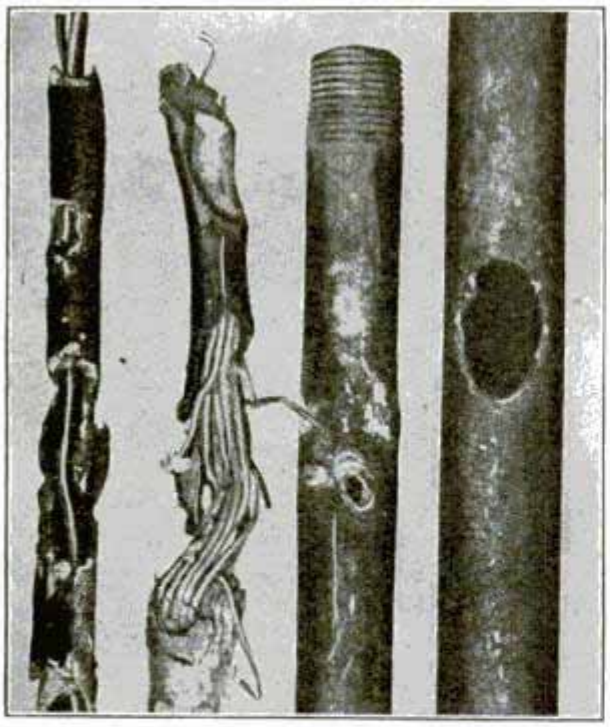
Short circuits and open circuits in interior wiring are also often responsible for loss of property by fire. Unsoldered connections, insufficient insulation, and improper

location of wires are among some of the causes, but besides these there is the danger of rats gnawing the insulation off the wires, chemicals or moisture rotting the insulation, and electrolysis of the insulation, which causes sulphur fumes. These fumes attack the copper wires which in time are so corroded that an arc is formed.

The locations of short circuits are often very hard to ascertain. In one instance a wall had been covered with tapestry which had running through it metallic threads. The tapestry was carried underneath the plate of a switch, the current of which was conducted over the metallic threads to a gilded picture moulding near the ceiling and over this to a point where a nail had been driven through the picture moulding and made contact with grounded material of some kind, possibly gas or water pipes. The passage of the current melted the metallic threads in the tapestry, but was fortunately discovered before much damage was done.

In wiring a building, particular attention should be given to see that no wires come in contact with any of the pipe lines.

The result of such contacts are shown in the illustration, where the gas pipe in each case was punctured by an arc, and the escaping gas ignited. In one case the contact with a pipe proved to be an advantage. An



Characteristic Types of Short Circuits and Grounds

electrical wire having set fire to the woodwork, also made contact with a water pipe and burned a hole through it, releasing a deluge of water, which effectually stopped the progress of the flame.

Many fires are caused by incandescent lamps, although it would seem that the amount of heat generated would be insufficient to cause a fire in anything but the most combustible material. This is true when the heat is allowed to escape, but when it is confined by being wrapped in cloth or other insulating material the heat, which can no longer radiate, will accumulate until the kindling point is reached. For this reason incandescent lamps should never be placed where they may come in contact with combustible material.

There are many other sources of danger due to electricity such as sparks from motors, electric flat-irons left with the current turned on, overheated rheostats, etc.; but the greatest number of fires are caused by crossed lines without protective apparatus, short circuits, open circuits, and grounds.

One might think the dangers arising from spontaneous combustion were very insignificant, but grain and coal handlers have learned from costly experience that these materials, when piled in large quantities, are sure to become heated and eventually burst into flame unless some means is provided for cooling them. When coal which is piled more than 15 ft. deep becomes damp, the lime in the coal is acted on by the moisture and the heat accumulates to such an extent that the coal often becomes red hot; and in many grain elevators expensive machinery is installed to keep the grain in motion to prevent it from heating.

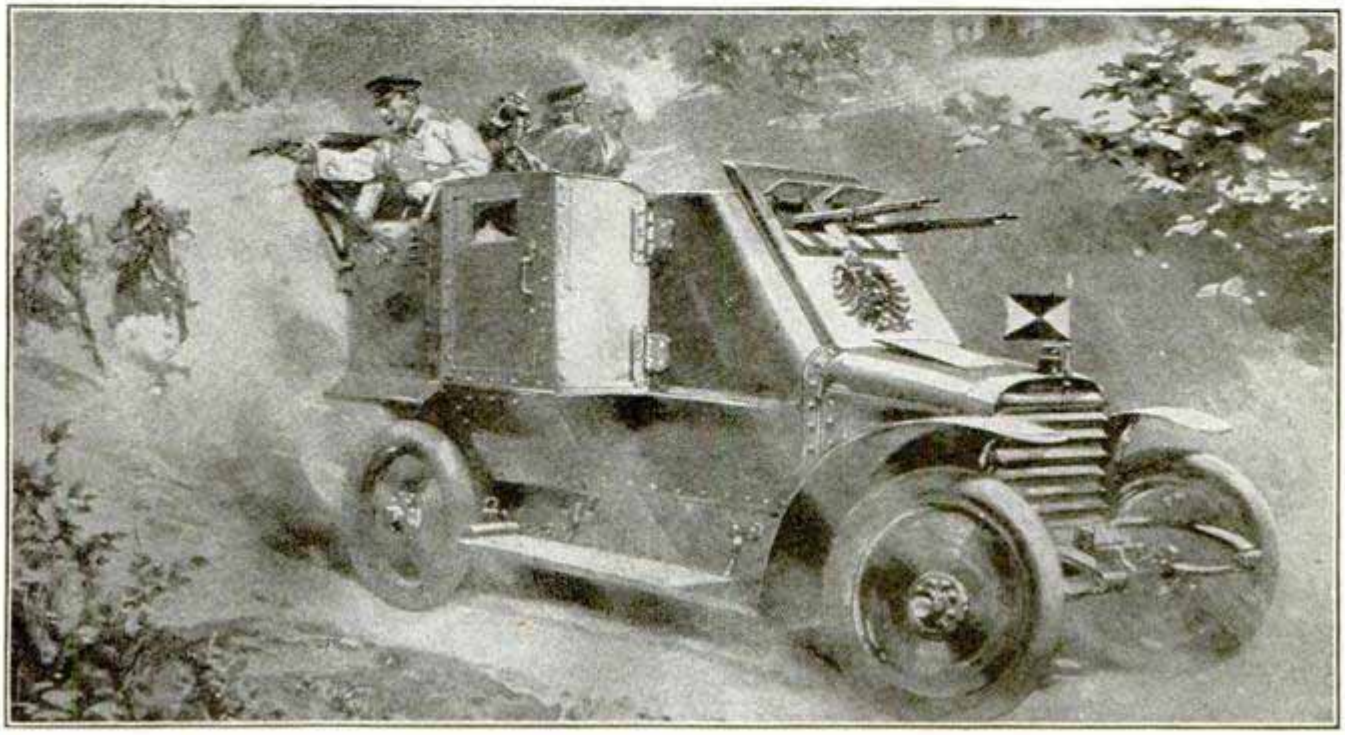
There are many other substances liable to spontaneous combustion, one of which is oily waste, which if stored away in sufficient quantities is almost certain to ignite. For this reason all oily waste, rags and refuse should be kept in metal boxes.

All of the conditions that tend to produce fires are dangerous, but the greatest danger of all—the one which causes the greatest number of fires, and the one which the underwriters find the most difficult to overcome is carelessness. Fire causes which come under this classification are no longer filed in the classified list, as they were found to be simply a repetition of a few varieties such as "Filled the gasoline stove while lighted," "Upset the lamp," "Children played with matches," etc., these records giving no information of new conditions to be guarded against, and simply filling up the files.

When all the various causes of fire are taken into account, it is evident that there

are many things to be considered in providing suitable means for eliminating the conflagration hazard, but the means of protection and prevention which are now available cover all possible causes of fire and, as will be seen later, the thoroughness and exactness with which these devices are investigated and tested is unequaled in any other branch of applied mechanics.

(Continued Next Month.)



ARMORED AUTOS FOR GERMAN ARMY

A ponderous armored automobile was recently tested before the Emperor of Germany as a preliminary to its adoption by the German army. The machine is protected by armor ¼ in. thick and in actual warfare would be protected by an armored hood, while the wheels would be guarded by circular plates of steel armor. There are two loopholes with shutters for quick-firing rifles in front. Leather pouches fitted inside contain a small battery of quick-firing pistols for defense at close quarters.

NEW YORK SUBWAY TROUBLES

When the subway in New York city was planned it was expected that the rapid motion of the frequent trains would cause a continuous flow of air through the tunnel. For this reason the overhead openings to the air, which were difficult and expensive to build, were placed at considerable distances.

When the line was first opened the small particles of steel from the grinding of the wheels and rails caused great annoyance; a trouble which had never been noticed in surface or elevated roads. This has somewhat abated, but the question of ventilation and cooling is causing the engineers trouble. On warm, and especially on "muggy" days, the air in the subway, after having been breathed by a million people in 24 hours, becomes almost unendurable, and many passengers have on this account abandoned the quick subway service and returned to the elevated lines, which take twice as long to make the trip.

At the Times' station it is now proposed to install a $45,000 ammonia refrigerating plant, with the ammonia exhaust carried far up above the buildings; but while the refrigeration part is reasonably practical, the result of a bursted pipe, which would fill the tunnel with deadly ammonia fumes, is a

chance engineers hesitate to take. Another plan is proposed of sinking wells and evaporating the cool water by means of fans. There is evidently an inviting field for some ingenious inventor to come to the rescue with a safe and thoroughly practical remedy.

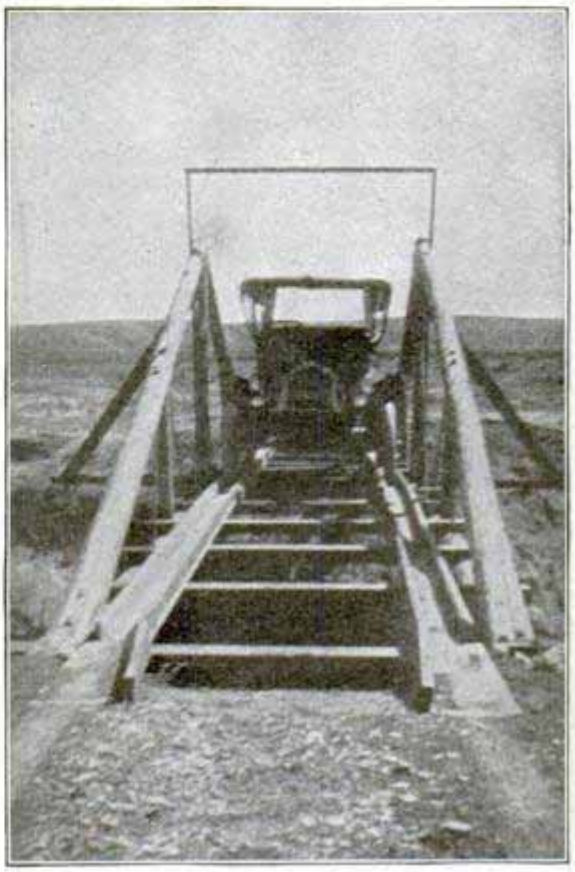
GERMAN POSTOFFICE IDENTIFICATION CARDS

For 12 cents the traveler in Germany can now secure a card of identification which will be accepted at any postoffice. In addition to a general description of the owner of the card, a small photograph is attached. A small cancelling stamp covers a part of the photograph, the remainder appearing on the card. When the holder of a card changes his appearance he must get a new card.

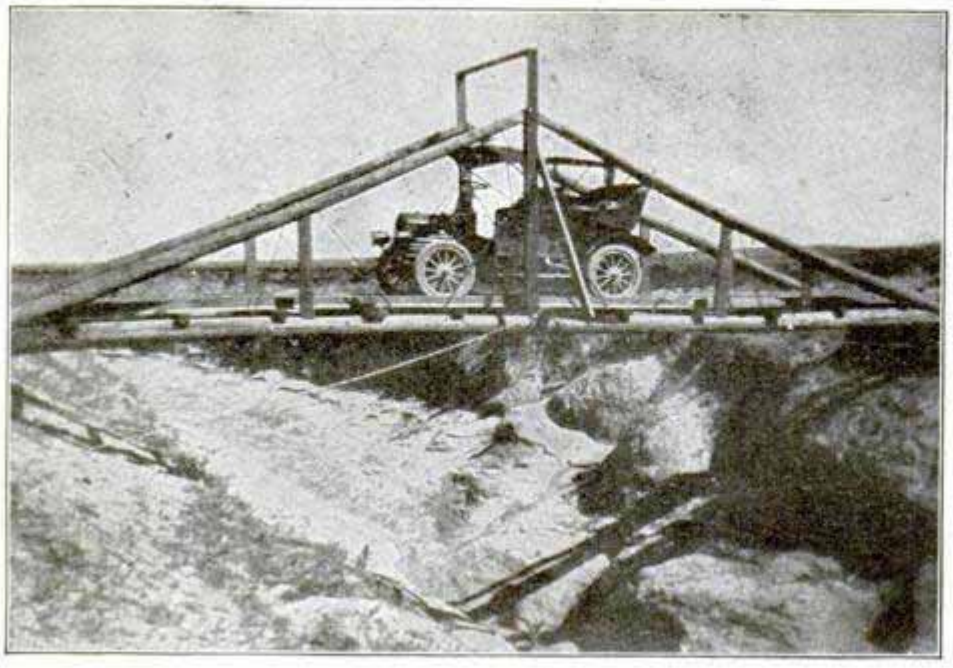
UNIQUE AUTOMOBILE BRIDGE IN DESERT

The daily mail and passenger automobile line between Roswell and Torrence, New Mexico, is over sandy deserts, and crosses only one stream in 101 miles. J. W. Stockard, manager of the company, has invented and built a unique automobile bridge to span the Macho. Like other mountain streams, it changes from barely a spot of water to a roaring torrent in a few minutes when the deluge from a sudden storm miles away comes down.

The bridge is constructed without floor or supports in the bed of the stream. The first quality protects it absolutely from all travel except that of automobiles and keeps off the herds of cattle that live on the plains; and also insures it against washout. Thus it solves two important questions for automobilists in the Southwest. The bridge is 64 ft. long, and, as there are no speed ordinances in the desert, the cowboy chauffeurs hit it at full speed, giving the tenderfoot passenger a shock that is hair-raising in the extreme.



It Has No Floor



The Home-Made Bridge

SUBMARINE SAILS 300 MILES AT SEA

Record Breaking Trip of the New American Torpedo Boat "Lake"

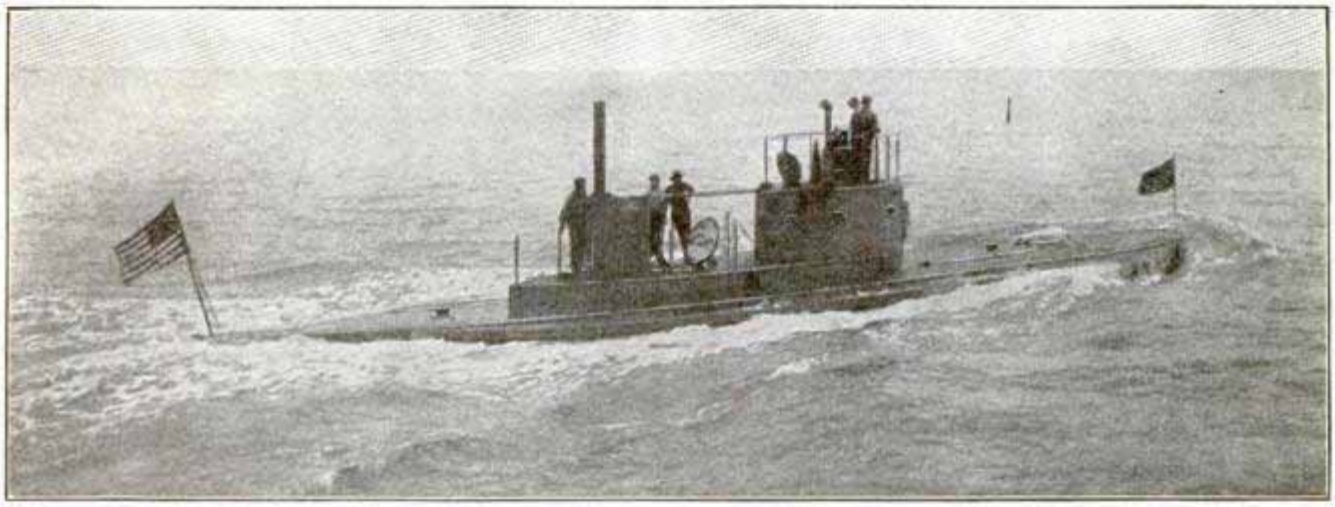
[The following account is by F. W. Baker, one of the newspaper men who made the trip.—EDITOR.]

The new submarine torpedo boat "Lake," the largest ever constructed in this country, recently completed an open sea voyage from Newport News, Va., to Bridgeport, Conn., at an average speed of over seven knots. This performance is considered remarkable owing to the fact that the "Lake" was unconvoyed, a feat never before performed in this country.

After receiving her finishing touches at the yard of her builders, the Newport News Shipbuilding & Dry Dock Company, the "Lake" began her long voyage on the afternoon of Monday, June 25. When Cape Henry was reached the engines were stopped long enough to enable a communication to be sent to her owners. The engines were then started again and never stopped until when off Barnegat, it being necessary to slow down to avoid a large school of whales, who evidently mistook the submarine for one of their number.

At about 2 o'clock p. m. on Wednesday, the 27th, the "Lake" arrived safely at Sandy Hook and anchored inside. Later on the voyage was continued up New York harbor and through Hell Gate under her own power, into Long Island Sound to Bridgeport, at which place she arrived without a mishap of any description.

This submarine marvel consists of a steel capsule of cigar-shaped form, within which is placed all the propelling machinery, air compressors, crew's quarters, etc., and which is surmounted by a wooden superstructure and deck, which gives the boat an appearance not unlike that of the original "Monitor," but on a smaller scale. The propelling power on the surface is supplied by gasoline engines turning twin screws; while submerged the screws are driven by electric motors from storage batteries of great capacity. Within the boat are comfortable quarters for the crew of ten persons, including a galley in which the meals are cooked by means of electricity. Sufficient air may be stored in the air tanks to allow the boat to be submerged several days without causing distress to the crew.



The "Lake" Running on the Surface

She is equipped with three torpedo tubes, which can be reloaded and fired several times without coming to the surface, the commanding officer in the meanwhile keeping his eye on his prey by means of a sighting instrument which projects above the surface of the water, and even if discovered, offers a target too small to be struck except by a chance shot.

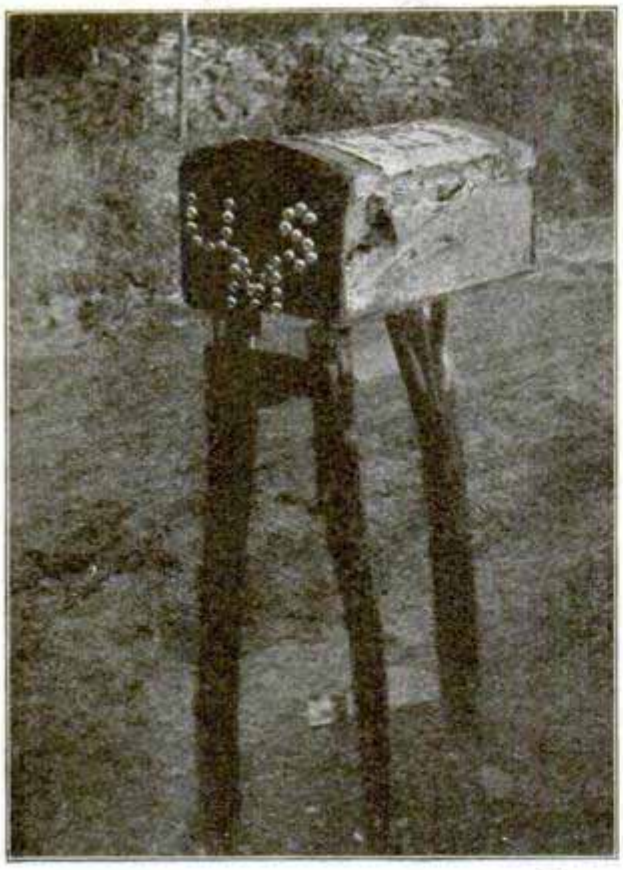
The boat is equipped with hydroplanes, or side rudders, which, when set at an angle by means of pneumatic power, cause the boat to descend on an even keel while going ahead, thus actually possessing a feature which Jules Verne's imagination gave to the famous "Nautilus."

The British "Dreadnaught" will be able to throw twice as much metal at a single discharge of her guns as any other battleship now in commission.

LOCOMOTIVE LAYS SUBMARINE CABLE

Cable steamers for laying ocean cable lines are well known, but recently a locomotive was pressed into a similar service when the big telephone cable was carried across the Connecticut river at Middleton. The cable is 1,640 ft. long and weighs 10,060 lb., and when the time came to draw it across the river no tug was to be found within 45 miles. Some greater power than a horse windlass was necessary, so a locomotive was hired to do the work. The railroad crosses on a bridge a few rods from the point where the cable was to cross. A 7-strand steel rope was taken across the river and passed through a series of snatch blocks and fastened to the drawbar of the engine. The other end of the rope was attached to the cable which was wound on a reel on the shore. A hand brake prevented the reel from unwinding too rapidly. When all was ready the engine crossed on the bridge, while the cable was dragged across in the opposite direction. A small scow supported the end of the cable to prevent its catching on the bottom of the river. The crossing was made in 16 minutes.

Some years ago, when the river was frozen, says the American Telephone Journal, a cable was laid near the same spot by drawing it across on the ice and then chopping a slot in the ice and dropping the cable through.



Hair-Covered Trunk Used by Ex-Sea Captain as Mail Box on Rural Route. This Trunk Has Been to All Parts of the World

PARLOR LOBSTER TRAPS

The time-honored lobster pot with an "entrance" at each end is to go. Since lobsters became scarce the fisherman cannot afford to lose a single one. With the old style trap many of the lobsters escaped, but with the new parlor trap entrance this is impossible. The Fishing Gazette says: "The parlor trap does not fish any better, but it holds all lobsters that enter. In construction it does not differ materially from the usual make except there is an open part in one-half of the side in which there is a net and hoop similar to the end nets or 'heads.' One end is closed entirely with netting so no lobster enters from one end. The other end is similar to the old trap. But there is a third net in the center of the trap through which the lobster in entering either at the side or on the end makes his exit into the 'parlor,' where he is safely impounded. On the parlor end is the door for taking out the lobsters from the trap."

TIDE AND WAVE MOTORS

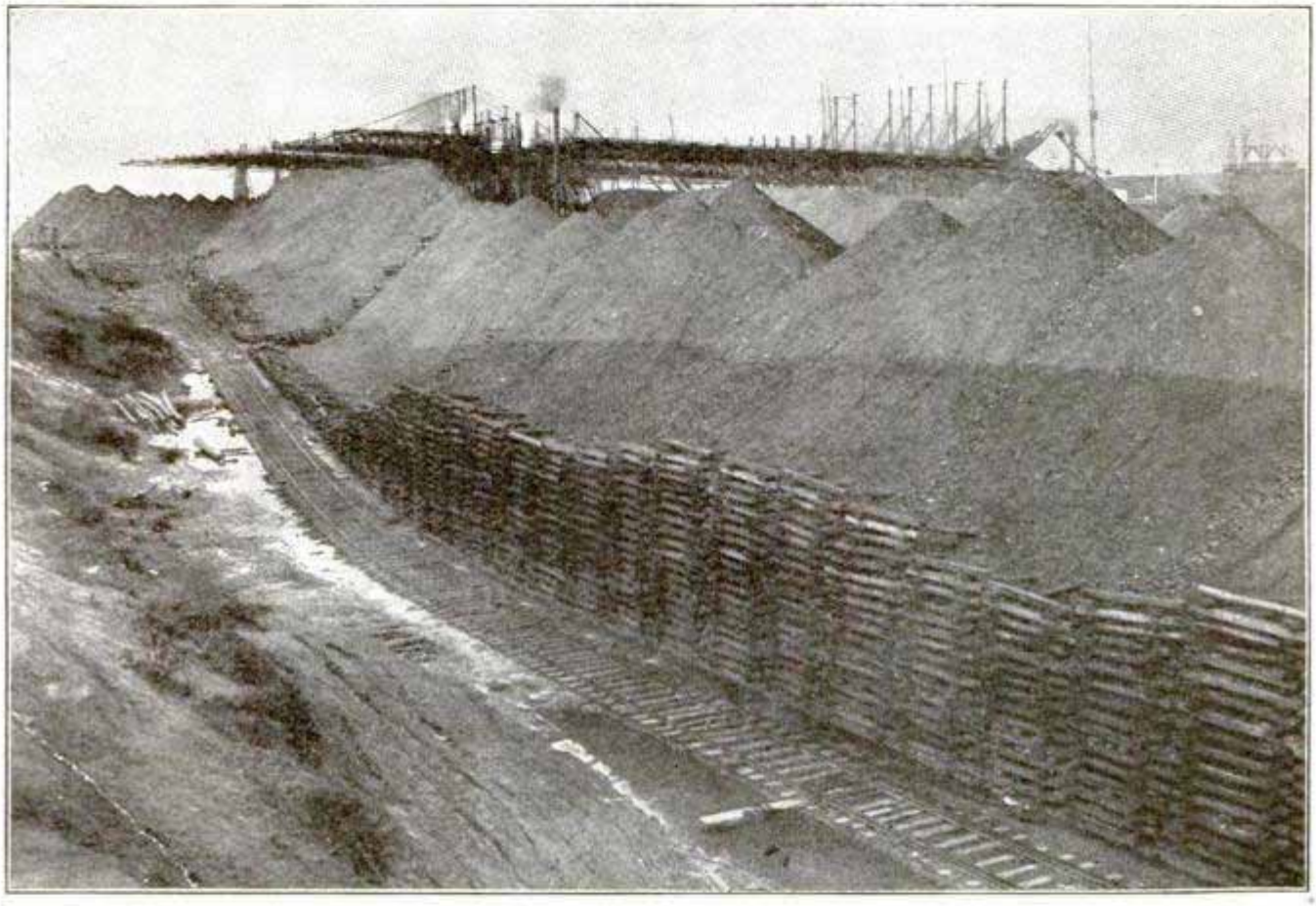
A reader requests a summary of the methods employed in the various wave and tide motors which have been made. The subject affords sufficient data to fill a large book, as more than 200 patents have already been granted in this country alone on such machines. To utilize the limitless power which daily goes to waste is one of the most fascinating as well as difficult of accomplishments. Some day some bright inventor may solve the problem and furnish light, heat and power for all without the use of a pound of coal.

WIRELESS ON BAVARIAN TRAINS

Locomotives on the Bavarian railway system are to be equipped with wireless telegraph apparatus, which will permit of taking and sending messages while the train is in motion. A signal bell will notify the engineer of the coming message and a few seconds later the signs of the message will appear on a paper band. Messages have been transmitted and received in this way over distances up to 200 miles.

MOUNTAINS OF IRON ORE AT LAKE PORTS CONTAIN MILLIONS OF TONS

There is a marked similarity in appearance between the huge piles of iron ore at a great lake port and a mountain range. The photograph on this page, made at the port of Conneaut, O., substantiates this statement for those who have never visited the immense receiving ports on Lake Erie. These mountains of iron are known as "stock piles" and represent those portions of the total ore movement from the upper lakes which are not for direct shipment after their arrival at the lower lakes. The ore which is not unloaded onto stock piles goes from the vessel directly into cars.



"Stock Piles" Awaiting Shipment to the Furnaces

There are 150 distinct kinds of iron ore. Whether it goes onto the stock piles at Lake Erie harbors or directly into cars may depend upon the kind of ore that the furnaces are most in need of at any particular time. The capacity of the railroads is not equal to the task of moving forward immediately all that is received in a day. At least this is true at most of the ports.

The weight of a single iron ore pile is often 50,000 tons and in height one pile may reach 100 ft. The piles at the rear of the unloading machine are the largest. Those dumped beneath the main body of the structure seldom exceed 25,000 tons in weight. Some one has figured that the 33,500,000 tons of ore shipped last season would make a dike of ore 10 ft. high and 10 ft. wide that would extend from Cleveland to New York. And, as to mountains, this quantity would easily make one 300 ft. high, 900 ft. wide and a quarter of a mile long.

Of this vast amount of iron ore, there usually remains on the docks of the lower lakes at the beginning of navigation some three or four million tons that have not gone forward to the furnaces. During the winter months when lake navigation is at an end, the railroads continue their hauling of ore from Lake Erie to the furnaces to such an extent as the weather will permit. Ore will often freeze, however, and it becomes necessary to blast it loose from the mountains. This is a dangerous occupation and many an ore shoveler has lost his life in recent years beneath some heavy portion of the mountain that has loosened and fallen upon him.

The ore movement of the present year at the beginning of the season was roughly estimated at from 35,000,000 to 38,000,000 tons. It may not reach the latter figure but will not likely fall far short of 36,000,000 tons. This will exceed all years in history. In the month of June alone 5,000,000 tons were shipped from Lake Superior. Ashtabula harbor—the greatest ore-receiving port in the world—received nearly a million tons during the same month; Cleveland is a close second to Ashtabula, and Conneaut, the Carnegie port, is not far behind Cleveland. In one recent week 3,800 cars of this heavy product went forward from Ashtabula harbor. This, too, breaks all records.

An effort is being made to create a market for North American coal in Brazil. The demand for coal there is confined to coast shipping and the railroads, and nearly all used is English, selling at $16 gold per ton.

In the last generation the town of Orsa, Sweden, has sold $5,750,000 worth of trees. By careful replanting a like income is guaranteed for every 30 or 40 years. Railways, telephones and many other luxuries, are free.

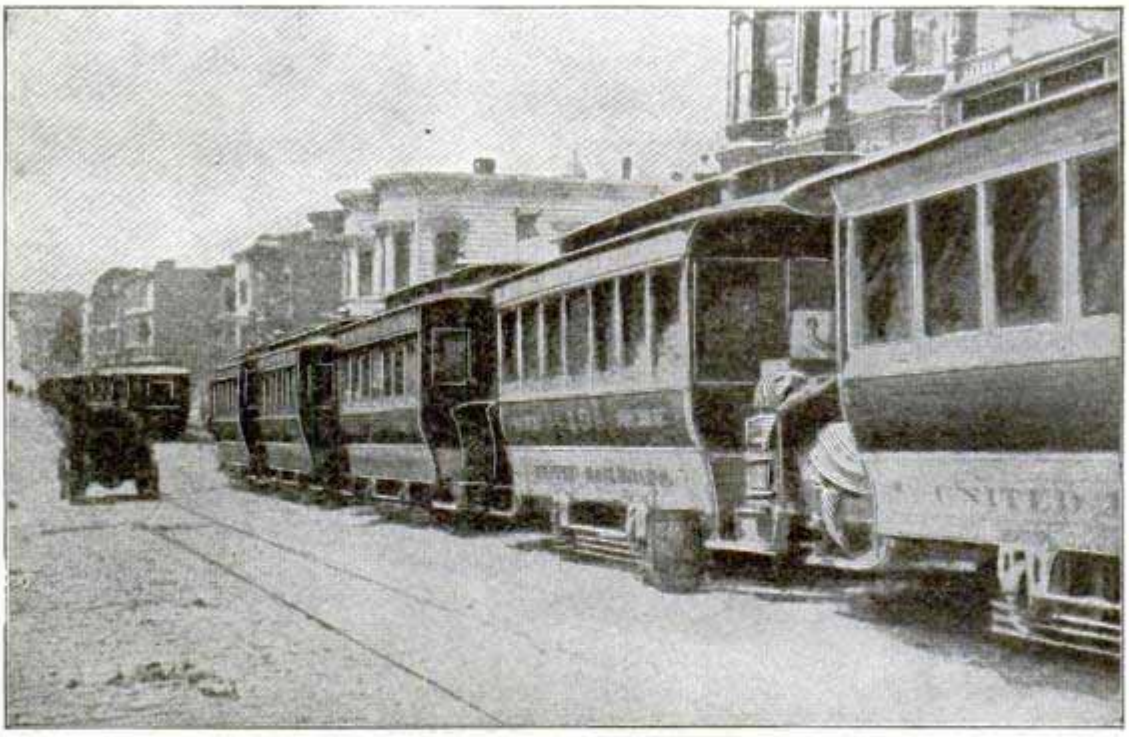
AUTO TRAVELS 606 MILES IN ONE DAY

A remarkable trip was recently made in which an automobile was driven from Detroit to Chicago and return, a distance of 606 miles, the same day. The party left Detroit at midnight and arrived in Chicago at 11 a. m. After a rest of one hour the return trip began, reaching Detroit at 10:50 p. m. The average speed for the entire trip was 30 miles an hour. No repairs were made during the day with the exception of replacing one tire.

DON'T POINT FINGER AT WIRES

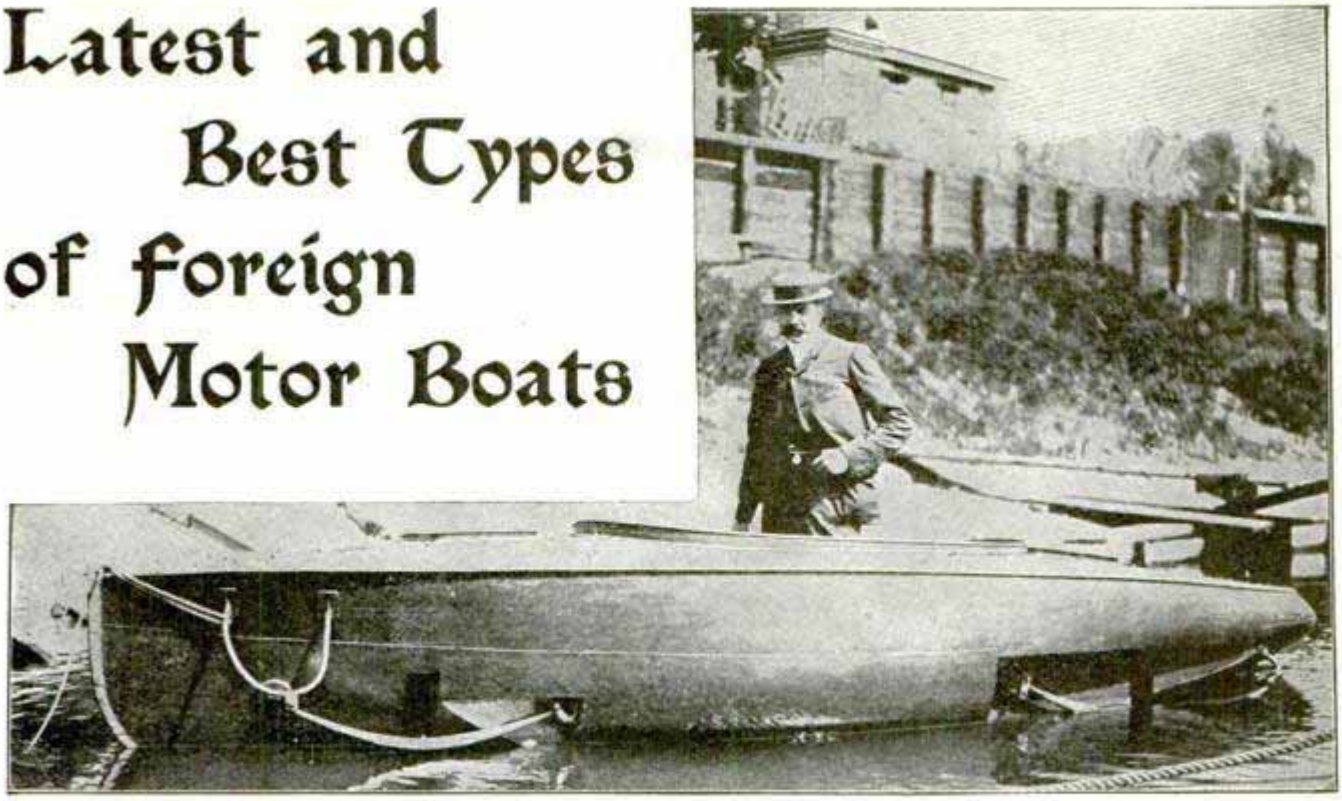
Pointing a finger at a fallen wire may be dangerous. An Oregon young man did so and received a shock which killed him. The wire had fallen the day previous, and the end had been picked up and wound around a fence post. The victim pointed his index finger at the wire, and, although 8 in. from it, the current leaped across the gap and passed through his body and electrocuted him.

QUAKE VICTIMS LIVE IN STREET CARS



AFTER THE BIG FIRE HUNDREDS OF REFUGEES FOUND SHELTER IN STREET CARS WHICH STOOD IN LONG LINES ON TRACKS IN THE UNBURNED DISTRICT. HERE THE PEOPLE LIVED AND SLEPT, THE CARS AFFORDING WELCOME SHELTER. THE ABOVE VIEW WAS TAKEN ON SUTTER STREET.

Latest and Best Types of Foreign Motor Boats



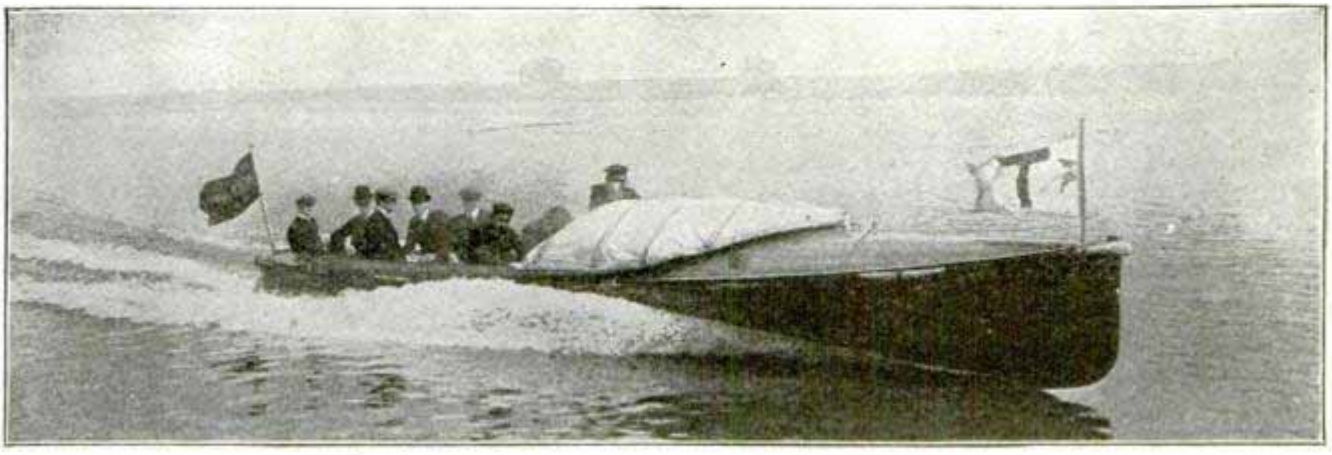
French Boat -- Runs on Land or Water

France, the home of innumerable marvels in the world of science and invention, has just produced an amphibious automobile that is one of the oddities of the century. The "Canot Voiture" which has lately been undergoing trials near Paris is a combination motor car and motorboat and can be used for land locomotion when not dancing over the waves; moreover, it can be altered for either service at short notice.

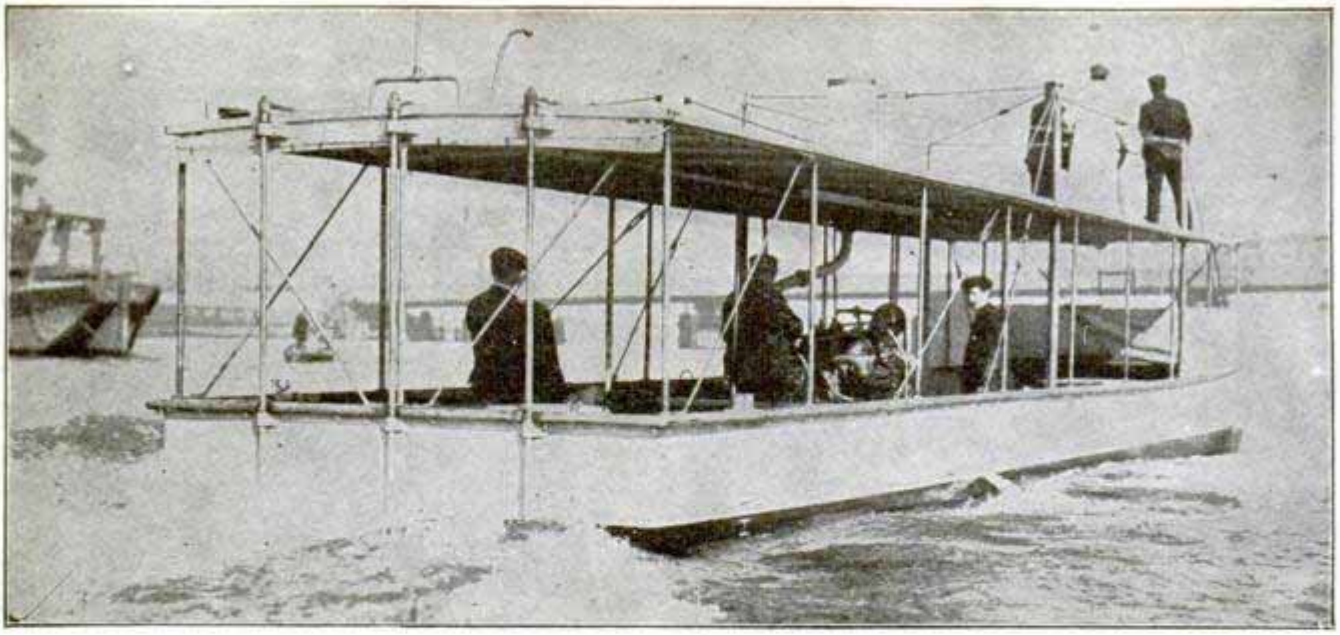
This curious combination craft and car is built on the lines of an automobile yacht, but conveniently placed are springs and supports for four wheels upon which it is adjusted for land service. The two rear wheels are driving wheels and may be used on water or on land as required. The tests of the new invention thus far made have proven very successful and this novelty in the auto field has developed very satisfactory speed.

One of the most interesting of the newer British motor boats is the "Svip." This little flyer is 35 ft. in length, 5 ft. 9 in. beam and 1 ft. 6 in. draft. The engines are 24-hp. 4-cylinder motors driving twin screws, the ignition being the standard low tension magneto. The exhaust is carried through a silencer fitted in a neat funnel which is fixed to a baffle plate immediately over the engines.

The boat is intended for fast cruising and has comfortable seating accommodations for 12 to 16 people and can be adapted to stand a very fair sea. On the first occasion on which the engines were started up the boat



Cruising Boat "Svip" -- 21 Miles an Hour



Shallow Draft Steel Boat, "Spider"

attained a speed of 20¾ miles per hour and on the official trial the flyer ran six times over the measured mile, with and against the tide at an average speed of considerably more than 21 miles per hour. A feature of the boat is the sliding hood which can be instantly collapsed and rolled up at the forward end when desired.

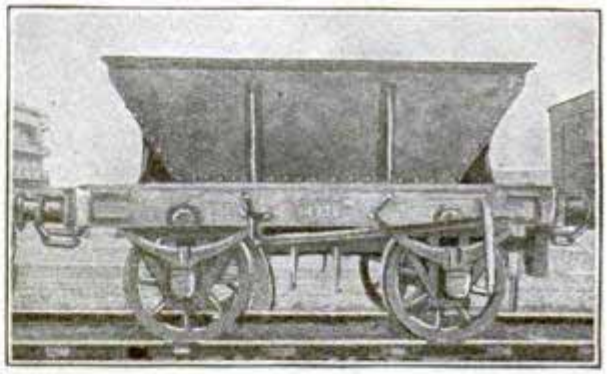
The Colonial office at London has recently had constructed for the use of the British officials in Southern Nigeria, a motor launch that is unique in many respects. The vessel is built of galvanized steel and is 56 ft. in length, 9 ft. beam and 12 in. draft when carrying a load of 4 tons. To facilitate steering on the light draft, three single-plate balanced rudders are provided. There are two propellers on one shaft, working in a tunnel.

The engine is a 4-cylinder Thornycroft marine motor. The normal number of revolutions is 800 and at this speed the engine develops 40 hp. on paraffin. The capacity of the fuel tanks is 80 gal. The hull of the "Spider" is open, with a short deck over the fore peak and protected from the tropical sun by a light wood awning on which is placed the steering wheel forward. The hull is subdivided by six watertight bulkheads, floor boards being fitted along the bottom of the boat, forming a deck. The engines of the "Spider" may be operated either on petrol or paraffin, but the latter will probably be used more extensively, since it is almost the only fuel obtainable in the part of the world where the boat will be in service.

A cube of irridium 1 ft. on each side would weigh 1,390 lb.

ENGLISH COAL CARS

The standard freight cars, or "goods" and "mineral wagons" as they are called on English steam roads, are quite small and run on four wheels. The illustration shows a coal car weighing 5 tons with a capacity

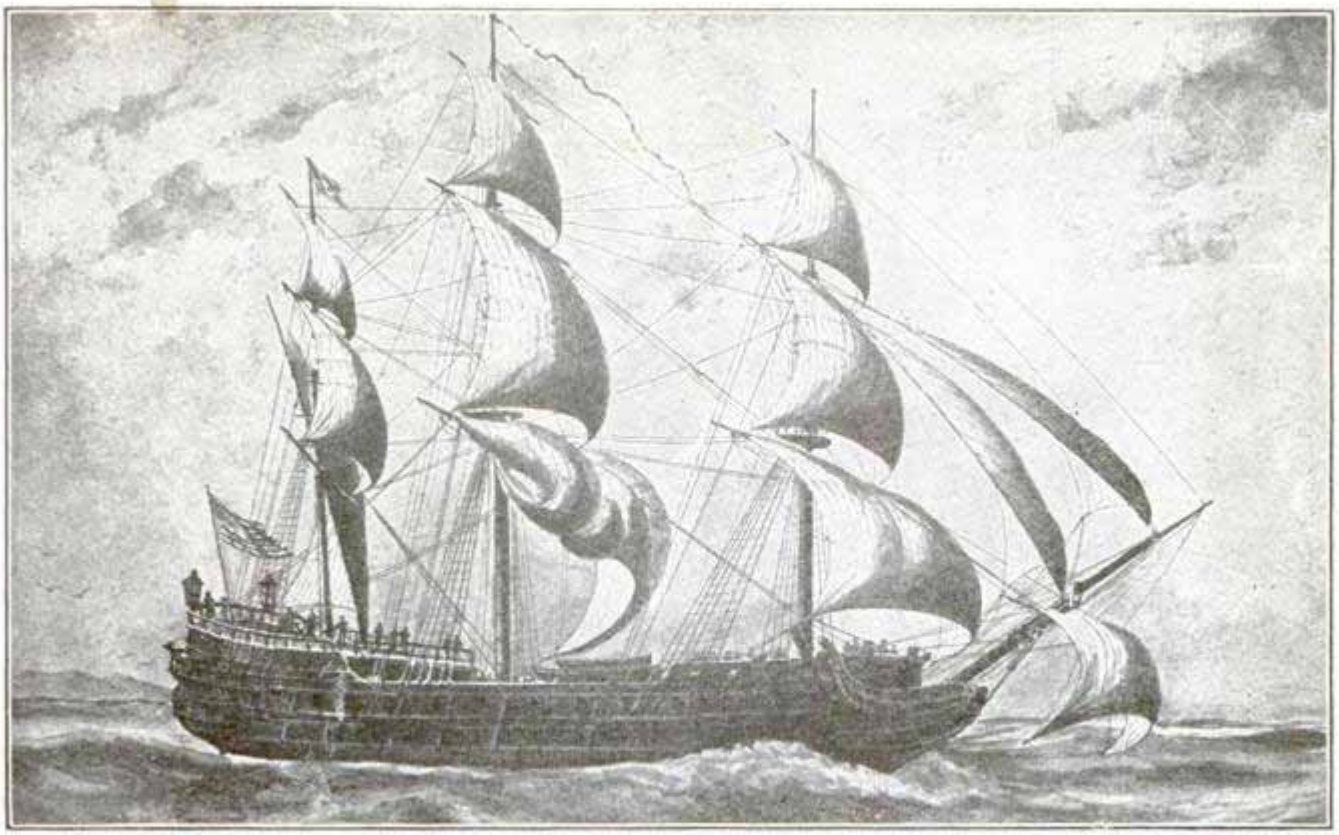


Holds Only Six Tons

load of only 6 tons. These cars are strangely in contrast with the big freight cars here which carry ten times the load. The small car is explained by the sharp curves in the track necessary to get into the collieries and points of delivery.

PILES MADE OF CONCRETE

A new concrete pile is made by spreading a layer of concrete on a wire fabric, having longitudinal rods attached at intervals. The fabric is then rolled up in a machine and the pile laid aside to harden. It also contains any desired number of vertical rods. One of the rods is a hollow tube and the pile is sunk by the water jet process.



PAUL JONES' MAN-OF-WAR

The "Bonhomme Richard," Paul Jones' famous battleship, which won the victory in the engagement of Sept. 23, 1779, with the British 44-gun frigate "Serapis," was formerly the "Duras," an old East Indiaman. When Jones refitted the vessel for warfare he also rechristened her. The "Bonhomme Richard" was built in 1766 and was 13 years old when she went into commission. Her dimensions were: Length, 152 ft.; length of keel for tonnage, 128 ft.; extreme breadth, 40 ft.; depth of hold, 19 ft.; burthen (French measurement), 998 tons. She had a battery of 42 guns, throwing 258 lb. of metal in a single broadside.

The battle waged furiously for four hours after Capt. Jones had lashed his vessel to the enemy. Then for the first time a British man-of-war struck her colors to the Stars and Stripes. Soon after the surrender the "Bonhomme Richard" began to fill, and Jones transferred all his men to the captured frigate and cut his own boat loose as she sank. The picture is a reproduction from a recently discovered drawing made by Paul Jones' own hand, which shows him to have been a good artist as well as a fearless fighter. The modern greyhounds of the sea give an impression of power and size, but utterly fail to compare in the grace, beauty and animation which stands out in every line of the "Bonhomme Richard."

UNSINKABLE STEAMBOATS

A Kiel shipping company is having five unsinkable steamboats built. In a test one of these vessels was laden with the equivalent of 200 passengers, and assuming that the ship had been injured in a collision, the engine-room division was pumped full of water, and a hole to admit water freely was made to the exterior. When the ship sank until full it had still a foot of free board above the surface.

STEAMSHIP LINE BETWEEN RUSSIA AND AMERICA

A direct steamship line has been established between Libau, Russia, and New York, with a view to increasing commerce between the two countries, and also affording a direct passage to the United States to Russian emigrants. The vessels will sail under the Russian flag and accommodate from 1,000 to 1,200 emigrants, besides first and second class passengers.

NOVEL LOCOMOTIVES FOR AFRICA

The illustrations show two new types of locomotives which were recently built at the Kitson works, Leeds, England, for shipment to South Africa.

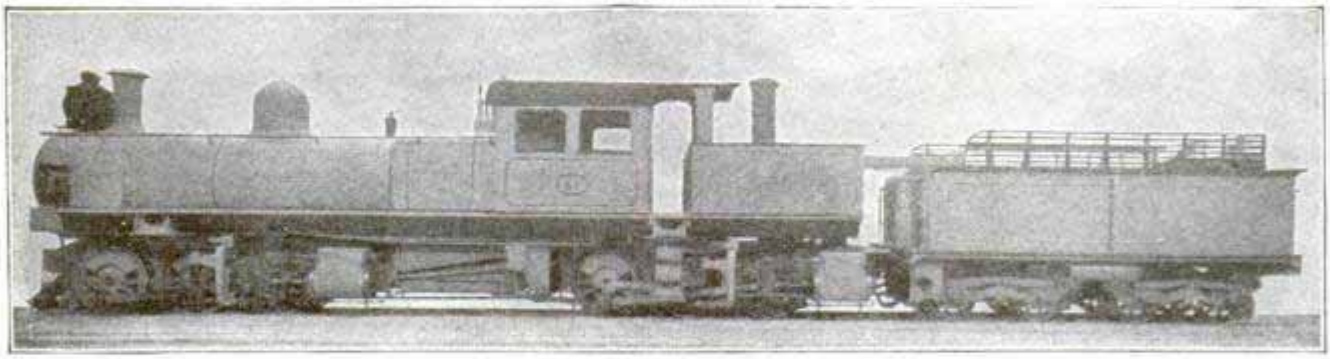


Fig. 1--Twelve Drivers--Unusual Construction

In Fig. 1 is seen an unusual construction, the superstructure of boiler, cab and water tank being carried on two long steel girders. Each section of driving gear is really an independent locomotive with its own valve motion, brake gear and sand supply, while the entire weight is carried on the 12 drivers. Steam is carried to each pair of cylinders independently, with ball and socket joints. The engine weighs 72 tons, and will take curves of short radius.

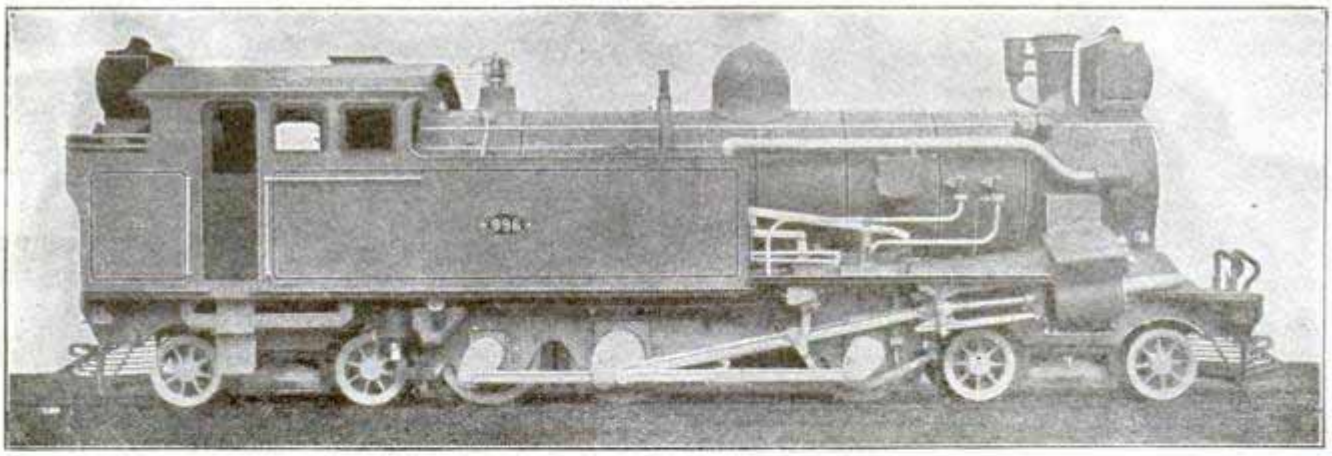


Fig. 2--Helper Engine for Pretoria Line

The engine, Fig. 2, was built at the Vulcan Foundry, Newton-le-Willows, as a helper for heavy passenger express trains on the Pretoria line.

An automobile was converted into a sheep-shearing machine at Portland, Mich. The engine of the car transmitted, by means of a belt, power to the wheel operating the power shears, and the work was rapidly and satisfactorily executed.

SANE LUMBERING

As one prominent lumberman recently put it, the lumbering industry today is a species of insanity manifested by a greedy desire to cut up all the good timber, large and small, in sight as fast as possible, when one might more easily provide himself a permanent business, conserve the forests to future generations and leave something of value to his family.

Suppose one secured 500,000,000 ft. of timber, picked out his mill site and built a mill capable of cutting 20,000,000 ft. a year, suggests a correspondent of the Lumber Review. He could keep cutting for 25 years, and at the end of that time, having left everything 10 in. and under, he could make a new start and cut the whole tract over again, the second cutting requiring 15 years, making 40 years in all. This permanent business would benefit others, also. A permanent mill town with fireproof saw mill, planing mill, dry kilns, etc., would follow, naturally, and the town would likely become a farming center, also, as considerable farming land would be secured with a timber tract so extensive.

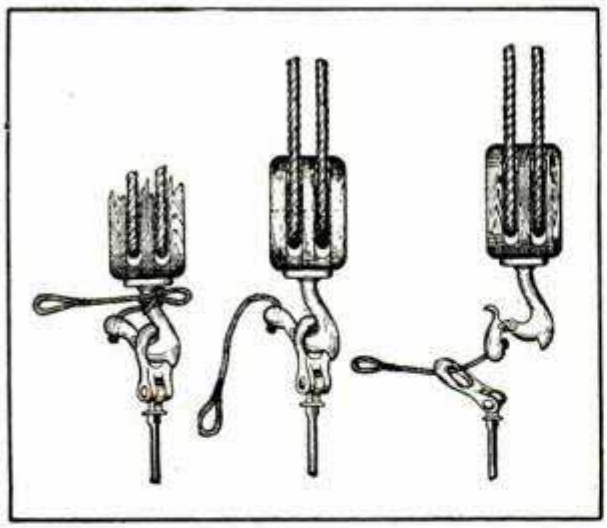
A BALLOON INCLINE RAILWAY

A German engineer residing in a mountain district proposes to build a balloon incline railway for transporting tourists up a mountain-side too steep for a cable incline road.

The balloon is fastened by a steel cable to a slide running along a single steel rail which is anchored to the mountain-side. The balloon is 35 ft. above the rail and carries a car or basket holding 10 persons. The ascent is made by the lifting power of the balloon, and a load of water ballast taken on at the summit causes it to descend. When the bottom is reached the water is let out and the conveyance is ready for another ascent.

RELEASING HOOK FOR SHIP'S BOAT

It is said by sailors that there is no more important a part of a ship's equipment than the releasing hook which forms a part of the gear by which the small boats are lowered. The ship may voyage for months, sailing thousands of miles, with no occasion to use a small boat. Then an emergency occurs in which every second counts, to say nothing of the danger of launching while a heavy sea is running which may smash the boat to splinters. From time to time improvements have been made in releasing



Hook For Releasing Small Boats

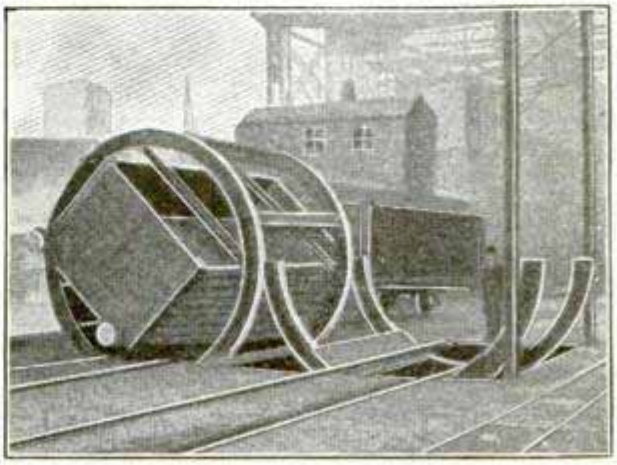
hooks. The latest improvement, which is being adopted by large steamer companies and navies, is shown in the cut. A quick jerk on the small rope effects the release in an instant.

A good imitation walnut stain is made of burnt umber and yellow ochre, in proportions to give the desired shade.

ENGLISH DEVICE TO UNLOAD COAL

A device for unloading coal, which was recently patented in England, consists of two large steel rings mounted on rollers and provided with booms, which hold the car firmly in place while being dumped.

These rings, or tipplers, are so made that an engine may pass right through, and the



How the Car is Dumped

entire train may then be unloaded, one car at a time. The device not only saves time but also cleans out every ounce of coal, as the car makes a complete revolution when being unloaded.

The tipplers are so designed that the center of gravity of the revolving apparatus, including the weight of the loaded car, is very near the center of the rings. The advantage of this is that little power is required to operate the tippler, a 5-hp. motor emptying as much as 100 tons of coal per hour.

EGGS CANNED IN KANSAS

Cracked or chipped eggs are not allowed to spoil in Kansas, but are preserved by canning. During the process of "candling," or sorting with regard to size, freshness and cleanliness, many broken eggs are found. These would keep in cold weather, but in summertime soon spoil.

The canning process consists in breaking the eggs into carefully cleaned tin cans, then placing the cans in freezers, where the eggs are frozen in a solid mass, after which they are placed in cold storage. The cans are of 10-lb. capacity, each holding about 12 doz. eggs. Some cans contain only whites, others yolks only, and others both whites and yolks. Bakeries and ice cream factories are large consumers of canned eggs.

CEMENT SHINGLES CHEAPER THAN WOOD

The use of cement for replacing articles made of wood is increasing every day. Cement has already replaced wood, to a great extent, in building sidewalks, bridges, fence-posts, steps, building-walls, foundations and many other purposes and is commanding considerable attention at present in the form of shingles. In the earlier instances of concrete roofing the material was used in the same manner as in laying a floor, but the great strength required in a floor is not necessary in a roof.

The cement shingles are only a little heavier than slate and not much more expensive than the best wood shingles, and, as they are practically indestructible, they are cheaper in the end than any other material, including tile and slate. These shingles are made in a great variety of designs and are reinforced

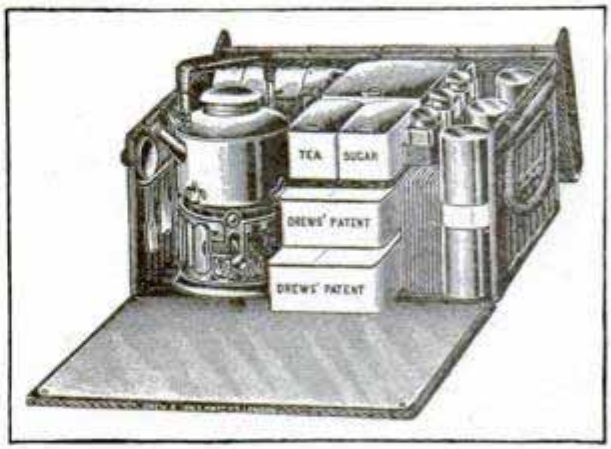
First Cement Shingle House

with metal skeletons, which hold the cement together, and terminate in loops at the edges for nailing to the roof. They are practically everlasting, as moisture, the cause of universal decay, is the chemical agent in the process of hardening cement, and when properly mixed and tempered the cement shingles become harder and more durable the more they are exposed to the weather.

French bakers in large fortified towns are required to have a certain stock on hand at all times in case of war. All French bakers must deposit a certain sum of money with the municipal authorities as a surety of good conduct, and must sell their bread at a price fixed by law.

COMBINED TEA AND LUNCHEON BASKET

A handy tea and luncheon basket designed for the use of motorists provides for all the wants of four persons. It contains

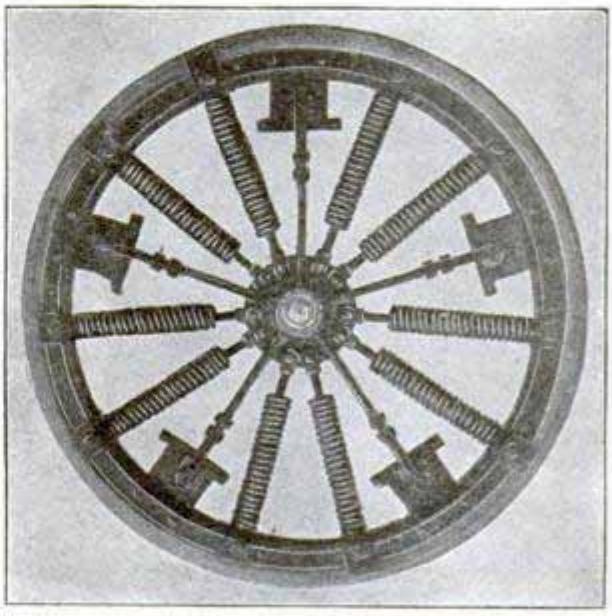


Provisions for Four Persons

provision-boxes, cups, saucers, plates, cutlery, etc., and a kettle with a burner underneath, all arranged compactly. The basket has silver-plated fittings, giving it a handsome appearance, and when the lid is shut down, a waterproof cover slips over all to keep out the dust.

SPRING WHEEL FOR AUTOS

Inventors are steadily at work to perfect a spring wheel for motor cars which will do away with the expense and annoyance of keeping up pneumatic tires, while providing the same ease in riding. The wheel illustrated is made up of five steel spokes

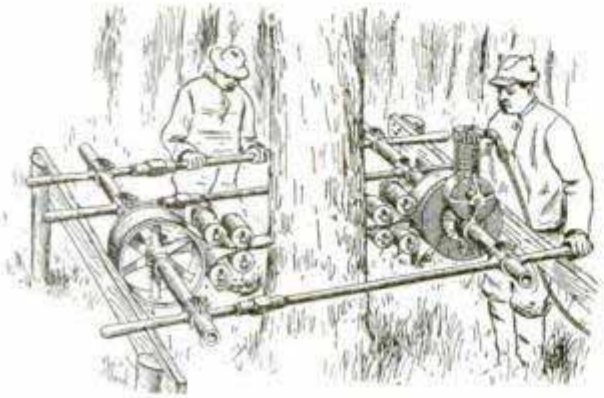


Steel Spokes and Helical Springs

extending from a steel hub to sockets in the rim which permit considerable movement; also ten helical springs. The tire is solid rubber.

PORTABLE MACHINE FOR FELLING TREES

A portable sawing machine, simple in design and carrying its own motive power, thus making it entirely independent, is a recent invention destined to be of great value to lumber men.



Motor-Driven Sawing Machine

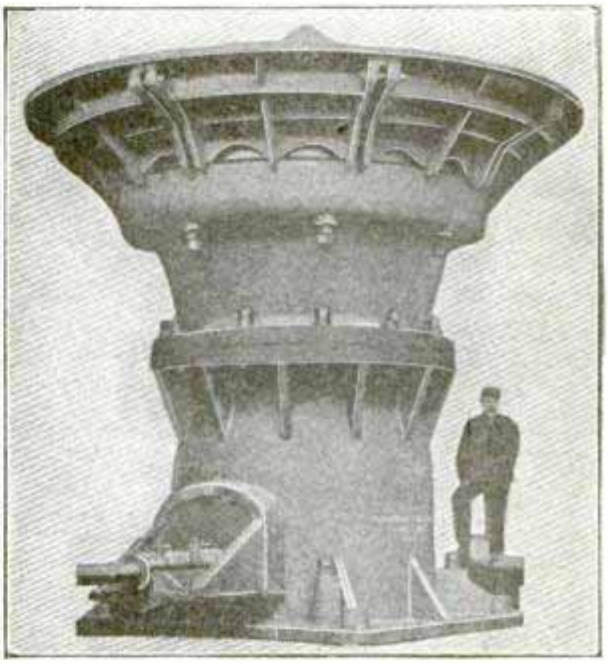
A tubular framework supported in any suitable manner carries two band wheels—one driven by a gasoline or other suitable motor, the other running loose—over which passes an endless saw Guiding pulleys bring the running and cutting edges of the saw together so they move in the same kerf. Of the two sets of rollers employed at each end, one keeps the upper and lower runs of the saw in close facial contact and the other causes the saw courses to approach the first set of rollers in a gradual curve, and also holds the saw in close frictional contact with the driving pulleys, says the American Inventor. The simplicity of construction and the portability of the device constitute two great advantages.

SHIPPING LIVE FISH WITHOUT TANKS

Fish can live out of water for a long while, provided their gills are kept wet. Taking advantage of this fact, a method of shipping them without tanks has been devised. A wooden box is filled with water to a depth of ⅓ in., and the fish are placed in the box, which is then hermetically closed. Oxygen is introduced into the box through a tube reaching to the bottom. As the oxygen before entering the box passes through several water bottles it is thoroughly saturated with water vapor. In this way the gills are kept wet and the fish preserved alive and in excellent condition for from three to four days. The result is practically the same as when the fish draw oxygen from the water that washes their gills, exchanging, as in our breathing system, carbonic acid for it.

LARGEST STONE CRUSHER IN THE WORLD

The rapid increase in the use of cement for all construction purposes has created an unprecedented demand for crushed stone. What is believed to be the largest crusher



This Crusher Weighs 110 Tons

ever built was recently completed. This machine weighs 110 tons and turns out 5-in. cubes which are afterward run through smaller crushers. It is of the gyratory type, the rock being fed through three hoppers, the openings of which are 24 in. wide and 66 in. long. The crusher is 25 ft. high, runs at a speed of 350 revolutions per minute, requires 175 hp. and turns out 700 tons per hour.

A wonderful new sight is being tested on a 6-in. gun on the British vessel "Africa." The sight indicates and allows for decreased muzzle velocity, owing to erosion, the rate at which an object is traveling, and, also, the difference between a shot fired through the air when the barometer is high and when it is low.

AUTO HELPS FIREMEN

In an eastern village recently, when an alarm of fire was sounded, the one available team was hitched to the fire engine, leaving only two volunteers to look after the hook and ladder truck. A passing automobile was pressed into service and drew the truck to the fire.

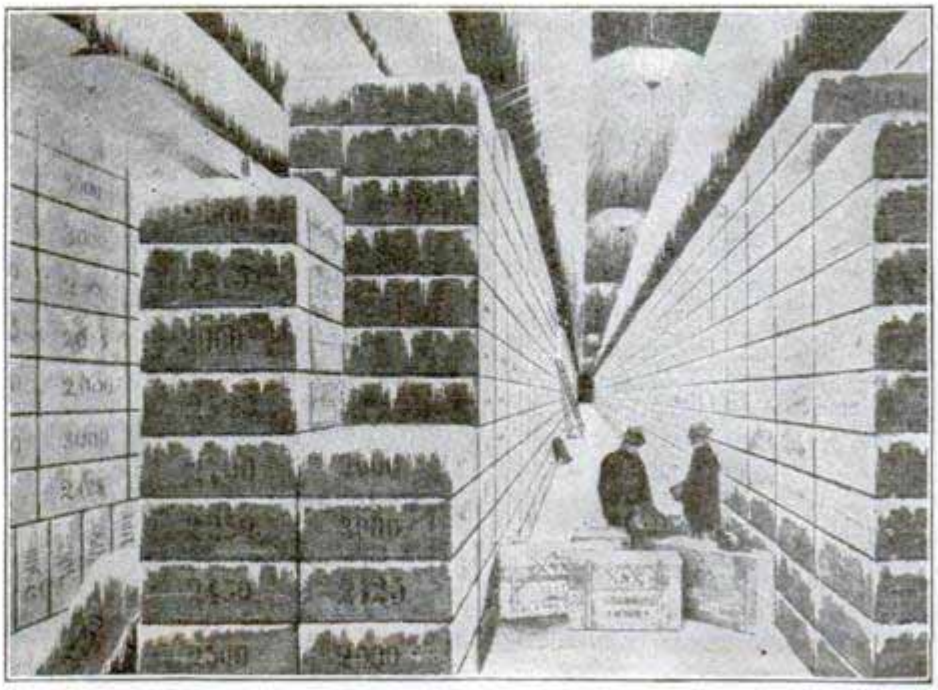
Automobile Propelling a Fire Engine

COLD STORAGE FOR FLOWERS

To retard the blossoming period of flowering plants in order to secure flowers at any desired time of the year the German gardener places the bulbs in cold storage. Lilies, hyacinths, mayflowers, gladiolas, roses and lilacs—for all of which there is a large demand in other countries—are the plants usually subjected to this unique process. For the mayflower, especially, Spain, South of France, Italy, Russia, England, South America and Asia afford fine markets and immense quantities of mayflower plants are shipped to these countries.

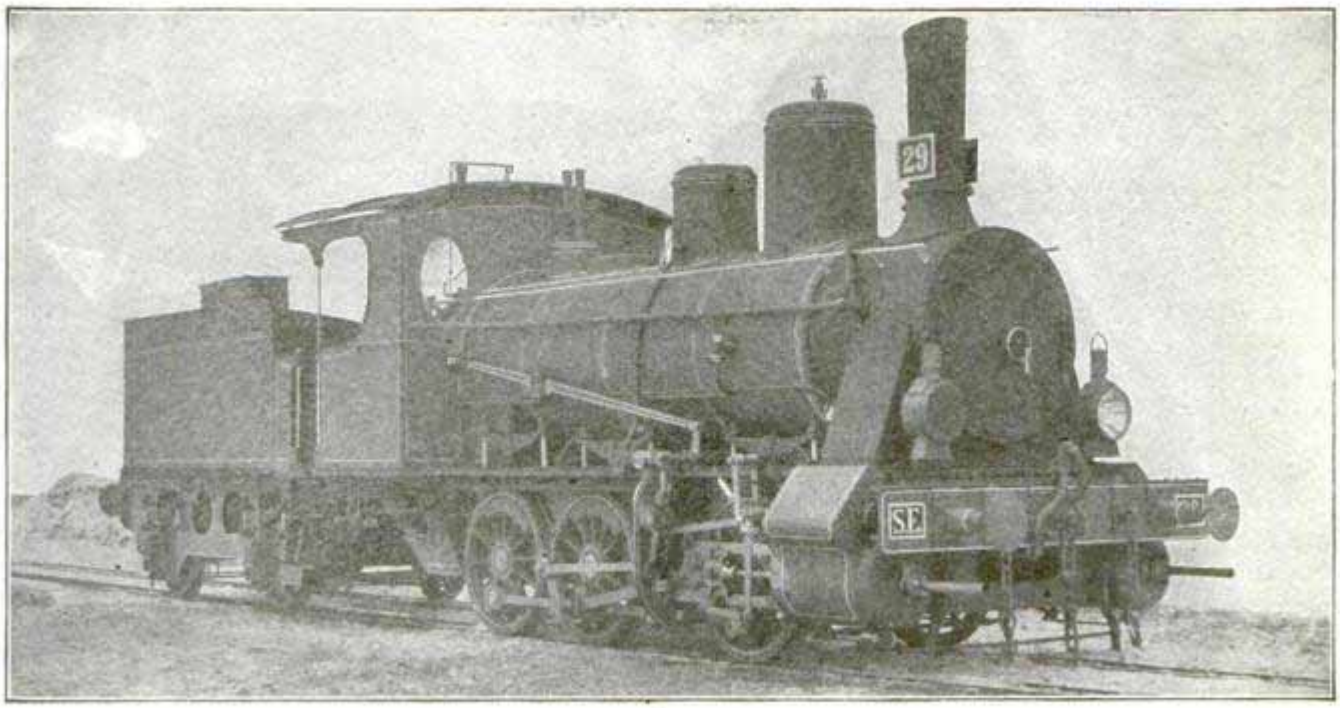
The bulbs are prepared for storage by stripping them of the leaves, then cleaning and sorting them. The good ones are arranged in bundles of twenty-six or twenty-eight, then packed in boxes and sent to the cold storage warehouse. They are then called "ice bulbs." For mayflower and lilac bulbs the temperature maintained in the warehouse is 25° F.; for lilies and gladiolas 32° F.; for roses 30° to 25° F. The relative humidity is high—up to eighty or ninety per cent.

The "ice bulbs" will produce flowers at any period, in any season within 20 to 28 days, without forcing. They are planted in sand, earth or muck and kept in the dark for the first ten days to prevent too many leaves on the plants. The next ten to eighteen days they are kept in the light and at



Cases Filled With Mayflower Bulbs in Cold Storage Warehouse

NOTABLE FOREIGN LOCOMOTIVES--NO. 7

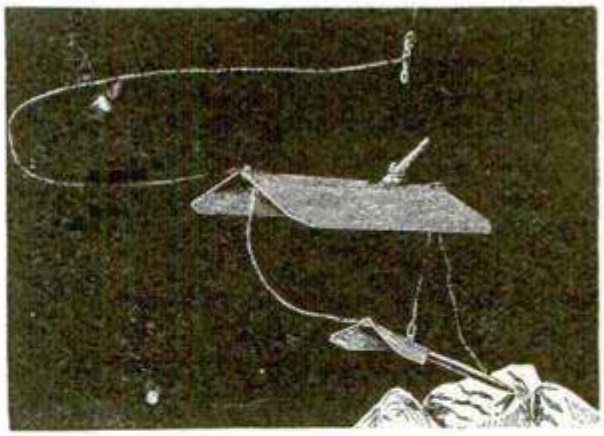


SPAIN—SIX COUPLED FREIGHT LOCOMOTIVE ON THE SOUTHERN RAILWAY OF SPAIN. THE SPANISH RAILWAYS ARE 5 FT. 6 IN. GAUGE, WHICH GIVES THE ENGINES THE APPEARANCE OF BEING VERY WIDE AS COMPARED WITH THEIR LENGTH. THEY ARE BUILT SHORT ON ACCOUNT OF THE NUMEROUS SHARP CURVES ON THE LINE.

the end of that time are fully developed. The temperature should range from 50° to 59° F. The leaves and blossoms of the plants are said to be of stronger and fresher appearance than when the plant is treated in the usual manner, and the blossoming period can be retarded as much as six months. Ice bulbs sell in Germany for about one cent each. Our illustration shows a view in a cold storage warehouse containing about six million mayflower bulbs.

KITES FOR SOUNDING SHALLOW WATER

A water-kite fastened to a wire cable and cast over the side of a ship is the latest in sounding devices. The kite, which consists of two parts connected by a coupling, is sunk by the oblique pressure, just as an atmospheric kite is raised by the wind, says Public Opinion, and may be sunk to a vertical depth regulated by the length of the cable. A scale and register on the side of the winch tell the depth to which the kite has descended. When the kite strikes bottom, the coupling is released and the lessened tension of the cable sets in motion an alarm bell on deck, to attract the attention of the watch. The kite follows the ship under any condition of weather, and when fixed for a certain depth will sound the



Kite, Towed Along Under Water, Striking Bottom

alarm as soon as the ship passes into shallower water. The kite is not reliable for depths greater than 30 fathoms.

When moving pictures are taken of a buggy moving at such a speed that the spokes revolve in unison with the interrupting shutter of the camera, then the buggy in the pictures appears to move while the wheels stand still.

CHIMNEYS TO RESIST EARTHQUAKE

When chimneys of brick or cement blocks toppled and fell during the San Francisco earthquake, the breaks always occurred in the mortar joining them, and not in the bricks or blocks themselves. One of our readers, John W. Haynes, of San Jose, Cal., suggests a method of building quakeproof chimneys. He says:

"I believe chimneys would be earthquakeproof if the cement blocks were made with a ¾-in. hole in each corner in which to cement iron pins, a little less than twice the thickness of a block in length, as the chimney is run up. By using two of the blocks diagonally opposite each other in setting the pins, continuous rods would be built up with the chimney. The method would be cheap and easy to use."

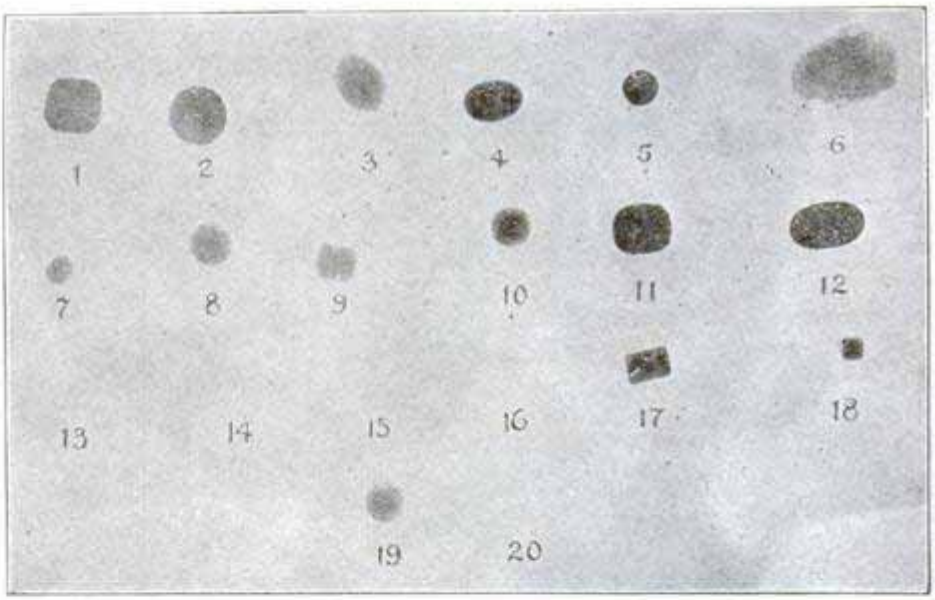
X-RAYS AND A DIAMOND THIEF

The young woman from Texas who, while examining diamonds at a jeweler's in Omaha, Neb., put a $300 gem in her mouth and when charged with the act swallowed it, has unwittingly aided science. Hitherto it has been an accepted fact that diamonds are transparent to the Roentgen rays, says the Keystone, while imitations are opaque and appear in an X-ray photograph with sharp outlines. The X-rays were used, however, to locate the diamond swallowed by the girl, the jewel casting a faint shadow, which was verified by placing three first-water diamonds in scattered positions below or back of the thigh of a person experimented on and photographing them, and the spots were the same as that cast by the swallowed jewel.

The young thief agreed to have the diamond cut out provided she were spared the consequences of her act, but as she was under 21 years of age and a native of Texas she could not legally become a party to the agreement. On trial she claimed she put the gem in her mouth to test it and did not know what became of it. However, she was found guilty and sentenced to five years in the penitentiary.

Our illustration, from the Keystone, shows an X-ray skiagraph of precious stones. Real diamonds cast the light shadows, Nos. 13, 14, 15 and 16; while the imitation, No. 19, casts a dark shadow. It is also noticeable that the black diamond, No. 20, a dull and lusterless substance, is as transparent to the X-rays as the brilliants, while the diamond bortz, No. 6, is much less transparent than either, though more so than the imitation, No. 19. The garnets, Nos. 11 and 12, cast darker shadows than the imitation garnet, No. 2; and the turquoise and pearl, Nos. 4 and 5, cast much darker shadows than the opal, No. 3; sapphire, No. 7; chrysolite, No. 8; emerald, No. 9, and ruby, No. 10. The rough tourmaline, No. 17, casts a darker shadow than the polished tourmaline, No. 18.

Galvanized iron roofs should not be painted until exposed to the rain and weather for several months. The paint will not then scale off.



X-Ray Skiagraph of Precious Stones

PROFIT IN CEMENT BLOCKS

A cement block man figures out the cost as follows, with a machine turning out 150 blocks per day:

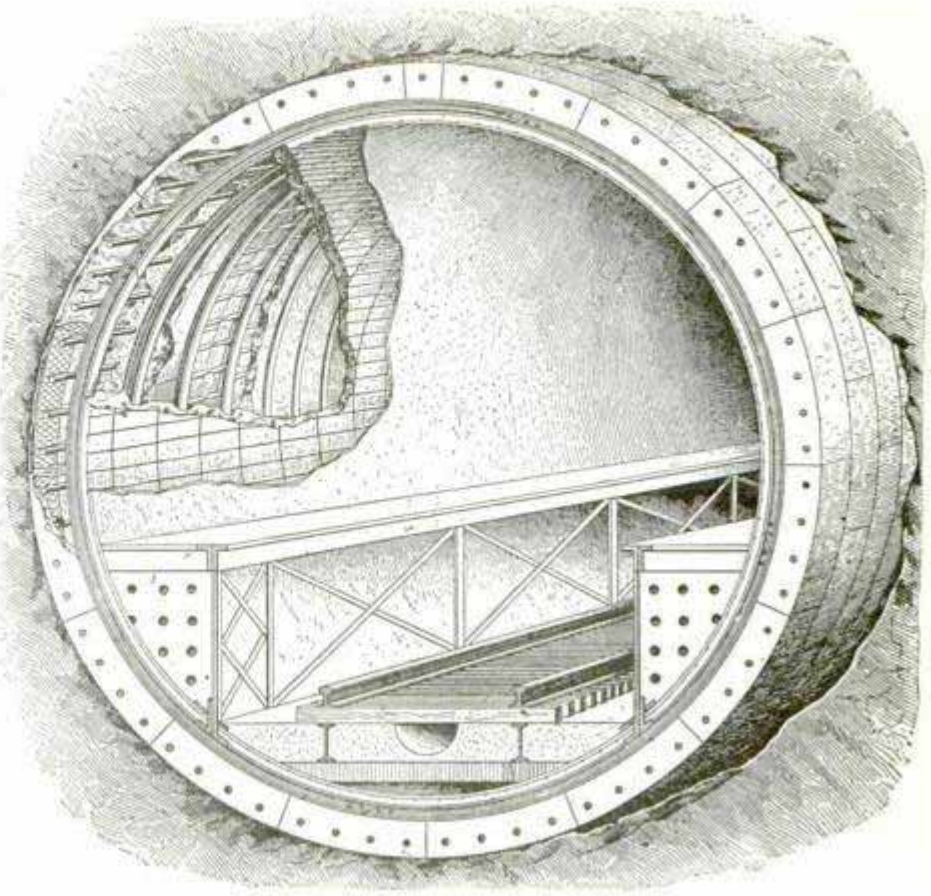
Five barrels of cement, twenty barrels of sand and three common laborers constitute the labor and material for a day's work.

5 bbls. of cement, at $1.50 per bbl....	$ 7.50
20 bbls. of sand, at $1.00 per yd.....	2.50
3 laborers at $1.50 per day each.....	4.50
Total cost	$14.50

This makes the cost of a block about 15 cents; the block retails for 35 cents.

REINFORCED CONCRETE TUNNELS

A new system of tunnel construction contemplates the use of reinforced concrete in the walls of the shell in place of cast iron or steel. The system is for use with the Hastings tunnel shield which was used so successfully in the construction of 4,139 ft. of 24-ft. 9-in. bore on the main conduit of the Chicago intercepting sewer system.



New Concrete Tunnel System

The foundation of the reinforced tunnel lining is to consist of a series of metal reinforced segment blocks molded by a new method without pressure or tamping, placed by a rotary segment hoist connected with the shield and forced into position by the hydraulic jacks that shove the shield forward. Waterproof pads will be used in the joints and seams of each ring of segments and the inner surfaces of the blocks will be coated with waterproof material, after which a reinforcement of circular steel beams, a beam to each ring, will be placed. These circular beams will be braced by connecting longitudinal bars attached at equal distances around the circumferential beams, says the Iron Age. Over this foundation and at a suitable distance from it will be laid a heavy wire netting and over the netting will be applied a coating of cement concrete, completely imbedding the metal. The interior surface will be troweled smooth. This form of construction is said to be durable and of moderate first cost compared with other systems of building.

NIAGARA FOR BEAUTY AND POWER

The Burton bill, which has for its object the preservation of the scenic grandeur of Niagara Falls to the people, was passed by the House of Representatives on June 4. By the terms of the bill the United States reserves the right to take unlimited quantities of water from the Great Lakes for sanitary and drainage purposes; the President is authorized to open negotiations with Great Britain in regard to a line of action in preserving the river, and the amount of water which may be taken from the river for the production of electrical energy is left to the discretion of the Secretary of War.

It is estimated that, allowing for losses by friction, etc., the total hydraulic energy represented by the river in its 237 feet of fall between Lake Erie and Lake Ontario is 3,500,000 horsepower. At the present time, on the two sides of the river, a total of 900,000 horsepower is being developed. The river discharges 230,000 cubic feet of water per second from the one lake to the other; by limiting the number of cubic feet which may be used for power purposes the government will be able to save the falls from our over-eager commercialism.

Probably the most striking estimate of Niagara's power from a commercial standpoint is that made by H. W. Buck, electrical engineer of the Niagara Falls Power Company. In an article in the Outlook he says:

"The total hydraulic energy of the falls, if all were developed, would represent about 3,500,000 horsepower. To generate one

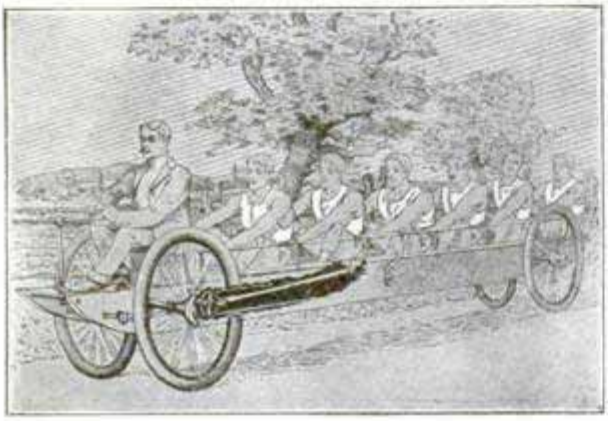
horsepower continuously for a year by a steam engine requires about 13 tons of coal, so that to generate the amount of power represented by the falls would require about 50,000,000 tons of coal per year. This would cost not less than $50 per horsepower-year. As against this, Niagara power can be generated and sold in large quantities for $15 per horsepower-year, or $35 less than is possible from the use of coal and the steam engine.

"From the above it will be seen that if all the hydraulic energy of the falls were utilized for power purposes there would result to the country an annual saving of $122,500,000 and an additional saving in the consumption of 50,000,000 tons of coal. These figures illustrate what it actually costs the people of this continent to maintain Niagara Falls as a spectacle."

From the number of petitions and the general agitation of the subject it seems the American people are still willing to pay the price.

BOAT RACING ON LAND

For inland organizations whose members would enjoy boat racing were they only located conveniently, a new rowing shell for



Develops the Rowing Muscles

developing the rowing muscles has been invented. The crew pull on straps fastened to a rail on each side and push against foot braces, thus giving the movable seats a reciprocating motion, says the Scientific American. The device is used for land boat races.

PLAN MUNICIPAL ICE HOUSE

The question of municipal ice plants is being agitated in Detroit, Mich. The plan is to erect a number of ice houses and to cut the ice around Belle Isle, owned by the city. Members of the park department who have little to do in the winter will have charge of the cutting and storing. The ice will be sold to the consumer at the actual cost of maintenance of the municipal plant, the householders to be supplied first.

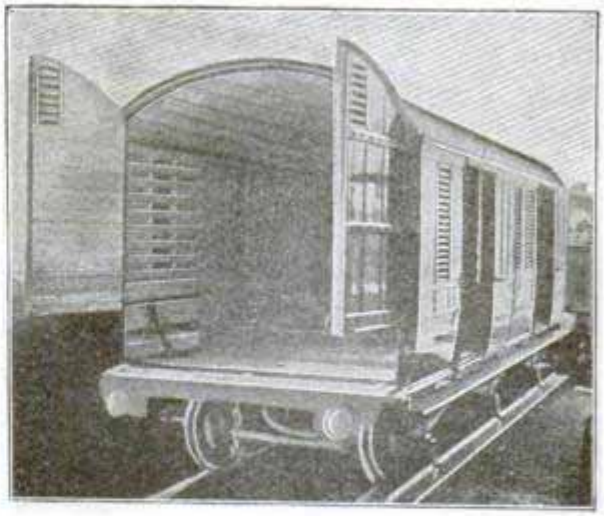
Contracts for two 16,000-ton battleships, "South Carolina" and "Michigan," have been awarded, one at $3,540,000 and the other at $3,585,000.

SAILING DAYS OF OCEAN PASSENGER STEAMERS

Very few sailings are made by transatlantic liners on Fridays, and none on Sundays and Mondays, for all there are so many lines now operating. There is good reason for it, however. Superstition prevents many people from starting on a voyage on Friday, and most people like to start on Saturday. The entire suspension of business, even to different railroad train schedules, on Sunday, puts that day out of the question and because banks are closed on Sunday, making it impossible to get letters of credit, there are no Monday sailings.

FREIGHT CARS FOR AUTOS

The English railroads have had so much traffic in motor cars that one of them, the London & Northwestern, has built special



Car for Shipping Autos

freight cars for the exclusive shipment of automobiles. These cars are 27 ft. long, 8 ft. wide and about 9 ft. high. There are double folding doors at each end of the car as well as 5-ft. sliding doors at the middle.

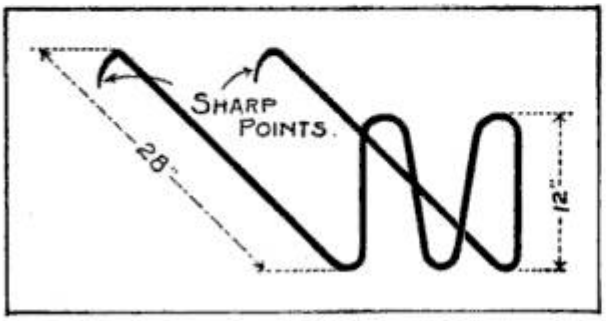
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

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

A HANDY HOLDER FOR LOOSE SHINGLES

In shingling, where the roof is sheathed tight and especially at the top in putting on the last rows of shingles a shingle holder



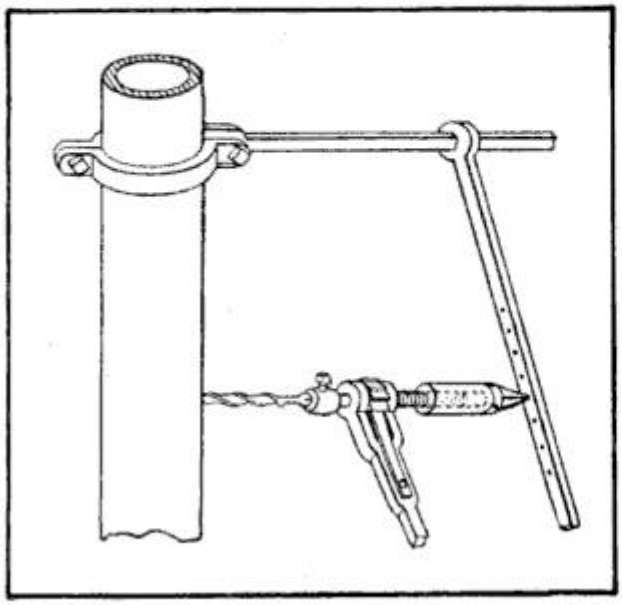
Holder for Loose Shingles

for loose shingles will be found a decided convenience. The holder is made of ⅜-in. steel pump rod and has sharp hooks which can be set anywhere on the roof or hooked over the comb. A half dozen of these holders, says the American Carpenter and Builder, will be plenty for anyone.

DRILLING HOLES IN VERTICAL COLUMNS

For drilling holes in vertical iron or steel columns try the following method:

Obtain an ordinary pipe hanger, which is made in two parts and so constructed that the ends do not meet, and clamp it to the column as shown. Place a 1-in. steel rod, 2 ft. long and having an eye in one end, between the two clamp bars and pass a bolt through the clamp bars and the hole in the end of the rod.

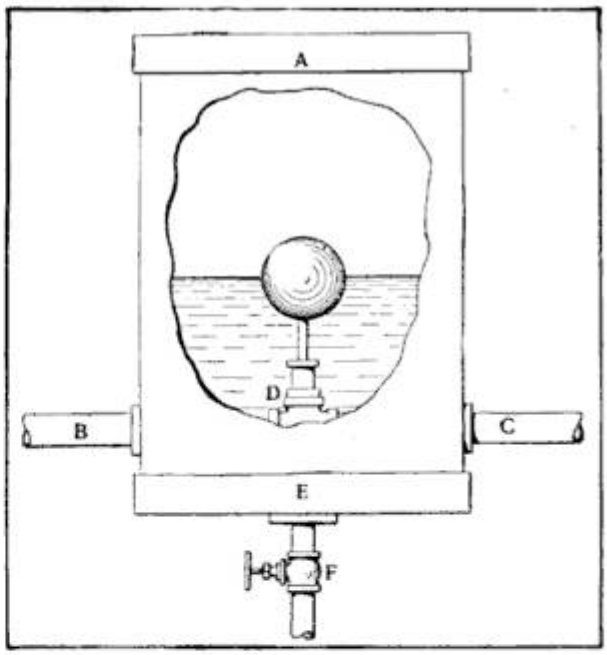


To Drill a Hole of Any Depth

Place a square wrought-iron rod, 1 in. thick, with an eye in one end, on the horizontal bar as shown, says the Engineer. Then put the ratchet in place and by moving the vertical bar nearer the column, the ratchet may be used to drill a hole of whatever depth desired.

HOW TO MAKE A STEAM TRAP OF PIPE FITTINGS

To make a steam trap of old pipe fittings, get a cast-iron pipe 2 ft. long, cap it at both ends, A and E, then drill and tap holes



Home-Made Trap

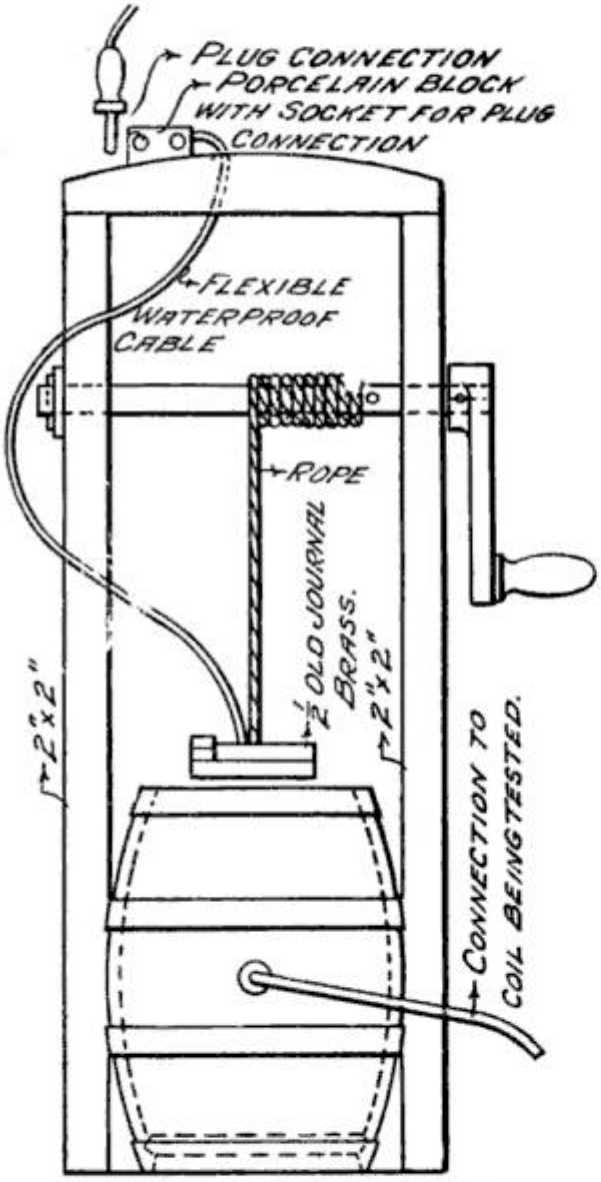
opposite each other for the pipe, B and C. The inlet is at B and the outlet at C. On to pipe C, which should have an extra long thread, screw an old globe valve, D, having previously removed the threads from the spindle of the same.

Attach a float ball to the spindle as shown. Valve F, says the Engineers' Review, is to drain the trap when necessary.

If valve D is properly connected, very little packing need be used on the spindle, as the pressure will tend to close the valve. The trap is for low pressure. When it fills with water the float will rise and so let the water out.

HOME-MADE WATER RESISTANCE

A portable home-made water resistance for testing purposes was made in the electrical repair shop of the street railway at Lansing, Mich. The Street Railway Review describes the device. By reference to the accompanying illustration it will be noted that this



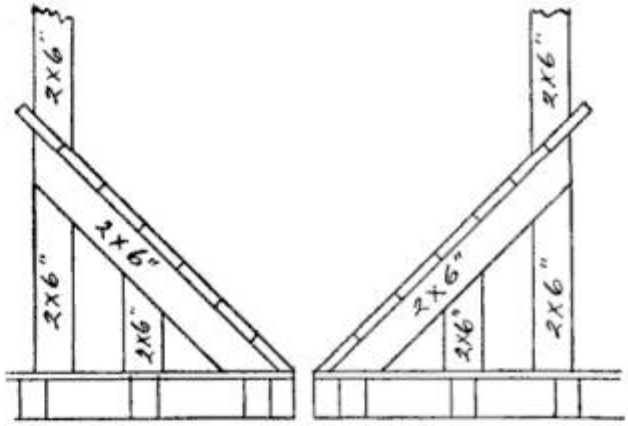
Home-Made Water Rheostat

water resistance consists of a small barrel or keg to the sides of which are fastened vertical 2x2-in. wooden posts. Near the top, these posts are pierced by a horizontal shaft fitted with a crank at one end. On this shaft is wound the rope which supports an old journal brass used for making electrical contact with the water in the barrel. By means of a flexible cable this piece of brass is electrically connected to a porcelain connection socket fastened to the framework holding the small windlass. A suitable plug with a flexible cable completes the circuit between the porcelain connection block and the source of current. The cable, from a plate immersed at the bottom of the inside of the barrel, is brought through a wooden bushing driven tightly into the bung hole. This cable is of sufficient length to connect with an ammeter or other instrument in the circuit with the coils to be tested.

WHEAT BIN THAT WILL NOT LEAK

A form of wheat bin which may be made large or small, built of any size lumber and will never leak is shown in the illustration from the American Miller.

Build the hopper first. Put in the rafters,

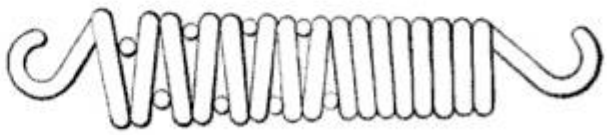


Non-Leakable Wheat Bin

then floor them, running the flooring crosswise and having it extend out past where the studding will be. Cut the studding on a bevel to fit the hopper. The sketch is an end view.

HOW TO LENGTHEN A SPRING

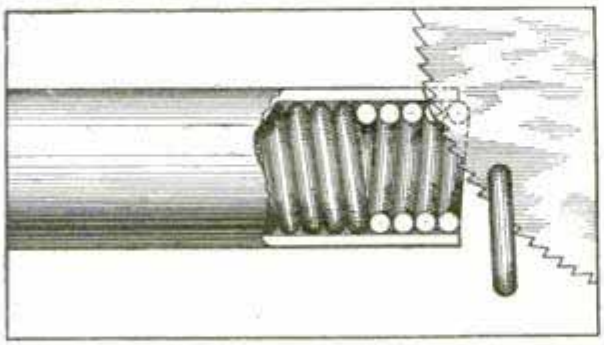
This is a simple matter, but often very convenient. Drive wedges in between the coils, and before taking the wedges out, drive wire nails in between the coils. Then place the spring where it is to be used, says the Engineers' Review, and drive out the nails, letting the tension come on the spring.



Method of Lengthening

RAPID METHOD FOR MAKING RINGS

Having had occasion to make a large number of brass wire rings, I found the following method the quickest and best: The wire to be made into rings was first made into springs, which were then cut along one side, thus forming as many rings as there were coils in the spring. As the springs



Ring Cutter for Lathe

were wound with the coils touching each other, the elasticity of the wire brought the ends of the rings opposite each other, thus doing away with any offset at the junction.

To cut the rings I used a very thin circular saw, fastened to an arbor and used in a lathe. Then I fastened a piece of brass tubing in the tool post, by means of a straight-tail dog, and fed the coils through by hand, running the lathe backwards at high speed. In this way I cut over 2,000 an hour, the rings dropping out of the end of the tube, as shown in the sketch.

There are many methods of making wire into springs, and any device which makes good close wound springs will do, but for this particular purpose I have found the following method very satisfactory: The wire is wound on an arbor in a lathe, and is fed through two pieces of wood held by the tool post. The pieces of wood should be clamped together so that the friction will draw the wire out perfectly straight, and the tool post should be fed by the screw-cutting attachment of the lathe.—Contributed by A. W. Griggs, 955 Market street, Kenosha, Wis.

WATERPROOFING FOR CEMENT BLOCKS

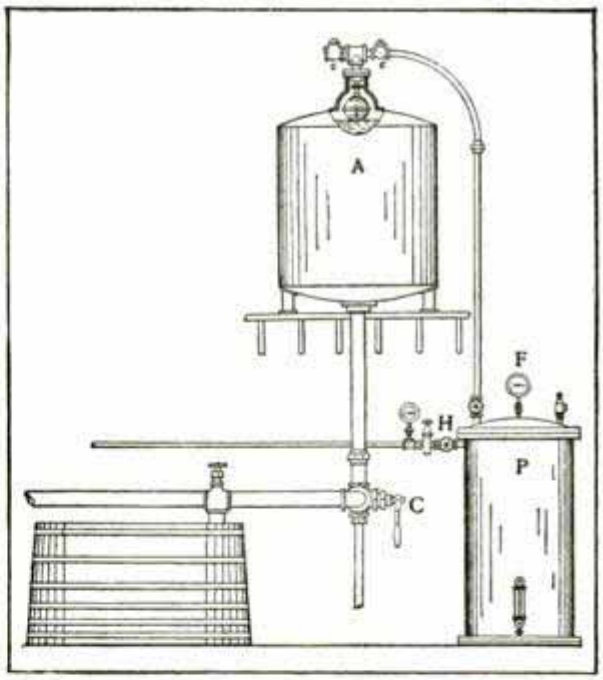
Shave ½ lb. castile soap into 1 gal. water; let dissolve, but do not make a suds. Apply it while boiling hot to the surface of the blocks, using a brush. After the soap wash dries apply a luke warm solution of ½ lb. powdered alum in 4 gal. water. Two applications, says Cement Era, will close all pores and make a perfect waterproofing.

HOW TO MAKE A WATER AIR COMPRESSOR

In an establishment consuming an average of 25,000 gal. of water per day, drawn from the city mains through a 1½-in. pipe under an average pressure of 60 lb. and discharged into tanks of 1,000-gal. capacity each, the water was made to supply all the compressed air required for several machines, thus doing away with the expense of operating an air compressor. The system was arranged as follows:

A tank, A, of 1,000-gal. (133 cu. ft.) capacity was placed over the water tank room, and another tank, P, of 66 cu. ft. capacity was placed below tank A, in the water tank room and the piping was arranged as shown.

To operate, the handle of the three-way cock, C, is given a one-eighth turn, causing the water to flow from the water main into tank A, until the float valve closes and in



Compressing Air by Water Power

turn discharges the corresponding volume of air through check valve, E, into tank P. The handle of the three-way cock is then turned to its natural position, when the water flows from tank A, to the water tank and in turn draws in air through check valve, G, ready for another filling.

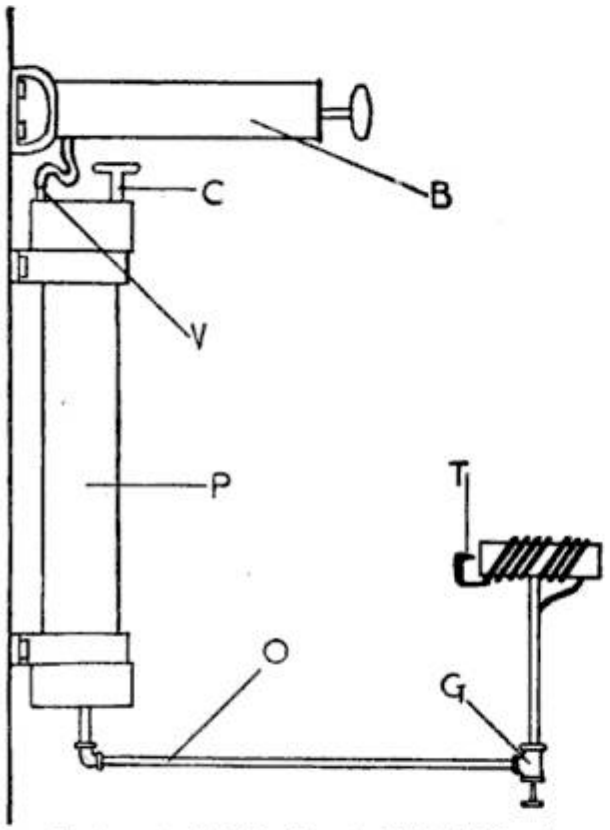
In filling tank A with 1,000 gal. of water 133 cu. ft. of free air is compressed in tank P, to about 2 lb., says a correspondent of the Engineers' Review, and by using 25,000 gal. of water per day it equals 25 fillings or the displacement of 3,325 cu. ft. of free air compressed to about 50 lb. pressure per square

inch deducting necessary losses. This air is drawn out of tank P, through a reducing valve, H, under the desired pressure.

HOME-MADE GASOLINE BRAZING TORCH

A gasoline brazing torch which fastens to the wall in front of the work bench and swings back out of the way when not in use, may be made as follows:

Thread both ends of a 2-ft. length of 2-in. gas pipe. In a 2-in. cap drill a hole to receive a single tube bicycle valve, V; drill another hole and tap it to receive a ¼-in. pipe, C, 5 in. long, on which weld a piece of iron to form a handle or T for convenience in replacing the piece after filling the tank by way of the apped hole.



Fastens to Wall in Front of Work Bench

Fit the 2-in. cap on the top of the 2-in. pipe. Drill and tap the cap for the bottom for a ¼-in. pipe, O, 2½ ft. long and threaded at both ends. Make the burner of a piece of bicycle tubing, says the American Machinist, with a 2-ft. length of small-sized tubing coiled around it. An angle valve at G controls the supply of oil to the burner. The arrangement of the burner causes a continuous generation of gas by the blast. Make a hole not larger than a pin prick in the cap, T, at the end of the coiled tube. Fasten a bicycle pump, B, to the wall just above the tank to use in keeping up a constant pressure in the tank.

HOW TO MEND OLD SACKS

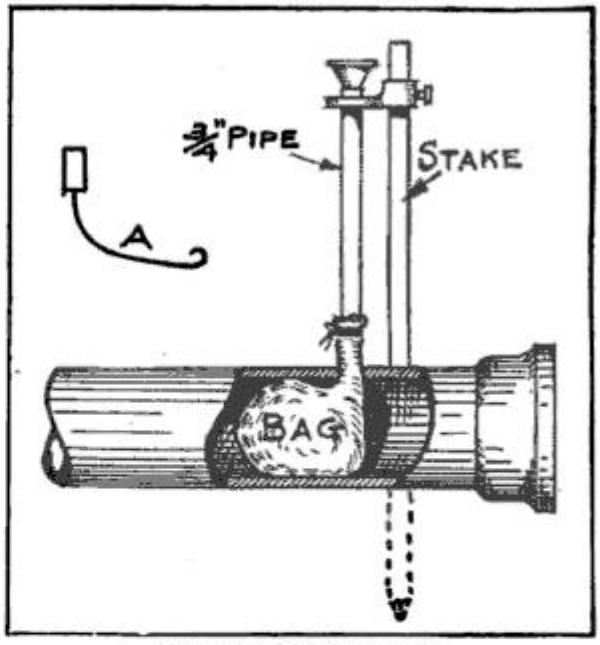
Turn the sacks and shake them well. Make some good paste and apply it around the rent, using a brush. Cover the rent with a piece of cloth, says the American Miller, smooth it on with the hand and your patch is complete.

GAS BAG FOR STOPPING MAINS

Flow of gas from the main can be stopped by means of the gas bag illustrated, a device much used by gas fitters. To make the bag use common bed sheeting, cutting it 1½ in. larger than the circumference of the pipe; sew it up, turn it inside out and then dip it in linseed oil so it will hold water.

Put the bag over the hook, A, and put it into the pipe, then remove the hook and fasten the mouth of the bag to a ¾-in. pipe as indicated. Support this ¾-in. pipe by a stake driven into the ground. Pour water through the ¾-in. pipe into the bag until it is full and stops the flow of gas.

To remove the bag grasp it at the mouth with one hand and with the other pull out the ¾-in. pipe. Pull slowly on the bag, thus forcing it to the inner or top surface of the pipe and causing the water to run out. From 2 to 3 lb. can be created in the bag, depending on the height of the water column, 15 seconds being necessary to insert the bag and cut off the flow of gas.



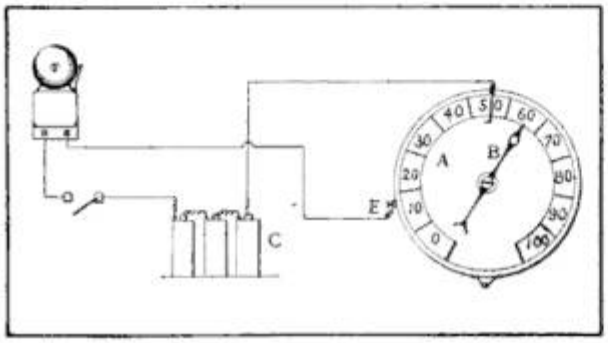
Stop-Bag for Gas Main

For a 10 or 8-in. main, use a 10-in. bag; for 6 and 4-in. pipe use a 6-in. bag and for 4, 3 and 2-in. pipe, use a 4-in. bag.

TANK ALARM FOR LOW WATER

In a water supply system where the tank is located a distance of two miles from the pumping station, and where there is an alarm to notify when the tank is full, but none to tell when it is empty, a correspondent of the Engineers' Review installed a device as follows:

A is a water pressure gauge and B is the pointer. An insulated wire runs from the battery, C, to and through a hole in the top of the gauge shell. A bare end extends down low enough to allow the pointer to form a contact. This causes a current to flow from the batteries through the wire to the hand of the gauge and to the bell by means of the wire, E, which is fastened to the case of the gauge, by either soldering,

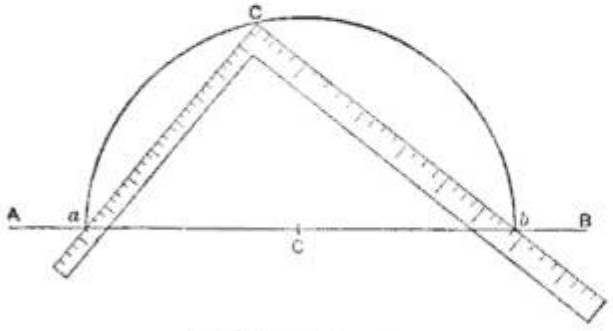


Tells When Tank is Empty

or with brass or copper screw. The switch is for cutting out the bell when the water pressure is low enough for the pointer to hit against the end of the wire.

HOW TO TEST A SQUARE

Draw any line (A-B) with any radius and use any point on the line as the center, C, describing a semi-circle, a c b. If the square is a true right angle, says the Metal Worker, one arm should meet the diameter at b, the other arm at a, and the corner come directly

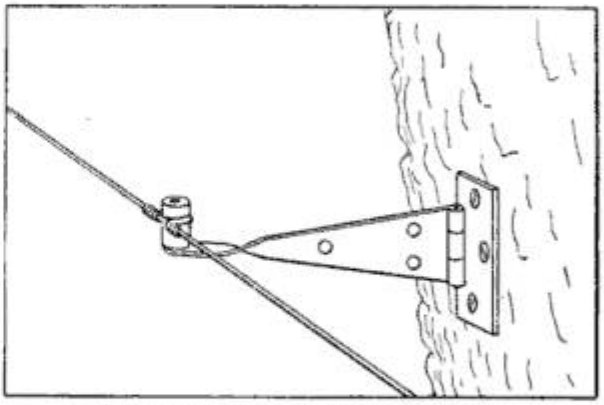


Testing a Square

on the circumference at c. If the test is carefully made any inaccuracy in the square may be detected.

FASTENING LINE WIRE TO TREES

Where it is impossible to set poles for a rural telephone line, a good method of fastening the wire to the trees is as follows:

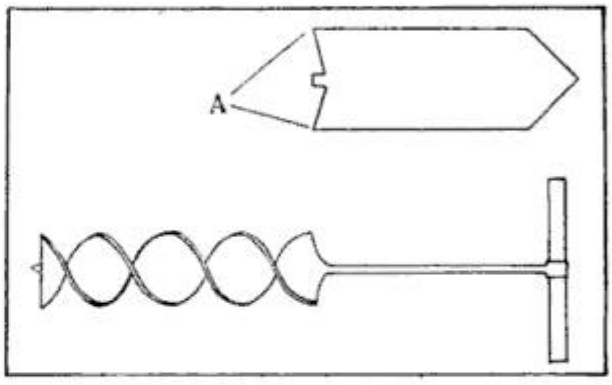


Hinge for Fastening Line Wire

Take a hinge (the longer the better and safer), nail it to a limb as illustrated. Twist the tip one-fourth turn and bolt a porcelain button to it, to which button fasten the wire. When the motion of the tree is parallel with the line, the wire will give and when it is at right angles with the line, the hinge will take up the motion and prevent the wire breaking.—Contributed by F. W. Mintzlaff, Grafton, Wis.

HOME-MADE POST AUGER

For the auger use a piece of 3x¼-in. soft steel 3½ in. long. Cut it as shown; sharpen the wings, A A, not attempting to finish the spur. Then forge a handle hole in one



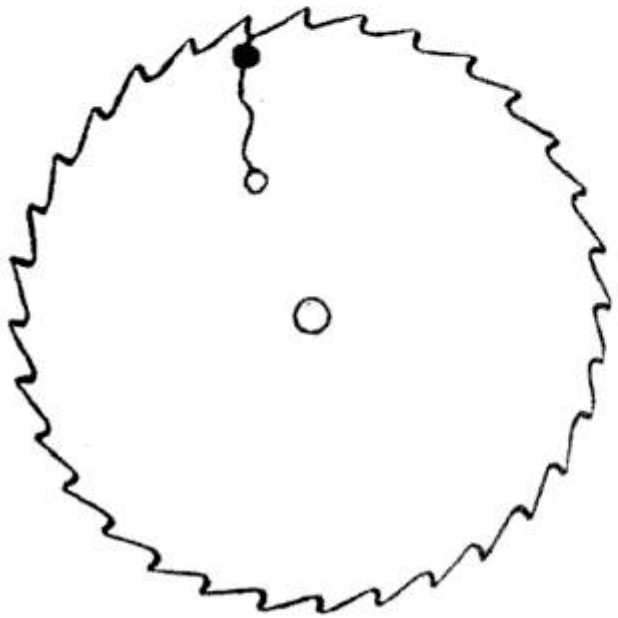
Good Post Auger

end of a piece of ¾-in. round stock 30 in. long; weld this piece to the auger blade, heat the blade and twist it in the vise (to the left). Finish up the cutting edges over the horn of the anvil and make a square point of the spur. A correspondent of the American Blacksmith, who has made fifty augers of this kind, finds them very satisfactory.

METHOD OF MENDING CIRCULAR SAW

Do not throw the cracked circular saw into the junk heap, make it as good as new by the following method:

Drill a ¼-in. hole at the crack near the teeth and another hole at the end of the crack. Countersink the hole near the teeth on both sides and insert a rivet very neatly,



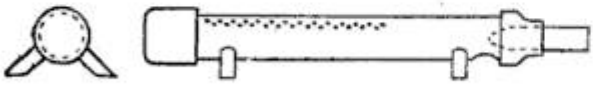
Repair for Cracked Saw

finishing the heads of the rivet down even with the saw blade. Should the crack be an extra long one, says the American Blacksmith, two rivets may be necessary.

GAS STOVE FOR WORK BENCH USE

This handy device for heating soldering irons, etc., is made of a piece of ½-in. gas barrel, 8 in. long. Cap one end and to the other fit a reducing socket having a short length (2½ or 3 in.) of ¼-in. barrel in its smaller end. The outer end of this ¼-in. barrel should take the rubber tube, the inner end being reduced by forging to leave a small hole as indicated by the dotted lines.

Cut an aperture, to admit air, on the ½-in. barrel as close to the reducing socket



Gas Stove for Work Bench

as convenient and at the cap make four rows of holes to allow the air to escape. Screw in four pins ¼ in. in diameter to serve as legs, says the Model Engineer, London. Provide a sheet iron box to stand on the bench to retain the heat and a bar of ⅜-in. round iron across the interior to support the soldering irons.

PREVENTING BLISTERS IN PHOTOGRAPHS

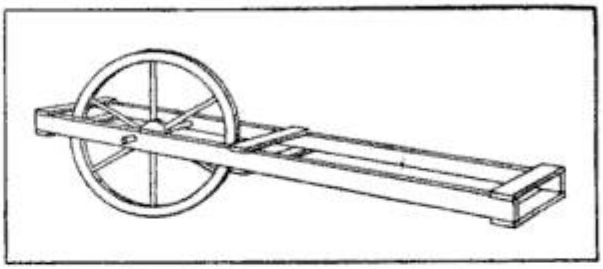
Blisters in photographic prints or plates are frequently ascribed to the hot weather, though they sometimes develop in cold weather, to the mystification of the amateur.

The cause is the difference in temperature between the atmosphere and the baths used in developing.

In summer one will work along with the atmosphere, wash water and toning bath high but uniform, and then plunge the prints in a fresh hypo bath that has become as cold as ice owing to the fall in temperature which always results when hypo is dissolved in water. The result, says Camera Craft, is a case of blisters. And the same result may be accomplished in winter, merely by having one of the baths much colder or warmer than the others.

WHEEL FOR LAYING OUT ORCHARD

This device is made of two 1x4-in. boards, 10 ft. long, and an old wheelbarrow wheel. Establish base lines on the orchard ground



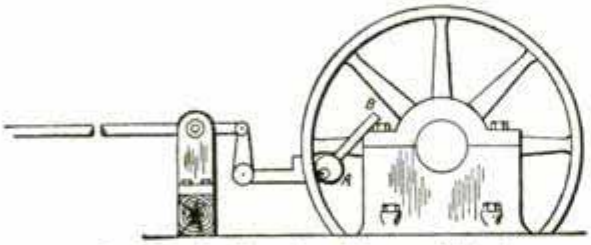
For Laying Out an Orchard

when it is ready, then draw the wheel from one tree point to a point at the opposite side of the field and so back and forth until the ground is marked one way. Then mark it the other way and where the wheel marks cross is the place for a tree. Dig a hole there, says the Rural New Yorker, and set the tree on a line each way with the marks. By this method every tree will be exactly in line.

Nitric acid of 1.2 specific gravity will darken cherry. Let stand 12 hours, then wash off the acid and dry.

TURNING A FLYWHEEL

This device is similar to one described in our April, 1906, number, but is for moving a heavier machinery load. To prevent the grip on the wheel from slipping the inside



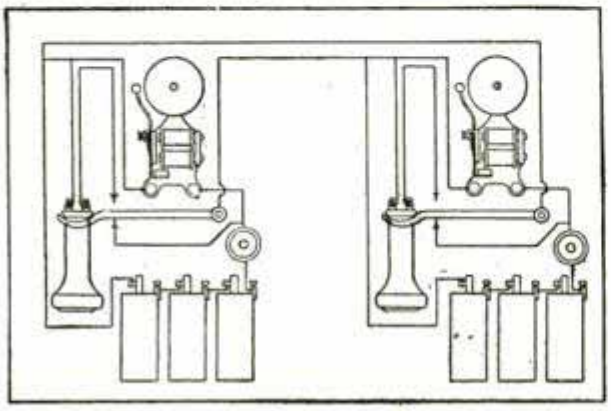
Device for Turning Heavy Wheel

jaw of the wrench was turned in a lathe and an eccentric cam, A, with a short lever, B, made. When the long arm is raised, the full throw of the eccentric is turned against the inside of the rim of the wheel, holding the jaws of the starting device firmly. With this device the engine cannot be turned backward unless the device is anchored to the floor. One man is required to adjust the eccentric, which is detachable, and another to manipulate the long lever.

A correspondent of the Engineers' Review, who uses this method of starting, has a rope transmission with 13 grooves for 1½-in. rope, and to protect the metal between them, he inserted a copper plate, long enough to lap three grooves, under the jaw of the wrench.

HOME-MADE BATTERY-CALL TELEPHONE

The wiring and connections of two battery-call telephones are shown in the accompanying sketch. No transmitters are used, the receivers being used for that purpose, and the receivers and bells are thrown in and out of circuit by means of the hooks,



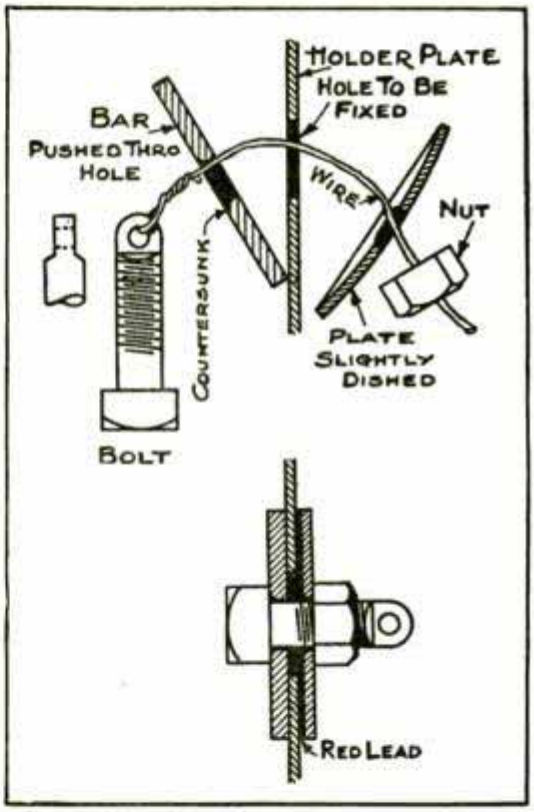
Telephone With Battery Call Bell

which hold the receivers. When the hook is down it closes the circuit at the lower contact and brings the bell in circuit, and when it is up it touches the upper contact and connects the receiver. When either push button is pressed both bells ring, as they are in multiple with both sets of batteries.

By connecting the bells and receivers in this manner only two line wires are necessary, and if a ground connection is used, only one wire will be needed.—Contributed by Richard E. Jenness, Kirkwood, Missouri.

TO REPAIR A GAS-HOLDER LEAK

File a ⅝-in. bolt flat 4 or 5 threads from the end and drill a small hole through the



Repair for Hole in Gas Holder

end. Fasten a wire in the hole, string a bar on the wire and place the whole on the inside of the holder, as illustrated. Use a steel plate and nut on the outside and make the joint with red lead.

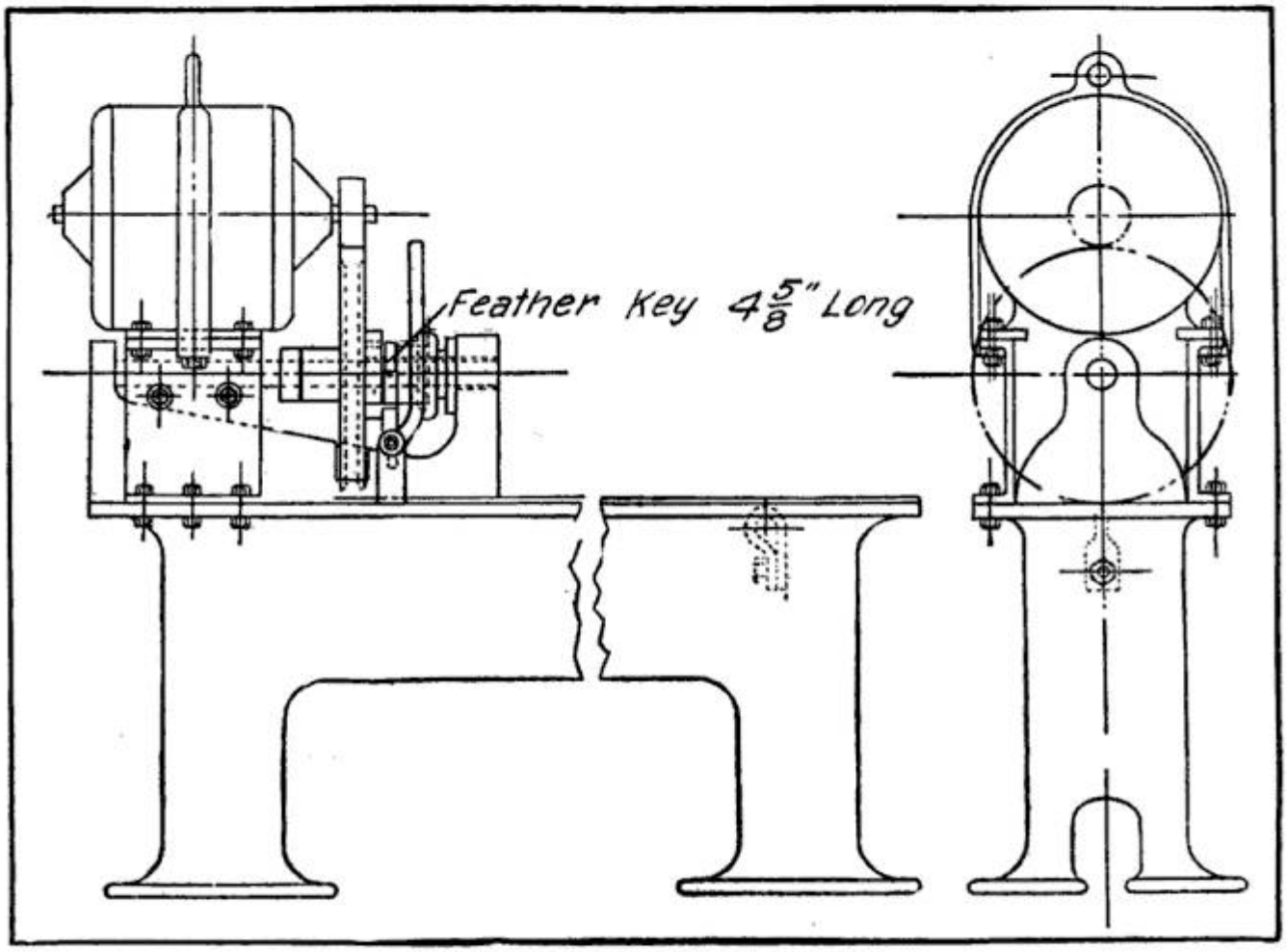
HARDENING DRILLS FOR GLASS

Prepare a solution of zinc dissolved to saturation in muriatic acid, says Machinery, and reduce by adding an equal quantity of water. Dip the drills in this and use without tempering.

PORTABLE LATHE FOR MACHINE SHOP

A portable lathe is one of the conveniences used in the Columbus (Ohio) shops of the Pennsylvania lines. A small motor is applied to an ordinary 16-in. lathe, as shown in the illustration. By the arrangement of the switches either 120 or 240 volts can be used. A small amount of field resistance gives a considerable range of speed.

This lathe can be moved about convenient to whatever engine is being served. It is provided with two hooks by which it can be picked up by an overhead crane and placed wherever desired. There is a combined clutch and brake provided with the handle, convenient to the operator, so that when the clutch is thrown out, the brake is applied, stopping the lathe spindle but allowing the motor to run. In calipering holes for bolts the portable lathe has reduced the expense 40 per cent in the time it saves.



Portable Electrically-Driven Bolt Lathe

Aluminum cannot be successfully soldered. Holes may be filled with solder, but two separate pieces cannot be soldered together.

THE TWEEZERS FOR PICKING UP SMALL ARTICLES

Lay the object on the back of the hand—usually cleaner than the palm—and then pick it up with the tweezers. In this way, the tool gets a good grip on the object, such as a screw or pivot, says Machinery, and is not so apt to slip.

PROTECTING WAX FINISH

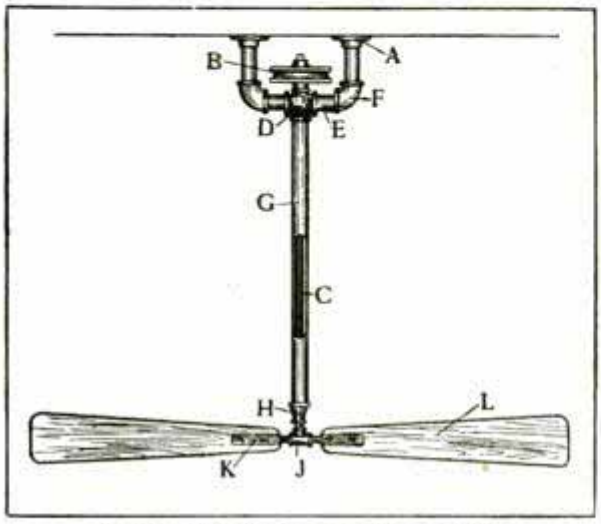
Every drop of water allowed to fall on wax finish will leave a white spot. Try protecting the wax, suggests the Master Painter, with a coat of the following: Zanzibar copal varnish, 6 parts; boiled oil, 6 parts; turps, 10 parts, all by weight. Mix together well and apply.

REMOVING BROKEN STUD BOLTS

Drill a hole in the bolt, being careful not to drill too small. Then drive a square nail set or any square tool into the bolt and screw it out with a wrench. This method is easy and rapid.—Contributed by C. I. Mitchell, Temple, Texas.

CEILING FAN MADE OF PIPE FITTINGS

A ceiling fan costs from $6 to $32.25; here is one made of pipe fittings at a total cost of 99 cents and which works to perfect satisfaction. The parts required and their cost are: Two drilled flanges, A, 10 cents; 5-in. pulley, B, 25 cents; ½-in. pump rod,



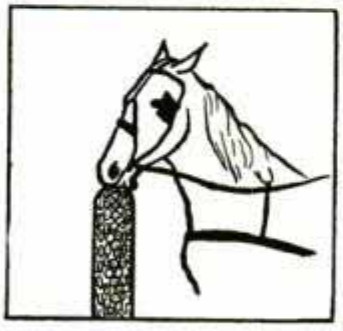
Ceiling Fan That Costs 99 Cents

C, 8 cents; cross, D, 4 cents; two nipples, E, 4 cents; two elbows, F, 6 cents; ¾-in. pipe, G, 10 cents; ¾x½-in. reducer, H, 3 cents; ½-in. tee, J, 4 cents; two couplings, K, with male connections, 9 cents; fan blades, L, made of ⅜-in. pine, 16 cents. The fan should be mounted 7½ ft. from the floor and the pulley connected by belt as shown.

I have made several of these fans, painting and gilding them, so that they compare favorably with factory-made ones in every way.—Contributed by Ora S. Harmas, Fennimore, Wis.

PROTECTION FOR HITCHING POSTS

Most horses seem to take particular delight in chewing up hitching posts if made of wood and unprotected, but when covered with tin washers fastened by nails as shown in the sketch, the most voracious animal will soon refrain from this pastime.



The tin washers referred to are the kind generally used by roofers in laying paper roofing and can be fastened with ordinary steel wire nails.—Contributed by Stoke Richards, Santa Clara, Cal.

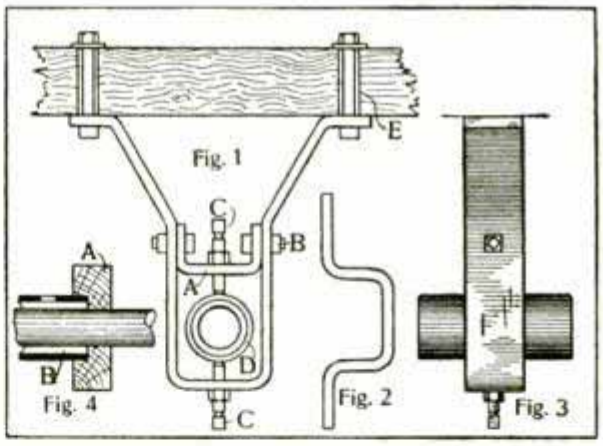
HOW TO MAKE A SHAFT HANGER

Almost any machinist who has a forge can make a good hanger, which will have all the adjustments found in an improved ball and socket hanger.

A piece of wrought iron, about ½ in. by 3 in. for ordinary size shafting, is bent to the shape shown in Fig. 1, if a drop hanger is desired, and if a post hanger is to be made, the iron frame can be of the form shown in Fig. 2. A side view of the drop hanger is shown in Fig. 3.

In making a drop hanger, a piece of iron like that used in the frame is bent over at the ends, as shown at A, Fig. 1, and fastened by means of ⅝-in. bolts, B. The center is tapped for a ⅝-in. set screw, C, which is directly over a similar set screw in the frame. Both set screws are provided with jam nuts so that they may be held from turning after being adjusted.

The bearing consists of a piece of common iron pipe, D, equal in length to four times the diameter of the shaft and countersunk on opposite sides at the center to receive



An Adjustable Hanger

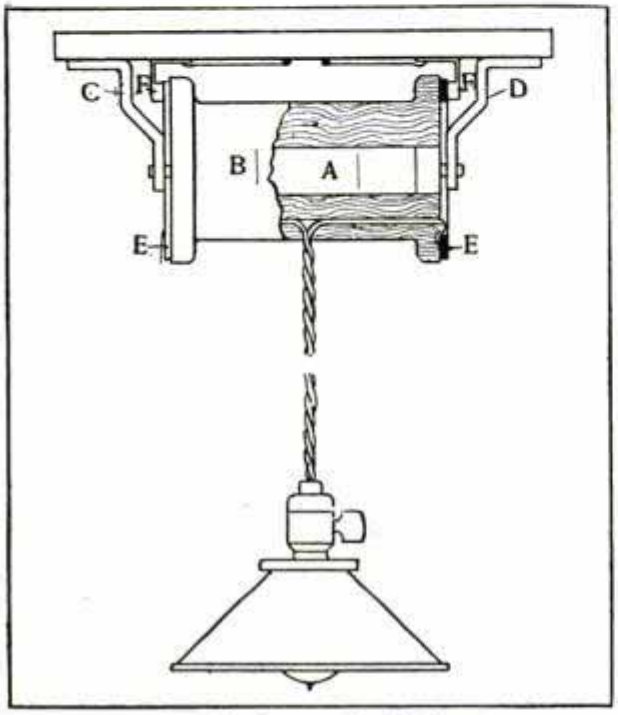
the set screws, C. A hole should be bored through the pipe near each end to allow pouring the babbitt. To do this make two pieces of wood as shown at A, Fig. 4, and slip one over each end of the pipe with the shaft in the center, thus leaving a space, B, to receive the babbitt. Thoroughly smoke or chalk the shaft to prevent the babbitt from shrinking on it, and if the inside of the pipe is very smooth make a number of grooves with a cape chisel.

In fastening up the hanger make the hole E (Fig. 1) somewhat larger than the bolts, F. This allows lateral adjustment of the hanger. The vertical adjustment can be obtained by the two set screws, and if one end of the bearing should be a little too high, it can be lowered by loosening the

bolts, B.—Contributed by Lee R. Clarke, 116 S. Eighth Ave., Bozeman, Mont.

HOW TO MAKE AN AUTOMATIC LAMP CORD ADJUSTER

Procure an old curtain roller, A, and cut off the solid end. Fasten it in the wooden spool, B, which is drilled to receive the



Automatic Lamp Cord Adjuster

wires from the incandescent lamp. Make two sheet brass brackets, C and D, one having a round hole, and the other a slotted hole to prevent the spring shaft from turning. Then make two brass rings, E E, and fasten on ends of spool. Solder the lamp wires to these rings and make two sheet brass brushes, F F, to make contact with the rings.

The lamp may then be lowered or raised the same as a window shade.—Contributed by Wm. D. Probst, 1036 Erie St., Youngstown, Ohio.

EMERGENCY GASOLINE SUPPLY FOR AUTOS

Every automobilist should carry with him a length of small rubber hose for use in case the gasoline feed pipe running from the supply tank to the carbureter should rupture. Also he should carry an extra can of gasoline—say a gallon or two gallons—the spout of the can being fitted with a cork stopper. To one end of the length of hose must be fitted a short length of small pipe. Then in the emergency mentioned, says the Automobile, all that is necessary is to stretch the loose end of the rubber hose over the fractured end of the gasoline pipe and push the other end of the hose, having the pipe, through a hole made in the cork stopper of the extra can of fuel and by propping up the can he will be able to supply the motor with gasoline during the home run.

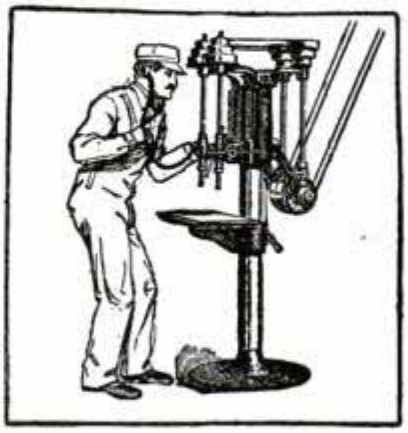
THE CAMERA AS A DRAFTING TOOL

Sometimes a perspective view of assembled castings is required when it would not be advisable to call in a skilled artist. For instance, when bids for a casting are required, the patterns being furnished, and it is desirable to send the foundry people blueprints showing the nature of the work. A good and cheap way, says the American Machinist, is to use the camera as a drafting tool.

To do this take a photograph of the pattern and make a blueprint from the negative. Outline in pencil, emphasizing points of particular importance. Then dip the print in sodium hydrate or in common lye. This will turn the blue into pale yellow and leave the pencil outline in bold relief. Then trace, free-hand, the outline on tracing cloth.

A STETHOSCOPE FOR MACHINES

When a physician examines a patient, about the first thing he does is to produce an instrument which looks like the earpiece of a phonograph, and proceeds to adjust it to his ears and apply the extremity to the various parts of the body. A modification of this instrument, which is known as a stethoscope, has been found valuable for locating troubles in machines.



When a noise is heard which cannot be located the stethoscope can be used as shown in the sketch. The instrument in this case should have a longer hose than those used for medical purposes to allow easy access to all parts of a machine.

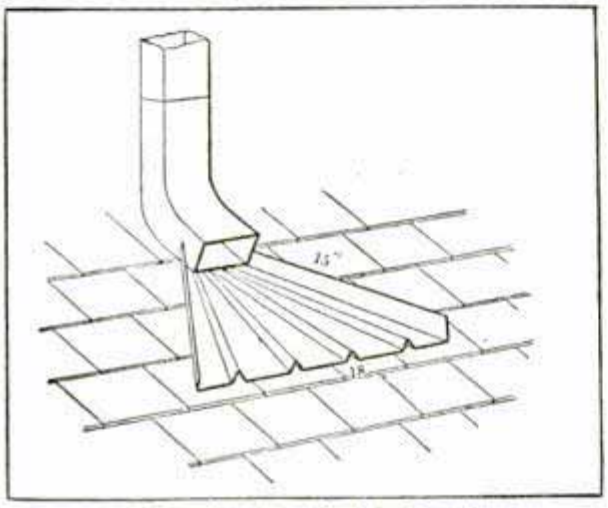
It should be remembered that in a machine which is not running properly sound is produced first, and then heat. Sometimes

when the parts get hot it is too late to remedy the trouble, as they may be so badly cut that they are ruined. To detect the sound quickly before much heat is produced, apply the stethoscope as shown in the sketch, moving the free end to different parts to find the precise point the noise comes from.

An instrument of this kind, made by a correspondent of Machinery, consists of simply a piece of rubber tubing, and when the end is placed to one ear and the other ear closed with the finger the device is very effective.

A WATER SPREADER FOR ROOFS

It often happens that shingle or slate veranda roofs having only a slight pitch become worn at the down spouts, where the deluge of water in time works down through the joints of the roof covering.



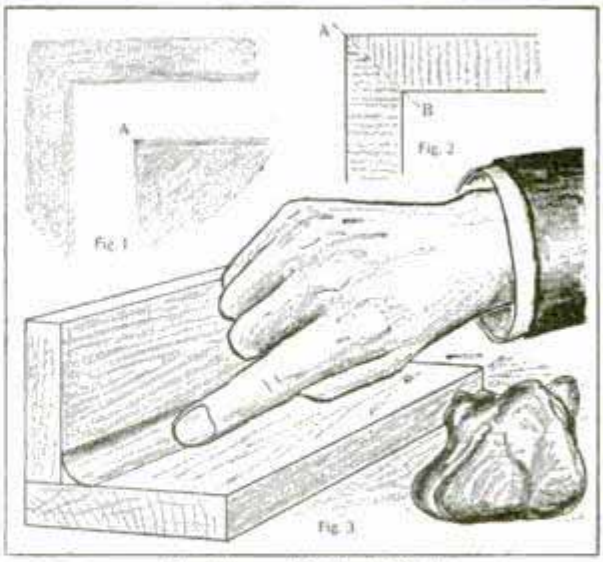
Spreader Attached to Spout

To remedy this trouble, a correspondent of the Metal Worker devised the spreading deflector shown in the sketch. It should be made of sheet copper or galvanized iron, and should be about 15 in. long by 18 in. wide.

HOW TO MAKE FILLETS FOR PATTERNS

It is a mistake to leave out the fillets on any pattern, even on hurry-up jobs, which require no finishing. The object of the fillet is not to beautify the work, but to strengthen the casting, and it is much more necessary than rounding the outside edges, which is often done on patterns in which the fillets have been neglected.

This will be more clearly understood by referring to Fig. 1, which shows the cavity left in the sand after a pattern without fillets has been drawn from the mold. It will be noticed that a sharp edge is left in the sand at A, which is easily washed away by the molten metal, thus making a dirty, porous casting. The corner opposite A offers no protruding edge and, as far as a



Making a Putty Fillet

clean casting is concerned, requires no rounding, but, as will appear later, it is well to round it for other reasons.

Fig. 2 shows the casting which would be produced by pouring the mold shown in Fig. 1. When the molten iron cools it crystallizes, the lines of crystallization being at right angles to the surface as indicated by the vertical and horizontal lines. The effect of this crystallization is the same as would be produced by gluing a number of very thin pieces of wood face to face, and then gluing the ends together at the beveled corner. It is evident that the weakest point would then be at the corner. This is exactly the case with the iron. If sufficient force is applied to a casting of the form shown in Fig. 2, it will invariably break along the line of A-B, although the section of the metal at that point is greater than at any other.

It is a curious fact that rounding the pattern at A (Fig. 2) will strengthen the casting and, as would naturally be expected, the addition of a fillet at B will further increase the strength. The rows of crystals will then swing round from a common radius much as in the position of soldiers when making a turn. Thus instead of the rows of crystals meeting on a line as at A-B they will arrange themselves in wedge-shaped segments, thus leaving the metal more homogeneous.

Having thus seen the necessity of fillets in patterns, there are doubtless many who would be interested in a quick, easy method of making them. This is shown in Fig. 3, the only tools necessary being the hands, and the only materials a lump of putty and a dish of turpentine.

Dip the index finger in the turpentine and

rub along the part which is to receive the fillet. Then roll a piece of putty out long like a lead pencil and lay in the corner. Dip the finger in the turpentine again and then rub on the putty as shown. If a large fillet is wanted, use the thumb and if a very small one is required, the little finger can be used. Pressing on hard also reduces the size of the fillet. After thus forming the fillet allow it to stand about an hour, when it will then be ready to shellac. When the pattern is finished the fillet cannot be distinguished from the best leather fillets and if properly applied will last as long as the pattern.

HOW TO CASEHARDEN IRON OR SOFT STEEL

Procure a quantity of old boots and heat same in a sheet iron box until thoroughly charred. Place the articles to be casehardened in the box and cover them with the charred leather. Reheat and keep at a dull red heat for an hour or more and then plunge the contents in cold water or brine.

If a blue color is desired, the articles after being treated as above should be ground and polished and then placed in a pan of sand. Apply heat and when the desired color appears drop the articles in cold water.

HOW TO MAKE A FARM-LEVEL

A serviceable farm-level which does not cost over 50 cents to make is shown at Fig. 1. The level should be 4 or 5 ft. high with a crossbar 3 ft. long at the top. To the ends of the crossbar tie small glass tubes and connect them with a piece of rubber tubing 4 or 5 ft. long, which fill with colored water up to the line A B. When the instrument is set so that line A B exactly corresponds with the upper edge of the crossbar, the latter will be level. This instrument is as accurate and nearly as convenient as a level costing $15 to $25, says the Yearbook of the Department of Agriculture.

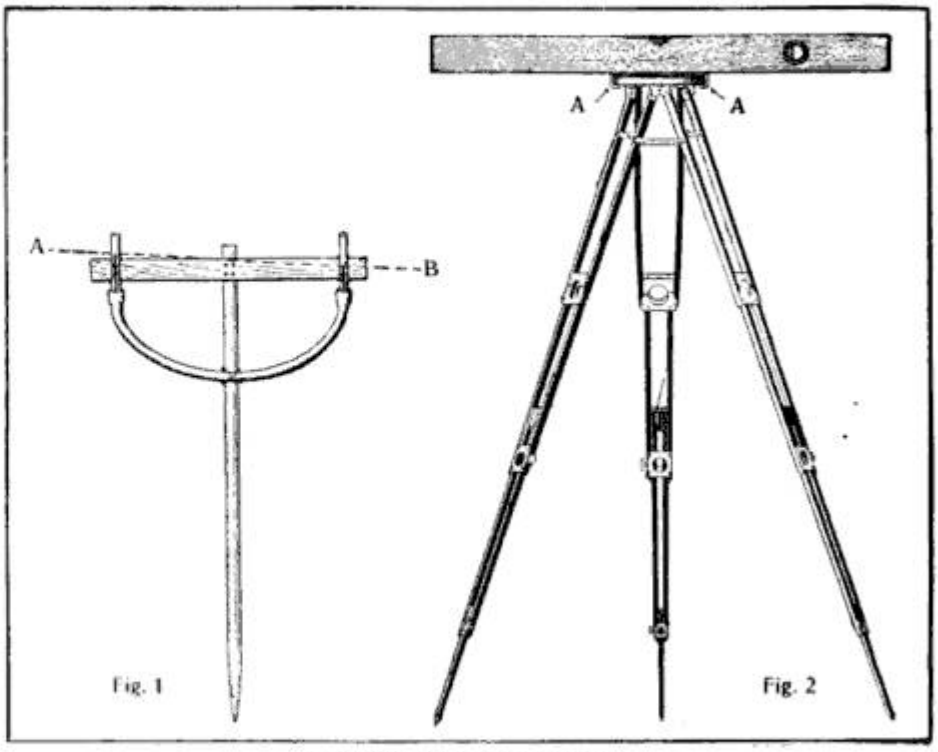
A more expensive and more convenient farm-level may be made by fastening a 30-in. carpenter's level to the head of an ordinary camera tripod, using two right-angled screw hooks as at A, Fig. 2. The level will cost about $1.25.

HOW TO REPAIR A LEAKY HANDHOLE

A leaky handhole located in the rear end of the boiler, where the plate had been allowed to leak until the head of the boiler had corroded away so that it could not be kept tight, was repaired by a correspondent of the Engineers' Review as follows:

A steel ring ⅜ in. thick and 1½ in. wide was procured from the boiler shop and put on. To do this the ring was bored for ½-in. rivets and corresponding holes were drilled in the boiler head and countersunk on the inside, in order to bring the heads even with the plate and leave a clear place for the packing. The countersinking was done by placing the drill chuck in a piece of ⅜-in. pipe and running it through the front handhole; and by fitting the countersink in the chuck and the outer end of the pipe in the ratchet, one man did the turning while the other kept the countersink in the hole, and from running out of center.

When driving the rivets, a cupped piece of pipe was used to hold them in place in the same way, until they were headed. Then by the use of a gasket that did not require "following" the job was completed satisfactorily.



Inexpensive Farm Levels

THE CONSTRUCTION OF A HOME-MADE MOTORCYCLE

At the present time motorcycles are playing a great part, not only for a pastime but for practical use as well, and it is the earnest desire of most young men to own one. As I have had practical experience in this line I feel able to lay before the readers of Popular Mechanics a general outline with illustrations showing the construction of a practical machine.

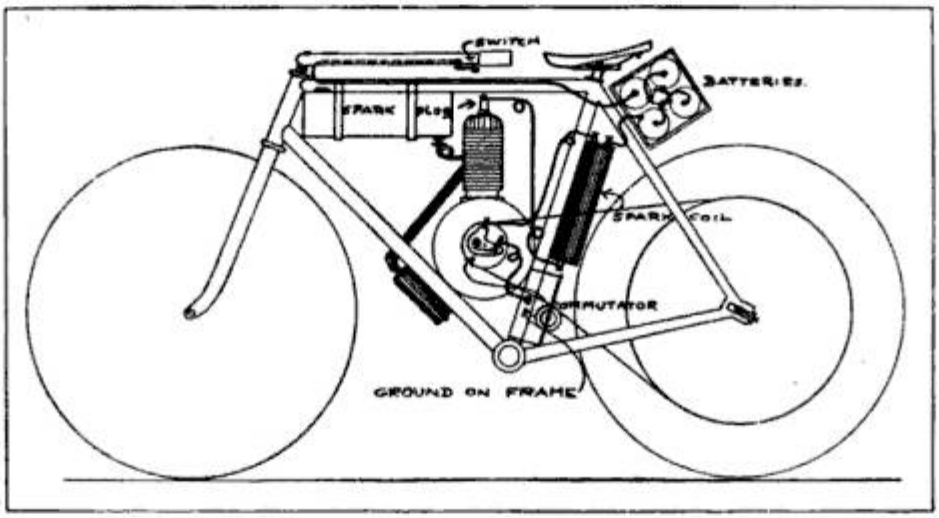
In designing a home-made machine it is well to follow the lines of a regular motorcycle as much as possible, the location of the motor, transmission, etc. The first consideration is that of finding a suitable frame, one that is of heavy construction, with reinforced joints and with a slight or no drop to the crank hanger.

There are several bicycle motors with all necessary attachments on the market which sell for $45.00 to $65.00, according to horsepower. Included with the other attachments is the metal driving-pulley rim which is to be attached to the left side of the rear wheel, which must also be fitted with a coaster brake. This metal rim is provided with legs or clamps which are to be bolted fast to the wooden rim. A spring saddle will be found much more comfortable than the ordinary bicycle saddle and will add but little to the expense of the outfit.

The motor is to be clamped to the front slanting bar, for which clamps are provided; care must be taken to have the engine driving pulley in a true line with that of the rear pulley rim. The belt should be stretched on and the idler wheel put in place, then wheel the bicycle along the floor and note if the belt runs straight and true, if not, shift the engine until the pulleys are in line.

The gasoline tank is clamped to the horizontal bar on top and with small pipe connecting it to the mixing valve or carbureter. The battery box and spark coil are located by clamps on the rear slanting bars, directly behind the seat. The electric wiring should be carefully executed, placing a switch on the grip of the handle bar, by which the circuit can be opened or closed by the thumb or forefinger. This gives immediate control of the engine, and is very necessary, especially when riding in crowded thoroughfares where it is vitally important to stop quickly. The writer has narrowly escaped serious injury in a collision, due to a defective and poorly insulated switch, by which he was unable to break the circuit.

The battery box is made to hold 4 dry batteries, from which the current passes through the switch and commutator and thence to the induction coil, from which it leaps to the spark plug in the engine cylinder. A diagram of this wiring is given in the sketch.



Arrangement of Apparatus and Wiring

After making all these connections and everything else is in place, place the rear wheel of the motorcycle in a rack which raises it from the floor and start the motor to see if all is in working order. There is always a lot of final adjusting to be done after the machine is assembled and should be done as each occasion arises. First, test the spark by closing the circuit with the switch and after disconnecting the spark plug wire, hold it about ¼ in. from any part of the plug and slowly turn the rear wheel until the spark leaps across the space, the revolution of this wheel causing the commutator on the engine to make and break the circuit, which induces the spark. If no

spark is seen, then there is a defect in the wiring at some place.

When this feature is in working order, mount the machine, turn on the gasoline supply, open the throttle half way, place the spark advance lever at a little more than midway, open the compression cock (if one, or if the motor has an automatic valve lift, no attention is required to this) and placing the feet on the pedals start the motor and rear wheel in motion. Do not try to start the motor by slow pedaling, as in most cases a rapid revolution is necessary to obtain the first explosions after which the compression cock is closed and the engine will speed up at once. As soon as it does, regulate the speed with the spark advance lever which will be found to govern the speed absolutely. If the motor does not catch a few explosions at first, regulate the spray valve until it does, as that is the vital point for a perfect mixture.

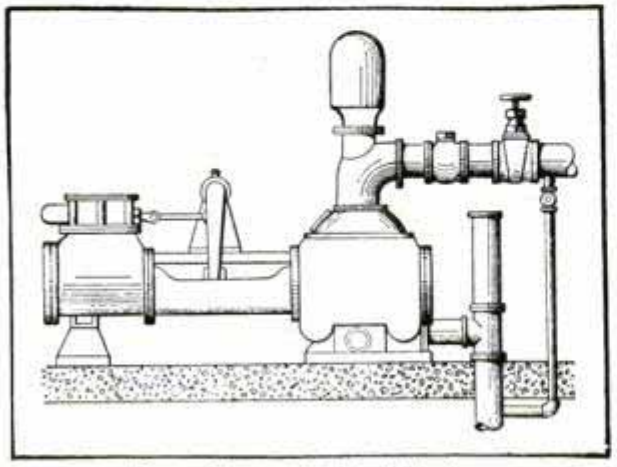
It is well to experiment with the engine in this way until one is familiar with the levers before taking it on the road, after which, with some final adjustments to the belt, etc., no trouble should be had.

To complete the machine in regard to appearance, mud guards may be added; heavy tires and long straight handle bars will add greatly to its good looks.—Contributed by Prentice P. Avery, Ridgewood, N. J.

PRIMING A STEAM PUMP

A pump which was used for fire protection purposes only and which was required to be under steam pressure at all times, made the engine room so hot that the steam was shut off. One day at an unexpected visit of the inspector, the engineer succeeded in turning on the steam without being observed, but though the pump started up he could tell it was getting no water. Fortunately, the inspector did not ask to see the pump throw a stream. After his departure the engineer made an examination and found that the foot valve on the suction pipe leaked and the pump had "run down."

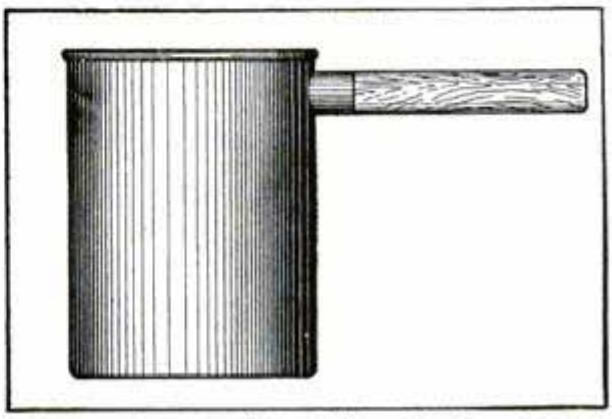
To prevent trouble of that kind occurring again, says the Engineers' Review, he piped up a connection from the service pipe to the suction as illustrated. With this arrangement, if the pump ran down again, it would be an easy matter to prime the suction pipe.



Pump Connected for Priming

HOME-MADE COOKING UTENSIL

As handy a dish as one can have for the kitchen is made from an empty coffee can. Take a piece of tin about 1 in. by 3¼ in., roll into a tube and solder, making a tube



Inexpensive and Convenient

1 in. long and 1 in. in diameter. Now whittle out a soft wood stick 5½ in. long, to fit the tube tight. Secure the two by driving a small nail through both, filing off the end of nail. Now solder the end of the dish near the top. You can handle this utensil over a stove without burning the hands. When the dish is worn out, unsolder and put on a new dish.—Contributed by T. L. Reed, La Porte City, Iowa.

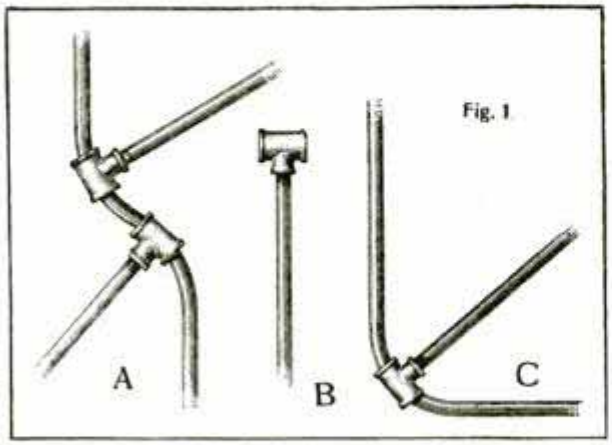
CASE-HARDENING CAST IRON

Pulverize equal weights of saltpeter, prussiate of potash and sal-ammoniac and mix them together. Prepare a dipping solution by adding to each quart of cold water 1 oz. prussiate of potash and ½ oz. sal-ammoniac. Heat the cast-iron pieces red hot, says Machinery, roll them in the powder, then plunge them into the liquid.

Oiling of smoothly polished castings, such as cylinder heads of steam engines, more than doubles the loss of heat by radiation. —Kent.

GOOD METHODS FOR BENDING PIPE

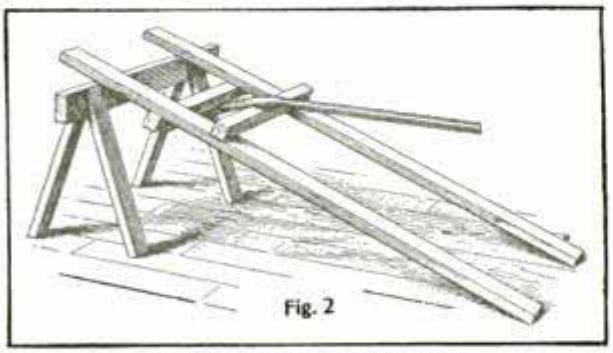
A "hicky" (B, Fig. 1) is a useful device for making bends in small pipe, up to ¾-in. To make a hicky, bullhead a 1¼x1-in. tee on the end of a piece of 1-in. pipe, 4 ft. long.



Bending Pipe with "Hickies"

Then lay the pipe to be bent on the floor, or leave it in place, slip the tee on the hicky over the pipe to a point near where the bend is to be made. Start the bend with a slight pressure on the lever, then move the hicky along the pipe a little and apply pressure again. Repeat this operation until the bend is made as desired (C, Fig. 1). To make an offset, use two hickies (A, Fig. 1), holding the first bend in position with one and using the other to make the offset.

For bending pipe up to 2 in. a good method is shown at Fig. 2. Lay two 10-ft. planks up against a horse or window-sill, placing them 3 ft. apart. Nail a piece of 4x4-in. timber to the under side of the planks, and provide another piece, which leave loose so it can be moved back and forth as desired, says the Metal Worker. Insert one end of the pipe to be bent under the lower 4x4-in. piece and adjust the other



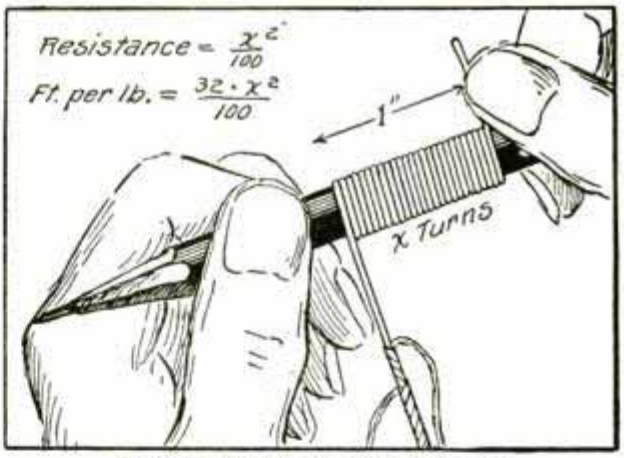
To Bend 2-In. Pipe and Up

4x4-in. piece to the point on the pipe where the bend is to be made. Then apply strength to the projecting end of the pipe to make the bend.

HOW TO CONVERT A LEAD PENCIL INTO A WIRE GAUGE

An article in the July number of Shop Notes describes a method of finding the resistance of any copper wire by means of the slide rule. The method there given is entirely correct, but as a wire gauge is required to determine the size of the wire and a slide rule needed for the necessary calculations, and as many persons possess neither of these instruments, I thought the following method would prove acceptable.

The only device required by this method is a common lead pencil on which is marked off two spaces: one 1 in. long and one ½ in. long. To obtain the resistance per 1,000 ft. of any size wire first remove the insulating covering for a distance of a foot or more, depending on the size of the wire, and then wind the wire on the lead pencil as shown in the sketch. Count the number of turns per inch using the 1-in. space for large wire and the ½-in. space for fine wire. When



Lead Pencil Used as Wire Gauge

the number of turns per inch is determined, square that number and point off two decimal places and you then have the resistance per 1,000 ft. at 20° C.

When the resistance is known the number of feet per pound can be found by multiplying by 32. Of course all these results are only approximate, but they are sufficiently accurate for practical purposes.—Contributed by A. Wiilatowski, 165 Alexander St., Atlanta, Ga.

FILLING TIRES WITH SAND

When it is impossible to inflate the punctured tire of your auto, try filling it with sand, if any is available. The sand will cushion the tire in a measure and keep the dead weight of the machine off that wheel.

DRILLING OVERHEAD HOLES

Anyone who has ever had occasion to drill holes in a ceiling, or any other place where the job has to be done overhead, knows what tiresome work it is. A strong man will feel exhausted after holding his arms overhead for five minutes without doing any work and when the work of feeding and turning the drill is added, it is almost impossible to continue working for more than three or four minutes at a time.

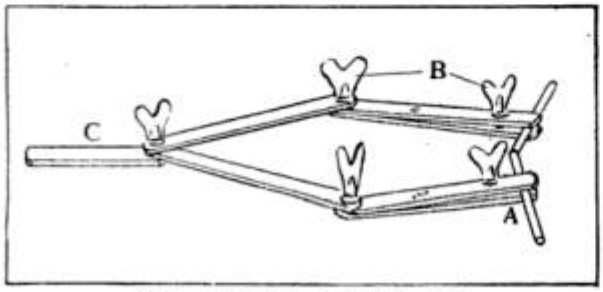
Simple and Easy

Having had occasion to do some overhead drilling, I found that the men's labor could be greatly reduced by means of the device here illustrated, which consists of simply a board, which acts as a lever, with the fulcrum at the round of the ladder. The board to work well, should be in a horizontal position and if the round is not in the right place, it may be changed by moving the lower end of the ladder, or if this will not produce the desired effect, a few blocks of wood placed between the brace and the board will bring the board to a horizontal position. The pressure should be applied to the board as far from the round as possible, thus increasing the leverage.

When the ladder is inclined too much it is hard to reach the handle of the brace. In that case the brace can be placed on the other side of the ladder and the board can be raised by placing your shoulder below it. —Contributed by A. J. Saxe, Engineer, Railway Exchange Building, Chicago.

CLAMP TO HOLD WIRE WHILE SOLDERING

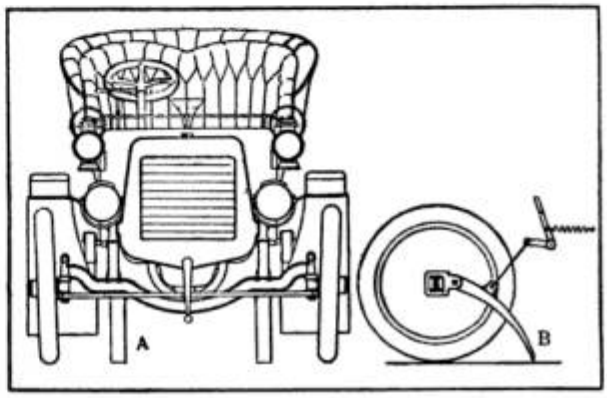
This clamp may be made any size and of almost any material, soft iron being preferable, however. It is used for holding wire or small metal pieces while soldering or brazing. The hand screws, B, should be somewhat harder than the arms and clamps. The machine is very flexible and rods can be held at any angle by adjustment. A indicates the vise jaws, and C the handle. It is of especial convenience in soldering as one or both hands may be free to spread the solder or flux.—Contributed by David R. Shearer, Lenoir, N. C.



Clamp for Use in Soldering

DEVICE TO PREVENT AUTOMOBILES FROM BACKING

In hilly localities it is often advantageous to equip an automobile with the device shown in the sketch. A large ratchet lever,



To Prevent Auto from Backing Down Hill

A (shown in detail at B), is pivoted from the axle with the point suspended in the air normally, but capable of being lowered when desired, thus preventing the machine from backing.

TO REMOVE STAINS FROM NEGATIVES

A good formula for removing stains from negatives is as follows:

Iron sulphate	3 oz.
Sulphuric acid	1 oz.
Water	3 oz.

Another method is to allow the plate to soak several days in a solution of hypo.

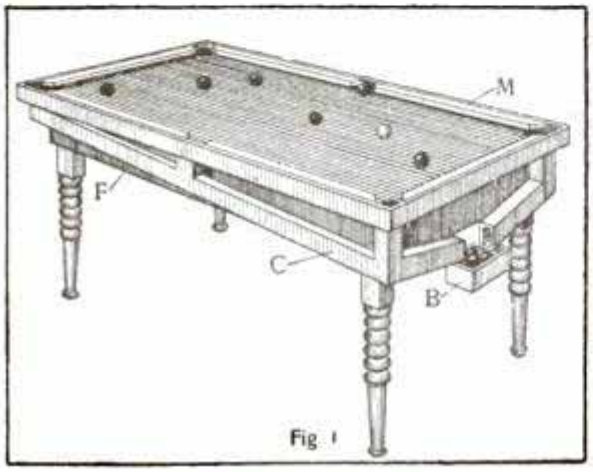
MARKING CORRECTIONS IN BLUEPRINTS

The simplest and best way to mark corrections in blueprints is to use a saturated solution of common sal soda for a writing fluid and do the writing with an ordinary new and clean steel pen. The marking will stand out clearer and whiter than the lines of the print.—Contributed by M. L. Schiaffino, 2 Belen St., Guadalajara Jal, Mexico.

MECHANICS FOR YOUNG AMERICA

HOW TO MAKE A POOL TABLE

While it is impossible for an amateur to make a pool table suitable for a match game, or one in which the mechanical qualities permit of three cushion shots being made, it is an easy matter to construct one that will



Home-Made Pool Table

possess sufficient mechanical perfection for the ordinary player. A pool table of this kind will prove very interesting and entertaining, and is not very expensive to make.

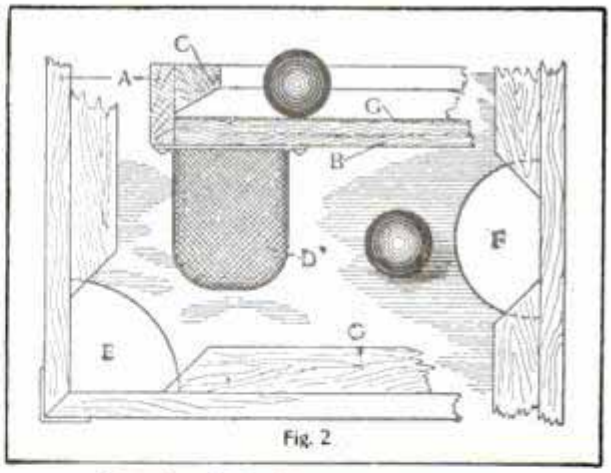
The first thing to do is to procure a kitchen table, having a good level top, and a box frame, as shown at F, Fig. 1, to prevent it from warping. This may be purchased for about $1.50 or $2.00, and when tables of different proportions are being considered preference should be given to the one that is longest in proportion to its width, as it would then resemble more closely the shape of a regular pool table.

The rubber cushions, which are so expensive in regulation pool tables, are replaced in this one by wood moulding cushions (M, Fig. 1), the elasticity being furnished by the balls, which are made of solid rubber. The size of the balls depends on the size of the table, but for ordinary tables the common 5-cent size solid rubber ball will be found suitable. In making these balls a feather edge is left all around the parting line of the mold. If this were allowed to remain the balls would not roll straight, so it should be removed by rubbing on fine sandpaper. Sixteen balls will be required, one of which (the cue ball) should be painted white to distinguish it from the rest.

Six pocket holes should be cut in the table top as shown in Fig 1, and in detail at E and F, Fig. 2. The cushions, C, Fig. 2, should then be attached to the side strips, A, by means of screws. The side strips are then to be screwed to the table top, B, as shown. The cushions should be a little more than half the diameter of the balls, and should be placed so that the top is a little lower than the tops of the balls, but not as low as the center because the balls would then jump over them.

The simplest form of pocket is the cloth pocket, D, Fig. 2. This may be made of almost any kind of cloth, and can be tacked to the under side of the table. In order to avoid the trouble of searching the pockets during a game the device shown in Fig. 1 is very effective. The chutes, C, carry the balls from all the pockets to a box, B, where they may be readily obtained without walking all around the table.

The appearance of one of these tables may



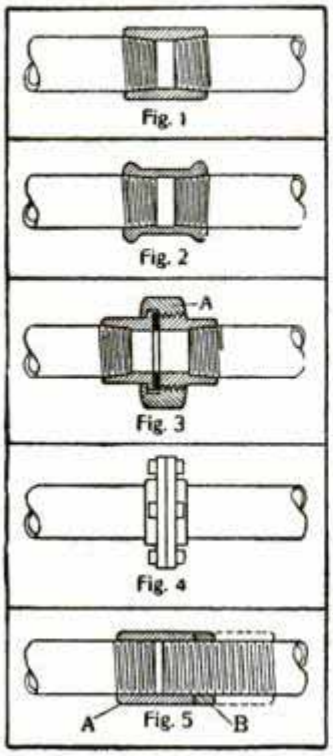
Details of Cushions and Pockets

be greatly improved by covering the surface with green cloth. This also tends to decrease the effects of any unevenness in the surface.

METHODS OF JOINING PIPES

The simplest form of pipe joint is shown in Fig. 1. It is the common pipe "coupling" and is the form generally used, but conditions often make its use impossible. If the pipes are in a position which does not allow turning them, such as being

screwed in other fittings, then the coupling cannot be used, as screwing either pipe into the coupling would unscrew it from the fitting.



This difficulty is sometimes overcome by using a "right and left," which is shown in Fig. 2. This fitting is just like the coupling, except that one thread is right-hand and the other one left-hand. In using the "right and left" neither pipe has to be turned. They are simply separated enough to receive the "right and left," which is then turned with a pipe wrench, thus bringing both pipes together. While this method of joining pipes is very good, there are several objections which often make its use impracticable. The threads on one pipe have to be left-hand, which is a departure from general practice, and in many places the pipes cannot be sprung the required distance without injuring other joints in the line.

When pipes which can neither be screwed or moved longitudinally are to be joined, they are often fastened by a "union," which is shown in Fig. 3. Both halves of the "union" are screwed to the pipes to be connected and are brought together and fastened with the nut, A, as shown.

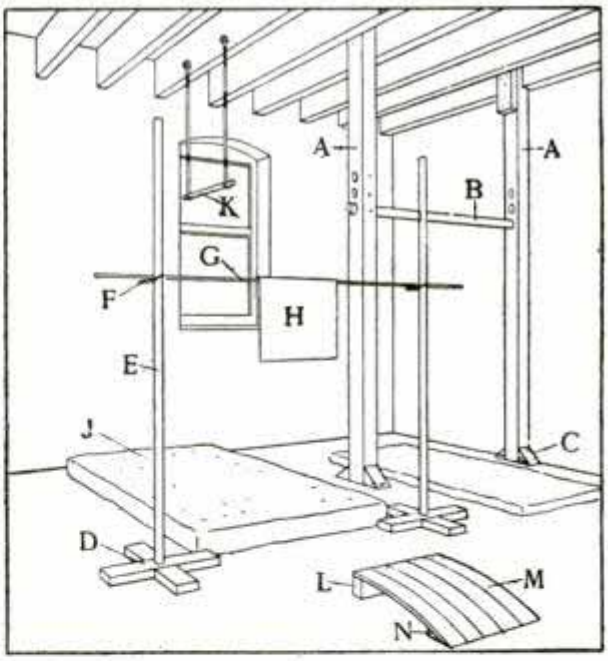
Another form of union is shown in Fig. 4 and is known as a "flange union." It is used mostly on large pipes where the common "union" would be impracticable, but is often used on small pipes when the pressure is extremely high.

A form of coupling used in nearly all electrical conduit work is the "running thread nipple," which is shown in Fig. 5. A special coupling, A, is used and the threads on both pipes are right-hand, the only difference being that one thread is continued some distance from the end of the pipe, to allow screwing the coupling past the end, as indicated by the dotted lines. The ends of the pipes may then be brought together and when the coupling is screwed back it covers the joint as shown. The coupling in this case has straight threads instead of the tapered threads shown in Fig. 1 and is provided with a lock nut, B, to hold it in position. The greatest objection to this joint for most purposes is that it leaks, but in electrical work this ceases to be an objection.

HOME-MADE GYMNASIUM APPARATUS

Most of the apparatus for gymnasiums is so expensive and so easily made that probably many readers have used their own ingenuity in constructing the same. A few suggestions might be found in the apparatus shown in the sketch which represents a small gymnasium such as could be built in one corner of a basement or in a barn.

The horizontal bar is made by fastening two four-by-fours, A A, in a vertical position and placing the bar, B, in holes bored through A A. The bar can be either a piece of pipe or a strong wooden pole, and should be drilled at the ends to receive large steel wire nails, which slide through similar holes in the uprights, A A, and hold the bar from sliding out. If the floor is of wood, the uprights may be fastened by cleats as shown, but if it is cement, a hole large enough to receive a ¼-in. rod, which



Gymnasium Suitable for Basement

should extend up into the four-by-four a distance of two or three inches, should be drilled. The drill for making the hole in the cement can be made from an old file as described in Shop Notes for June, 1906.

The high-jump apparatus consists of two standards, E, mounted in bases, D, and supporting a thin strip of wood, G, by means of two wire brackets, F.

These brackets may be bent from heavy steel or brass wire, to the shape of a screw-eye, making the hole in the eye a trifle larger than the vertical poles, E. It will be found that brackets made in this way will stay where placed, as the weight of the wooden strip, G, causes the eye to bind on the standard, E. In practicing the high jump it will be found that a handkerchief or towel, H, laid over the bar will be more easily seen than the strip and will prevent one from losing his step.

An old mattress, J, will take the place of the expensive mats found in gymnasiums, which frequently cost $20 or more. It may be used in connection with the high jump apparatus, or may be placed under the trapeze, K. The trapeze is too well known to need any description, and the materials used in its construction are somewhat varied, depending on what is available. The bar may be either hard wood or gas-pipe, and may be supported by sash-cord, heavy wire, or strong braid.

The spring board, M, can be made by nailing a number of barrel staves to the wooden strips, L and N. If the barrel staves sag too much another narrow strip should be nailed across the middle on the under side. If rubber-soled shoes are not used this board might prove too slippery, in which case a small piece of carpet should be tacked on the top and will serve the purpose nicely.

HOW TO BUILD A SMALL ELECTRIC FURNACE

An electric furnace is interesting to build and the one to be described is not a toy, but a practical device with which a great heat can be obtained.

Make a wooden core (Fig. 2), of the shape and size of the muffle required, using three strips of wood, as shown. Two of these strips (A and B), should be ½ in. by ¾ in. by 4 in., and one piece (C), tapered from ¼ in. by ¾ in. by 4 in. to ⅛ in. by ¾ in. by 4 in. Screw the three pieces together with the tapered piece in the center, by means of two screws at one end. Mark off 2 in. at the unscrewed end and carve it into a core, as shown, 1 in. wide and ¾ in. high. Leave the tapered piece longer than the other pieces so that the core may easily be removed when the time comes. When the core is properly carved to shape and smoothed, wrap a piece of parchment paper around the shaped part, fix another piece at each end and secure them with wax.

Mix some finely powdered fire-clay cement (previously damped) to a thick working consistency with silicate of soda (water-glass); spread a very thin layer all over the parchment paper and place the core in a warm place to dry slowly.

Platinum wire is used in obtaining the heat for the furnace. First decide what voltage you wish to work your furnace with, then pull a piece of platinum wire down through a drawplate until about No. 24 or thinner. You may be able to buy wire of exactly the right size and so save time and trouble. Join up the length of wire in circuit with a lamp, using it as one would a resistance and determining what length is required to kill the light of the lamp. Then cut out the lamp and move one terminal down the length of platinum until it gets red-hot and adjust until the greatest heat is obtained. Mark the length of wire and cut it off. These experiments are best carried out on a sheet of asbestos board. In the furnace illustrated, current was obtained from a small dynamo, a 14-in.

Fig. 1--The Electric Furnace Complete

length of wire was used and the voltage required to obtain the greatest heat was about 30; amperes, 5.

When the fire-clay on the core is dry (not hard), wind on the platinum wire (Fig. 3), leaving the two ends free to connect to terminals. Hold the wire in position by binding it with cotton. The cotton will burn out when the furnace is first used. Cover the

platinum wire with a fairly thick layer of fire-clay and place the whole in a warm place for the clay to harden.

Make a box of thin sheet iron (Fig. 4), cut a square, A, out of one side and another out of the front. At the front rivet a shelf, B. In side A, rivet a piece of slate at D. Drill holes E E, in the slate. Screw the two terminals into these holes and fix them by nuts at the back. Drill holes, FF, to pass the ends of wire through.

When the fire-clay is dry, wind a long length of thin asbestos string around it. Have plenty of asbestos waste on hand and place a little at the bottom of the box. Place the muffle in the side of the box and bring the ends of the wire through holes FF. Pack more asbestos waste all around until the box is nearly full, then seal the top with a mixture of 1 part plaster of paris and 2 parts fine silver sand or of powdered granite stone, made into a thick consistency with water. When this has hardened, cut off the surplus and leave it level with the front of the core.

Place the box entire in a warm oven and let stand six hours. Then take it out, secure the ends of the platinum wire by clamping them under the bottom; screw the nuts of the terminals; take out the binding screws in the wooden core and carefully withdraw the tapered strip. Then remove the two pieces of wood and peel off the parchment. Place the box back in the oven until thoroughly dry, gradually increasing the heat until the fire-clay is baked.

Make a clamp of a globe holder such as is used on gas brackets. See Fig. 5. Let the two front teeth clip the front of the box and use the screw at the back to tighten it up. The stand can be turned up in the latter any shape desired. Metal is the best material for the stand on account of the heat. (Fig. 1.)

When the stand is ready, place the furnace in position, connect it up with the dynamo through a resistance and raise the heat slowly the first time it is used. The furnace will be in fine condition after it has been used once or twice and an enormous heat can be obtained, says a writer in the Model Engineer, London. Pure gold can be melted with ease. By crushing ordinary glass beads to a powder, mixing them with water to a paste and then fusing them, very pretty jewelry can be made.

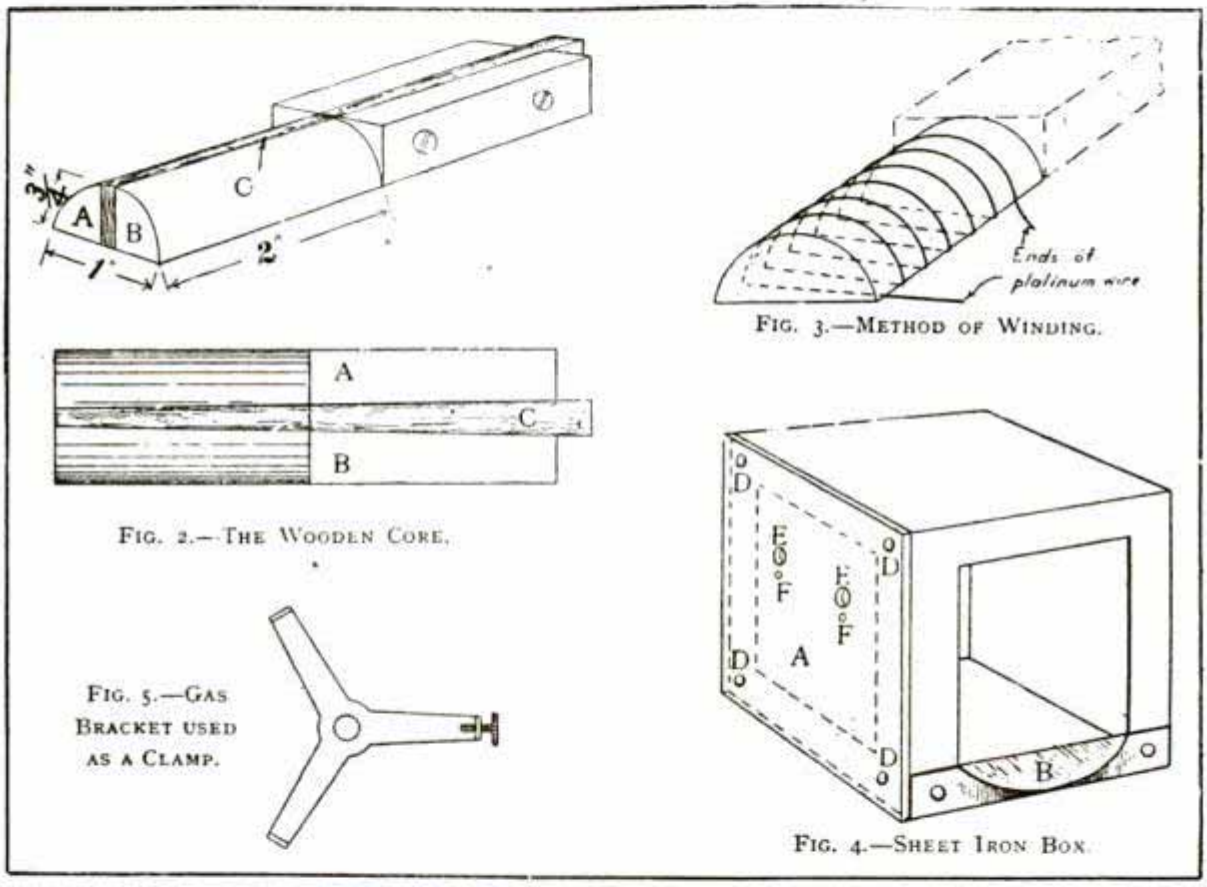


FIG. 2.—THE WOODEN CORE.

FIG. 3.—METHOD OF WINDING.

FIG. 4.—SHEET IRON BOX.

FIG. 5.—GAS BRACKET USED AS A CLAMP.

CLEANING BRICKS OF MOLD

To clean green mold from bricks wash them clean with strong soda water, let dry, and shellac them. This is too expensive for many bricks, says the Master Painter, and is not permanent, though the bricks will look well for a long while.

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OLD-TIME ALARMS.—"Speakin' o' long runs ter fires," said old Joe to a circle of veterans of the old Brooklyn Volunteer Fire Department in a well-known refreshment emporium one afternoon last week, "'minds me o' one o' ther longest 'n' hardest drags on record. 'Twas in their fall o' '61—I recollect et 's though 'twas yissiddy, fer Jinny—thet's m' woman—handed me twins thet day. 'Course I celebrated, 'n I wus fixed up p'rtickler well fer th' 'casion.

"'Long 'bout dusk I meandered down ter ther injine house o' old Fourteen. Me 'n Jim Perkins 'n Hezzy Barker wus a-sittin' up in ther bunk-room er kinder takin' et easy, Jim 'n Hezzy hed been a-helpin' me celebrate ther 'rival o' ther twins. We was speckerlatin' like consarnin' twins 'n things, when up jumps Hezzy all a'flutter.

"'Fire!' yells he, 'n er gol-darned big 'un, too!"

"With thet we all looked, 'n sure 'nough ther was er red glow 'way off t' ther east'rd.

"We was all excited by this time an' was a-wonderin' ef ther cussed bell-tower man hed fallen asleep.

"'Come on, boys!' shouts Jim; 'let's get old Fourteen on ther way 'fore ther bell rings!'

"So downstairs we three piled. Jim, he shins up on ther machine 'n muffles ther bells so's they c'dn't ring an' start off ther other companies till old Fourteen got er good start with er full rope. Then we shoved th' doors open 'n run out th' injine. Ther was Hezzy 'n me on th' tiller 'n Jim hed th' bight o' th' rope. 'Fore we'd gone er block we had pooty near er full rope, 'n then I jumped up 'n pulled ther muffler out er th' bells.

"'Shake 'er up, boys!' shouts Jim, 'n every man 'n boy on th' rope pulled th'r hardest 'n run th'r fastest. Down ther street went old Fourteen. Bells a-jingling like sixty 'n th' wheels a-drummin' over the cobbles. We passed two injin' houses on ther dead run 'n other machines, they wus run out ter foller us 'Course they thought we'd got er still 'larm somehow.

"After we'd galloped helf er mile ther was seven machines a-goin' through ther streets like blazes, th' men on th' ropes a-yellin' like mad, an' we wuz at th' head o' th' percession. 'Way down t' th' end o' th' street we c'd see th' red glare o' th' fire, but 'twas quite a ways off yit. So we kept a-runnin', an' Hezzy 'n me a holdin' onter th' tiller a-guidin' th' jerkin', swayin' thing 's near straight 's possible, which th' same wus nigh impossible, fer Hezzy 'n me wus feelin' kinde beat out. Fast ez er runner'd git fagged out there'd be another ter fall inter his place. Th' racket hed brought out er big crowd, 'n everybody wus a-runnin' ter th' fire. 'Citement reigned s'preme, 'n the hull heav'ns wus ablaze wi' red.

"After goin' over er mile we passed th' end er th' street 'n ran out inter er wagon road thet led out t' th' farms in th' sububs, which th' same would be 'bout where we call 'downtown' nowadays. Back o' us we c'd hear th' shouts 'n th' bells er th' other companies, which was a-comin' along similar fast.

"But somehow thet gol-darned fire didn't seem t' git no nearer, 'n ez we'd left mos' o' th' crowd blocks behind, th' runners th't got winded dropped out 'n ther wus few thet took their places on th' rope. I wus nigh ready t' drop, 'n m' legs seemed t' hev th' rumaticks. Old Fourteen began t' slow down some, fer we wus a-runnin' up hill by this time. Th' road was a-gittin' harder all th' time 'n we wus in th' subbubs fer certain.

"Long 'bout this p'int Hezzy leans over t' me white-like, 'n ses ter me, ses he, 'Joe, I gotter drap outer th' run 'n bid good-by t' supper,' ses 'e. So, Hezzy, he drops out, 'n his agonizin' motion et partin' wi' thet cargo o' his'n wus lost in ther jingle o' th' bells. Ther boys kept on pullin' f'r dear life. Ther other injines wus clus behind, but they c'dn't pass old Fourteen, even ef they'd cot 'er, because th' blamed cowpath we wus in wus too narrow 'n th' bushes on both sides fanned th' machine ez it passed through.

"Well, ter make this harrowin' tale short, we come t' er ful' stop at th' brow o' th' hill. Ther wus th' gol-dorned fire a-blazin' away up 'n th' sky. 'Twas th' moon, o' course, 'n she hung big 'n red on th' skyline. She wus a-risin', an' o' course we c'dn't see 't till we clum th' hill.

"Th' boys, they got t' cussin', 'n me 'n Hezzy 'n Jim kem in f'r a big slice o' th' gineral damnation. Th' langwige wus p'rtickler bad, but 't seemed t' fit th' 'casion' bout right. Hezzy, o' course, didn't care er cuss, 'cause he wus back on th' road a-takin' a last sad adoo of them yittles o' his'n, 'n when the other machines rolled up ther wus similar addishuns t' th' cussin' which th' same didn't shut down till th' boys hed toted th' machines back t' th' houses.

"Me 'n Hezzy 'n Jim wus 'membered copious like in th' boys' prayers thet night, you bet. Somehow th' huskies c'dn't see 't thet er pair o' innercent twins c'd er started th' hull fire department on such er goose chase, 'n some o' them wus unkind 'nough ter hint thet ther dad wus a-tryin' fer to get th' moon fer a plaything."—Stewart V. Macgillivray.

WHY DON'T MY PUT-PUT PUT?

By F. I. Rogers.

Oh! why don't my put-put put?
That's what fuzzled my bughouse brain.
Everybody else's put will put,
While I crank and crank in vain.

My arms are scarred, my hair turns white,
My brain is a buzzing bee.
As I yank the crank both day and night
And never a put puts she.

With a broken back and muscles aching,
I threaten myself to go hang—
When the cussed thing with a murderous fling
Swears back with a put-put-put—bang!

L'ENVOY

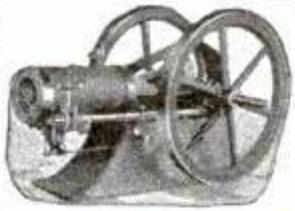
A thousand suggestions I clutch,
Ten thousand more I heard—
A friend comes with his magic touch,
When, lo! she puts like a bird.

—Motor Boat.

GASOLINE ENGINE IN THE PRINTING OFFICE.—Every printer who recollects the pleasant (?) experience of having the gasoline engine "buck" on him when starting the press with the paper several hours overdue will lend a sympathetic ear to the following from the Britt (Iowa) Tribune:

This office is going through a period with a gasoline engine to enliven things. It is one of the best engines made and cannot go wrong if ordinary intelligence is used, so the directions say, and this is no doubt true, but 13 men, 11 boys and nine engineers were fixing it for six hours, and at 11 o'clock a. m. it would run all right if someone turned the wheel. It is the simplest engine in the world, so the directions say. It is an oil cooler, high pressure, non-stinker and anti-profanity instigator. We sent for Vern Gilden. He thought the tropic of capricorn had slipped into the king row, and was sure the exhaust was bent. He unscrewed the umbilicus, drew the range finder out, greased the pud tongue, bent the down-haggadingus and then put it together again. Everything looked right, and we set a boy turning an hour or two to see if it would combust, but it wouldn't. Then we sent for Herb Redmond. Herb has assisted every automobile man

(Continued on Page 960.)



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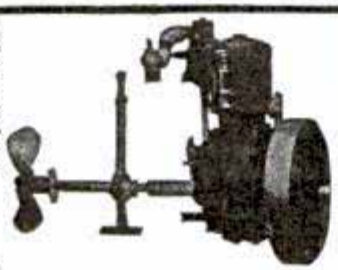

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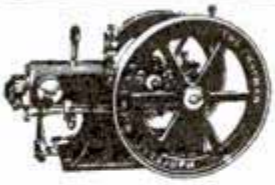

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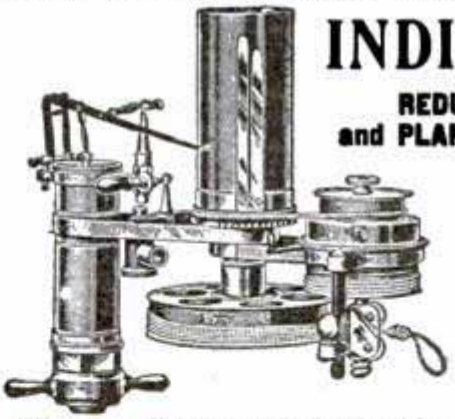

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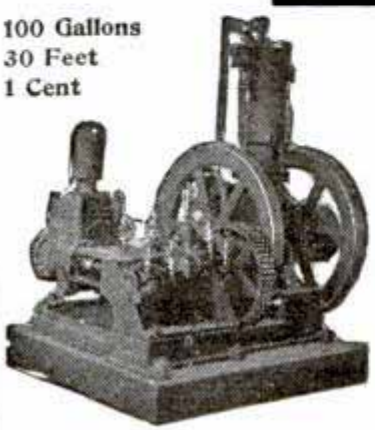

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Town..... State.....

(Continued from page 958.)

in the country a dozen times apiece and saved several of them from suicide, and he said he thought oil had accumulated in the do-floppus so the guyacutus couldn't coalesce with the non compis mentis, so he took out the dufunny, wiped the synovial fluid from the pandemonium, and removed the oil. This made everything look right.

The engine should have said "kapeet, kapeet" right along now, but it merely said pr-r-r-r, and that was all. There is a tea cannister annex screw on top of the main duodendum that runs up through the roof that usually says "kapunk" at each explosion, that was maintaining a discreet silence all this time, and Herb resolved to go up on the roof and investigate this. He found that the blizzard had blown it full of snow which melted last night when the thing was hot, and froze up last night when it was cold. This solved the mystery. When it tried to "kapeet" inside, the "kapunker" outside was frozen up stiffer than the right leg of the goddess of liberty on the state house. Herb restored the outside "kapunker," which released the inside "kapeeter," and confidence was immediately restored. A gasoline engine is just as simple as pulling turnips when you just get onto its curves. But our experience is that no gasoline engine can "kapeet" when it is bunged up in the snoozle.

◆ ◆ ◆

DIMENSIONS OF SEA WAVES.—A recent article by Dr. Vaughan Cornish, in the London Geographical Journal, furnishes some extremely interesting data respecting deep sea waves. From many hundreds of observations made during forty years by independent observers, he shows that on the average the height of a wave in feet (measured from crest to trough) is in round numbers one-half of the wind's velocity in statute miles per hour. By this rule, which does not express a dynamical law, the height of a wave raised in the deep, open sea by a wind of full hurricane force—i. e., having a velocity of 90 statute miles per hour—would be 45 feet.

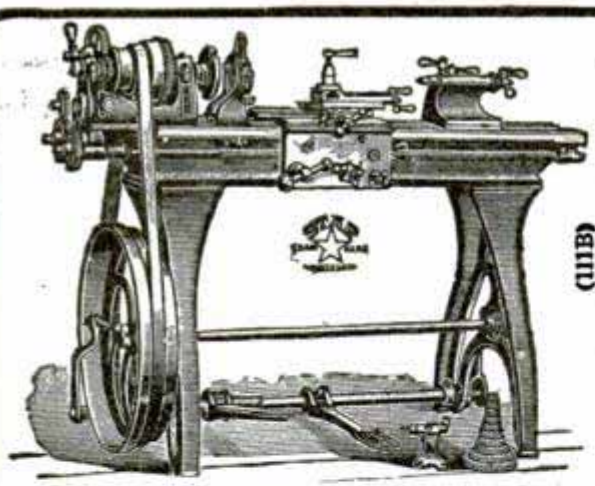
SOME DEEP MINES DRY.—Great depth of mining is not always synonymous with largely increased water; in fact, the deepest mines in the world are comparatively dry, and many of them are dusty in the lowest levels, and water must be taken below for drilling and other purposes. In most deep mines the greatest volume of water is encountered about 1,500 feet from the surface.—Mining and Scientific Press.

ADMIRAL DEWEY SAYS:—We don't want war! We want a navy to prevent war. We need more ships and we need more men. We have the best navy in the world—I believe that. And I believe it because our enlisted men are young men, Americans, intelligent, brave. Why, they could fight the ship if every officer on board were killed.

THERMIT.—Every manufacturer should know about "Thermit" the mixture in powder form of iron oxide and aluminum. With this powder one can operate a miniature steel foundry anywhere in or about a plant. The apparatus is even more simple than a blacksmith's portable forge, and no larger. Thirty seconds after lighting the mixture one can weld steel pipes, rods, bars, shafts or rails. A valuable booklet fully describing and illustrating this process, which is already in general use on steam railroads, will be sent free if Popular Mechanics is mentioned, by addressing Goldschmidt Thermit Co., 43 Exchange place, New York City.***

VINELESS POTATOES.—To make 15 potatoes produce a bushel of tubers in 60 days is a feat a Montana horticulturist claims to have accomplished. The potatoes are grown without vines and are unmolested by bugs or grubs, moreover they can be grown on the housetop or in the cellar. The method consists in placing the potatoes in a half bushel of sawdust, peat or straw which allows free circulation of the air and applying solutions of various salts. One cubic foot of sawdust is allowed to each seedling and the rows are arranged 6 inches above each other. A single potato will put forth from 12 to 16 tubers as large as itself.

A prominent physician in Chicago has a vegetable cellar which he ordered cleaned out ready for fall supplies. In removing a quantity of earth in which vegetables had been packed last winter nearly a peck of fine new potatoes were discovered, as large as one's fist. A few tubers had been accidentally covered and the vineless growth was the result. The doctor, who has been an ardent experimenter in plant life, himself, in relating the incident to the editor of this magazine, remarked that when he heard the Montana story he laughed at it. Only a few days later (July 30) he had the same demonstration actually uncovered before his own eyes. The new potatoes had absolutely no connection with the air by means of a vine, and were connected with each other in groups of three or four by small roots. The doctor will plant a sub-terra garden this winter.



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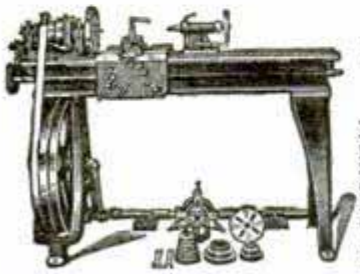

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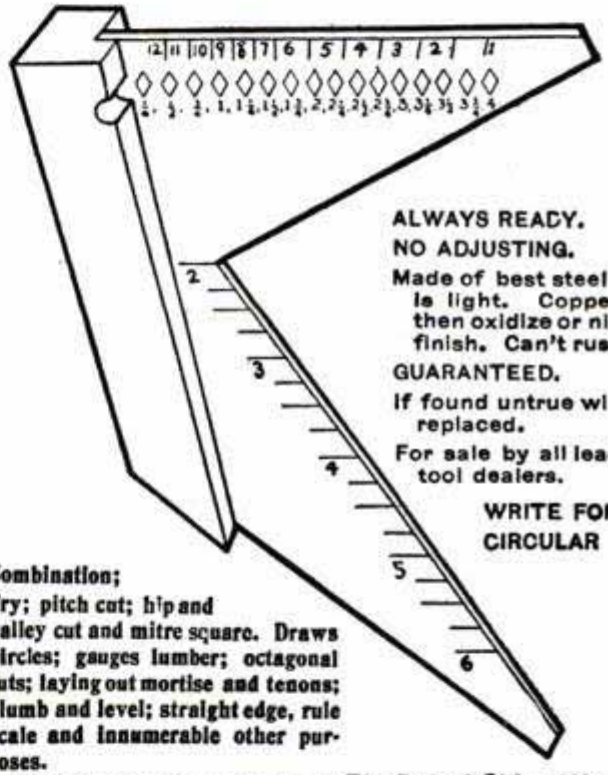

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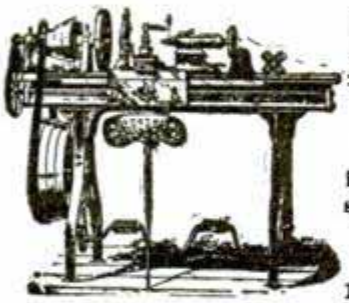

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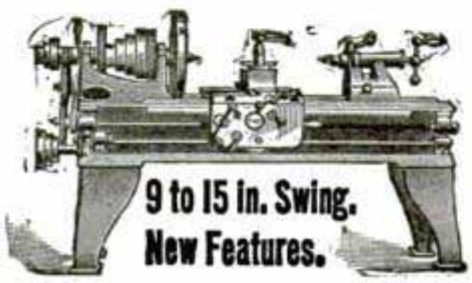

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SAWS FROM POP'S PATENT BUREAU.

Patents must pay or the large manufacturing concerns would not take out so many.

* * *

A good patent does not always go with a good invention, just as some valuable real estate is affected by defective titles.

* * *

Half of a good patent on a practical invention is better than no patent at all.

* * *

The man who sleeps on his invention for fear some one will steal it, is likely to wake up to find that there are other inventors who didn't go to sleep.

* * *

"Nothing risk, nothing gain" applies to patents as well as to other investments.

* * *

A crank is a man who thinks of things that average men neglect, hence many inventors are cranks, but very few machines could run without cranks; just so with the social machine.

* * *

The average trust is made up of ten per cent cash, thirty per cent patents, ten per cent equipment, twenty per cent nerve and thirty per cent water. The public furnishes the cash, the inventors the patents, and the promoters the nerve and water. The equipment,—well that's often stolen.

* * *

When you have made an invention, don't hide it, but hunt up the best "knocker" you know and show it to him and ask his opinion. If he don't kill it, show it to your friends, and if it survives them, show it to a competent patent attorney for his opinion. Any invention that successfully runs this gauntlet is worth patenting.

* * *

When you have obtained a patent, don't expect the world to get on its knees and offer you a fortune for your "idea." You may have to do a little kneeling yourself before the fortune is in your pockets.

* * *

Remember, the supply of new and useful inventions can never exceed the demand, and they are about the only thing of which this can be truthfully said.

NEW METHOD OF IRRIGATION.—A farmer has made a discovery that will be of vast importance to farmers during a dry season. He has found that by planting onions and potatoes in the same field in alternate rows, the onions being so strong bring tears to the eyes of the potatoes in such volumes that the roots of the vines are kept moist and a big crop is raised in spite of the drouth.

POINTS FOR INVENTORS

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

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

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

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

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

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

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

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

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

Branch office at
Washington, D. C.

PATENT NOTES.—A recent decision of the U. S. Court of Appeals for the District of Columbia illustrates the importance of an inventor being diligent in applying for a patent.

In the case referred to A claims to have made the invention in July, 1902, and went to the factory of W in the early part of January, 1903, and exhibited a rough sample of his device, to induce W to either buy the patent or manufacture the articles on a royalty. A did not file his application for patent on this device until December 14, 1903, but W soon after A's visit to his factory claims to have invented the same device and in March, 1903, filed an application for patent on same, and the patent was granted W on May 26, 1903. W swears that A did not show him the device on which W procured the patent, but something else. The court decided that A was undoubtedly the first inventor of the device patented by W, but in view of A's delay from July, 1902, until December 14, 1903, he was not diligent in protecting his invention, and as there was only his own testimony to the effect that he had exhibited his invention to W in January, 1903, the court held that W must be considered a bona fide inventor and held that his patent was good, as he applied first.

It is unfortunately true that many maufacturers are disposed to take advantage of information given them by inventors, and secure patents on such inventions without regard to the rights of the real inventor. This, of course, could not be done if the inventors would take reasonable precautions to protect their interests before showing their inventions to manufacturers, or if they would apply for patents promptly.

It is frequently difficult for an inventor to prove that an invention was stolen from him by a manufacturer, especially if the latter in getting a patent on such invention makes changes, as he usually does, which give a different appearance to the invention.

It is sometimes desirable for the inventor to submit his invention to practical manufacturers before going to the expense of taking out a patent, but in doing so he should take precautions against the theft of his ideas should the manufacturer be disposed to take advantage of the information thus obtained. It is not always safe to depend

(Continued on page 968.)

EVERY INVENTOR

Who Wants to know

1. What are the most profitable inventions,
2. How to perfect inventions,
3. The first step to take in getting a patent,
4. How to protect himself from parties who might steal his invention before he can get a patent
5. How to find out what patents have been granted on inventions like his, or intended for the same purpose.
6. How much it costs to get a patent,
7. How long it takes to get a patent,
8. What protection a patent is,
9. How he can sell his patent after he obtains it
10. How to handle his patent to get the most money out of it,
11. Where and at what expense he can have working drawings made of his invention,
12. Where and at what expense he can have models or experimental machines made,

should send his questions to

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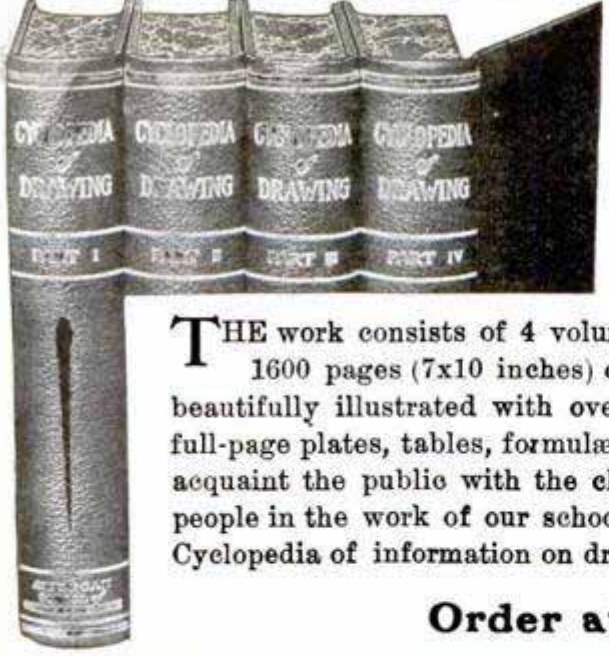
(Continued from page 966.)

upon the opinion of the manufacturer as to the probable commercial value of an invention, because in many cases it is to his interest to discourage the inventor, especially if the article is something that would compete with the manufacturer's products, and if the manufacturer has any idea of later appropriating the invention himself. It is a sad commentary on our criminal laws that no provision is made for the criminal prosecution or punishment of one who steals an invention. This weakness in the law, coupled with the low standard of ethics in certain kinds of business, are responsible for the appropriation of many valuable inventions.

In a recent interview, the superintendent of one of the largest manufacturing plants in the United States, said that an important part of his duties was to find out about the inventions made by their employes and appropriate them if they were considered valuable. He stated if an employe made a good invention and was allowed to get away with it, that it would probably result in the loss of his position as superintendent.

The standard of business ethics proven to prevail in the large packing houses of the country and other enterprises, seems to be considered good enough for many smaller concerns, and for an inventor to protest against the unauthorized appropriation of his invention by his employer or some other concern, is considered in the nature of a joke. There are of course exceptions to this rule, and some inventors are treated fairly and amply rewarded for their efforts. These cases are now exceptional, but in view of the present trend, we believe the time is not far distant when the value of the inventor's work will be recognized by his employer, and capitalists will be disposed to give him a fair share of the profits resulting from his ingenuity.



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HOW TO USE THE BAROMETER.—Wind is air set in motion. The barometer is almost always affected before the wind actually begins to blow or the rain to fall. The length of time which passes between the first appearance of a change of weather and the actual setting-in is not always the same.

2. When the barometer is steady there is no great likelihood of a storm being near us, while, when it is unsteady, there is danger of the wind freshening to a gale. This unsteadiness may be due to mere local causes, so that it is at times very hard to say whether it shows that a serious storm or only a slight squall is coming on.

3. A sudden rise of the barometer is very nearly as dangerous as a sudden fall, because it shows that the level is unsteady. In an ordinary gale the wind often blows hardest when the barometer is just beginning to rise, directly after having been very low.

4. When the barometer at any place rises very high and continues so for some days, it is because there is too much air at the place, and the wind will be light. A gale can only set in when the wind flows away, and it will not at first be severe at that place.

5. When the barometer is very low and continues so, there may be calm and even dry weather for a short time, what is called a "pet day" or a "weather-breeder"; but there is great danger of a serious storm, because the air will try to force its way into the districts where the barometer is low and increase the pressure there. The storm will probably be the worst where the barometer has been the lowest.

6. The barometer rises for northerly winds (including from northwest, by the north to the eastward), for dry or less wet weather, for less wind, or for more than one of these changes

7. The barometer falls for southerly winds (including from southeast, by the south to the westward), for wet weather, for stronger wind, or for more than one of these changes.

8. Besides these rules for the barometer, there is one about the way in which the wind changes,

which is very important. It is well known to every seaman, and is contained in the following couplet:

"When the wind veers against the sun,
Trust it not, for back it will run."

9. The wind almost always shifts with the sun, that is, from left to right in front of you. A change in this direction is called veering.

10. If the wind shifts the opposite way, that is, against the sun, the change is called backing, and it seldom occurs unless when the weather is unsettled.—The Motor Boat.

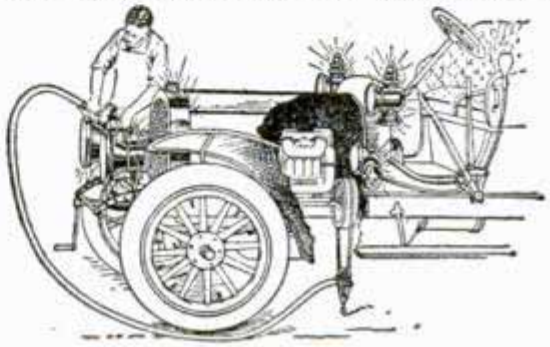
◆ ◆ ◆

ALUMINUM BOOKS FOR THE BLIND.—That reading matter in a cheaper form may be provided for the blind, it is planned to emboss the Braille letters on sheets of aluminum instead of paper. These sheets would be durable and could be made in duplicate; they would also be easier to read from than the paper, especially for those who become blind late in life and whose sense of touch is not so delicate. The aluminum sheets are so thin that it takes 250 of them to make an inch thickness.

◆ ◆ ◆

"EDIBLE MENUS" are a London novelty. The menus are made of pink marzipan and lettered with fine sugar-icing. Each is enclosed in a little box and propped at the guest's plate. At the end of the meal the guest eats the dainty bill-of-fare.

AUTO POLISHING DEVICE.—An automobile is now made to keep itself bright by means of a new device which is driven by the motor. A belt from the flywheel drives a flexible shaft at the end of which is a spindle to which the buffer and polishing wheels are attached. All the brasswork



and plated parts can be quickly polished; a revolving brush is also used in removing dirt from any part of the car.

NEW USE FOR TELEPHONE RECEIVER.—An old lady was one of a large number in a Michigan rural district to install a telephone, and her appreciation of the device was keen. One day the whole circuit was out of order, no one being able to ring up "central" and two linemen were sent out to locate the trouble. When they reached the house of the old lady mentioned, they found her darning socks over the receiver, quite oblivious to the inconvenience she was causing.

WOKE THE WRONG MAN.—An Irishman slept in the same room one night with a negro. His face was blackened during the night by a practical joker. Starting off in a hurry in the morning he caught sight of himself in a mirror. Puzzled, he stopped and gazed, and finally exclaimed:

"Begorra, they've woke the wrong man!"

A farmer sold a load of wheat
And bought of boards three thousand feet.
In eight short years he came again
To buy some boards and sell some grain.
But, when he heard of boards the price,
He said some things that were not nice.
He told the dealer 'twas a fright
The way he'd shoved things out of sight.
And then to arguing they went
But could not reach a settlement.
They argued through the sunset red
Till other folks were tucked in bed.
They argued through the weary night,
They argued through the morning light,
And still these two could not agree
Just what the price of boards should be.
'Twas all because the farmer thought
That boards and studding should be bought
At prices paid in ninety-eight
With wheat priced at the present rate.

The millman told the wholesale man to boost the price of pine;
The wholesale man told the traveling man to pass it down the line;
The traveling man told the retail man what the wholesale man had said;
The retail man told the farmer man—and then wished that he was dead.
But what the farmer man remarked with many a naughty word
The saw mill man and the wholesale man and the salesman never heard.

—American Lumberman.

SHOP HINTS.—It doesn't take a worn piece of sandpaper long to eat up, in time, the price of a new piece.

* * *

The giving of information creates a vacuum which tends to suck in more—if the intake isn't clogged by too much conceit.

* * *

The boss said he didn't know whether it was spontaneous combustion or not, but Brown was certainly fired for cause entirely within himself.

* * *

Of course you can't keep your overalls clean all the time, but you can change and have them clean occasionally, and—why not make it pretty frequently?

* * *

All bosses are not perfect, it is true, but if you could get in the boss's position for a while you would probably find yourself doing pretty much as he does.

* * *

If people were as well content to wait for their lumber to dry as was the Irishman to await the growth of the tree to which he was to be hung, the problem of getting properly-dried lumber would be less troublesome.

* * *

An emery stand put into a dark corner furnishes a better setting for the display of sparks, but when that is said there is not much more to say in favor of such a location, while there is a lot to be said against it.—The Wood Worker.

NEW BOOKS

EXPERIMENTING WITH INDUCTION COILS. By H. S. Norrie. Paper; 100 pp.; 25 cents. Spon & Chamberlain, New York. An instructive little book, full of practical and interesting experiments. Plain language.

TRIGONOMETRY SIMPLIFIED. By C. Chas. Maison. Cloth; 60 pp., illust. Price, 50 cents. The National Book Company, Cleveland, Ohio. Contains all the important investigations on the subject, both for practical and theoretical work. Arranged so the principles may be readily grasped by anyone.

MODERN PRIMARY BATTERIES. By Norman H. Schneider. Paper; 100 pp.; 25 cents. Spon & Chamberlain, New York. Gives construction, use and maintenance in practical and experimental work.

PRACTICAL MOTOR CAR REPAIRING. By Eric W. Walford. Paper; 130 pp., illust. Price, 50 cents. Percival Marshall & Co., London. A handbook for motor car owners and drivers, telling how to repair the machine in any probable emergency.

WOODWORK JOINTS. Paper; 100 pp., 178 illust.; 25 cents. Spon & Chamberlain, New York. Tells how to make and use woodwork joints of all kinds. Also contains a chapter on circular woodwork.

OCEAN AND INLAND WATER TRANSPORTATION. By Emory R. Johnson. Cloth; illust., 400 pp. Price, $1.50. D. Appleton & Co., New York. Begins with the history of ocean transportation and follows it down to the present time, ably discussing it in its economic aspects. Inland water transportation is treated in the same interesting manner.

CONCRETE BLOCK MANUFACTURE, PROCESSES AND MACHINES. By Harmon Howard Rice. Cloth; 8vo; 150 pp.; illust. Price, $2.00. John Wiley & Sons, London. A critical and thorough study of the manufacture of concrete blocks for building hollow walls at the present time.

MANUAL OF EXAMINATIONS FOR GOVERNMENT POSITIONS. By Frank Pergande. Cloth; 352 pp. Price, $5.00. Frank Pergande, Pub., Milwaukee, Wis. This work affords thorough knowledge for the use of applicants desiring to enter the Custom House, Rural or Railway Mail Service, and other examinations. Contains an abundant amount of reliable information for those desiring to enter the government service. Tells just what it is necessary for one to know, so that he need not tax his brain to remember a deal of useless matter.

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SIGNATURE WAS GOOD.—A story is told of how the late ex-Gov. Joseph A. Gilmore, of New Hampshire, when he was superintendent of the Concord & Claremont Railroad, once wrote a letter to one of his section bosses who had done something to displease him. All the man could make out was the date and Superintendent Gilmore's signature.

Some time afterward, being in Concord, the man went to call on the superintendent at his office.

"Hello, John, how do you do?" said Mr. Gilmore. "Well, what are you doing now?"

"Why, I'm up here at the same place on the section, Mr. Gilmore," replied John.

"What!" said Mr. Gilmore, "didn't you get a letter from me?" naming the date.

"Why, yes, certainly," answered John.

"Well, didn't you know that that was a letter of dismissal?"

"Letter of dismissal!" cried the astonished John. "No! I couldn't make it out, except that it was from headquarters and signed by you, sir. But

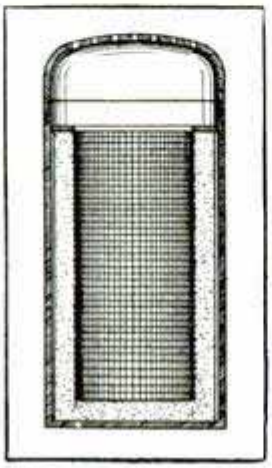
after some study I concluded it was a pass. As none of the conductors on the road could read it, they all accepted my statement that it was a pass from Mr. Gilmore, and I have been riding on it ever since."

John kept his place on the section.—Boston Herald.

BIGGEST MAN IN THE WORLD.—The biggest man in the world is a Russian named Feodor Alexiovitch Machnow, now visiting this country. He is in constant fear of being kidnapped and when he landed in New York supposed it was Hamburg, to which port he was told he was being taken.

He is 26 years old, is 9 feet 3 inches high, and weighs 365 pounds, and eats as much every day as a good sized family.

SALT SHAKER.—The caking of salt in a shaker is one of the petty annoyances that causes many cuss words from hungry men. This shaker, invented by Mr. Frank Kendall, of Chicago, is so constructed that the salt will never cake. The salt is enclosed in a wire cylinder, which is surrounded by an absorbent substance which takes up the moisture from the salt and quickly dries out. This substance is a secret, but the other features of the device are being patented, and arrangements are being made to put the shakers on the market.



YANKEE DRILL CHUCK.—A new and improved chuck especially adapted for light and rapid drilling where accuracy and tight or sure grip are required. Is built for hard service, and is closed and released entirely by hand, avoiding the use of a key or spanner and saving much time thereby. Has been tested in two years severe service in a large shop before being put on the market.

POSTAL CARD DUNS.—Never use a postal card to dun a person. It's against the law and the receiver can recover damages.

"How did this happen?" asked the surgeon, as he dressed the wound in the cheek and supplied a soothing poultice to the damaged eye.

"Got hit with a stone," replied the patient.

"Who threw it?"

"My—my wife," was the reluctant answer.

"Hum! It's the first time I've heard of a woman hitting anything she aimed at," muttered the surgeon.

"She was throwing at the neighbor's hens," explained the sufferer. "I was behind her."

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FOR SALE CHEAP—1½ H. P. motor castings for bicycle. Partly finished. One 4x5 camera with tripod. One high grade medical electric battery. O. Hultberg, 1213 Seventh St., Rockford, Ill.

WANTED POSITION with some house handling gas engines, wind mills, etc. Can sell, install and estimate on the above lines, and am a competent machinist. Will be open for engagement about December, 1906. No. 9046, care Popular Mechanics.

DO PATENTS PROTECT?

This is one of those questions that can be answered "Yes" and "No." When the invention is new, the specifications, drawings and claims of the patent application are properly prepared, and the application skillfully and conscientiously prosecuted before the Patent Office, the resulting patent will protect the inventor or patentee in the enjoyment of his invention. If, on the other hand, the drawings and specifications are inaccurate or incomplete, and the claims are not sufficiently broad; or if the prosecution of the application is not efficient, the resulting patent will afford no protection except possibly as a "bluff." To the average man, all patent papers, or the instruments issued by the Patent Office over the signature of the Commissioner of Patents, and bearing a red seal and a blue ribbon, &c., &c., look alike. Many inventors who receive such instruments judge of the value of the patent, by the drawing or picture of the invention which it contains. Others think the patent must be all right if the description is full and complete as to all details. A few, those who are experienced in such matters, know that the patent "claims" at the end of the specification, limit the protection granted, and if they are not broad enough to cover modifications of the invention described in the specifications and shown in the drawings, the patent has but little protective value.

Of course, it is not expected that inventors should know the difference between a strong patent and a weak patent, as that is a matter for those who are skilled in patent law and have had the experience in mechanics that fits them to pass upon the various legal and mechanical problems that every patent presents. Hence it is important for the inventor to employ a competent and conscientious attorney to obtain a patent for him. But how can he know in advance what patent attorneys have these qualifications? There is no infallible rule for this, any more than there is for "sizing up" a doctor, a preacher or a banker. There are certain general rules however that are helpful and they may be summarized briefly as follows:

Don't employ the attorney who seemingly offers to work for nothing.

Nor the one who holds out "special inducements" for you to employ him.

Nor the one who has so much business that he cannot give it personal attention, but turns it over to clerks.

Nor the one who has not had the experience and training necessary to equip him for the patent law profession, but simply knows how to advertise, and to hire men to attend to the business obtained through his advertisnig.

Meet your patent attorney if possible and explain your invention to him, not to some subordinate.

Remember that the cheapest is never the best, but usually the worst.

Don't put confidence in the attorney who tries to make you believe there's a fortune in your invention, or who wants to know if you will accept $15,000 or $25,000 cash for the patent when obtained.

Don't employ any lawyer except a patent attorney, for the general lawyer knows nothing about mechanics or patent law.

If you call to see a patent attorney with a view of employing him, and he turns you over to a subordinate it is a safe general rule not to employ that attorney for he either has too much business or is not competent to pass intelligently on your invention and is afraid he will display his ignorance.

Having once found a competent and faithful attorney don't change simply because another promises to get better results.

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FOR SALE—12 H. P., 2-cylinder runabout, with dynamo, acetylene lamps and everything complete. Will take 15-inch screw cutting engine lathe or other tools suitable for small machine shop in exchange. R. H. Bess, Fay, Ohio.

WILL MAKE RADIATORS for 25c a foot for the next thirty days. Soot proof plugs, 90c each. Auto Parts Co., 47 Canal St., Chicago.

FOR SALE—Wayne "D," 20-horse runabout automobile, Fisk tires, brand new, just from factory July 14, 1906. Want larger car. Make me an offer. E. H. Davis, Evart, Mich.

FOR SALE—$100. Steam runabout in good order. Take motorcycle in trade. Bartling, 202 Chestnut St., Detroit, Mich.

FOR SALE CHEAP—Launch with 2 H. P. Detroit engine; 16-foot; new this season; owner called away. J. W. Heard, Woodland Ave., New Rochelle, N. Y.

FOR SALE—Bargains in underground gasoline storage tanks with pumps, oil tanks and filters. Cortez Wilson, 239 Lake St., Chicago.

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FOR SALE—Orient buckboard, Columbia motorcycle. Write for particulars. Geo. Rees, St. Joseph, Mo.

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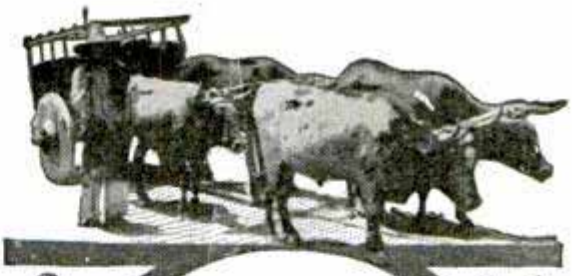

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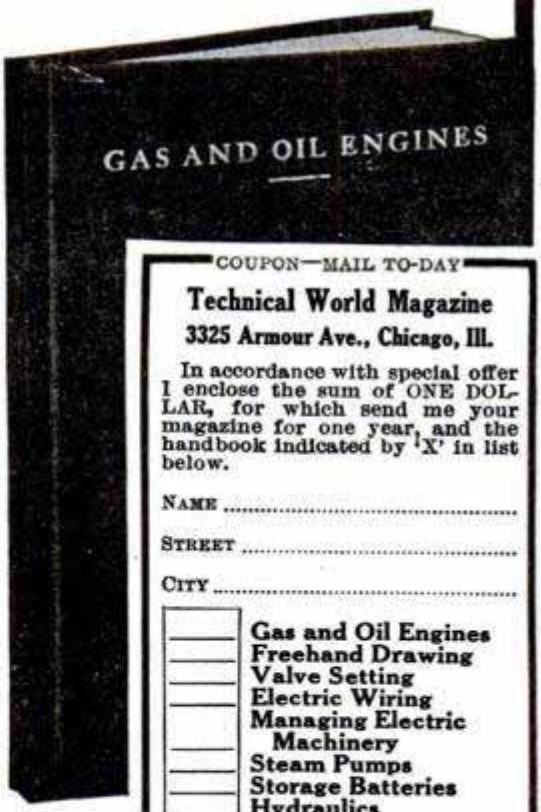

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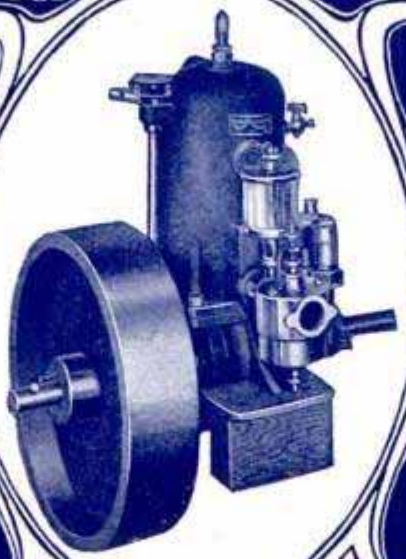

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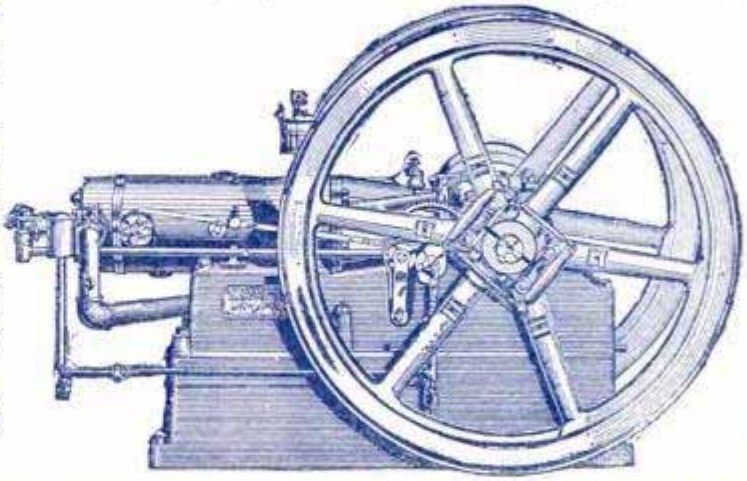

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They give you a reliable power during the day, and at night will transform your country home or cottage into a luxurious city residence. What is the use of doing by hand what a little outfit of this kind would do for you at one-tenth the cost and in a quarter of the time? **You cannot afford to buy until you have looked over our new 50 page catalogues and compared our prices.**

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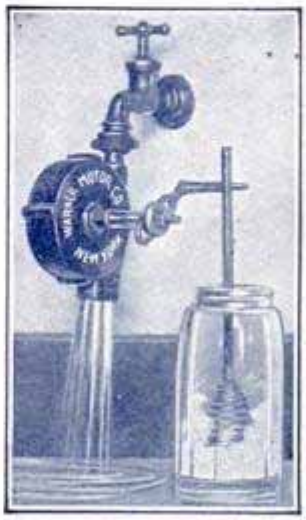

"Turn the faucet—that's all."

You can run a fan, sewing machine, egg beater, small dynamo, or bottle washer; sharpen knives and scissors, polish silver, copper and brass wares, and do a hundred other things to lighten labor in every household. The original faucet water motor and only one of high efficiency on the market.

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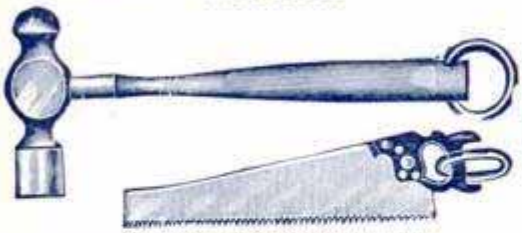

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