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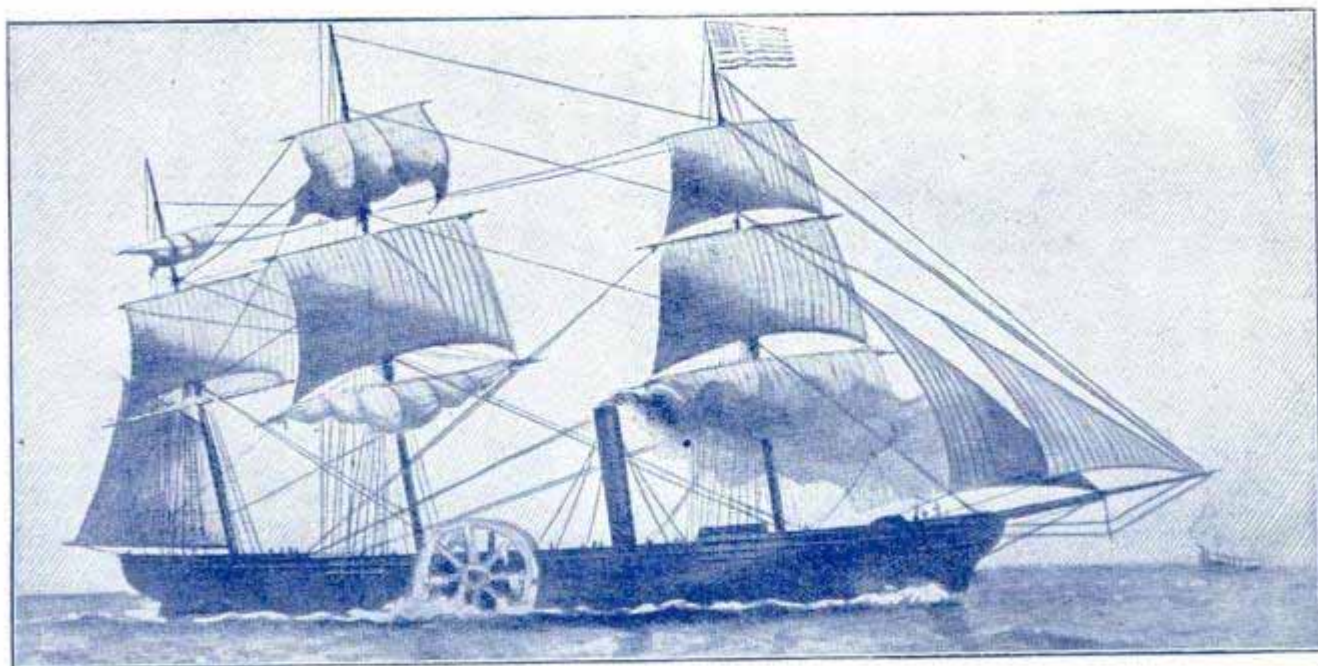
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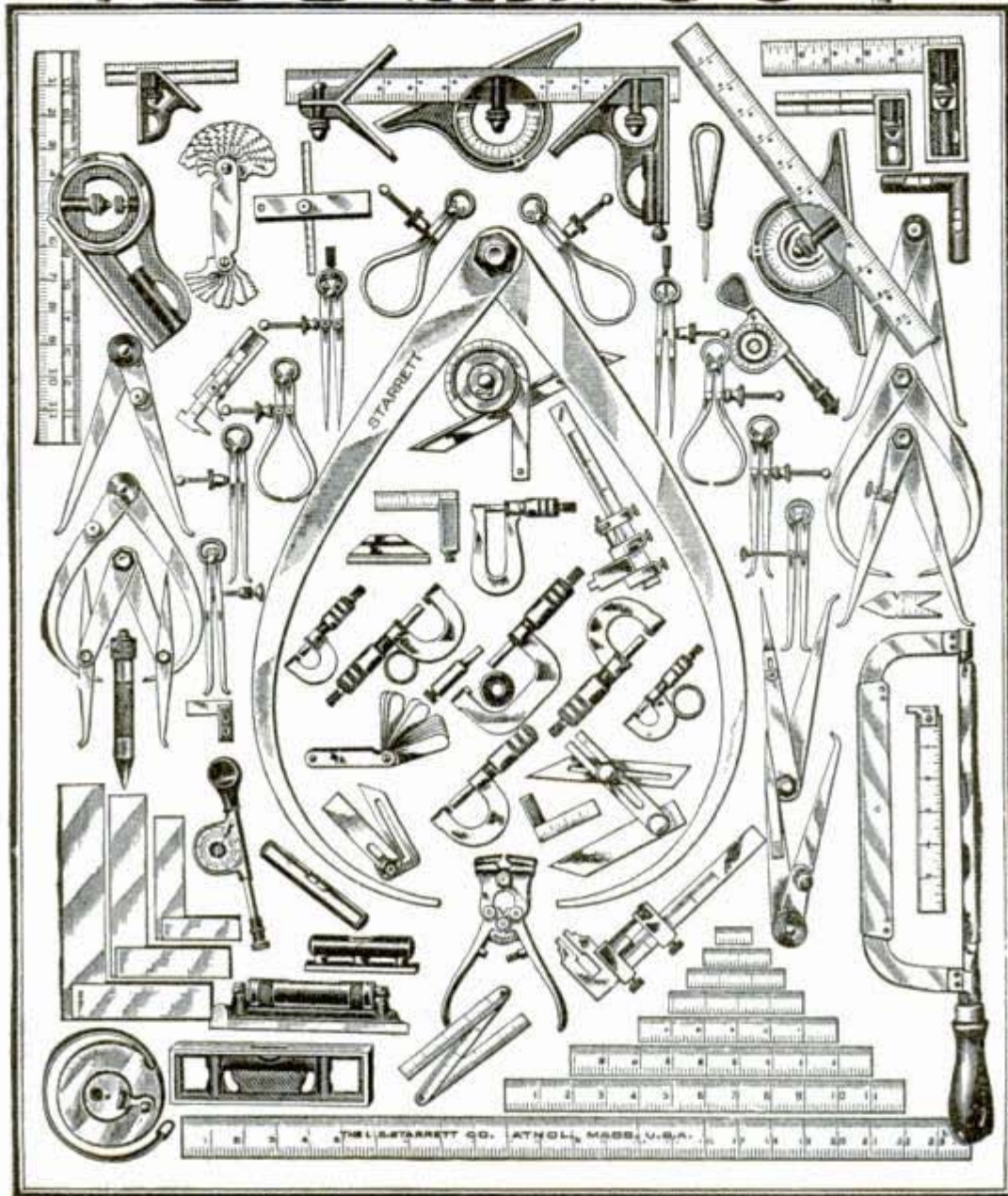
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THE STORY OF KORNIT

The Earning Power of Money Invested in

KORNIT

Here is a financial Opportunity to make an investment in an up-to-date, energetic, money-making Industrial Manufacturing Company, which owns all the United States patents, processes and exclusive rights for producing Kornit, a product never before manufactured nor sold in this country. The demand for Kornit is great, and the profit of manufacturing and selling is ENORMOUS.

☐ Read every word of this announcement and ACT AT ONCE.

The Earning Power of Money

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 to-morrow, but right now, to-day. You are making money. Why not invest a little and later on reap the benefit? It is a wise thing to do, and the wise and thoughtful people who are doing it are the ones that live in ease.

A FINANCIAL OPPORTUNITY

By President Chas. E. Ellis

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

The average price of hard vulcanized rubber for electrical purposes is today consider-

ably over one dollar per pound—at the present writing something like \$1.25 per pound.

KORNIT CAN BE SOLD AT TWENTY-FIVE CENTS PER POUND and an ENORMOUS profit can be made at this price, so that it CAN EASILY BE SEEN that where KORNIT IS EQUALLY AS GOOD and AS A MATTER OF FACT, in many instances, a BETTER non-conductor than hard rubber, it can compete in every case where it can be used with great success on account of its price. For electrical panel boards, switchboards, fuse boxes, cut-outs, etc., there are other materials used, such as vulcanized paper fibre, slate, marble, etc. A piece of vulcanized paper fibre, 3x4x1 inch, in lots of 1,000, brings 20 cents per piece. A piece of Kornit of the SAME DIMENSIONS could be sold with the ENORMOUS PROFIT OF OVER 100 PER CENT, at 10 cents. The absorptive qualities of Kornit render it such that it is FAR PREFERABLE to that of vulcanized fibre. It will not maintain a flame. Of all the materials which are now in the electrical market for supplies and insulators there is, as we have stated above, none that are satisfactory. Kornit will fill this place. Its tensile strength per square inch averages from 1,358 pounds to 1,811 pounds, which the reader can readily see IS MORE THAN SATISFACTORY. This test was made by a well-known electrical engineer, who is now acting in that capacity for the United States Government with a Standard Riehle Bros. testing machine.

waste horn and whole hoofs are being sold by the ton today principally only for fertilizing purposes. There is one town alone, Leominster, Mass., where they have an average of eight tons of horn shavings every day. These waste horn shavings are now only being sold for fertilizing material. These eight tons of horn shavings manufactured into Kornit and sold for electrical purposes would easily bring \$3,000. At this price it would be selling for less than one-fifth of what hard rubber would cost, and about one-half what other competitive materials would sell for, even though they would not be as satisfactory as Kornit.

Kornit has been in use in Russia about four years. In Riga, Russia, which is the



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

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.; pieces for games, such as draughts, chessmen, dominoes, checkers, counter chips, cribbage boards, etc.; telephone ear pieces, stands, etc.; piano keys,

typewriter 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.

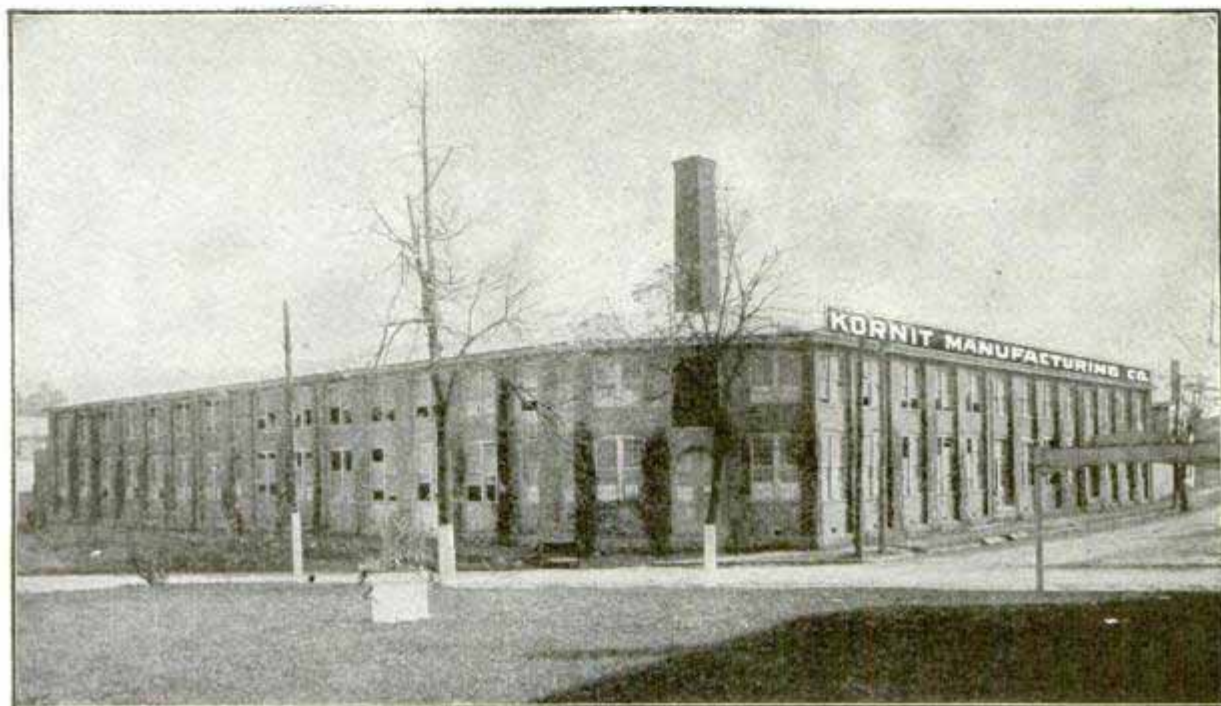
THE GREAT DEMAND FOR KORNIT IN THIS COUNTRY

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 would be over 32 per cent per year. THIS IS NOT IMPROBABLE. AN EXPERT ELECTRICAL ENGINEER who holds one of the most responsible positions here in New York City made the statement, after thoroughly examining and testing Kornit for electrical purposes, that in his most conservative estimation there can be ten tons of manufactured Kornit sold every working day in the first year. This would mean that the Kornit Manufacturing Company would pay a dividend out of its earnings the first year of over seventy-five per cent (75%). This is probably more than will be paid the first year, but there certainly seems to be a good prospect of paying a large dividend the first year.

THERE WILL BE SUCH AN ENORMOUS DEMAND FOR KORNIT AFTER IT BECOMES INTRODUCED THAT FROM YEAR TO YEAR THE DIVIDENDS EARNED WILL BECOME LARGER. THIS IS THE BEST OPPORTUNITY TO MAKE AN INVESTMENT THAT YOU HAVE EVER HAD.

It is a well-known fact that THE MOST LEGITIMATE AND PROFITABLE way to MAKE MONEY is by manufacturing some product that is "NECESSARY" and ONE THAT CAN BE FULLY CONTROLLED so that nobody else can manufacture the same article. Look at Sugar (which is protected by a high tariff); at Standard Oil, the Telephone, the Telegraph, and we might go on and enumerate many more monopolies. THEY ARE THE BIG MONEY MAKERS OF 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

have full charge of the KORNIT FACTORY IN THIS COUNTRY. It is planned that OUR FACTORY WILL BE PRODUCING AND THAT KORNIT SHALL BE A WELL-KNOWN AND UNIVERSALLY USED ARTICLE IN THE ELECTRICAL AND OTHER TRADES OF THIS COUNTRY EARNING AND PAYING LARGE AND SATISFACTORY DIVIDENDS EACH AND EVERY SIX MONTHS. Watch the July issue of POPULAR MECHANICS for a photograph of Mr. Kurt Bierich, the son of the inventor of Kornit. A few shares obtained now may be the foundation for a fortune or the much-desired income for support in the unknown years that are to come. We leave it to you if it would not seem good judgment to take immediate advantage of this opportunity. Anyway, please write me at once and let me



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

and ARE DULY TRANSFERRED TO THE KORNIT MANUFACTURING COMPANY, and the same is DULY RECORDED IN THE PATENT OFFICE OF THE UNITED STATES.

WE HAVE A FINE FACTORY

OUR factory is located in Newark, N. J. (Belleville Station). The machinery is now all complete and in its place. We will be manufacturing Kornit by the time POPULAR MECHANICS reaches you. To this end the services of the son of the inventor, MR. KURT BIERICH, who is a graduate of FREIBURG UNIVERSITY, GERMANY, has been retained. He arrived here the 10th day of last month to take full charge of the scientific construction of the factory. MR. KURT BIERICH spent two years in his father's factory at MENKENHOF, RUSSIA, and six months at the workshops in RIGA, RUSSIA, mastering every minute detail of the manufacturing and working departments. MR. BIERICH, JR., has been employed for six months recently in superintending the erection of a Kornit factory for the English company at Stoke Newington, N., London, WHICH HE BROUGHT TO COMPLETION IN THE MOST SATISFACTORY MANNER. MR. BIERICH, JR., will

know just what you will do. If it is not possible for you to take shares now, write and tell me how many you would like and how soon it will be convenient for you to do so, provided I will reserve them for you. As soon as I receive your letter I will answer it WITH A PERSONAL LETTER AND WILL ARRANGE MATTERS AS YOU WISH TO THE BEST OF MY ABILITY.

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

I know you will agree with me that you have never had presented to your notice a better opportunity to make an investment where such large profits can be made because of the exclusiveness of control, and the great demand and low cost of the raw material, which is now almost practically thrown away. Join me in this investment, and I assure you it is my sincere belief that in the future you will say: "That is the day I made the most successful move in my whole life."

MY OFFER TO YOU TO-DAY

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

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

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

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

year. If this business were doubled the second year, of course the earning capacity would double and the dividends would be over thirty-two per cent. (32%). Prominent and well-known Electrical Engineers assure me that this product cannot help and is bound to make enormous profits. I would recommend that you send for as many as



PRESIDENT CHARLES E. ELLIS.

you may wish at once. You, in my conservative opinion, can safely count on the large earning capacity of these shares. I will at once write you a personal letter with full information, and send you our illustrated book, "A Financial Opportunity," containing a score of photographs of the KORNIT industry, taken in Russia.

Please let me hear from you.

Yours very truly,

CHARLES E. ELLIS,
PRESIDENT.

**717B Temple Court,
New York City, New York**

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

Built to Bake—Tolman Ranges

WOULD you hesitate to buy a stove or range of us by mail if you were confident you could save \$15.00 to \$40.00 by so doing, and at the same time run no risk? That is exactly what we are offering you. A stove or range second to none in the world at a price far less than your local dealer

can even buy such a range. We are able to save you many dollars, in your range buying for three reasons, viz.:

1. Our direct selling plan, from factory to family (One Profit).
2. We have a perfect factory and foundry of our own.
3. We have the experience of over twenty-three years.

For durability, economy and baking qualities, our Tolman Ranges are unsurpassed. They are made from the very best of material, by skilled workmen, in our own factory. The ovens are large, square, perfectly ventilated and fitted with oven thermometer which prevents any waste of fuel from overheating the oven. No one has ever yet disputed the fact that Tolman Ranges are absolute range perfection. We challenge comparison.

We do not claim that we manufacture the only good range on the market today, but we do say, we will sell you a stove or range, far superior to any other on the market today, at a price far lower, and terms fairer than those offered you by any other stove manufacturer or dealer.

It is a well established business principle to buy where you can buy the cheapest, **QUALITY CONSIDERED**. Your home merchants do this **EVERY TIME**. Not one of them will pay you a cent more for the articles you offer them than they can procure the same thing for of **OTHERS, WILL THEY?**

Then why pay your local dealer fifteen to thirty dollars more for a range than you can procure a better article for of us? Our "FACTORY TO FAMILY" plan enables you to buy of us by mail safer than of your local dealer.

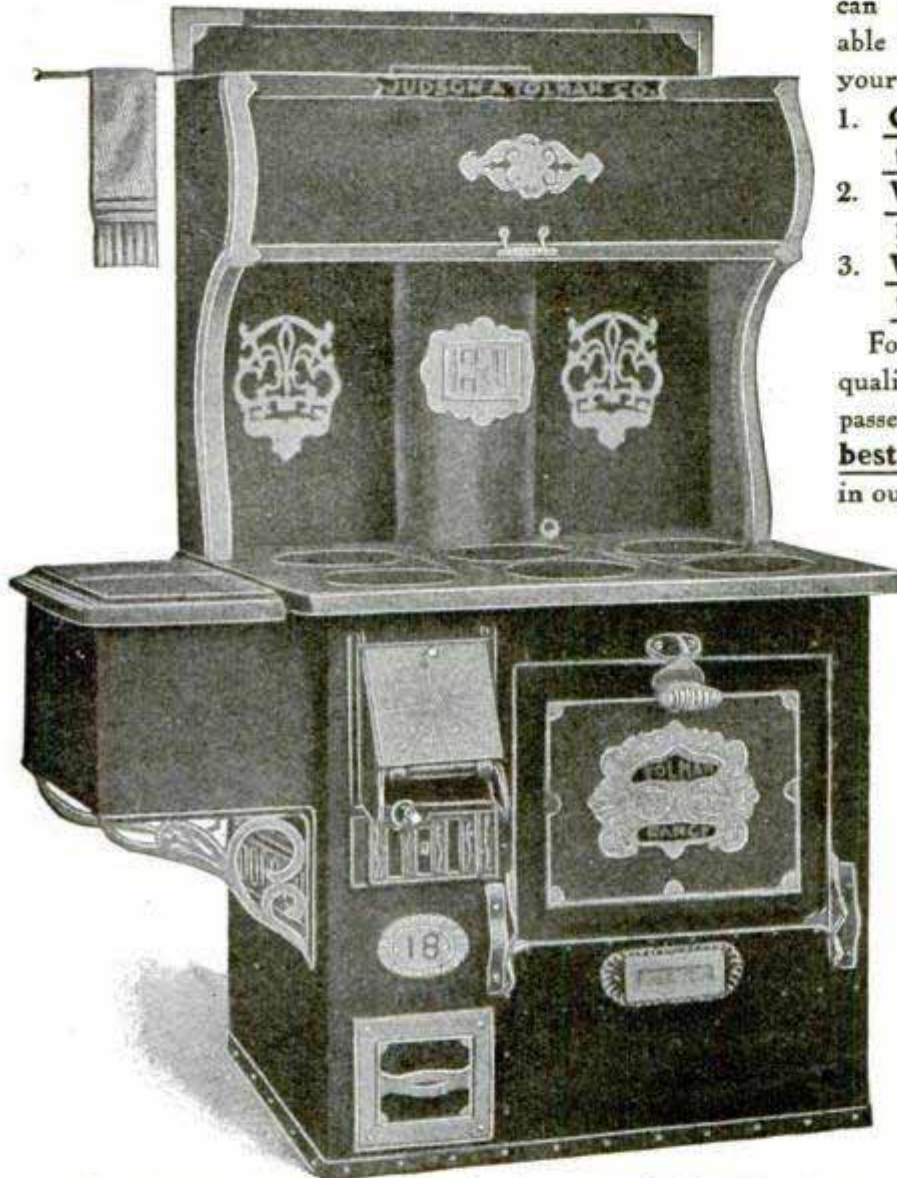
We have pleased customers in nearly every county in the United States. Their letters show that we saved them money and gave them entire satisfaction. We know that we can give satisfaction, and save you money. You run no risk because we ship on **ONE YEAR DECISION TRIAL AND GIVE YOU A TEN YEAR GUARANTEE.**

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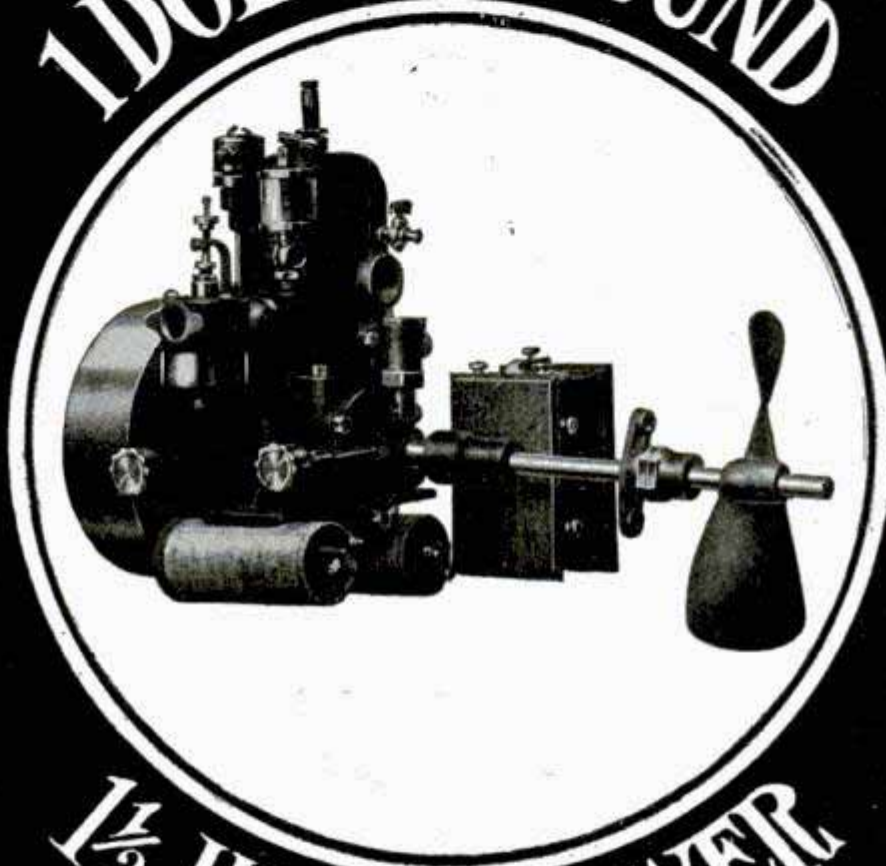


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We pay the freight and other charges in advance—our funds—no money of our customers in advance. We place it in the smallest town in the United States just as freely as we would in New York City. There is absolutely no risk, expense or annoyance. You can try it in your home for 20 days, get the opinion of your real and disinterested friends, can compare it with others. Then if you do not wish to keep it we will take it back, entirely at our expense. In this way you will not be "talked into buying," as you may have been some time to your lasting regret. Moreover, your friends and neighbors will not know on what terms or at what price you purchased. Agents disclose your business to make other sales. (You know how fast agents talk.) This, however, is of small importance compared to the beautiful, sweet tone you get in THE 1906 WING PIANO. Even the saving of many dollars is of less importance. Any American home wants and DESERVES the best and sweetest. You have it only in THE 1906 WING PIANO.

Sold Direct from the Factory and in No Other Way

For this reason YOU SAVE FROM \$75 TO \$200. The WING PIANO you buy at wholesale—at the cost of making—with only our wholesale profit added. THERE'S THE SAVING. Agents would have to be paid, if we had them. Salesrooms would have to be rented if we had them. Local advertising would have to be done and paid for. All this would increase the cost of the Piano, if we did it. By selling the Piano direct to you, we save you from \$75 to \$200. THE 1906 WING PIANO is in a class of its own and NEEDS no agent to talk for it. Its own sweet tone sells it.

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have been manufactured and sold. They are recommended by thousands of satisfied purchasers in your State, and every one of the United States, by seven governors of States, musical colleges and schools, prominent orchestra leaders, music teachers and musicians. Our book contains names and addresses, arranged by States.

THE INSTRUMENTAL ATTACHMENT

enables any ordinary player to imitate perfectly the tones of the MANDOLIN, GUITAR, HARP, ZITHER and BANJO. This improvement is patented and can be had only in the Wing Piano.

WING PIANOS are made in our own large factory—of choice materials throughout, by very experienced workmen. This explains their great durability.

A guarantee for 12 years against any defect is given with every WING PIANO. We take old Pianos and Organs in fair exchange. Easy monthly payments if desired.

The 1906 Wing Piano - We are one of the very few firms that have been in continuous business well toward a half century. We have been studying and learning every year of the full thirty-eight.

But the very recent discoveries of our Mr. Wing, Senior, give THE 1906 WING PIANO such greatly increased vibration that the slightest touch brings forth a surprising quantity of round-musical sound. Even a young child—and before the first lesson—can produce this. They therefore practice easily without fatigue and become players! THE 1906 WING PIANO does not require vigor or strength to make it respond. It is BUILT to be played upon by hands as delicate as those of CHILDREN, but has such a reserve of power and vibration that it charms the adult pianist also. Many pianos you see advertised are now built to be played upon by foot power. Children do not become musicians on such pianos, but are worn out in the vain attempt. You and yours expect to live with your piano for a lifetime. You want its refining influence upon your home. If it is heavy touched and dull of speech no one will learn to play it. THE 1906 WING PIANO will be sent free to prove that it has more real life than any you have ever heard.

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IF YOU INTEND TO BUY ANY PIANO, a book which gives you the information possessed by experts. It tells all about the different materials used, the way these parts are put together, what causes pianos to get out of repair. It makes the selection of a piano easy. It is absolutely the only book of its kind ever published. It contains many large pages and illustrations. If read carefully, it will make you a judge of piano quality. We send it free to anyone wishing to buy a piano.

Send to-day while you think of it, a postal just giving your name and address, or send us the attached coupon, and the book of information; also full particulars about the Wing Piano, with prices, terms of payment, etc., will be sent to you promptly by mail if you think of buying.

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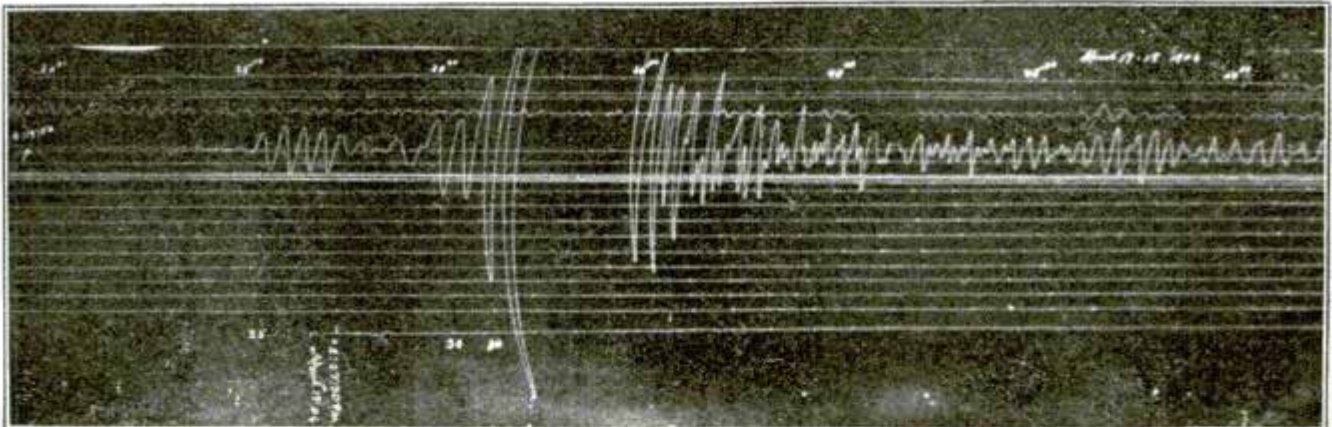
THE INSTRUMENT THAT RECORDS EARTHQUAKES

**While San Francisco Was Falling the Seismograph in Washington
Felt the Shock**

A delicately poised needle in one of the Government institutions at Washington, D. C., trembled violently while San Francisco was being destroyed. True to its purpose, the vibrations of this needle in sympathy with the earthquake shocks thousands

past few years that there has been installed the latest and largest type of seismograph, imported from Strassburg.

The seismograph is so delicately adjusted that it will even register the feeble, unfelt earthquakes which frequently occur in all



Photographic Reproduction of the Seismograph Record at Washington, D. C., of the San Francisco Earthquake

of miles distant, traced a permanent record of the disturbance and has preserved a history of the great convulsion which scientific men say will prove of great value.

The sensitive apparatus in question is an instrument known as the Seismograph, the function of which is to record all earthquake shocks, violent or slight. It is located at the headquarters of the United States Weather Bureau. This institution has had in use since 1892 instruments for automatically recording and measuring the trembling of the earth, but it is only within the

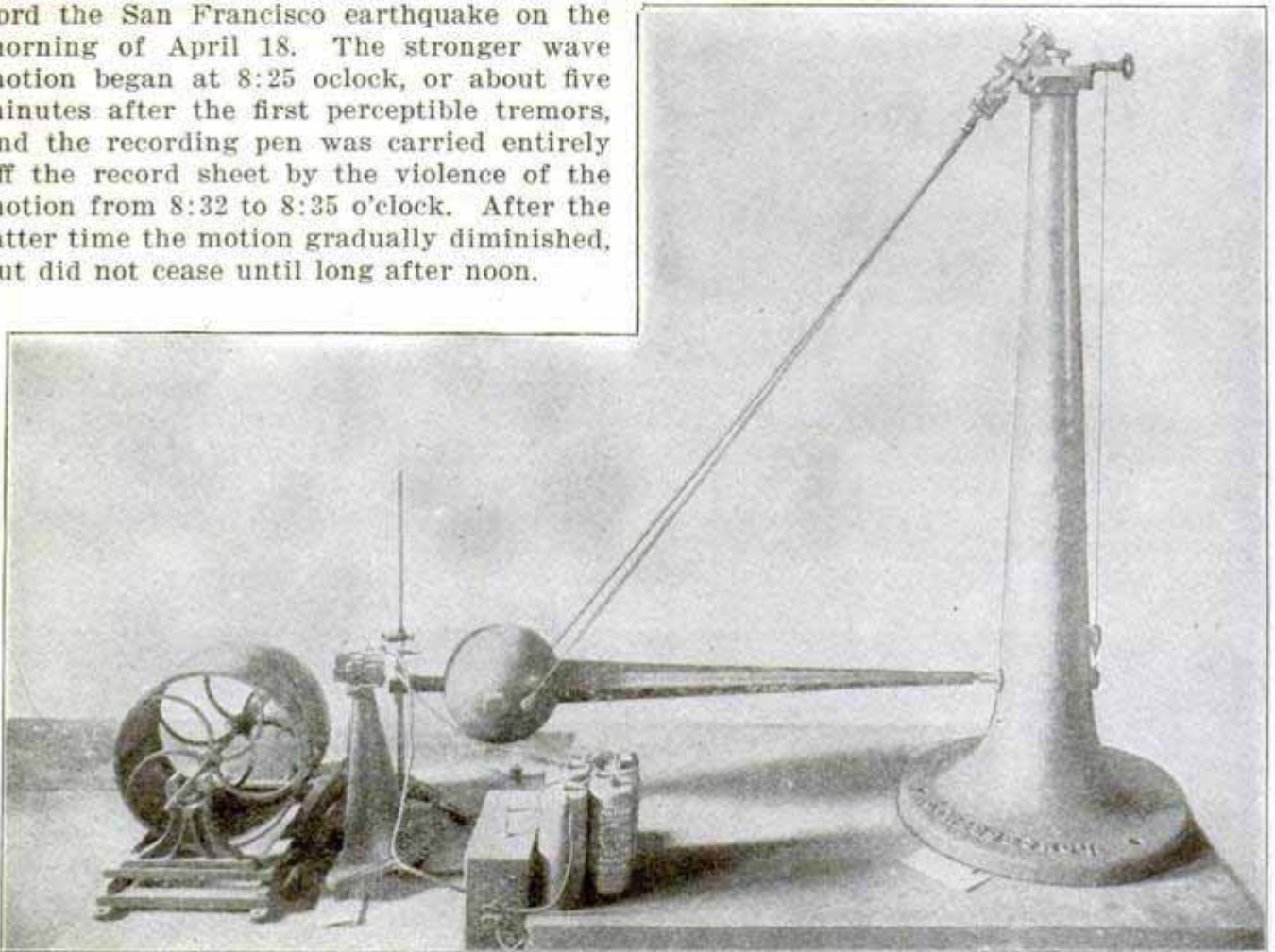
parts of the world. The chief features of the apparatus are a horizontal pendulum supported on sharp steel points and swinging with great freedom of motion; and a massive lead weight, the latter so arranged that it remains at rest during an earthquake, notwithstanding the fact that the earth and its own supports are undergoing severe vibratory displacements.

The magnifying and recording lever which is instrumental in writing down the earthquake's message to science is made of a very thin sheet of aluminum, bent into an

inverted trough-shaped form to secure stiffness. The record is traced on a sheet of smoked paper wrapped around a cylinder. In order that there may be the least possible friction at the tracing point the coating of soot is made relatively thin and paper with a highly glazed surface is used. The record cylinder makes one revolution per hour and a mechanical attachment shifts it endwise as it revolves.

It was almost 8:20 o'clock a. m., Washington time, when the seismograph at the Weather Bureau headquarters began to record the San Francisco earthquake on the morning of April 18. The stronger wave motion began at 8:25 o'clock, or about five minutes after the first perceptible tremors, and the recording pen was carried entirely off the record sheet by the violence of the motion from 8:32 to 8:35 o'clock. After the latter time the motion gradually diminished, but did not cease until long after noon.

a tremor, there appears to be no reliable conditions on which to forecast an earthquake. Storms of wind or rain, periods of intense heat, cold or drought, even areas of probable cyclones and tornadoes, are foretold with very reliable accuracy. But all these have to do with conditions of the atmosphere; it is not unreasonable to expect that the indications, if any, of an approaching earthquake will have to be sought for within the earth itself, if indeed the disturbance is accompanied by any advance conditions.



Seismograph at Washington, D. C.--This Picture was Taken Before the Instrument was Fastened to its Foundation

As to the cause of the recent earthquake, scientists differ widely. Some attribute it to a displacement of rock strata resulting from a gradual but long-continued rising of the coast range of mountains. Others find in certain sunspots an explanation satisfactory to themselves; still others connect the upheaval with the recent activity in Vesuvius. In this latter claim is included the observer at the Government observatory at Greenwich, England.

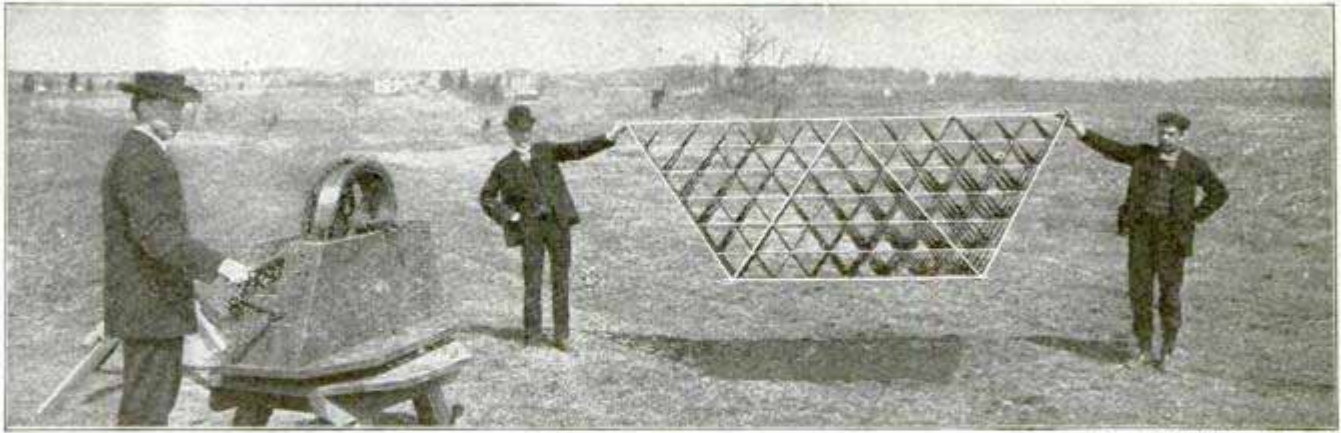
Aside from a peculiar condition of the atmosphere which people in California have long recognized as "earthquake weather," and which generally precedes by one or two days

The subject certainly affords a large and attractive field for study and research.

REFRIGERATOR CARS ON INTER-URBAN LINES

The Cleveland (Ohio) board of health has recently ruled that milk brought into that city must not exceed 50 degrees F. in temperature when delivered. In consequence, a demand has been made on the interurban electric lines handling the milk supply that they provide refrigeration facilities, so that the dairymen can comply with the new rule.

KITES FOR ARMY WIRELESS WORK



Copyright Waldon Fawcett

Bell's Cone-Shaped Kite Used in Wireless Experiments

The wireless telegraph corps of the U. S. Army are conducting some interesting, and it is said successful, experiments in working wireless telegraph by means of kites. These kites, which are constructed with wires which serve not only as framework of the kite but as antennae as well, are the invention of Prof. Alexander Graham Bell. The illustrations give a very fair idea of the shape and construction of the kites and a field sending and receiving station.

The same wire which serves as kite "string" also makes electrical connection between the kite and the operator. The sending apparatus is said to be very much simpler than anything yet devised for short line work. The operator receives through a pair of telephone receivers which are held to the ears. A hand brake controls the letting-out of the kite wire, and an ordinary direct connected crank is used to wind it in again.



Copyright Waldon Fawcett

Receiving Wireless Messages by Means of a Bell Kite

COLD AIR PIPED FROM WELLS

Cold air for keeping the houses cool and preserving butter, eggs, meat, etc., is supplied by the wells at Thompson Falls, Mont. The wells are about 60 ft. deep and are fed through a gravel formation by the moun-

tain streams. A current of cold air rises from them continually. To use the air the wells are closely covered and tapped with large pipes a few feet below the ground; by this means a temperature of 55 degrees is maintained in public buildings and dwelling houses. For cold storage purposes, a house is built directly above the well.

MODERN STEEL STRUCTURES RESIST EARTHQUAKE

Astonishing Demonstration at San Francisco--Modern Skyscrapers Stand While Old-Style Three-Story Buildings Fall

By J. M. Baltimore, San Francisco



No. 1.--City and County Building: A Total Wreck

(The following from our staff correspondent in San Francisco is in response to our request for information specially concerning the condition of the modern steel constructed skyscrapers, and will correct the general impression that this type of construction failed under earthquake shock. The announcement that more steel-frame buildings will be erected at once will now be better understood.—Editor.)

The chaotic condition of affairs here, which is simply indescribable, together with having lost all my own personal effects in the fire, has made it difficult for me to send a report with as full details as you expect. Practically everyone has a new address, and the engineers and architects I had to seek out were no exception to the rule. They are working night and day, and will grant an interview of only a few minutes.

The modern steel construction, including the skyscrapers of twelve or more stories, apparently stood the shock in a manner

which astounded even their most enthusiastic advocates. Even the conflagration which followed, and whose mass of heat and flame



No. 2.--Post Office: Unharmed



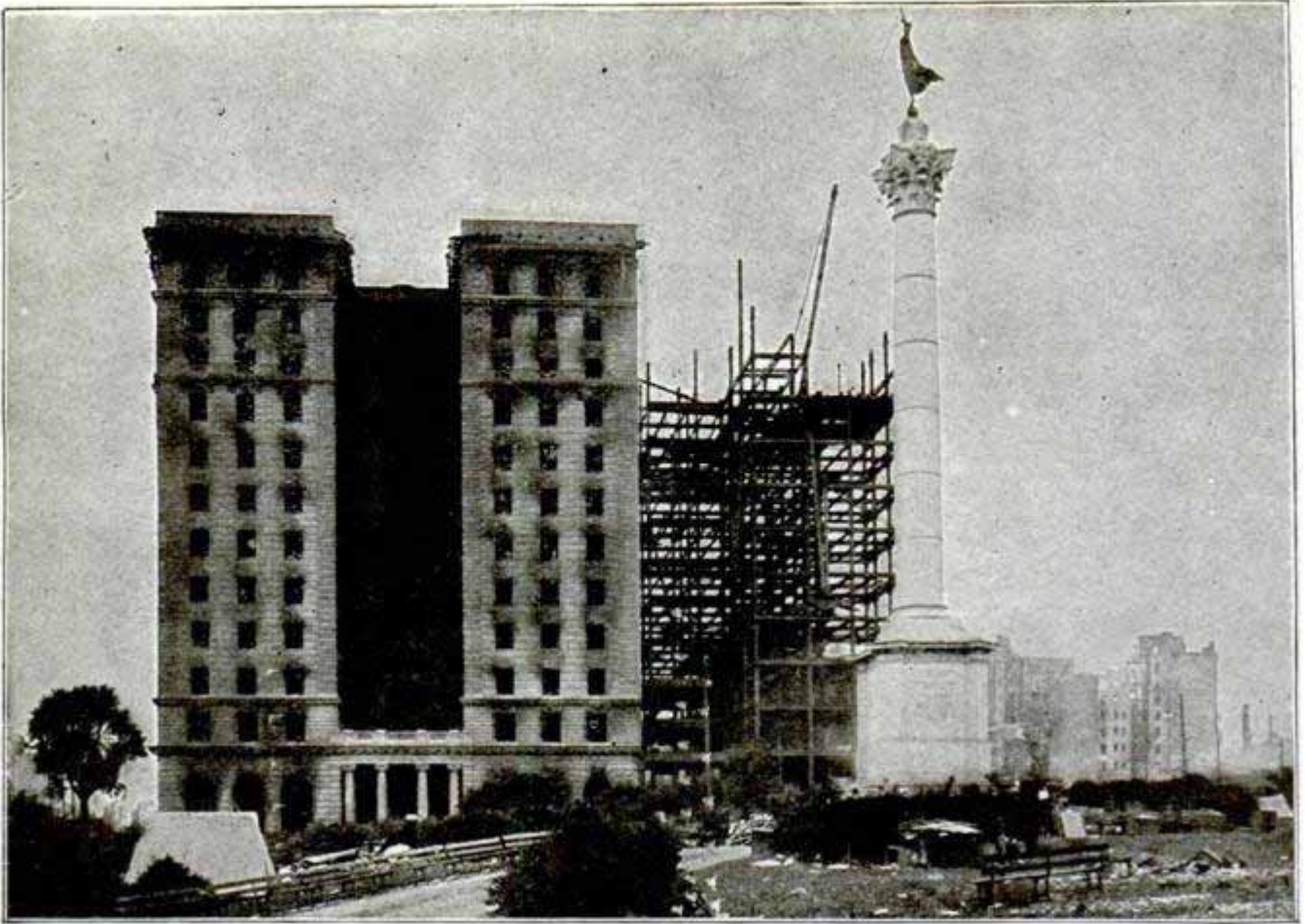
No. 3.--Call Building, 300 Ft. High--Interior Burned Out, but no Visible Cracks in Outer Walls

was simply a great gulf of roaring, boiling fire, failed in several cases to destroy the steel structure while burning out everything combustible in its interior. The following is compiled from the first examinations of the experts; a minute investigation will take weeks and perhaps months, and may possibly reveal strains which are not apparent or easily discovered.

Photograph No. 1 shows the once magnificent City Hall, including the Court House, Hall of Records, City Prison, Hospital, Police Courts, etc., after the dreadful earthquake and fire. It must have been the very center of the seismic disturbance, for no building in all San Francisco was one-tenth as badly damaged by the quake as was it. It was practically wrecked; then the fire, some 30 hours later, completed the work of ruin. The shock knocked off all the stone and metal covering all around the huge and towering dome, one of the finest in the United States, leaving the top standing. The network of steel structural part standing comparatively intact. This magnificent structure originally cost \$5,000,000, and was several years in process of construction. It is deemed past all repair. Engineers have made a careful examination of the



No. 4.--Flood Building--12 Stories--Interior Burned--
Can be Restored for \$100,000



No. 5.--St. Francis Hotel; 200 Ft. High; Interior Burned; Structure Unharmcd; Skeleton at Right is the Addition Under Construction

ruins, and are of the opinion that it will have to be taken down and entirely rebuilt. It was composed jointly of granite, sandstone, pressed brick, reinforced concrete, structural steel and a considerable proportion of wood. How it stood the fearful

shock and then the fire may be seen by the photo.

No. 2 shows a part of the brand-new Post Office building. It stood the heavy shocks without a perceptible external crack or seam. All the sidewalks both granite and



No. 7.--General View of Burned Business District--Note Tall Steel Constructed Buildings--Some Were Under Construction and Will be Rushed to Completion

concrete and streets surrounding the building were broken to pieces, bulged up and smashed, bent, and overlapped. The fire did comparatively but little damage, as may be seen. Only a part of the interior burned at all. Even many window panes were not broken. The building is made, externally, of fine California granite; the interior of fine marble brought from nearly all parts of the world, and other fine stone and structural steel. It certainly stood the ordeals wonderfully well. This building cost Uncle Sam about \$5,000,000. The total cost of repairs is estimated at \$100,000.

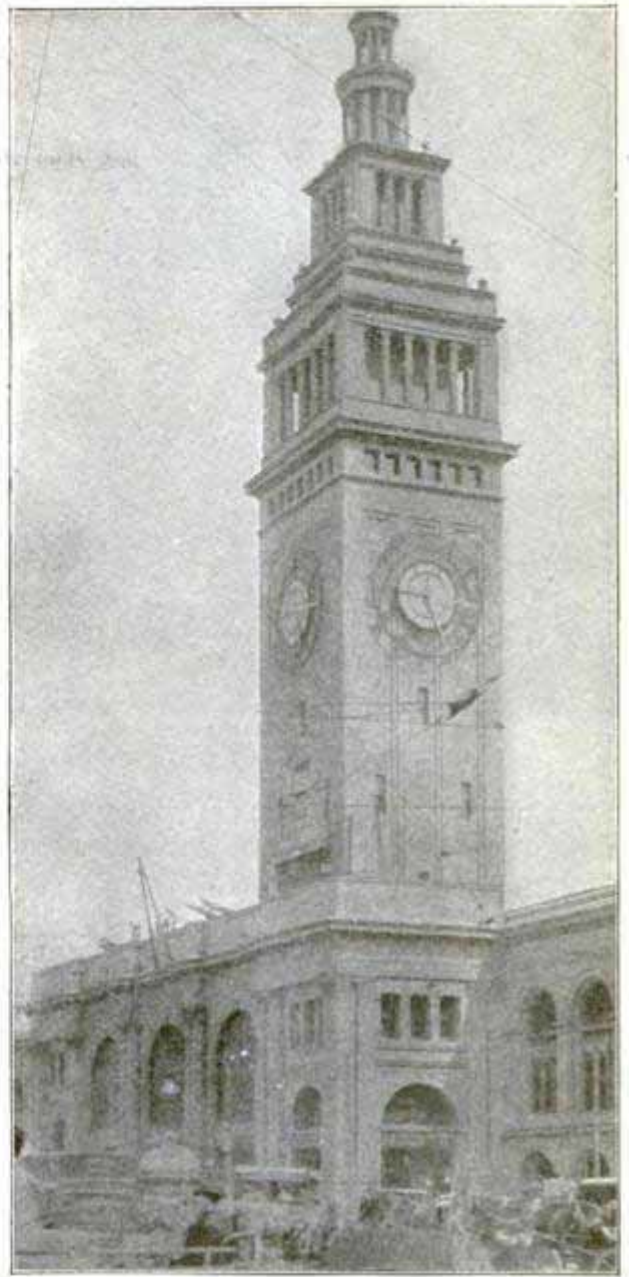
No. 3 shows the famous and beautiful Call building—the one standing in the center background. It was one of the few modern buildings that stood the two tests. The Call stood the shock without a visible external crack or seam. The interior of the building subsequently burned from basement to apex and yet it stood intact just as the photo shows, blackened and charred inside. The building has been adjudged safe by engineers. It has a massive frame of structural steel; all external material being of fine sandstone. The building cost over a million dollars, and was one of the chief architectural ornaments and glories of San Francisco. It was 300 ft. high from sidewalk to pinnacle.

No. 4 is the great Flood building, 12 stories high, after the shock and fire. It stands Gibraltar-like, not a crack or seam. Just furnished and filled with tenants; cost, \$4,500,000; built of structural steel, sandstone and concrete basement; all marble and terra cotta interior; a noble and magnificent structure of which San Francisco was proud. Floors comparatively intact; basement comparatively intact. Will cost only \$100,000 to restore as formerly.

No. 5; the St. Francis Hotel: It cost \$2,500,000; 200 ft. high from sidewalk; exterior, sandstone; structural steel; interior marble, terra cotta, other fine stone. Stood shock and fire splendidly without a flaw; floors stood well; not cracked or strained; all furniture destroyed which cost \$200,000 alone; building can be repaired with comparatively small expense; demonstrates what modern building can stand. That new part on right hand side under construction is to be part of the hotel when finished.

No. 6; Great Union Depot and Ferry landings; cost over million; structural steel, sandstone, marble, terra cotta; stood great shock well; escaped the deluge of fire; tower damaged and must be rebuilt; photo shows when shock stopped clock.

The new Merchants' Exchange building,



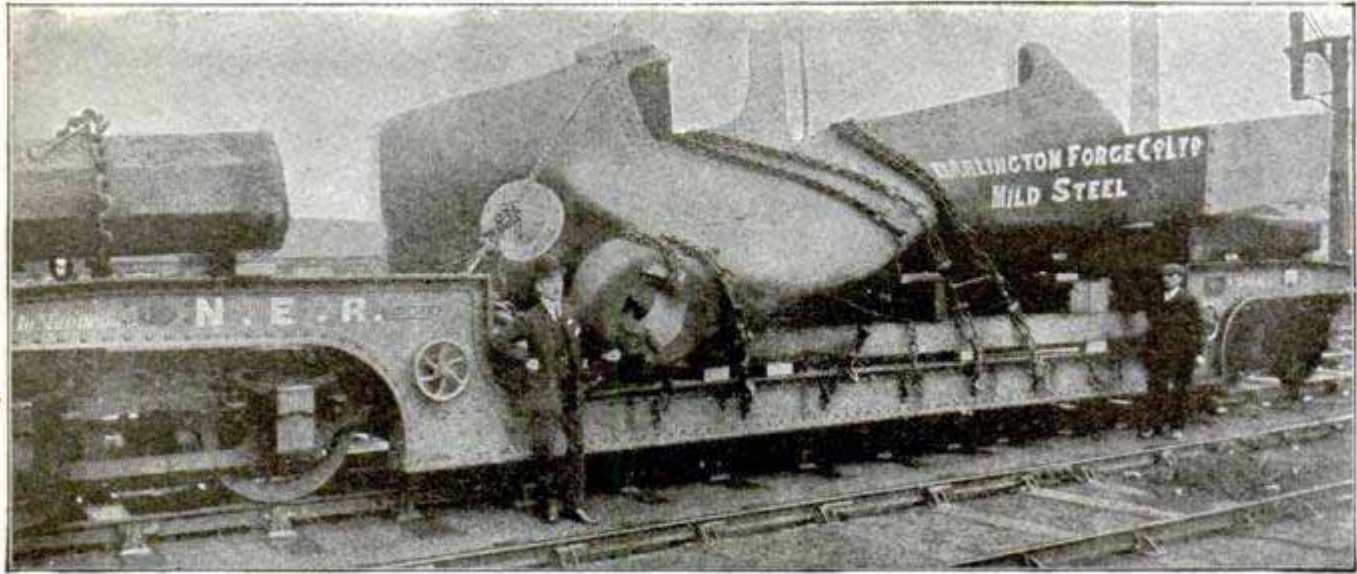
No. 6.--Tower of Great Ferry Depot--Clock Stopped at 5:15

14 stories high, and costing \$3,500,000, is structural steel frame, granite, pressed brick, terra cotta, marble; very little wood. Stood quake and fire splendidly, not all of interior was burned out. One of the best buildings in city. Can be repaired at comparatively small expense.

The same may be said of the beautiful Mills building; Crocker Bank building; magnificent Fairmount hotel; Savings Bank—all modern structures. A number of new buildings in course of construction stood the test well; all these are skyscrapers. See picture No. 7 for general view of business district.

—◆◆◆—
A new steamship line has been started to operate out of New Orleans to Rotterdam, with semi-monthly sailings.

SPECIALLY BUILT CAR FOR MOVING HUGE STERN POST



Stern Post of New Cunarder Loaded on Special Car

The huge rudders, stern frames and brackets for the two new turbine Cunarders, now building, were cast at Darlington, England, and weighed approximately 220 tons. In moving the big castings from Darlington to

Wallsend and Clydebank a specially constructed trolley car was used. The line was cleared on a Sunday and the great weight was conveyed safely at a rate of speed not exceeding three miles an hour.

LARGEST STRUCTURAL STEEL PIECES EVER MOVED BY RAIL

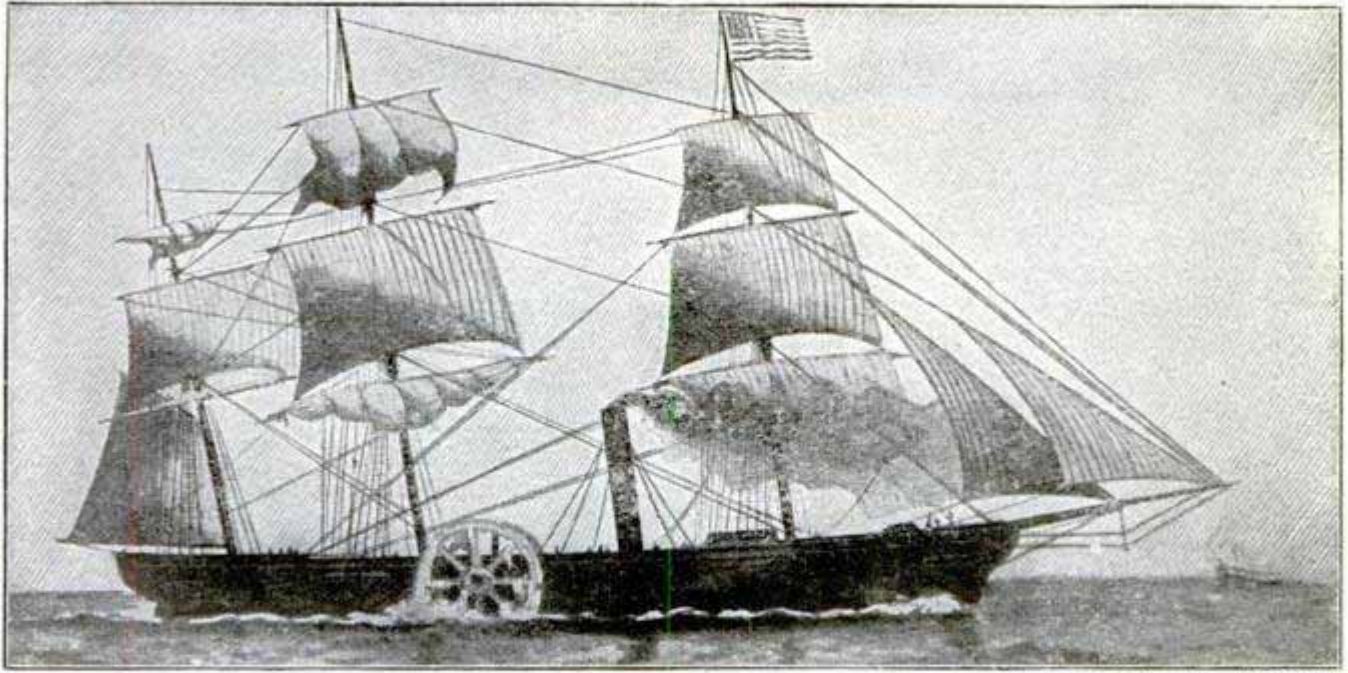


Largest Single Structural Steel Pieces Ever Loaded on Cars

Two cars, each of 150,000 lbs. capacity, were required for conveying two huge 30-ton steel girders used in the construction of a railroad bridge over the Housatonic river. The girders were the largest single pieces of structural steel ever loaded on a car.

Each extended 2 ft. below the bottom of its car and towered 14 ft. above the car rails. They were held in place by 12x12-in. timber blocking and long steel bars to prevent shifting in transit.—Contributed by Chas. W. Kimble, 417 Market St., Trenton, N. J.

FIRST STEAMSHIP TO CROSS ATLANTIC



Courtesy American Shipbuilder

Pioneer Transatlantic Steamship "Savannah." Built in 1819

The first steamship to cross the Atlantic was the "Savannah," a sailing craft of only 350 tons, which was afterward equipped with boiler, engine and two side paddle wheels. On account of her small size, only 80 tons of coal was carried, hence a good part of the trip was made under sail.

The "Savannah" left New York on March 29, 1819, for the city of Savannah, from which port she sailed on May 22 for Liverpool. The Atlantic was crossed in 29 days 11 hours, during which time the engine worked 80 hours.

In an article on the "Development of Steam Navigation" in the Connecticut Magazine is a quotation from the report of the engineer of the "Savannah." He writes that as they approached the coast of Ireland, they were sighted and supposed to be a ship on fire, therefore "admiral dispatched one of the king's cutters to her relief. But great was their wonder at their inability, with all sails set in a fast vessel, to come up with a ship under bare poles. . . . After several shots were fired from the cutter, the engine was stopped, and the surprise of her crew at the mistake they had made, as well as their curiosity to see the singular Yankee craft, can be easily imagined. They asked permission to go aboard, and were much gratified by the inspection of this naval novelty."

From Liverpool the "Savannah" steamed to St. Petersburg, stopping at Copenhagen and Stockholm, and everywhere creating great excitement, and receiving royal honors.

A curious feature of the "Savannah" was the construction of the paddle wheels which were so built that the wheels could be quickly folded up like a fan and lifted on board. This was to prevent strong waves from smashing the wheels.



DEMANDED DUTY ON RELIEF FIRE ENGINE

A group of buildings at Heuninhen, Germany, near the German-Swiss frontier, took fire recently and a fire engine was sent out from Basle, Switzerland. The customs officials demanded duty on the engine before it crossed the border, and while they parleyed the buildings, 100 yds. away, burned to the ground.



A NEW STEEL CITY

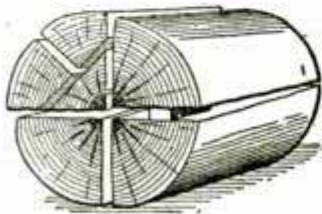
A new steel-working city is being created on the shores of Lake Michigan a few miles east of Chicago, just over the Indiana state line. The entire city will be built starting with the bare ground. Mills will be erected for the manufacture of all kinds of steel, and when completed will employ 15,000 workmen. It will be a model city, in which the best ideas of the leading experts will be embodied, and all the public utilities will be laid out to best advantage, as there are no streets to tear up as yet, and no buildings in the way of doing these things right.

MAKING BARRELS A WASTEFUL INDUSTRY

Sources of Supply are Being Rapidly Exhausted

Of the making of barrels, as of books, there seems to be no end; nevertheless the time is rapidly approaching when the barrels will either have to be made of other material than wood, or go out of existence. The "tight" barrel, which in the language of

the manufacturers is one built to contain liquids, has for years been made of white oak. The supply of this wood is almost exhausted in Europe, and it is already becoming scarce in this country. Already the stave men must go back many miles from railroad or



A "Cut" Split Into Stave Bolts



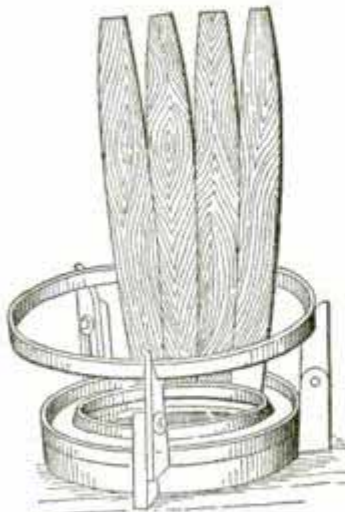
Stave Bolt Ready for Cylinder Saw



The Sawn Bolt



Finished Stave With Proper Bilge and Bevel



Setting Up a Barrel



Windlassing a Barrel



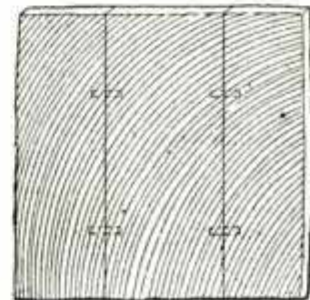
Driving Truss Hoops



Driving Iron Hoops,



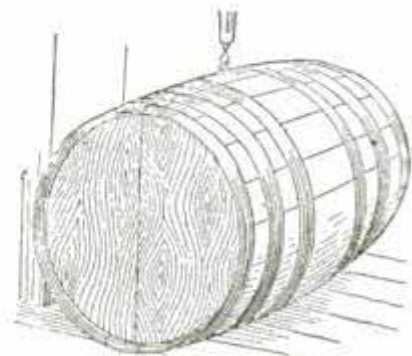
A Bolt for Making Headings



A Square of Heading



The Finished Barrel Head

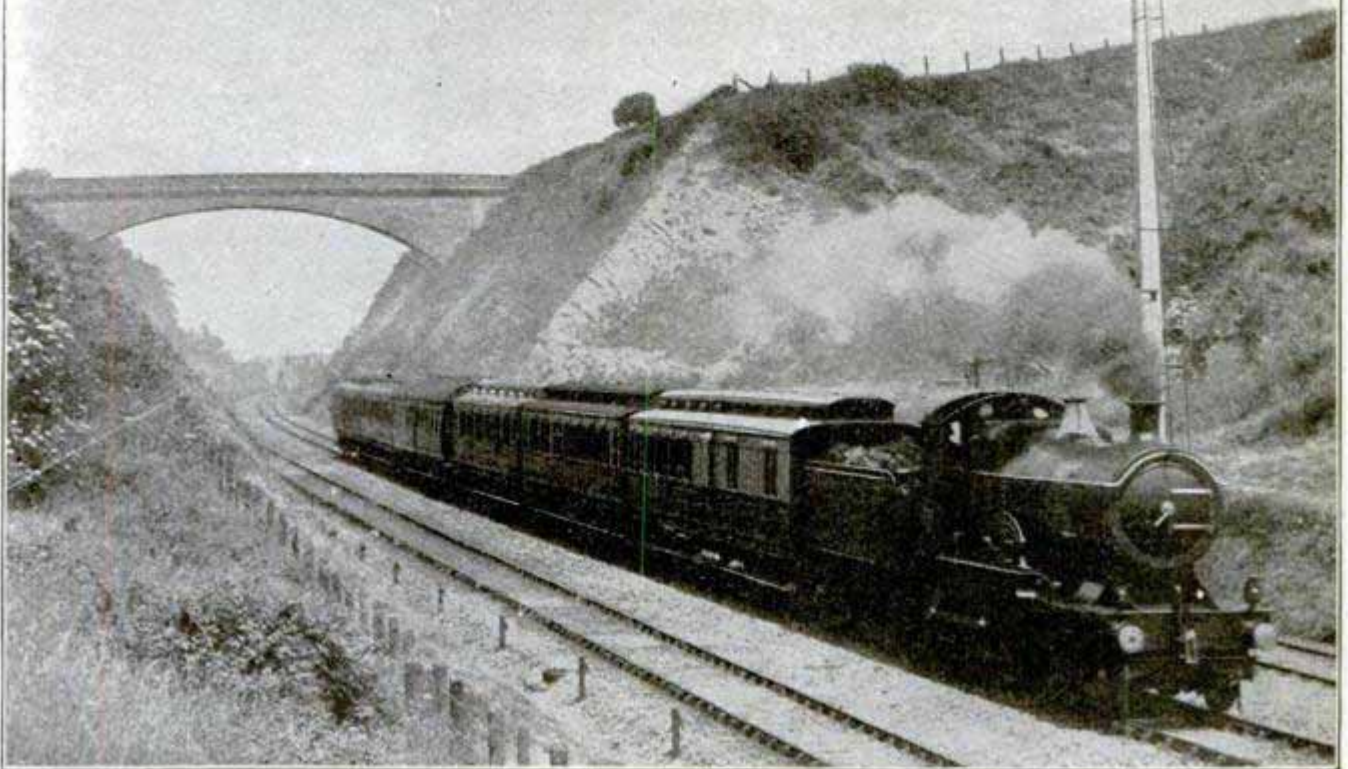


Boring and Reaming Bung Hole

WOOD CRAFT

Progress of a Stave From Log to Barrel

NOTABLE FOREIGN LOCOMOTIVES



“THE PLYMOUTH LIMITED” of the Great Western Railroad, England. This train makes the longest non-stop run of any in the British Isles--from London to Plymouth, a distance of 246 miles--and the time from starting signal in London to full stop in Plymouth is 267 minutes. In many places a speed of 80 miles an hour is sustained for long stretches.

river and the cost of getting to transportation is felt in increased cost of barrels.

In an interesting article on barrel making, Wood Craft calls attention to the wastefulness of tight barrel manufacture. The white oak staves for these barrels, of which 200,000,000 are produced in this country annually, sell for \$40 per thousand; while the same quality and quantity of oak if sold to the furniture maker would bring \$80.

Barrels which in the days of hand labor brought \$4 now sell for 90 cents owing to the invention of machines which assemble the staves, form them into shape, insert the heads, pull on the hoops, bore the bung holes, and roll the barrels down into a car, without a human hand touching them more than once or twice. But these machines which do the work which formerly would have required a small army of men, cannot produce the chief essential—the white

oak. Long before Mother Earth can be coaxed into growing a new crop of trees, the inventors will be called on to furnish a substitute for the wooden barrel, either by making it of other material, such as paper, glass or metal; or the barrel will retire in favor of some other form of container. The illustrations, showing the progress of a stave from the block to the completed barrel, we reproduce by courtesy of Wood Craft.

MILLION FOR SUBMARINES

One million dollars will probably be placed at the disposal of the Secretary of the Navy to be expended in advancing the science of submarine warfare. Foreign navies are pushing actively their submarine work, and it is deemed necessary that this country must not be left in the rear.

FOOD FOR STARVING CREW IN MID-ATLANTIC



Food for a Starving Crew

A British cruiser recently came across a little Portuguese sailing vessel in mid-Atlantic and far out of the regular track of ships of any sort, which signaled that she had no food on board and asked for immediate assistance. The sailing vessel had left the West Indies 72 days before with a cargo of beans and sugar for Lisbon; had been driven south by adverse winds and had been in the spot where found for a month. Food giving out, the crew had tried to subsist on the beans; one of the men died from scurvy.

The little boat sent to the cruiser was loaded with provisions—flour, potatoes, biscuits, preserved meats and other things and the emaciated sailors who received it were overjoyed. Sailors on the cruiser threw tobacco, cigarettes and oranges to their fellows in misfortune. Then the sailing vessel, "Louisianito," signaled her thanks and the cruiser sped on her way.

WHAT IT COSTS TO SEE AT NIGHT

The lighting bill in the United States runs into millions of dollars every year. It would be an interesting sight could one travel in a balloon from the Atlantic seacoast west, as fast as the shades of night progress, and watch the myriads of lights that from city streets and farm houses flash and twinkle as the evening lamps are lit.

It has been estimated that the cost of the five principal lighting mediums in this country for the past year was as follows:

Electricity	\$100,000,000
Oil	60,000,000
City gas	35,000,000
Acetylene	2,500,000
Natural gas	1,700,000

An opportunity is here presented for the mathematicians to estimate the number of pine knots these nearly two hundred million dollars would pay for, at the price of knots in 1800 A. D.

HOUSE-BUILDING UNDER TENT

In order to complete a costly summer home at Lake Geneva, Wis., in time for use this season, a novel method was resorted to. An enormous circus tent was secured and erected over the spot where the building was to stand. This was at the beginning of winter. The tent covered an entire acre, and with numerous fires burning constantly the work of excavating and foundation laying proceeded night and day.

BUILDING ON SAND AT SAN FRANCISCO

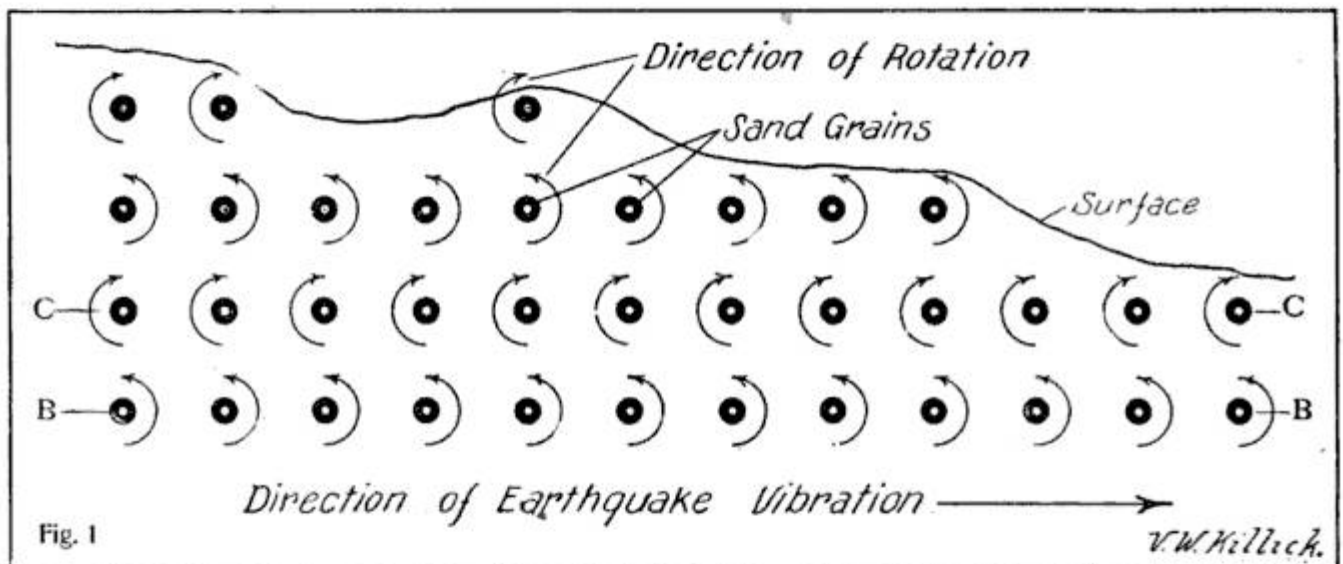
Sand Foundations Safe--How to Make an Artificial Lake on Sand--Woman's Ingenious Method of Building up Residence Lot by Wind and Sand--Action of Sand During Earthquake

By V. W. Killick, San Francisco

(This extremely interesting account of the writer's experience in "sand building" was commenced before the great earthquake of April 18, and completed since that date.—Editor.)

It is said that San Francisco is a city built on sand. It has also been predicted that some day an earthquake will sink it below the sea. The first statement may be modified to one-half of the city being built on sand; but as to the second, practical observation of our great recent earthquake has given us greater and wider scientific ideas

occupied by a shrub-covered sand dune. The lake was built in a hollow, making but little excavating necessary. The excavation was then covered with a layer of soft clay about three inches thick. A roller was run over this, after which it was thoroughly moistened and again rolled. A second layer of clay six inches thick was then laid and treated as the first, only it was rolled several times after it was moistened. After being allowed to stand some time, it was again thoroughly moistened. Artistic rock



Showing Effect of Earthquake on Sand

as well as more confidence in building on the sand.

Long experience in San Francisco has proved that sand may be cultivated, irrigated, excavated and built upon much cheaper, and with as good and in some cases better, results than building on other materials.

First: To prove it may be cultivated I might state that the great 1,300-acre Golden Gate Park of San Francisco, with its wealth of palms and flowers, was entirely cultivated out of sand dunes that had been a desert waste for hundreds of years.

Second: It can be irrigated easily, because its softness permits quick excavation, and by coating the excavation with a thin layer of clay, rocks, etc., can be made to hold water. A large five-acre lake in Golden Gate Park now stands in the place formerly

work was added to the banks and the bottom of the lake covered with beach gravel. After being soaked for several days, the lake was filled, and it has held water ever since—nearly two years. During the dry season, on account of its shallowness, evaporation is rapid and it is necessary to occasionally add a little water to keep it full.

Third: It is by far more satisfactory to build on sand where it is stationary, or can be made stationary, than any other material. In places like San Francisco, where we have frequent earthquakes, it is very advisable to build on sand. This statement may sound somewhat absurd, but here is the reason for it: In the great San Francisco earthquake that destroyed much of the city, April 18 last, it was found that the greatest destruction to buildings was in places where the foundations were on solid material. The

western section of the city, which was almost entirely built on sand, suffered very little loss. Why?

Look at the diagram (Fig. 1). The large arrow indicates the direction of an earthquake vibration. Now, in the case of solid material this vibration affects the mass as a whole, but in sand the vibration affects the mass in layers. As the vibration moves forward a small belt or layer of sand, represented by the dotted line, B, separates, as it were, from the main body and the grains of sand in the layer commence a rotary motion, the direction of which is represented by the small arrows. By this motion the whole layer moves slightly forward. The

the sand in the first place is moved, it is also returned to its original position unless the forward motion of the sand mass is sufficiently strong to force it over a bank or precipice, when its position cannot be controlled.

In the western portion of San Francisco there is an area of many square miles which was nothing but a sandy waste, with no vegetation whatever. It seemed a shame such a large portion of the western metropolis should not be turned to account. One man, however, determined to experiment. He sunk a well and at a depth of 50 ft. found water in one of the most arid places on the dunes. He proceeded to build a house

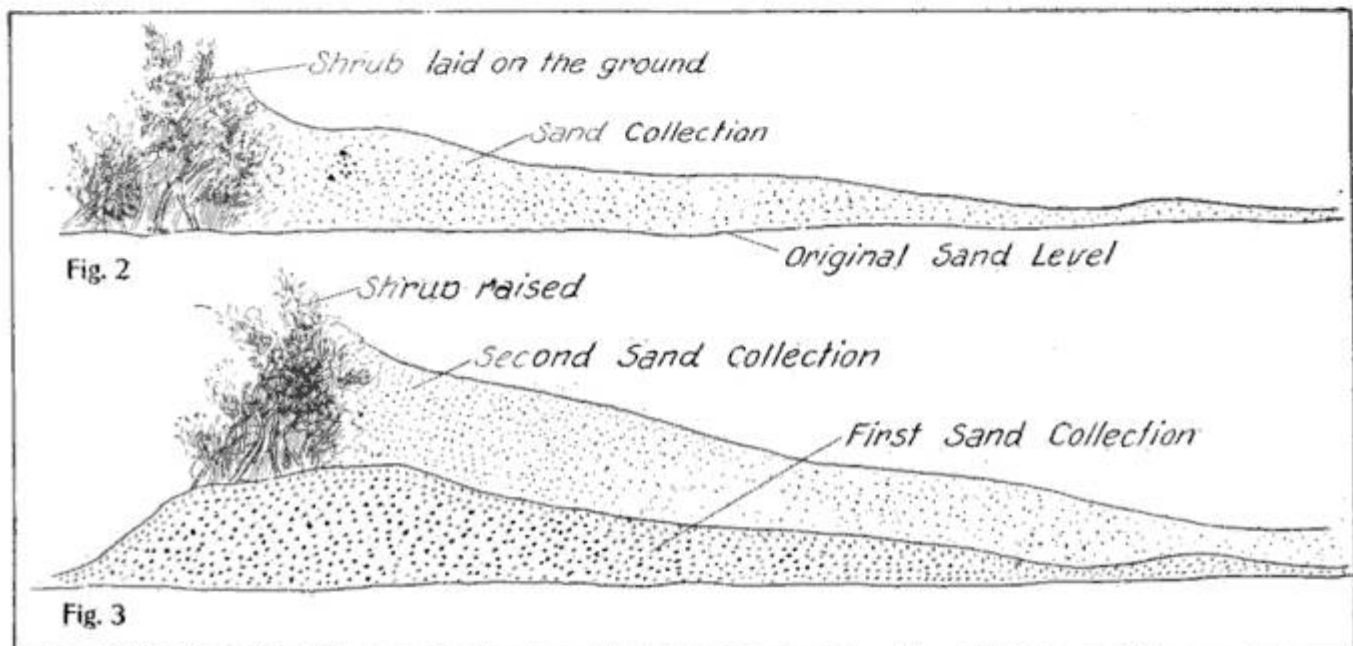


Fig. 2.--How Sand Level is Elevated

Fig. 3.--Further Stage of Elevation

next strata or layer above, see dotted line, C, is in its turn disturbed by the movement of the layer of sand beneath it. A rotary motion is caused in the grains of sand, but the rotations are in a direction opposite to that of the layer beneath. By this method the whole mass of sand is disturbed on much the same principle of ball-bearings, and hence the destructive force of an earthquake is greatly diminished on the surface of a sand hill.

But again: By the above mentioned process one would conclude that the sand would quickly shift its position and allow a house foundation to sink. This is not so. Every earthquake vibration has its forward and return motion the same as any other vibration. In the diagram is shown only the forward motion of the vibration. The return motion has exactly the same effect upon the mass as the forward motion of the vibration, except that the direction of all rotations is reversed. So we see that where

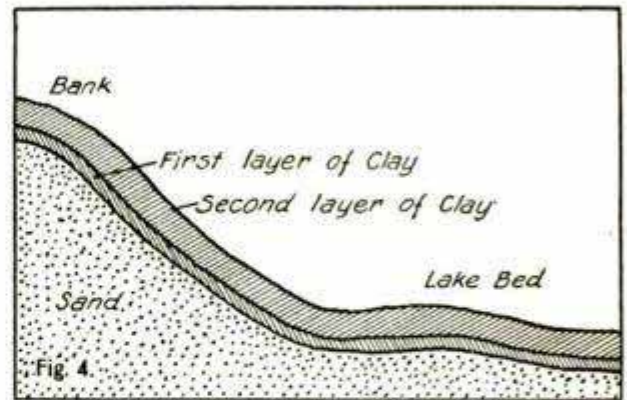
on a simple concrete foundation sunk 18 in. in the sand. Within six months he had fig trees bearing fruit, and vegetables and flowers growing in abundance. He hardly felt the recent terrible earthquake, and his house is as solid as ever.

From this man's experience, several persons ventured to buy lots close to him and try the same scheme. The city had never reckoned that the district would ever amount to anything, and so had never taken the trouble to even establish the standard grades for the streets, but as the lots were being bought up so rapidly it became necessary to do so. When a map of the district was made several persons who had already purchased lots discovered their lots were in some cases as much as eight and ten feet below the city requirements. Many became discouraged, as they did not think it worth the cost to haul in the hundreds of wagon-loads of sand necessary to make the fill and bring their lots up to the street grade; and

yet the lots had to be filled in or abandoned.

While the matter was as yet unsolved, the difficulty was overcome in a ridiculously simple way by a woman with a large supply of good common sense. She had purchased a lot which was nearly 15 ft. below the street level. For some time she had noticed the regularity of the western winds and also the surface movement of the sand. One day while the gardeners in Golden Gate Park were trimming the trees she procured a quantity of bushes and branches which the men had cut out. These she stuck in the sand, weaving the bushes into the branches until they formed a small wind-break. At the end of one week she found the sand had commenced to build up, and each day the accumulation was a little larger than the day previous. Soon the sand was as high as the wind-break, so she pulled it up and planted again on the newly made ground, and continued to do so until at the end of eight months she had brought the level of the entire lot up some seven feet. In talking with the woman at that time, she said to

me: "I find the more elevated the lot becomes the more sand it collects, and I believe inside another five months my lot will be raised the required height." And so it proved. The other property owners had fol-

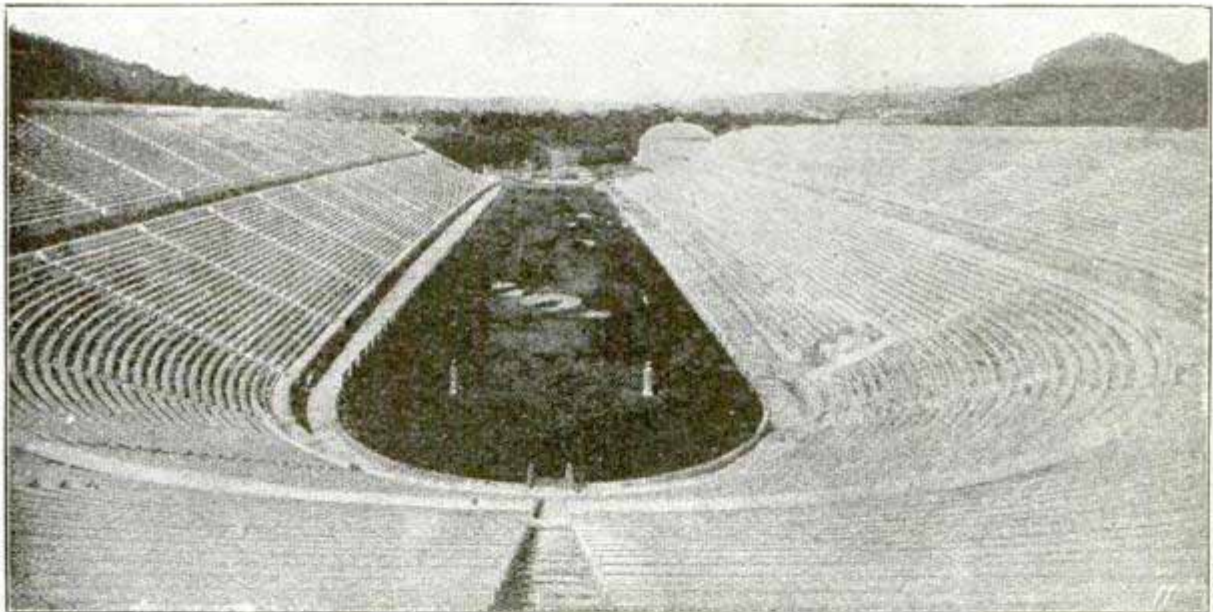


Cross-Section of Lake Constructed on Sand

lowed her example, with results equally satisfactory.

To people living on or owning property in sandy districts this information should be very useful. Experiment and see if you cannot turn your sand lot to good account.

NEW STADIUM FOR OLYMPIC GAMES AT ATHENS



The Great Olympic Theater Where the International Games are Held

On the very spot where the old Greek Stadium at Athens stood, a new building, an exact copy of the first, has been built, and from April 22 to May 2 the famous Olympic games were revived there. The event included a great variety of contests—swimming, long jump, high jump, fencing, 5-mile race, hurdle race, walking race, etc.—and was participated in by champions and athletes from all over the world.

The old Greek theater was laid out about

330 B. C. and games were first held there about B. C. 400. The building accommodated from 40,000 to 50,000 spectators. Private enterprise furnished the funds for the new building, which is built of pure white pentelic marble, and seats about 60,000.

When all the railroads now building or planned in Texas are completed, it will out-rank Illinois in mileage by 50 per cent. At present Illinois leads.

LONG-DISTANCE TELEPHONE PERFECTED

Is the Report of Experts--Adapted From the Violin

The report comes from San Francisco that David C. St. Charles has succeeded in so perfecting a long-distance telephone that conversation between New York and the Golden

VESUVIAN ELECTRIC RAILWAY WRECKED

The electric railway that winds up the lava-swept sides of old Vesuvius and which has carried thousands of tourists to the cone every year since its construction has been abandoned, and is partially destroyed. The electric railway was built several years



Climbing the Cone--Naples and Bay in Distance

Gate will not only be possible, but performed without the use of a stronger electrical current than for a short line. The inventor states he has found the secret in the sounding-board of the violin. For years he has made fine violins as a recreation. The details are not given out, but the instrument is intended to be placed midway and not at terminals. Its action is said to be a forcing of the sound wave forward, and preventing its rebound toward the sender.

BIGGEST GUN IN THE WORLD PROVES A FAILURE

The biggest gun in the world, and which, as might be expected, was invented and built in this country, has definitely been declared unsafe, and will go to the scrapheap. As only one of these mammoths was built, and that as an experiment, the loss is comparatively small, even though it is about \$100,000.

This gun was fully described in these pages at the time of its completion. It was constructed to shoot a 16-in. projectile a distance of 21 miles, even though it would be impossible to ever hit a mark at such range.

The big gun was found to be unsafe after a few firings, and really was as dangerous to our own folks as it was expected to be to an enemy. Twelve-inch guns are likely to be the limit for a long time, and certainly until some gun metal not now known is discovered.

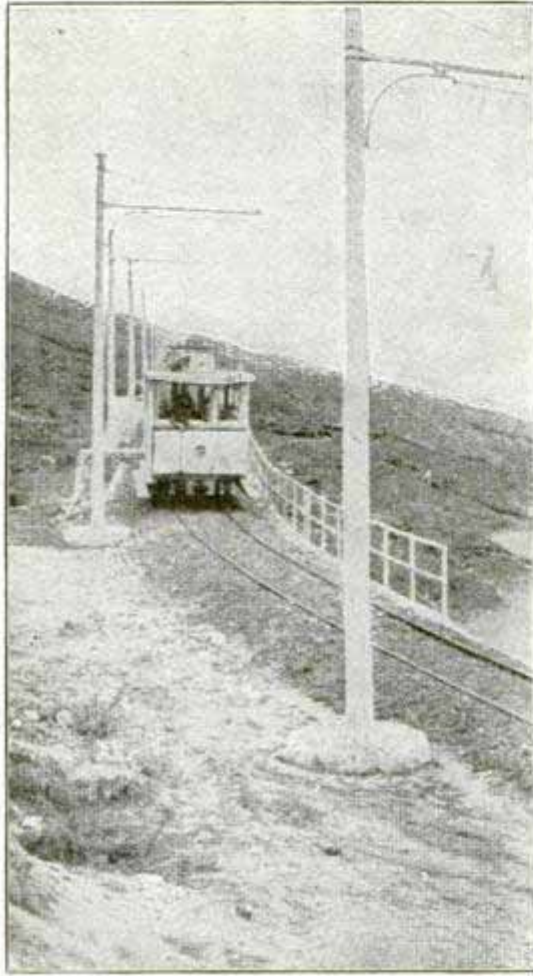
ago and cost, including cars, track construction and power house, \$250,000, or \$50,000 a mile. The cost of repairs is very high also, owing to deposits of lava at the upper portion.

The generating station which operates the cars by the overhead system is located near Pugliano, 319 ft. above sea level, from which point the electric route winds upward. Approaching the Royal Observatory—2,000 ft. above sea level—the gradient becomes so steep that the funicular system of cog-wheels is used for that section. After passing the observatory the rack is dispensed with and the electric line crosses a great lava area until it reaches the bottom of the old funicular railway—built 23 years ago—which climbs the cone to within a few hundred feet of the crater of the volcano.



Removing Ashes in Naples

The total length of the electrically operated sections of the line is nearly five miles and the trip over these portions is made in about 50 minutes. The electric locomotive



Foot of Lava Field

used has two motors of 85-hp. capacity each; the cars weigh somewhat less than nine tons each and each car is divided into three compartments, seating eight passengers.

The cable, or old funicular line, begins at a point 2,603 ft. above sea level and rises to a height of 3,874 ft. with grades varying from 35 to 65 per cent. Each car carries 21 passengers.

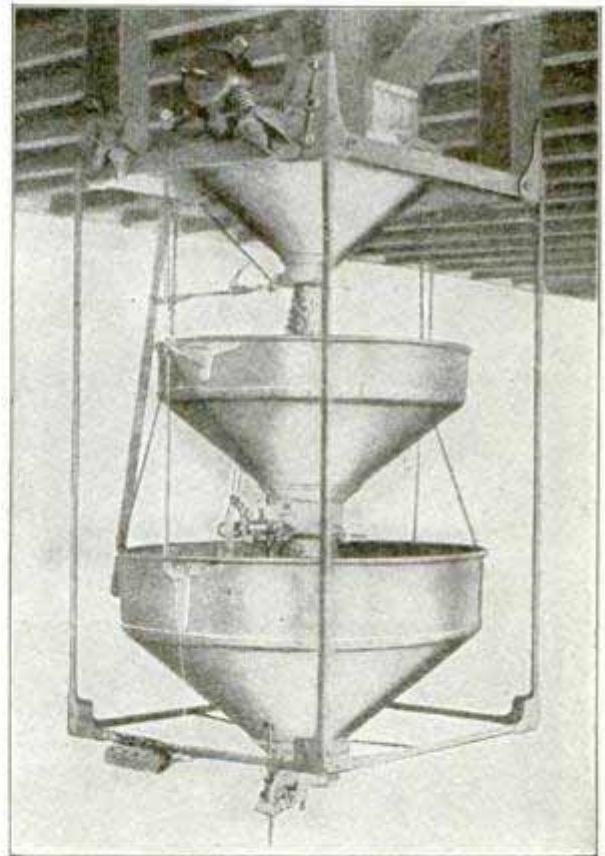
The devastation of the districts surrounding Vesuvius and the terror of the natives, who have been obliged to abandon everything and flee before the fury that no earthly power could stay, passes description. Bushels of ashes are daily swept up and removed from the streets of the city of Naples, and our readers are already familiar with the catastrophe that resulted in the market-place when the roof collapsed under the weight of ashes and hundreds of women and children were buried in the ruins. At Ottojano, one of the villages destroyed by the eruption, during the work of recovering the dead from the debris, two aged women who had been

entombed six days were found. These women had subsisted on some scraps of bread, and, though weak and speechless when taken out, revived under the ministrations of the rescuers.

MEASURING GRAIN WITH A METER

The latest method of measuring grain in a mill or elevator is by means of a meter, which measures the grain passing through and figures up the result quite as a gas meter registers the amount of gas. One of these grain meters will measure 5,000 bu. an hour, and when set in operation will continue its work indefinitely and without any further attention.

What the visitor sees in watching one of these machines is three metal hoppers, one above another, with the smallest at the top. The upper hopper remains stationary and serves to guide the grain into the second, which, when it becomes full, empties into



Measures 5,000 Bushels an Hour

the third. At intervals which do not conflict with the movements of the middle hopper, the third hopper discharges and makes the record.

The metric bill will not come out of the congressional committee this session, hence no action need be expected.

INCIDENTS OF THE SAN FRANCISCO EARTHQUAKE

It is not the province of a magazine of the nature of *Popular Mechanics* to go into the news details of the San Francisco earthquake of April 18. The daily press has already covered the subject with its customary energy and completeness. There are some mechanical features, however, which may be mentioned here.

Great interest has been centered in the modern steel structures, which seem to have withstood the shock with unexpected



Comparative Area of Three Great Fires

strength, although afterwards ruined by the flames. The report of the expert builders will not be ready for another month, when important data may be expected.

Had the destruction ended with the earthquake, the disaster, while great, would have been small compared to the devastation by fire which immediately followed. Buildings containing steam boilers, which went down at once broke into flames; matches even ignited in the crush and started other fires; and in a large number of instances live electric wires, whose insulations were torn off, or which parted, thus exposing bare ends, continued to furnish a flame which was soon lost in a conflagration. In Oakland and

San Jose, the railway and lighting plants were instantly shut down, which accounts for the comparative immunity from fire in these two cities. In San Francisco there seems to have been some delay in shutting off the current.

The reservoirs which contain the water supply are located some miles away, and the mains were broken by the shock, thus rendering the fire department helpless except along the water front, where salt water was available from the bay. Splendid work was done along the docks and the great Ferry building, the gateway of San Francisco, saved. In one instance a fire which had made a good start was extinguished by breaking in the heads of great casks of wine which was dipped out with pails, and the building saved. It has been suggested that a water system for fire service may now be built in which salt water can be pumped through steel pipes laid on or close to the surface; the steel pipes being expected to resist much greater shock than the ordinary cast-iron pipes, which readily open at the joints, whereas the steel pipes would be joined by extra large unions screwed on to extra heavy threads.

The promptness with which the water companies restored service solved the most serious trouble of the afflicted city, and came as a great relief to the entire country.

The railroad service for the city is chiefly from across the bay, passengers and freight cars being brought over in the largest ferries in the world. The promptness and efficiency of the steam transportation lines was something surprising and demonstrated an organization fully equal in its way to that of the regular army. The relief trains which started within a few hours from all parts of the country, together with the national response with contributions of money from millionaire to newsboy, presented a picture of American sympathy and energy which could not have been duplicated by any other nation in the world. The prompt efficiency of the relief movement was emphatically American, and characteristic of the American way of doing things in an emergency. But for this instant action thousands would have lost their lives.

The telegraph service for some days was confined to press and official messages, and under the circumstances was very good. While the wires were closed to private messages, one man in San Francisco used the Pacific cable and sent a message to relatives in Berlin, who in turn repeated the message over an Atlantic cable and thence to Los Angeles, where his family were

staying. This message made the complete circuit of the globe in transmission from 'Frisco to Los Angeles, a distance of 482 miles.

The use of artillery in leveling buildings in an attempt to check the passage of the fire was something which rarely occurs, and we believe has not been resorted to in this country since the Chicago fire. Among the discoveries after the fire was an extensive system of underground passages extending through Chinatown, a veritable catacombs two and three stories underground.

A notable feature of the commissary work was the equipment, at Los Angeles, of the longest mess train in the world. Thirty cars were hastily rebuilt and equipped as kitchens and bakeries, and provided with facilities for cooking and serving 20,000 meals a day. When one considers that 100 meals is a good day's work for the average palace dining car, the performance of this great "cook train" is better appreciated.

The automobile made a new record for itself. One of the first orders when Gen. Funston took charge was to confiscate all the automobiles in town, to be used in ambulance and relief work. Several new machines were discovered in freight cars, and these were run out and put to work.

The work of the regulars, disciplined, seasoned men, was of incalculable benefit, and abundantly demonstrated the value of a standing army in times of peace. To these men, trained to stand under fire, there was no occasion for excitement when marched into a burning city shaking with earthquakes. In no war could Gen. Funston perform a greater service than he did there.

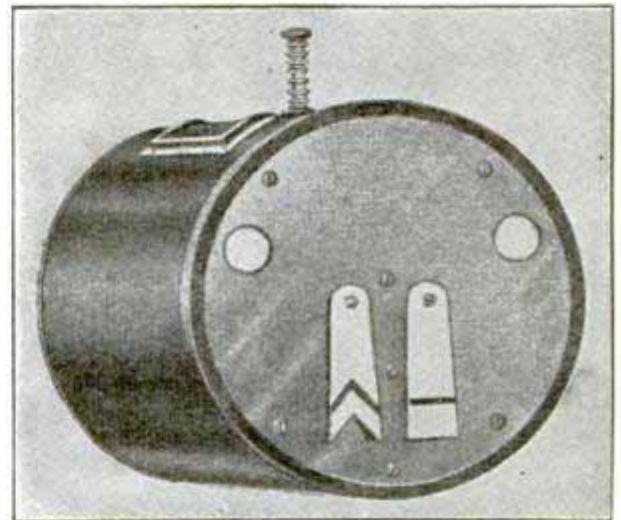
The earthquake, like a cyclone, played many curious freaks. For instance, in the midst of ruined four-story buildings stood a house of three stories, which had been lifted on jack screws and timbers to make room for another story beneath it. It stood apparently unharmed by the shock. Not a piece of the underpinning was displaced. One of the churches on Van Ness avenue had a mosque-like dome. The building was down, all the walls falling away, but the steel structure, invisible at a distance, remained supporting the dull gray dome, which seemed floating in the air like a balloon.

The rebuilding of the city, to which its citizens have already set themselves with western courage and energy, affords an opportunity which has no parallel in modern times. The destruction was so complete and covered so large an area that it is now possible to lay out a really large city along

twentieth century ideas and ideals. Whether it will be found practicable to do so remains to be seen. Be that as it may, the more important thing is the restoration of a great city at the Golden Gate, and in the accomplishment of this, which will be done with true western intensesness of activity, the builders of the new city will have the sympathy and assistance of the civilized world.

AUTOMATIC CAB SIGNAL FOR LOCOMOTIVES

A new automatic cab signal is applicable to both single and double-track roads and operates in conjunction with either disc or semaphore automatic signals, or with the manual block system, or independently of the same. It can be operated with storage batteries, gravity batteries, direct or alter-



Both Signals at Safety

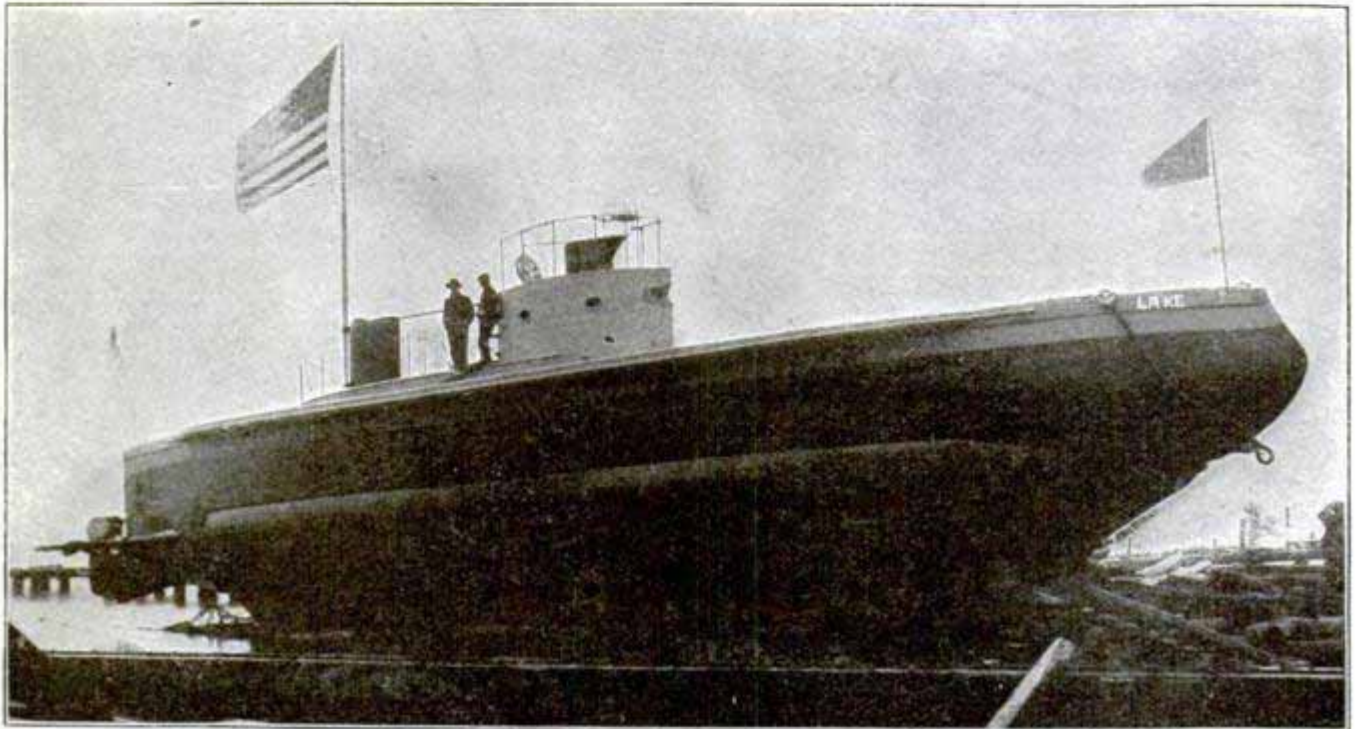
nating current power plants, and it is used with an automatic stop.

The illustration shows the mechanism that is placed in the locomotive cab, consisting of the signal indicator and a power unit. It will indicate a train in advance in the first, second, third or fourth blocks, as desired. It gives clear, caution and danger indications the same as the disc or semaphore signals, and if the automatic stop device is used it opens the air valve and brings the train to a service stop, if the engineer does not regard the signal as soon as it is given him. As shown the signal is in the normal clear position, both signal blades down and both lights white. If a train should be in the second, third or fourth block in advance, the caution signal blade is thrown to the horizontal position and the light on the left side is changed from white to green. When the engine proceeds to the entrance of the next block, if the train or

obstruction is within the first, second or third block in advance, the danger signal blade on the right side rises to the horizontal position and the light on the right side shows red. At this instant the automatic stop device is thrown into operation, as al-

ready described. Neither of these signals can be thrown to the clear position by the engineer until he has brought his train to a full stop, when the signals go back to the normal position to operate as the next block end is passed.

LAKE'S NEW EVEN-KEEL SUBMARINE



Even-Keel Submarine Boat "Lake" on Launching Ways

Copyright by Lake Co.

The latest of the Lake company's submarines is shown in the illustration, which is from a photograph as she rested on the launching ways just before going into the water. A bill is pending to purchase the boat. Should our Government decide not to do so, the submarine will be immediately sent across the Atlantic under her own power for delivery to some European power. The price of the boat is \$275,000.

Details are most carefully guarded, but the following features are given out for publication. The boat is 85 ft. long; submerged displacement is 220 tons; has twin screws; three torpedo tubes; guide wheels for running on the bottom; gasoline carried outside of spindle hull, eliminating danger from explosions; means for escape of crew in event of disablement of boat; greater deck space than any other submarine; ability to charge storage batteries and air flasks while cruising; magnetic influence of steel hull on the compass practically eliminated; and ability to reload torpedo tubes while submerged, under way.

Some of the conditions of the test are: Submerge to depth of 125 ft.; to run submerged at sea for a distance of 15 knots without coming to the surface except for observation with the omniscope; endurance test of 400 miles at sea under her own power, without convoy; to fire torpedoes while submerged and reload and fire; to remain at sea three days without convoy; to have a member of crew leave through the diver's door while the boat is entirely submerged; to establish and pick up under water cable and hold telephone conversation with the shore; to remain submerged two days with only the sighting instrument occasionally out of water. These and other equally severe requirements constitute the most difficult test to which a submarine boat has ever been submitted. The boat company are granted one month in which to train a crew of United States naval officers and men to handle the boat during the test. If the boat meets these conditions the Government is to purchase her; and additional and larger boats of the same type are to be purchased.

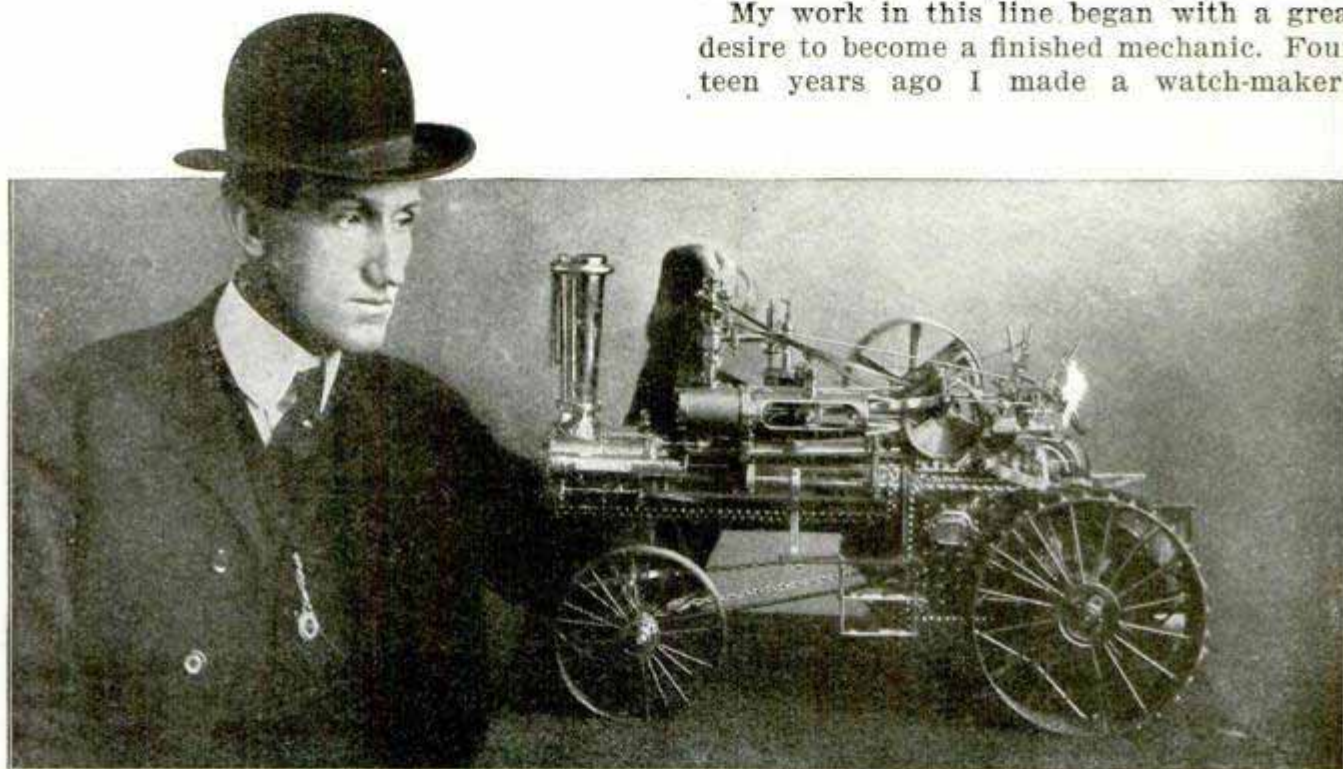
QUARRYING ICE--A NEW INDUSTRY

The great glacier on Mt. Blanc is being used for other purposes than furnishing an occupation to guides and an attraction for tourists. An ice trust has gone into the business on an extensive scale of quarrying the clear, hard ice, at an altitude of 4,000 ft. The ice is blown out in great blocks by means of dynamite, after which it is sawed into regular sizes and sent down the mountain on a narrow-gauge railway. Down in the valley it is loaded into freight cars and distributed through southern France. A warm winter has no terrors for the Mt. Blanc ice-man, he invests no money in ice-houses, and the supply is inexhaustible.

WORKING MODEL OF TRACTION ENGINE BUILT BY AMATEUR

Back of my jewelry store and optical parlor, in the city of Braymer, Mo., I have fitted up a little factory where every evening I spend a couple of hours in manufacturing horological tools of my own invention and doing model work. Here I built my complete working model of a traction engine, which in every detail is like the big 12-hp. engines of its type. The equipment of my factory includes a 5-hp. gasoline engine, a 2 k. w. compound generator, two motors, a screw-cutting lathe, two watch-makers' lathes, and a number of other special machines, such as milling and grinding machines of my own design and make.

My work in this line began with a great desire to become a finished mechanic. Fourteen years ago I made a watch-maker's



Working Model Traction Engine--1,350 Pieces

NEW ATLANTIC RECORD IN SPEED AND WIRELESS

The Atlantic steamship record was lowered 10 minutes by the new French liner "La Provence," on her maiden trip from Havre to New York. Time was 5 days 9 hours and 10 minutes. A new record in wireless was also made on this voyage, the steamer being in communication with both shores at the same time.

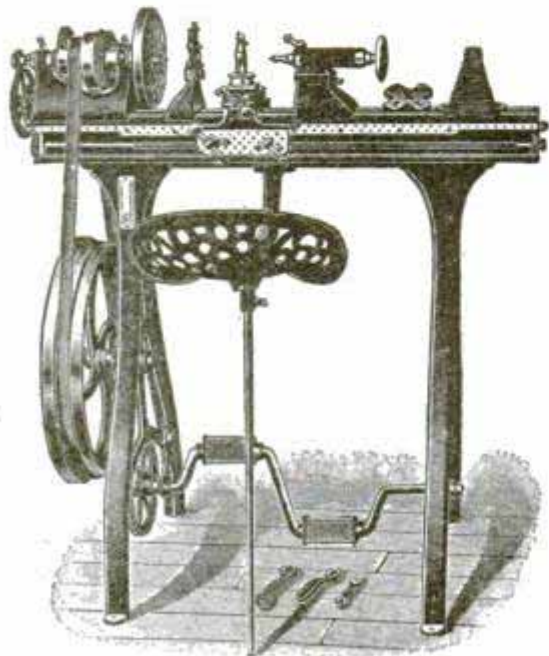
The dry dock Dewey reached the Suez canal on April 26. The dredgers had not finished and a delay of six days resulted.

bench, composed of 2,500 pieces, and lathe and began repairing watches and clocks. From that time I have been a reader of the best horological and scientific papers, but I never worked as an apprentice in my life.

In building this traction engine model I experienced many difficulties. It is nearly all built-up work, the three elbows in the steam pipe being the only castings used. It is built to the exact scale of a 12-hp. engine— $1\frac{1}{2}$ in. to the foot, or one-eighth size—and is composed of 1,350 pieces: 882 pieces in the two rear wheels, 41 pieces in the differential gearing, 30 flues, water and steam gauges, governor, safety valve, lubricator, pump and whistle. Many special tools

were required in its construction, all of which I made on the lathe.

I could not procure a glass tube 1-16 in. in diameter for the water gauge and so had to draw one out of a 1/4-in. tube. The engine that this model represents is set to carry 130 lbs. pressure to the square inch. It would have been much easier to have made this steam gauge register 130 actual pounds to the square inch, but it was not desirable



Lathe on Which Engine was Built

to carry such a high pressure on the model, so I concluded to increase the registration as many times as I decreased the size of the gauge, which is one-eighth, or to about the size of a dime. This gauge is of the drawn-tube type and the tube is drawn very thin. The internal diameter is 1-1,000 in. by 3-32 in. and even then it was necessary to use compound rack and pinions, so when the gauge shows 130 there is 16 1/4 lbs. actual pressure and the pop valve acts.

The differential gearing was quite a difficult piece of work, as I made the milling machine and wheel cutters to make all of the gears. The time occupied in building the model, including the many dies and gigs, was about ten months, working at odd times and after lamplight.—Contributed by S. M. Coffman, Braymer, Mo.

FIRST AMERICAN-BUILT TURBINE VESSEL

The first turbine-propelled steamship built in the United States was launched at Roach's shipyard, Chester, Pa., April 21st. The name of the vessel is "Governor Cobb." Her dimensions are: Length over

all, 300 ft.; beam over guards, 55 ft.; depth, 20 ft. 6 in.; draught loaded, 14 ft.

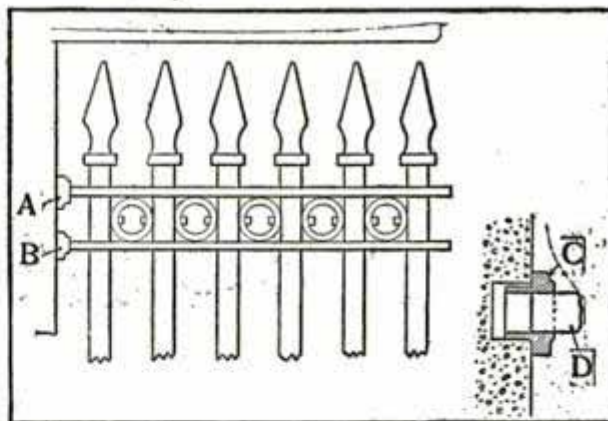
The "Governor Cobb" is a double bottom steel ship, having a main, saloon, gallery and dome deck. There will be 175 staterooms and 200 berths. All the modern appliances—steam steering gear, electric lights, call bells, etc.—will be provided. The motive power will consist of a set of Parsons marine steam turbines; the maximum working steam pressure will be 150 lbs.

FALSE CONSTRUCTION IN BANK WINDOW GRATINGS

The impression of strength and massiveness generally produced by bank gratings, bolts, bars, etc., is, in many cases, simply the result of appearance. The accompanying illustration shows a form of grating used in a New York bank, and described in Machinery.

The iron bushings, A B, are sunk into the stone as shown at C. These bushings slide on the rod, D, the length of which is a little less than the width of the window, so that if the bushings are moved toward the center of the window, the whole grating can be removed, as readily as it was erected.

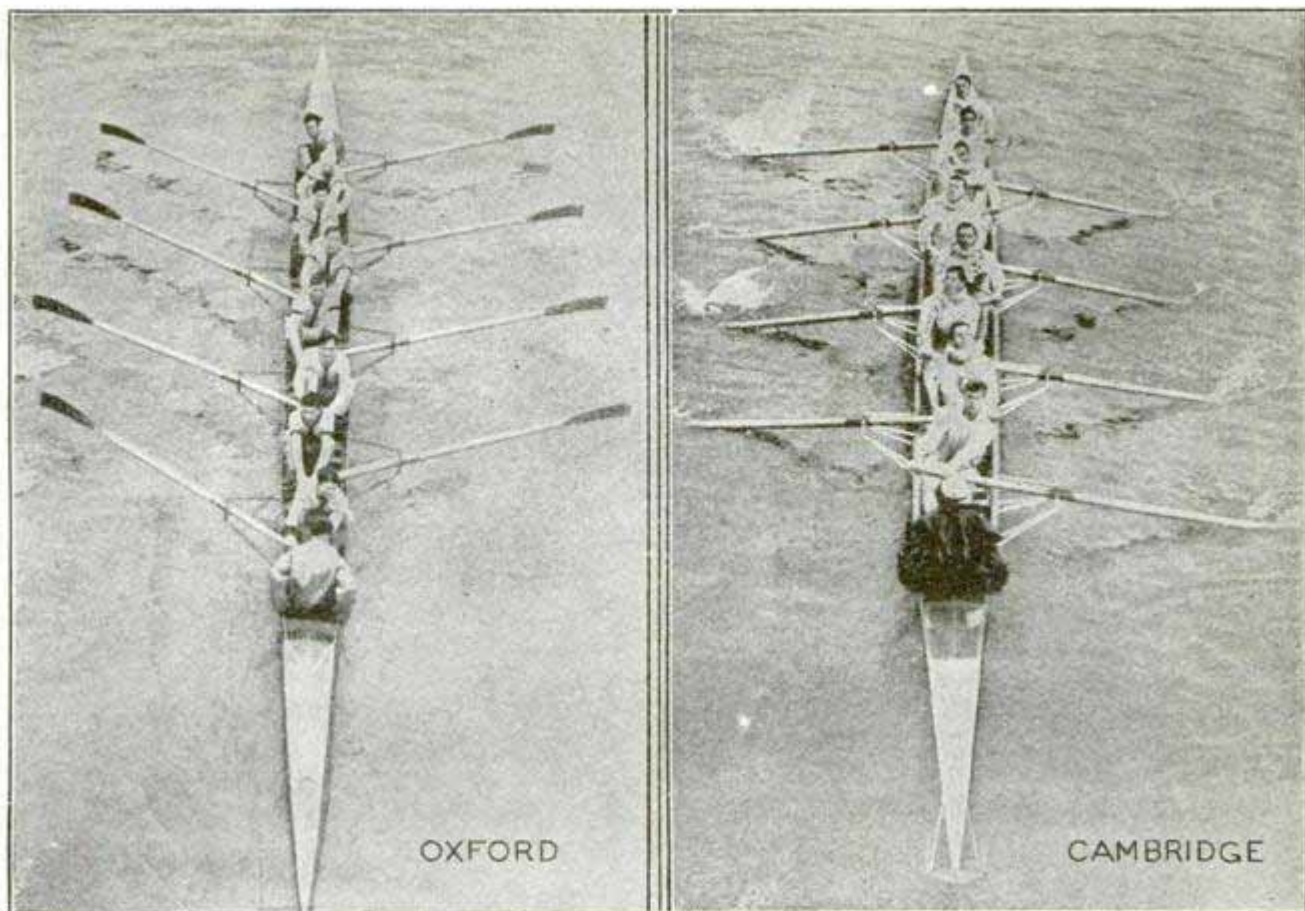
Gratings of this kind are often used in



Looks Secure--Is Not

buildings which have been previously erected, but in buildings which are under course of construction, bars are used, which are longer than the width of the window. It would not be surprising if thermit or electric welding were to be used for welding the bushings to the bars. The device shown would then be nearly as strong as solid bars.

A wonderful compound is reported from Europe which is claimed to convert the exhaust from an auto into the odor of choice flowers.



ENGLISH BOAT RACING EVENT--The Oxford and Cambridge boat crews held their annual racing event April 7. The rival crews were well matched and the contest promised to be a close one. Cambridge led from the start, however, and came out three and one-half lengths ahead.

CURIE, DISCOVERER OF RADIUM, KILLED

Prof. Pierre Curie, who, with his wife, was a co-discoverer of the wonderful element, radium, was run down by a dray in a Paris street on April 19 and killed. Prof. Curie and his wife began their search for radium in 1895, and in 1898 their labor was rewarded. The great scientist refused all public distinction in honor of his discovery, and up to his death was actively and unremittingly engaged in scientific research. He was 43 years of age.

RAISING A LAKE STEAMER

The lake steamer "W. E. Corey," which went aground on Gull Island, Lake Superior, last November, was raised in remarkably quick time by ten 11-in. and ten 9½-in. Westinghouse air-brake pumps. The pumps were distributed along the deck of the vessel and connected to force air into thirteen of the air-tight compartments in the vessel

to displace the water. During this proceeding boilermakers repaired leaks as fast as they discovered them, patching and using cement. This work took eight days, then all the pumps were set to work forcing air into the compartments.

From 3 p. m. of one day to 7:30 a. m. of the next day 600 tons of water were removed by the twenty pumps and the vessel was raised 4 ft., so that she could be pulled into deep water.

\$50,000,000 A YEAR PROPOSED FOR GOOD ROADS

Representative Gordon Lee, of Georgia, in a recent speech at Washington, declared that, according to estimates of the secretary of agriculture, the cost and extra burdens imposed upon this country by bad roads is not less than \$600,000,000 annually; and although a former bill for \$25,000,000 annually was defeated, he proposed an appropriation of \$50,000,000 a year, until the work had reached a satisfactory stage.

THE PRIME MOVER OF THE FUTURE

[Extracts from an address by C. E. Sargent before the Western Society of Engineers.]

The economy of the internal combustion engine has been recognized from its inception. Both the theoretical and practical efficiency of this type of prime mover is from two to five times greater than that of the average externally fired heat engine. The smallest gas engines have a thermal efficiency from 20 to 24 per cent, while the largest steam engine with all modern refinements known to the art, does remarkably well to turn into work 12 per cent of the heat supplied to the furnace under normal conditions.

A plant recently tested by the writer in which producer gas from anthracite culm was used, showed the cost of fuel per horsepower hour to be about 1.5 mills. By selling the by-products of the bituminous gas producers at the market price, a recent writer in "Power" claims that power from gas engines can be generated 14 per cent cheaper than from water falls.

The first cost of a large gas engine plant, including producers, coal handling apparatus, piping, scrubbers, cleaners, building, compressor and engines, is not far from that of a steam plant complete, including boilers, engines, pumps, condensers, chimney, piping and all accessories, so we can assume the first cost the same in each case. Gas engines do not wear out any quicker nor do they need any more repairs than steam engines. Gas producers are long lived, the apparatus requiring but little attention and few repairs. The Erie R. R. Co. have had two 200-hp. producers in operation at Jersey City for seven years, and the fire in one has never been out. Imagine the condition of a boiler after such a run.

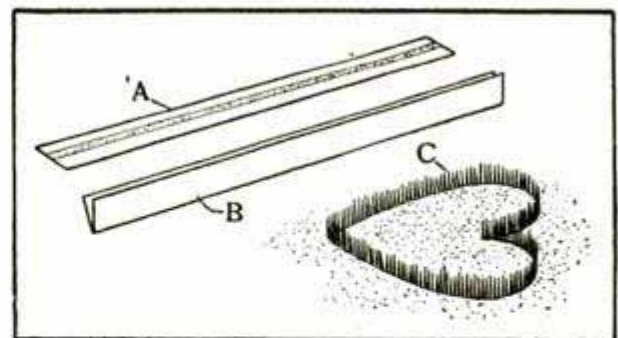
When compressed air is available, and all large units use this medium, gas engines of any size can be started and can take the full load in two minutes' time, as no warming up or cylinder draining is necessary. The waste heat, about 70 per cent of the heat supplied, can be used for heating, and a higher temperature can be maintained than with the heat from a steam engine exhaust. If the internal combustion engine has so many advantages over steam, why, then, has it not had greater development? Why are we not using gas engines in our large power plants? Why are we using 40,000 b. t. u. instead of 10,000 b. t. u. in

generating a brake horsepower? Why are we burning 400 cu. ft. of waste gases under our boilers to evaporate sufficient water for a horsepower hour when 100 cu. ft. burned behind the piston would do the same work? Simply because the American manufacturers have not kept pace with the development of the gas engine as a prime mover.

Five years ago when Mr. Henry Wehrum, who has probably done more to introduce the gas engine for power for steel mill work in the United States than any other man, wanted one and two thousand horsepower gas engines for the Lackawanna Steel Company's plant at Buffalo, there was practically but one engine obtainable and that of foreign make. A few months ago when the Carnegie Company wanted engines of the same size for the Edgar Thomson works, twelve proposals were received from American manufacturers.

MECHANICAL FLORICULTURE

Many artistic floral designs can be made by means of paper strips to hold the seed. The paper should be soft and thin—newspaper will do—and should be cut in strips about 1½ in. wide. Spread a little paste or mucilage along the center of each strip, and sprinkle the seeds all over the surface. Then when the paper strip is lifted, all the seeds will fall off except those held by the paste, and the strips will look like A in the sketch.



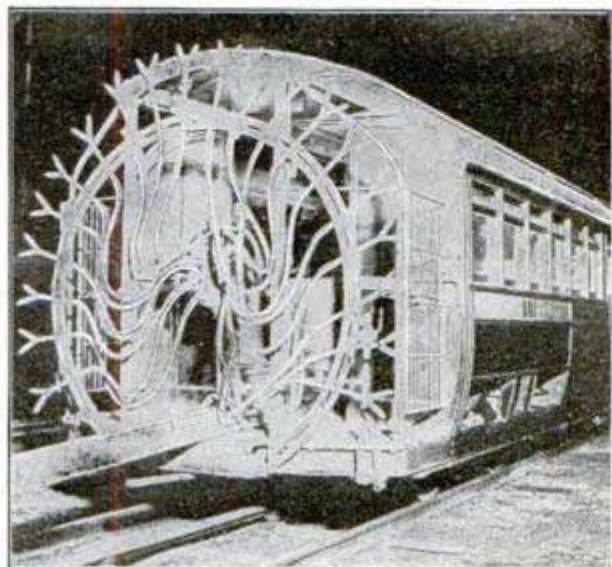
Mechanical Floriculture

Then fold along the center, as shown at B, and put away to dry.

The strips thus prepared are susceptible to many artistic designs, and can easily be planted in any form by bending. After the paper has been in the ground for some time it dissolves and leaves the plants standing, as shown at C.—Contributed by F. H. Welb, Claverack, N. Y.

TUNNEL WHITWASHED EVERY NIGHT

The London twopenny tube is white-washed every night. After the passenger traffic has ceased the car shown in the illustration passes through the tube. This car

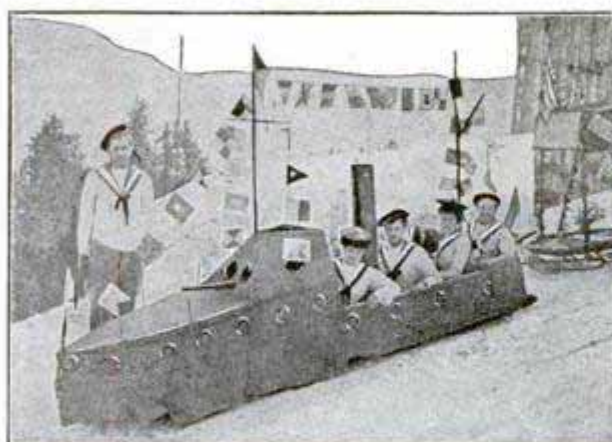


Tunnel Whitewasher

carries a huge tank of whitewash and as it moves along an electric pump forces the whitewash through the web of pipes at the end of the car, spraying it over every part of the tunnel.

SWISS TORPEDO-BOAT BOBSLEIGH

Many unusual snow craft are seen on the toboggan courses of Switzerland during the season, but probably the most novel and attractive during the past winter was a tor-



On Swiss Toboggan Runs

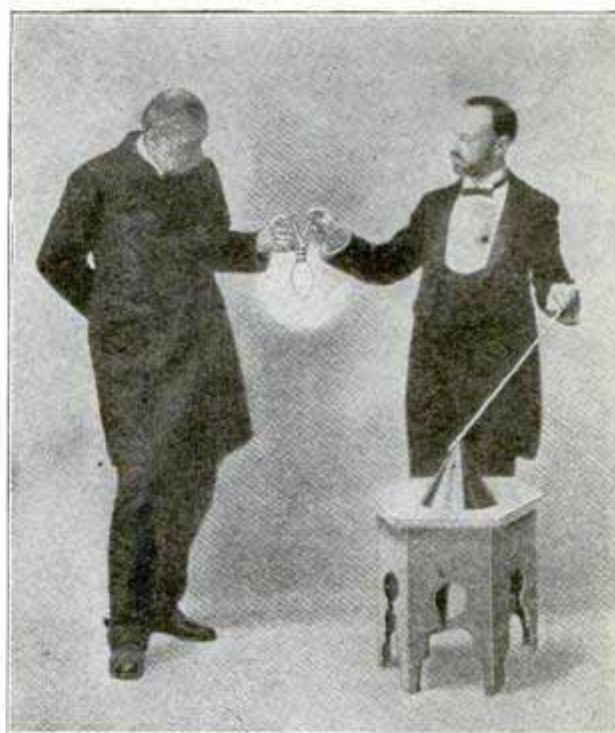
pedo-boat bobsleigh. This sleigh was rigged up "true to life" by two boys. Only girls and boys in naval costume were permitted to come aboard for a sail.

STARTLING ELECTRICAL DEMONSTRATION

Wonders of High Frequency Current Which Melts Wire while Passing Through Human Body

A direct current of 250 volts has been known to cause death, but several hundred thousand volts of high frequency alternating current may be passed through the body without the slightest tremor being felt, says The Electric City.

In high frequency electricity the current changes its direction of flow from 50,000 to 300,000 times in one second, which is very different from ordinary alternating currents,



Lighting an Incandescent Lamp by Current (From Oscillator) Passing Through Two Human Bodies

which usually change direction about 120 times a second, and are deadly.

Common alternating currents are also much more fatal than direct currents of the same voltage, while in high frequency electricity the current is reversed with such great rapidity that it does not flow long enough in one direction for the nerves to respond to it. It takes a definite fraction of a second for even the human nerve to be capable of feeling.

The properties of high frequency currents were clearly demonstrated by Mr. W. J. Clark, of New York, at the recent Electrical Show in Chicago.

Mr. Clark showed how harmless these currents are by lighting an ordinary incandes-

cent lamp by the current passing through his own body and that of an assistant. The amount of current which passed was 100 amperes, which is twice as much as has been required to produce death in some cases of electrocution.

In another experiment Mr. Clark replaced the incandescent lamp with a piece of fine wire, which was actually melted by the current passing through the bodies of two men.

LARGEST CAMERA IN THE WORLD

Operator Inside While Taking the Picture

This camera, which is three times as large as any other in the world, is owned by Prof. G. R. Lawrence, of Chicago. With it several noted pictures have been taken, including bird's-eye views of factories and towns. It is also used for enlarging other pictures.

The body of the camera is 9 ft. 4 in. wide, 6 ft. high, and 20 ft. long, when fully extended, and in its construction over 30 gals. of glue were used. The lens is 12 in. diameter and cost \$1,500. All moving parts, including the curtain slide, run on roller bearings. The focusing is done by two panels of glass, which can be moved to all parts of the field.

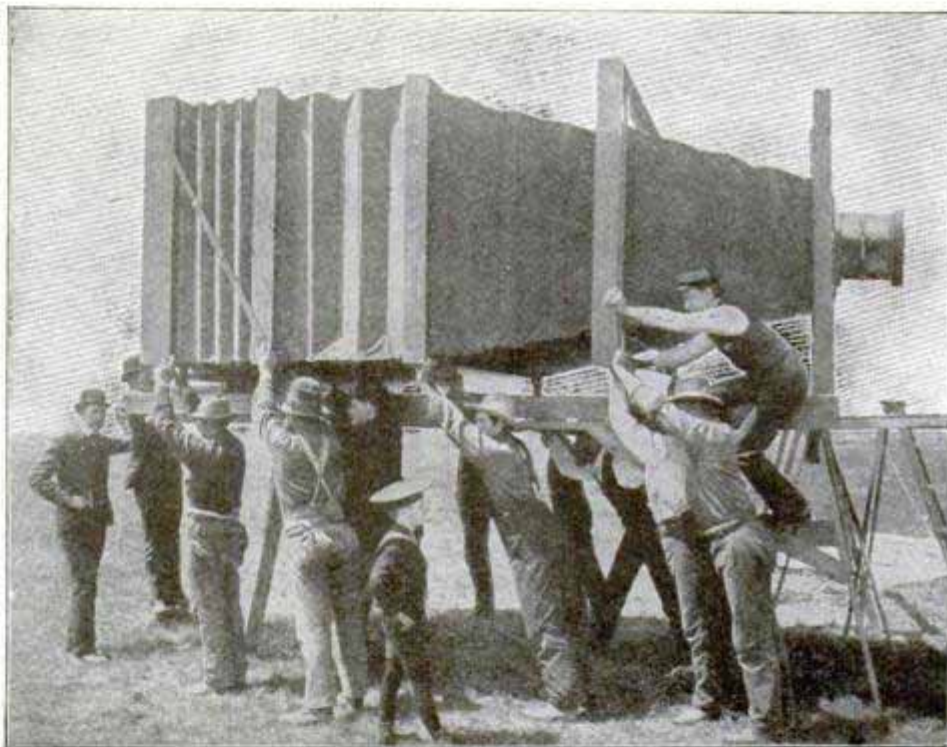
The plate holder weighs nearly 500 lbs., when loaded, and is put into the camera by means of a derrick. Great care is used in loading, as a broken plate would result in the loss of \$150. The plates are made of plate glass, 8 ft. long by 4 ft. 8 in. wide, and weigh over 200 lbs.

In order to dust the plates, a man enters the camera through an opening in the front. A piece of ruby glass is then placed over the lens, and the slide in the plate holder is withdrawn. After the plate has been dusted, the slide is replaced and the man steps out.

In making enlargements, the focusing is done from the inside and the operator remains in the camera during the exposure. In this process the entire apparatus is supported by springs, which absorb any possible vibration.

AN IMMENSE STORAGE DAM

Plans have just been completed by the Spring Valley Water Company, of San Francisco, for the construction of a \$2,000,000 dam across Calaveras Creek, in Alameda county, to store the water of both Alameda and Calaveras creeks and the water shed to which they are tributary. The dam is intended to augment the Alameda water supply of the company. The plans call for a concrete dam that will be 100 ft. high, 200 ft. thick at the base, and 25 ft. wide at the top. It will be 800 ft. long. Work on this giant dam will be commenced at once, and pushed forward to an early completion. A large force of workmen will be employed. Reinforced concrete will be used, and the work will require vast quantities of

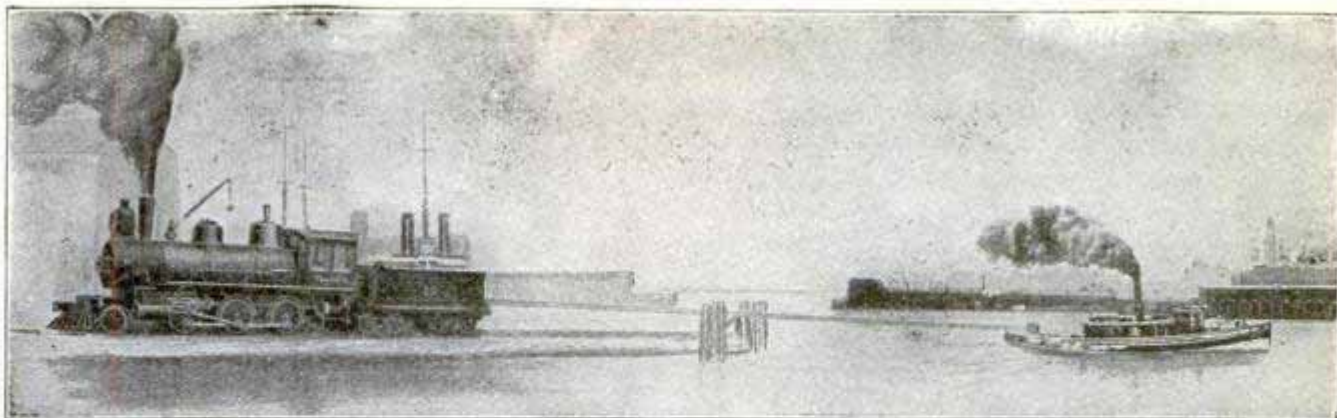


"When Fully Extended, It is 20 ft. Long"

cement, gravel, sand and corrugated iron rods. This dam will be among the largest and highest built on the Pacific coast, and its construction will require nearly a year.

AMERICAN MODEL ENGINEERS ORGANIZE SOCIETY

The American Society of Model Engineers held their first meeting at the Gilsey House, New York, on April 18. The following officers were elected: President, Mr. F. W. Geissenhainer; vice-president, Mr. E. B. Frank; secretary and treasurer, Mr. W. E. Spon, 123 Liberty St., New York.



TUG STRONGER THAN LOCOMOTIVE

The horsepower of the average tug is much less than the average locomotive, but still its pulling force is greater. The pull of a locomotive, under favorable conditions, is one-third to one-quarter of the weight on the drivers, and could not be increased with any amount of power, as an increase in power would simply cause the drivers to slip on the track. For this reason, in designing locomotives the cylinders are so proportioned that the force produced is barely sufficient to cause the drivers to slip. The pull or traction force of a locomotive is not the same as the load it can move, but is the weight it could lift with a rope, passed from the drawbar, over a large pulley.

The pull of a tug depends on the size of engine and propeller and the pitch of the propeller blades.

Mr. D. F. Murphy, the master mechanic of the Great Lakes Dredge & Dock Company, has found that a 760-hp. tug will break a 7½-in. rope with a steady pull, while many locomotives of double this horsepower could not break it without having a start.

When the motion of a tug is retarded its force becomes enormous. The tugs used for breaking ice in rivers sometimes encounter sheets of ice so thick that they will not crack immediately. The pressure of the prow then actually pulverizes the ice for a short distance and discharges it vertically.

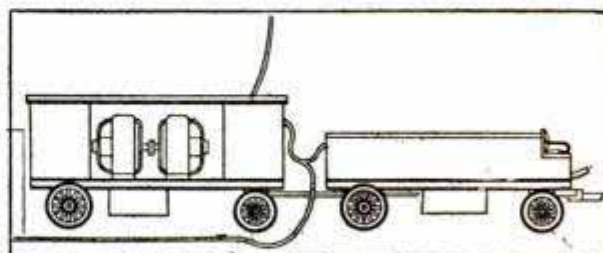
NEW ELECTRICAL WELDING PROCESS

There are three general methods of making welded rail joints. In one method, cast-iron is poured around the joint, the molten iron being obtained from a portable cupola. In another method the rails are fused together by a high amperage alternating current, generated in a transformer. When thermit was discovered another process of welding was developed, the ends of the rails being fused together by the heat of the thermit.

In a new system of rail welding, developed in Germany, and described in the Street Railway Journal, the heat is derived from a flaming arc, which allows the use of a direct current. The positive wire is attached to the carbon, and the negative wire is attached to the rail. The carbon is guided by a holder, which is moved by hand, and the arc produced is fed with steel, which melts and runs into a mold surrounding the joint. At the same time the ends of the rails be-

come fused and unite, thus forming a perfect joint.

The current is taken from a trolley wire and is reduced from 550 volts to 60 volts by the apparatus shown in the sketch. The large wagon contains a motor dynamo, and the other contains an auxiliary storage battery, which is connected in parallel with



Rail Welding Outfit

the generator. In using the apparatus the wagons are placed at the side of the tracks to be welded, and a wire hooked on the trolley wire. When a car approaches this can

be removed, thus allowing the use of the line at all times.

This method of welding is not confined entirely to rail joints, but has also been used in welding and repairing machine parts. Steam engine cylinders, power shears and other large welds have been successfully made, and it has proved to be a good method of repairing broken gears.

CABLE CAR IN BIG GREENHOUSE

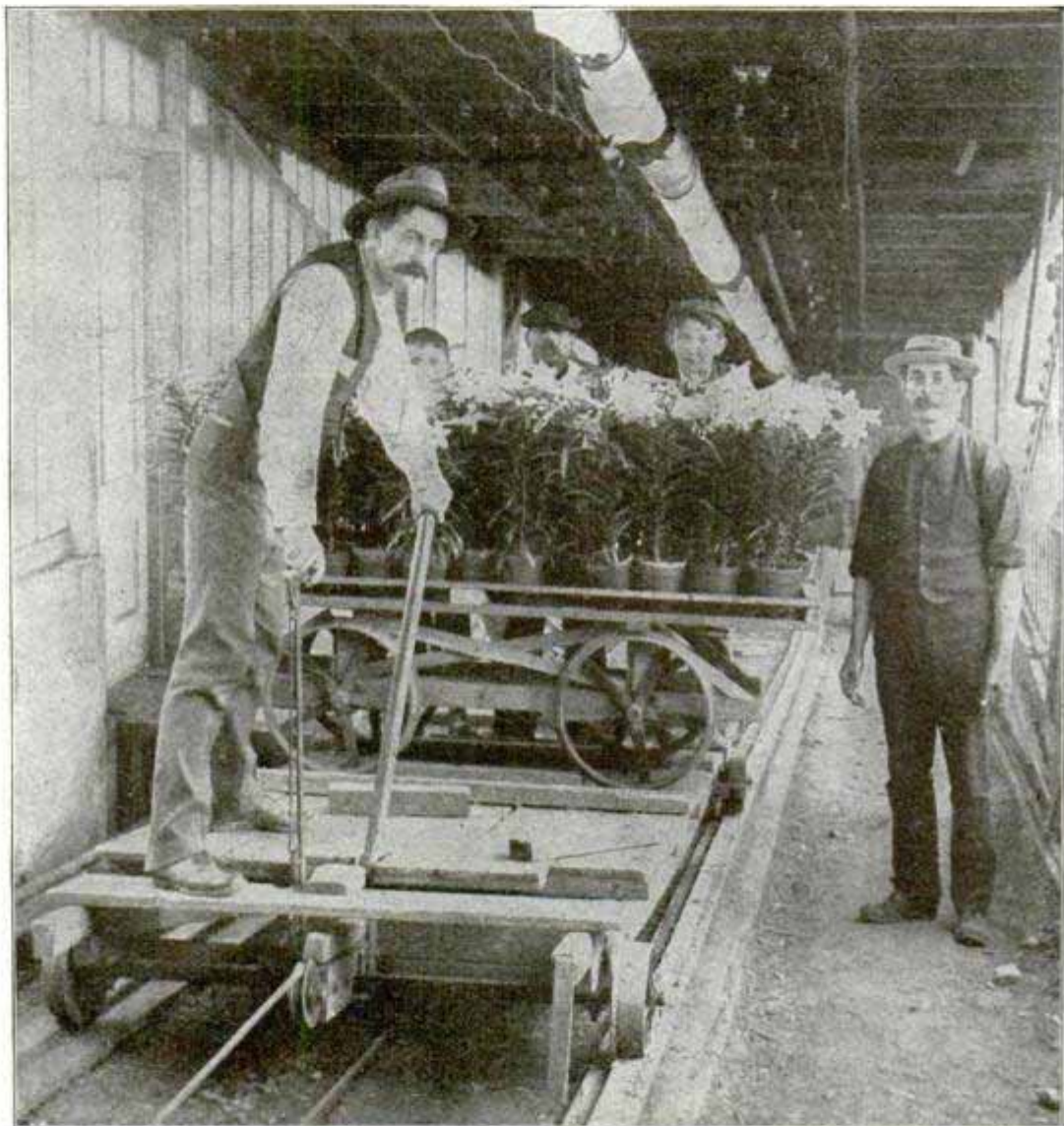
At a large florist's establishment in Massachusetts, where thousands of Easter lilies are grown every year, an ingenious method of moving the plants, either about the place or to send them to the market, is employed. All the greenhouses are connected by a wide covered shed in which a large cable car is operated. The plants to be moved are loaded on hand trucks, and these trucks, several at a time, are run upon the cable car which hauls them to the packing rooms, or to the teams. This spring the 35,000 fine plants in full bloom was a beautiful sight; as large numbers of these potted plants were sold the cable car system of handling them saved a great deal of time and avoided injury to the lilies as well.

A very satisfactory soft solder consists of a mixture of 2 parts tin and 1 part lead.

Last year there was used in the manufacture of veneer stock 138,646,000 ft., log measure; cut from American woods.

WHAT HEAT IS DEADLY?

There are many factors to take into consideration in answering this question. Persons can stand a very high temperature for a short length of time. For instance: A temperature applied externally to the limbs for the cure of rheumatism can be raised considerably above the boiling point of water without injuring the patient. This is undoubtedly due to the protective action of the perspiration.



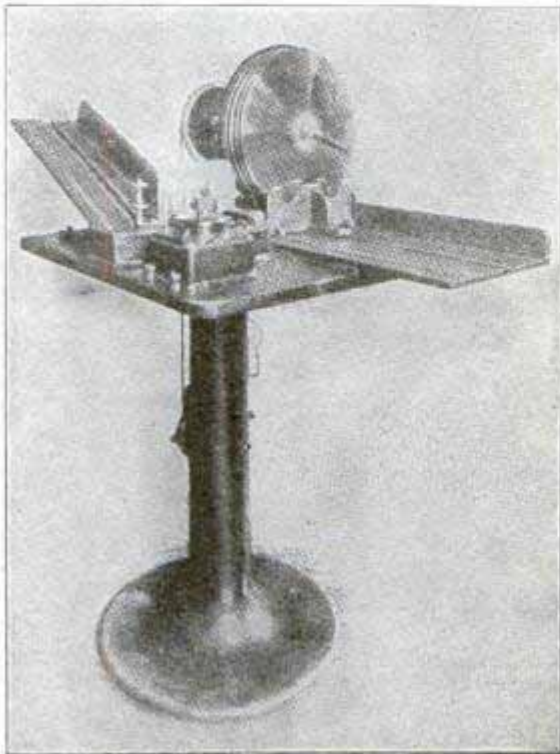
Cable Railway in a Greenhouse

If a person has plenty of water to drink, he can accustom himself to very high temperatures. Take, for instance, the workers around the iron and steel mills. These people work in temperatures so high that if they wear glasses the hot metal of the frames has been known to burn their faces. Of course, one must become accustomed to such excessive temperatures, and they are always very exhausting.—Contributed by Dr. Max D. Slimmer.

ELECTRICAL STAMPING MACHINE

Used by the German Post Department

Stamping letters by electricity is the improved method used in the German post-



Stamps 108,000 Letters an Hour

office. A new machine, the invention of a Norwegian named Krag, has been introduced

THE SELF-PROPELLED FIRE ENGINE

Will it Be Steam, Gasoline or Electric?

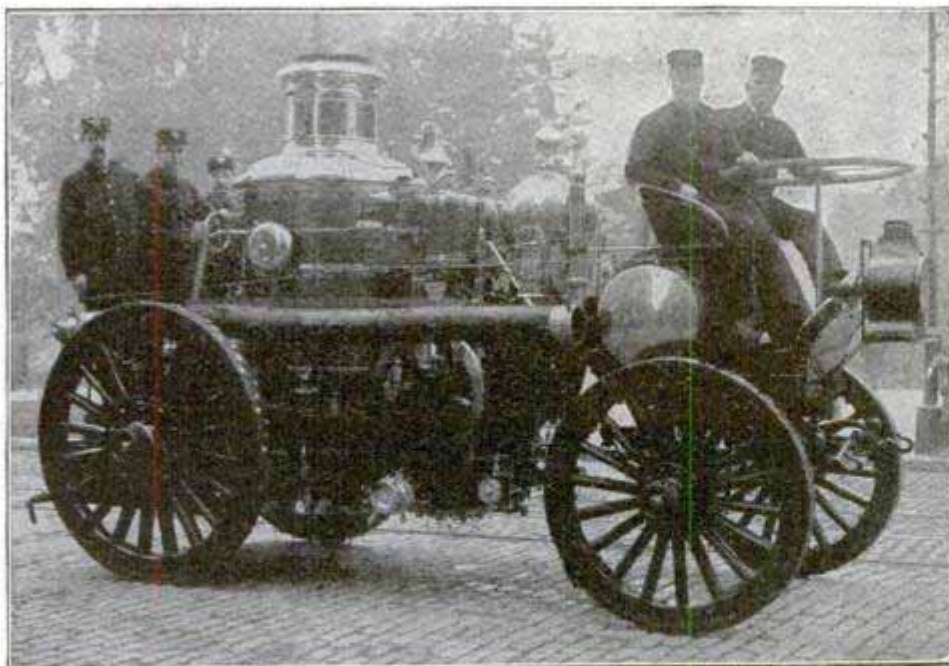
The success of the motor truck has suggested to the minds of many the application of a self propelling device for fire engines. The idea is not a new one, self propelled fire engines having been used in Chicago as early as 1877. Three of these machines were in service for two years, when they were removed from the department on account of scaring horses. They were steam machines and driven from the pumping engine. The exhaust passed up through the stack like a locomotive and on one occasion the flood of sparks emitted started half a dozen fires in an attempt to extinguish one.

The machine illustrated is propelled by steam but has many modern improvements and has been successfully used in the Boston fire department. Gasoline machines have been used in which the same engine does the propelling and pumping, but have not yet met with the approval of the chiefs of fire departments. Possibly this type of machine will be improved in the near future as it does away with the objectionable boiler. Electrical fire engines have been experimented with, in which a storage battery furnishes the power to drive the machine to the fire, after which the current is taken

from the nearest trolley wire. This system has been pronounced as ideal by leading fire experts, the only disadvantage being the weight of the storage battery.

Automobiles are fast coming into use by chiefs of fire and police departments, and fast traveling fire insurance patrols, police wagons and ambulances have proved equal to all demands. The fire engine will not long be limited in its movements to the strength of horses. It has been suggested that an engine could be propelled by gasoline motors to the fire, and on arrival

do its pumping with an electric motor taking current from service wires laid underground and coming to the surface at each hydrant. This system would enable the



Steam Self-Propeller--Boston.

and it will stamp 108,000 letters an hour.

A superior quality of tooth picks is now manufactured from swamp reeds.

construction of a fire engine with even greater power than the present steamers and weighing not to exceed one half as much, which would permit of much greater speed in answering alarms. The self propelled engine seems certain to come in the near future.

“COWCATCHER” ON MOTOR CARS

Some effort has been made by auto manufacturers and inventors to produce a device for the protection of pedestrians who may be run down by motor cars. One of these



For the Safety of Pedestrians

attempts—too crude to be more—is illustrated. A buffer and a cowcatcher arrangement is fitted to the front of the car. The device has been tried on a few Paris machines with indifferent success.

It is improbable that any device so unsightly in design will ever become popular with motorists.

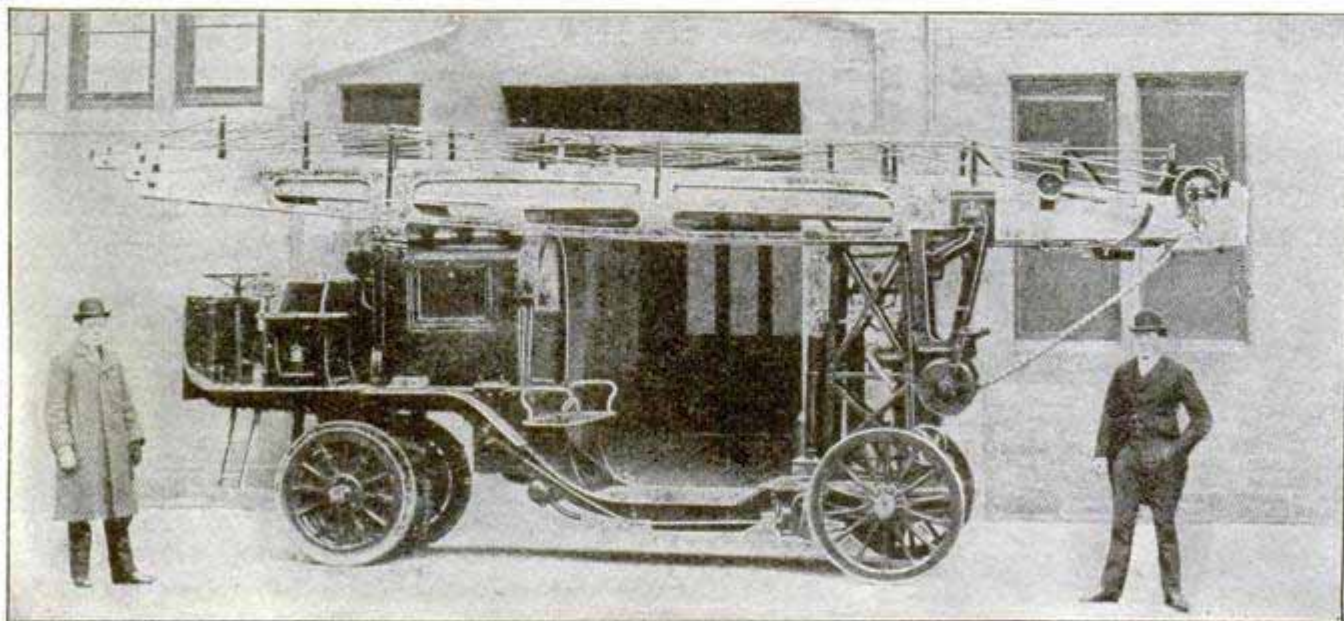
AMERICAN LOCOMOTIVES ABROAD

The best locomotives in the world are built in the United States. They are to be found doing hard service in nearly every foreign country. Engines for export are built to order and in appearance are often different from our own standard types. This is because the managers of foreign roads desire their own ideas carried out in this respect. On the opposite page will be seen several illustrations of this, in locomotives built at the Baldwin Locomotive Works. Fig. 1 shows a locomotive sent to Porto Rico; Fig. 2, Hawaii; Fig. 3, Chili; Fig. 4, Imperial Government Railway, Japan; Fig. 5, New South Wales Government Railway.

LARGEST MOTOR FIRE ESCAPE IN THE WORLD

The first motor fire escape in Great Britain and the largest in the world has just been added to the equipment of the Glasgow Fire Brigade. In appearance the machine resembles the German type, described in our May number. The motive power is a gasoline engine driving a dynamo, which transmits its current to two electric motors on the front wheels; thus the car is driven by the front and steering wheels. The extension ladder is built in one piece, with the body of the machine, says the Graphic, London, is 85 ft. long and is raised and lowered by a carbonic acid gas engine.

Black lead and suet, equal parts, mixed, make a good jewelers' rouge.



The Extension Ladder is Raised by a Carbonic Acid Gas Engine

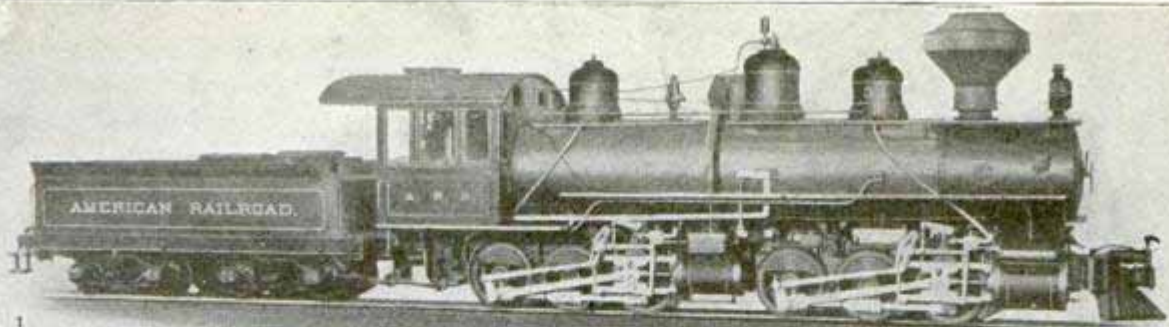


Fig. 1

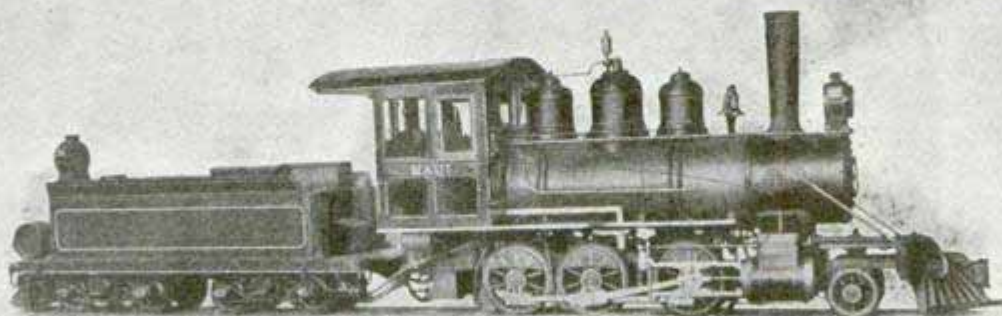


Fig. 2



Fig. 3



Fig. 4

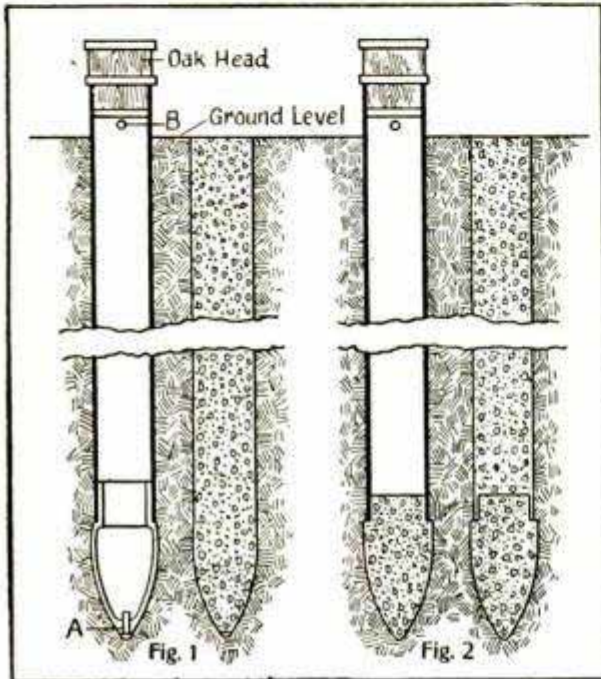


Fig. 5

IMPROVED SYSTEM OF CONCRETE PILING

A new form of concrete pile has been invented in which a steel shell is driven in the ground, the cavity thus formed being afterwards filled with concrete. The point or head may be of steel, as shown in Fig. 1, or it may be of concrete, as in Fig. 2.

The steel head is shaped like a projectile and is fastened to the shell as shown in Fig. 1. The head is a little larger than the



"The Steel Head is Shaped Like a Projectile"

shell, making the device easier to draw than if it were flush with the sides. A small rivet-shaped piece of steel, A, called the valve, is inserted in the point just before driving. This falls out in withdrawing and allows air to pass into the cavity below, the air entering at the inlet B.

The concrete head, Fig. 2, is similar to the steel head in shape, but is not fastened to the shell and is left in the cavity. Like the steel head it is larger than the shell, which facilitates driving as well as withdrawing.

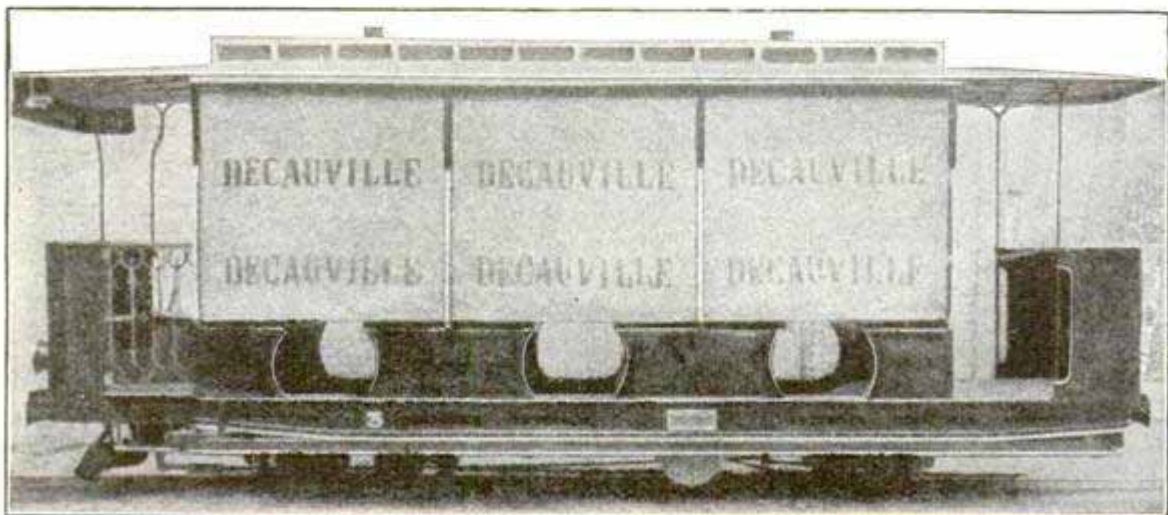
In placing piles under water the exposed portions are protected by steel casings, which are not removed until the concrete has set.

WIRELESS TELEGRAPHY IMMUNE TO STRIKERS

Wireless telegraphy will be resorted to as a means of communication in the coal regions during the strike. In former times during strikes the miners destroyed the machinery and cut the wires of the telegraph and telephone systems, so that it was almost impossible for the coal operators to keep in communication with the outside world. With the wireless installation nothing can stop a message once started, and should an attack be made on the station or mines the wireless operator would have time to call for aid.

FRENCH GASOLINE STREET CAR

The gasoline street car is again attracting attention. The latest effort of the kind is a car built in France, an automobile gasoline motor being used. The car has three forward speeds, $3\frac{1}{2}$, 10 and $17\frac{1}{2}$ miles an hour respectively: The reverse gives a $3\frac{1}{2}$ mile speed. The motor is of 14 hp., with a cone clutch sliding gear transmission and single chain drive. The motor is water cooled from a tank under the car holding 50 gals. The car seats 24 passengers and is lighted with acetylene for head and tail lights and interior. The motorman stands on the front platform as on trolley cars.



Motor 14 hp.; Seats 24 Passengers; Lighted With Acetylene

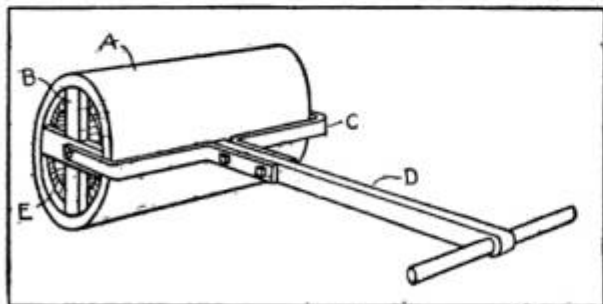
All the articles appearing in this department are reprinted in book form at the end of each year.

SHOP NOTES

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

EASILY MADE LAWN ROLLER

A good lawn roller can be made from a piece of sewer pipe, A (see sketch), with very little expense. The greatest difficulty is removing the flange, which has to be chipped off unless one has a piece of plain

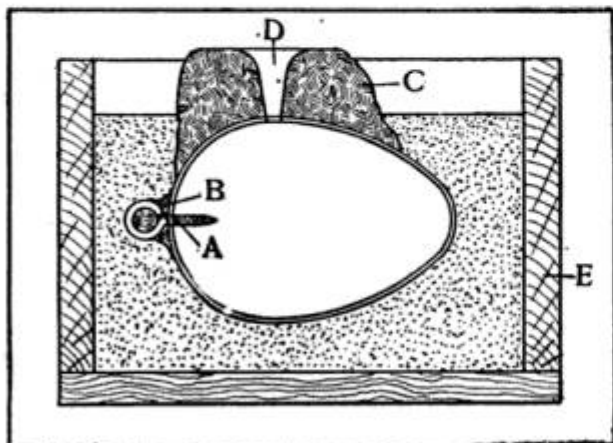


Lawn Roller

pipe. The bricks, E, are to give weight, and are fastened in with cement. The cross pieces, B, are 2 in. by 4 in. wood, and the forks, C, are made of wrought iron. The handle, D, is of wood, with a piece of pipe or broomstick driven through the end. The roller I made cost only \$2 and does very good work.—Contributed by Warren M. Morse, 50 Elmore St., Newton Center, Mass.

HOW TO MAKE A PLUMB-BOB MOLD

Make a small hole in the center of the large end of an egg, and another in the side, and blow out the contents. Dry the empty shell in an oven, and then fasten a small screw eye, A, in the end hole, by means of a piece of clay, B. Place another piece of



Mold for a Plumb-Bob

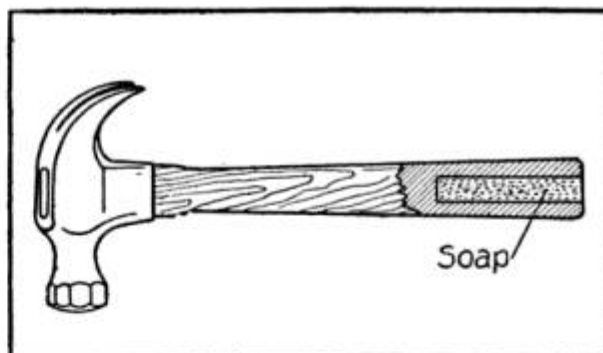
clay, C, over the side of the egg, leaving an opening, D, to pour in the melted lead later.

Place the egg, with the clay on it, in a box, E, and pack with sand, having the opening, D, on top, as shown.

Having thus prepared the mold, melt about a pound and a half or two pounds of lead and pour in the opening. Allow plenty of time to cool, and then break away the egg shell, and you will have a good plumb bob.—Contributed by W. J. Slattery, Emsworth, Pa.

HAMMER WITH LUBRICANT COMPARTMENT

In driving wire nails into hard wood they are not so apt to bend if lubricated with soap. A good way to have the soap always on hand for this purpose is to bore a hole in the end of the hammer handle, as illustrated,



Lubricant for Nails in Hammer Handle

and fill it with soap. In driving small brads into hard wood this will be found particularly useful.—Contributed by J. Weldon, 433 Columbia St., Brooklyn, N. Y.

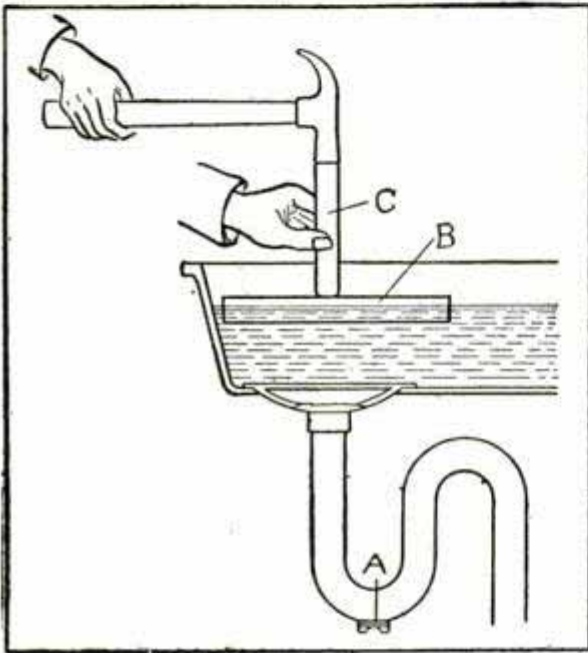
GOOD WHITEWASH FOR OUT-BUILDINGS

Place 1 bu. good fresh lime in a barrel and add 20 lbs. beef tallow; slake with hot water. When the lime is slaked the tallow will have disappeared, having formed a chemical compound with the lime. Dry colors may be added to make any color desired. Add the color before slaking the lime, or, if after slaking, mix with alcohol and then add to the strained wash. Thin to

flow nicely from the brush. A coat of this wash will last as long and look almost as well as much of the lead paint used, and costs a mere trifle to make.—Contributed by H. W. Kennicott, Palmyra, Va.

REMOVING OBSTRUCTIONS IN DRAIN PIPE

When a drain pipe becomes stopped up unscrew the plug, A, and remove the lint or other substance with a bent wire or old button hook. If the trouble is not remedied by this operation, it shows that the stoppage is at the other side of the plug. In this



Clearing a Drain Pipe

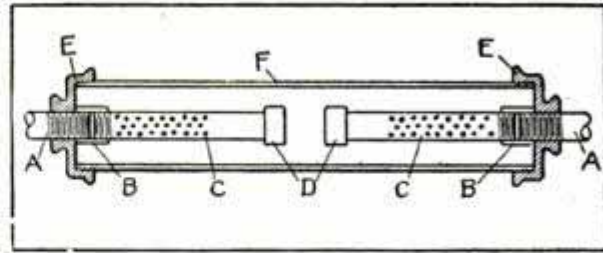
case draw 3 or 4 in. of water in the sink, and lay a board, B, over the outlet as shown. The board should be about 8 in. square and about 1 in. thick. Hold a stick, C, on the board and strike the end of the stick with a hammer. The shock of the hammer blow is transmitted through the drain pipe for a distance of many feet and will nearly always remove the obstacle.

HOW TO MAKE A GAS ENGINE MUFFLER

The use of a gas engine in a residence district is often objectionable, as the noise of the exhaust, even when greatly reduced, is very annoying, but by using the following apparatus, which only slightly reduces the power of the engine, the exhaust may be muffled down to absolute silence.

The muffler (see Fig.) consists of a 4-in. pipe 24 in. long, F, with a 4-in. by 1-in. re-

ducer screwed on each end, E. The 1-in. pipes, AA, project through far enough to



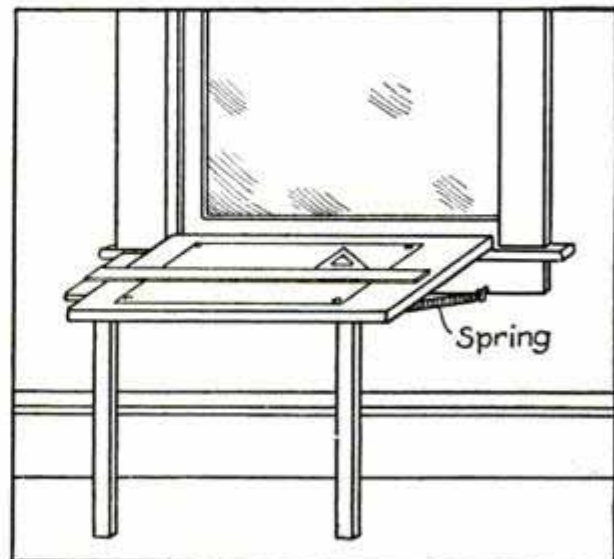
Gas Engine Muffler

hold the couplings, BB, and are each drilled with forty-eight 3-16-in. holes and fitted with caps, DD. One of the pipes, AA, connects to the engine and the other to the exhaust pipe, which is reduced at each connection until it is $\frac{1}{4}$ in.; eight 3-16-in. holes are drilled in the $\frac{1}{4}$ -in. pipe near the end, which is covered with a cap.

This muffler is being used with a 3-in. by 4-in. engine, making about 400 r. p. m., and the only noise produced is a slight hissing sound, which cannot be heard 10 ft. away.—Contributed by Edgar L. Drinkwater, 51 N. Ada St., Chicago.

TO CONVERT A DRAWING BOARD INTO A TABLE

Make two legs about 30 in. long, and buy two stiff springs about 8 in. long. Fasten the legs to the drawing board with hinges, and attach the springs by means of screw eyes. Screw two hooks in the bottom of the window casing and attach springs, as shown in the sketch. The springs hold the drawing board against the casing and also hold the legs down firmly on the floor, thus making the whole apparatus solid. The front edge of the board may be lowered by inclining the legs. When not in use the springs can

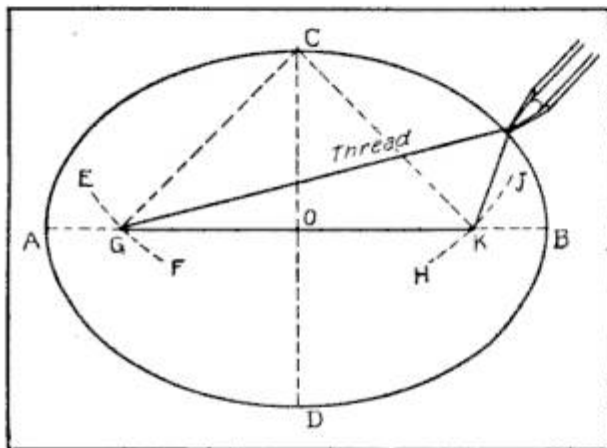


Drawing-Board Table

be detached and the apparatus may then be folded up and put away. I have been using my board in this way for a long time, and find it very convenient, and its use does not mar the window casing in the least.—Contributed by Chas. A. Prickett, Auburn, Ind.

TO DRAW AN ELLIPSE: GIVEN THE LENGTH AND WIDTH

A previous article in "Shop Notes" shows how to draw an ellipse having a required length, but the following method will give the required width as well. This method is as follows: Draw line A B—the required length; and line C D—the required width intersecting line A B at right angles at the middle point O. With C as a center and radius O A describe arcs E F and H J intersecting line A B at G and K, the foci of the



To Draw an Ellipse

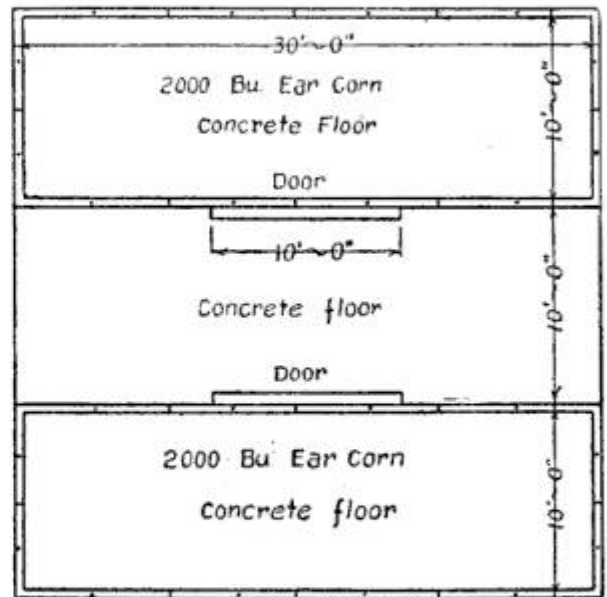
required ellipse. Drive pins or tacks in these points and form a loop of thread, just long enough to enclose the triangle G C K. Then place a pencil in the loop and trace in the ellipse, as shown.—Contributed by W. J. Slattery, Emsworth, Pa.

DOUBLE CORN CRIB AND FEEDING FLOOR

Select your site and lay out a space 30 ft. square—or whatever dimensions you may decide on; dig trenches 8 in. deep and 8 in. wide around the square and two crossways the square on either side the driveway. Board up these trenches and box up to a height some 6 in. above the ground and fill them with concrete.

As soon as this concrete has set put a layer of concrete 4 in. thick over the whole surface as a floor for both corn crib and driveway. While laying the concrete, along

the trenches set $\frac{1}{2}$ -in. bolts $6\frac{1}{2}$ in. long upright every 5 ft. and bolt on 2x6's the flat way to use as sills. Toe-nail 2x6's upright



Plan of Rat-Proof Corn Crib

every 2 ft., 14 ft. high to eaves and 20 ft. high along the driveway, making the crib 23 ft. high. The rafters should be 20 ft. long and the roof shingled.

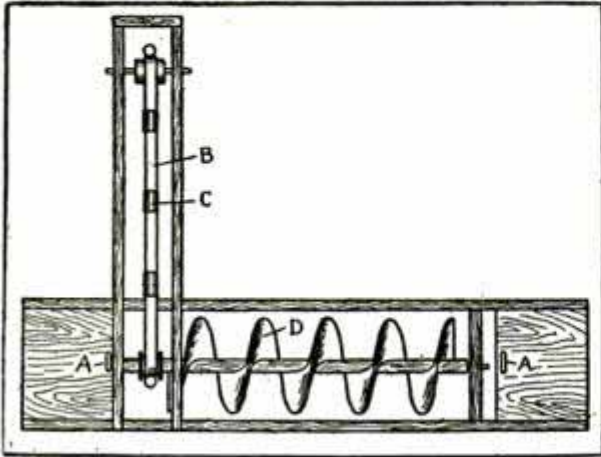
The crib will hold 6,000 bu. ear corn if the driveway is filled. Or one could have an oat granary of 5,000 bu. above the entry and need not scoop the grain out, but let it run into the wagon when loading. I use the driveway (30 ft. by 10 ft.) as a feeding floor and put ear corn on either side and use a portable corn elevator with horsepower. A door 10 ft. wide opens horizontally on each side of the driveway to let corn out to feed. My crib cost \$225 painted and complete, not charging anything to my own work. Used 20 cu. yds. of gravel and 116 sacks of cement. The concrete floor does not cost more than sills and board floor and my crib is rat-proof and will not rot.—Contributed by M. D. Johnston, Danvers, Ill.

A GOOD GUTTER PAINT

Put all old paint skins, cleanings of buckets, siftings and pieces of dry putty into an old iron kettle with raw oil and boil until all is dissolved. Then add fine, dry sand until the mixture is as thick as will spread under the brush. Apply quite warm—a heavy coat. When dry it will form an enamel like granite and can be colored to match the cornice. If properly prepared this paint should be as smooth as glass. It is also good for patching old tin roofs.—Contributed by H. W. Kennicott, Palmyra, Va.

PONTOON WATER ELEVATOR

There are many ways of raising water from a stream, by utilizing the power of the current, but probably the simplest and most efficient method is obtained by using the apparatus here illustrated, which I made myself at very little expense.



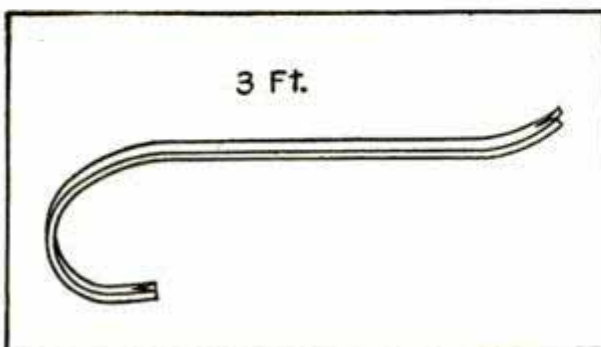
Pontoon Water Elevator

This device consists of a helical water wheel, D, which, in revolving, operates the bucket elevator at the left. This elevator consists of a belt, B, with several tin cans attached, as shown. I used two floats in making my machine, but in some devices of this kind three or four are used. The device is fastened by ropes, passing through the screw eyes, AA, and is set in the water at an angle of 45°.

I have only used this device for irrigating, on a small scale, but think that larger ones could be made to take the place of pumping stations, as there is no expense in operating. It could also be used to advantage in dredging and gold mining.—Contributed by Millis Knickerbocker, New Lenox, Ill.

TOOL FOR DRAWING SPIKES

For material take a piece of an old buggy axle, flatten and split both ends, and bend as illustrated. The claws of the rounded end



For Drawing Spikes

can be driven under the head of the spike by striking with a hammer.—Contributed by Leander Manning, Akron, Iowa.

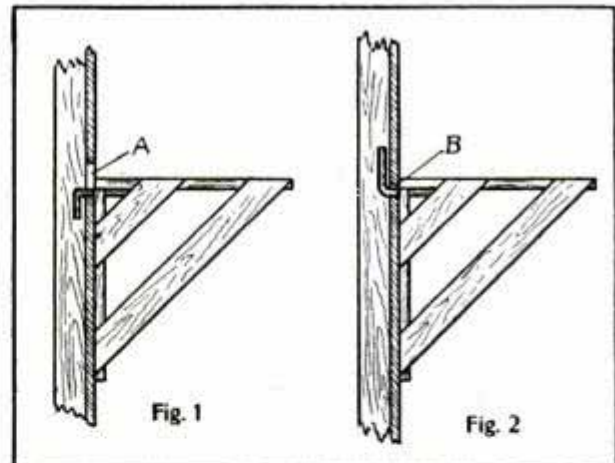
TO WRITE ON METALS

To write on iron, steel, silver or gold mix together 1 oz. muriatic acid and ½ oz. nitric acid and use as follows:

Cover the place on which you wish to write with melted beeswax; when the beeswax is cold write the name or words plainly with a file point or an etching needle, carrying it through the wax and cleaning all the wax out of the letter. Then apply the mixed acids with a feather, carefully filling each letter. Let the acid remain for from one to ten minutes, according to the appearance desired; then put on some water, which will dilute the acid and stop the process. Either of the acids separately would cut iron or steel, but it requires the mixture to take hold of gold or silver. After the acids are washed off, it is well to apply a little oil.—Contributed by Howard H. Iszard, Cuyahoga Falls, Ohio.

IMPROVEMENT IN PORTABLE SCAFFOLD BRACKETS

In "Shop Notes" for June, 1905, the portable scaffold bracket, shown in Fig. 1, was de-

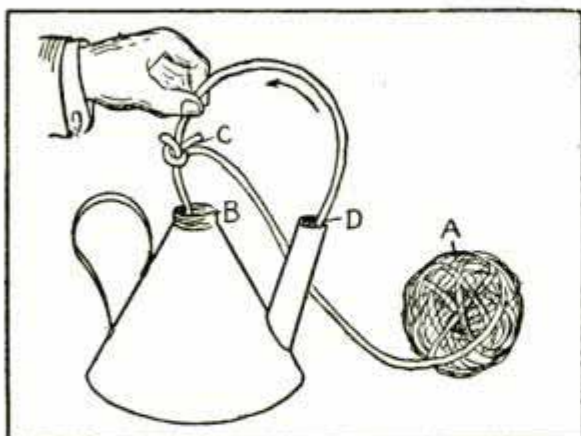


Improved Scaffold Bracket

scribed. I have found this form of bracket to be very useful and handy, but think it can be improved by turning the hook up (Fig. 2) instead of down. By so doing a longer hook may be used and the hole in the sheathing can be made much smaller than when the hook turns down. To remove the bracket it is only necessary to raise the outer end and draw the hook out of the hole, but the hook cannot come out when the bracket is loaded.—Contributed by Arthur Gray, Clifton, Ill.

TO PUT A WICK IN A TORCH

Unwind enough of a ball of wick, A, to go through the torch and push it in at B. Raise the torch to your mouth and give one hard



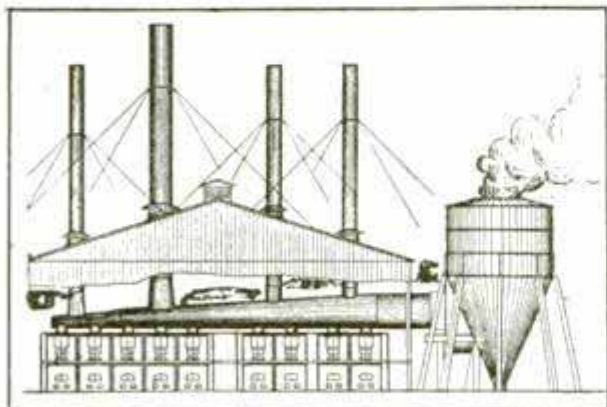
Putting Wick in Torch

blow, which will send the wick out at D. Tie it at C, making a circle about 14 in. in diameter. Then draw back from B until the mouth, D, is as full as wanted. Cut the wick off at D and push the rest in at B. This should not be done with oil above the wick pieces.—Contributed by Albert N. Crawford, 8 Lautner St., Allegheny, Pa.

PREVENTING CINDERS WHILE BURNING SAWDUST

In the power house of the Oregon Consolidated Ry. Co., where sawdust is used for fuel, the sparks and cinders emitted from the stacks have been so dangerous and objectionable that a cinder separating plant has been installed. This has not only relieved the residents and manufacturers within a half-mile radius, but has considerably increased the efficiency of the boilers.

The installation was the result of numerous complaints, due to cinders accumulating on sidewalks, porches, drying clothes, etc. A lumber company, which adjoins the power



No Cinders in this Smoke

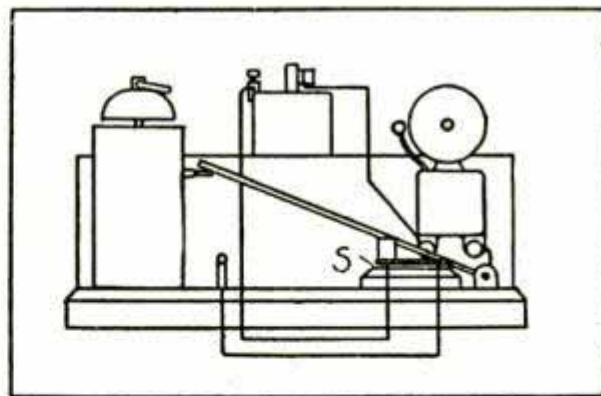
house, has had thousands of dollars' worth of lumber refused by inspectors on account of being blackened by falling cinders.

The accompanying illustration shows how the separator is applied. The large breeching, or smoke box, over the boilers connects to an immense draft fan, which discharges into the separator at the right. This separator works exactly like the ordinary dust separator, seen in nearly all large wood-working factories. As the smoke and cinders enter they receive a whirling motion, and the cinders, being heavier, gradually work down in a spiral path to the bottom of the separator, where they are automatically conveyed to the boilers to be consumed.

The cut shows only one section of the plant, the entire equipment, as stated in the Street Railway Journal, costing about \$19,000. The smoke coming from the separators has been carefully examined by powerful field glasses without revealing the slightest vestige of cinders. This, and the increased efficiency, make the cinder separating plant worthy of consideration for other localities where similar conditions exist.

PORTABLE ELECTRIC ALARM

In rigging up an alarm for a sound sleeper, as described in our April number, Geo. Albach, 95 West Twenty-first street, Bayonne,

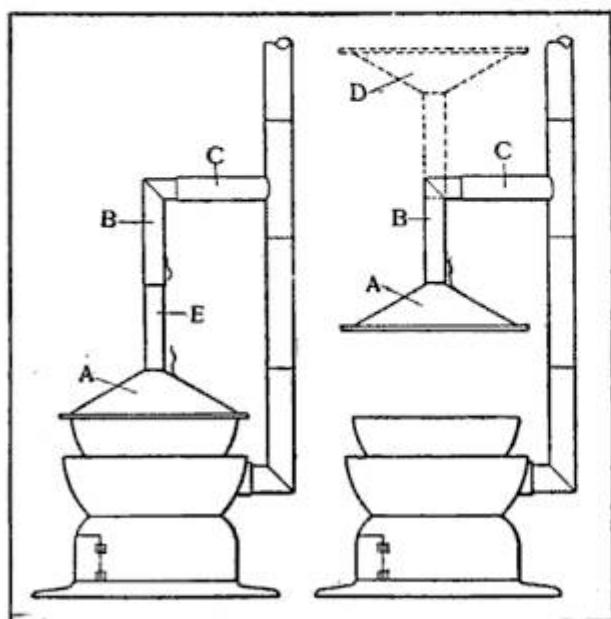


Portable Electric Alarm

N. J., made some improvements. He mounted the device on a board 12 in. by 7 in. by $\frac{3}{4}$ in., having beveled off the upper edge. At the back he nailed a piece 5 in. high and of the same length as the board. The bell he fastened to this back piece, and the battery was placed on a shelf on the rear side of the back piece. He also added a switch, S, which he fastened in the empty corner of the board, making it convenient to stop the bell. The apparatus can be placed near the bed at night and stowed away during the day.

DEVICE FOR CARRYING STEAM FROM KETTLE TO KETTLE

"In my candy-boiling department I have used a device for carrying steam from the kettle all winter," writes A. F. Houser, 114 S. James St., Hamilton, Ont., "and find it a great convenience."



Steam Hood for Candy Kettle

Referring to the illustrations, A is a cover with a pipe, E, attached, which pipe telescopes into B and, when raised, can be fastened with a hinged clasp to the bottom of B; B is an elbow which telescopes into C the proper distance to bring the cover over the kettle; C is a short length of pipe connected to a length of stovepipe.

The cover, A, with pipe, E, attached can be entirely detached from B, or telescoped into B and attached to it by means of the spring catch, or swung up out of the way when not in use, as at D, Fig. 2. The device is made of galvanized iron and riveted.

FORMULA FOR MANUFACTURING YEAST

Boil together for one-half hour, in a copper kettle, 40 gals. of water and 2 lbs. of ground hops; pass over refrigerator to cool to a temperature of 160° F.; pass the liquor from the refrigerator to a stout tub; add 1½ bu. (about 63 lbs.) crushed malt and stir the mixture thoroughly. Allow the mash to stand at that temperature for 1½ hours, then filter from the grains and cool to 70° F. The passage over the refrigerator serves to aerate the wort. At this point allow spontaneous fermentation to set in.

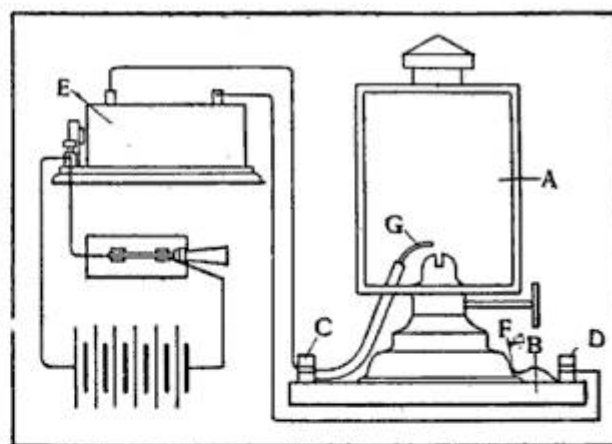
The yeast can be used in 24 hours, but is better if allowed to stand two days. Keep the fermenting tubs and other vessels clean by scalding from time to time with live steam. Said to give excellent results.

HOW TO MAKE AN ELECTRIC-KEROSENE LAMP LIGHTER

A device for lighting a ruby lamp is here shown, in which a spark from a jump-spark coil vaporizes the oil and ignites it. The ruby lamp, A, is mounted on a board, B, somewhat larger than the base of the lamp. Two binding posts, C and D, are placed on the board and connected to the secondary of the jump spark coil, E. A wire is fastened to binding post, D, and soldered to the lamp at F. The wire, G, is enclosed in a piece of rubber tubing, such as is used for insulating in automobiles, and the extremity so located that it will nearly touch the wick.

The spark from the vibrator would spoil the plate if the jump spark coil were put in the dark room, so it should be put outside, or placed in a box, in such a way that no light will fall on the plate. A ⅜-in. spark is about right and about six dry batteries should be used with the coil.

This device will also light an ordinary kerosene lamp and might be useful when



Electrically-Lighted Kerosene Lamp

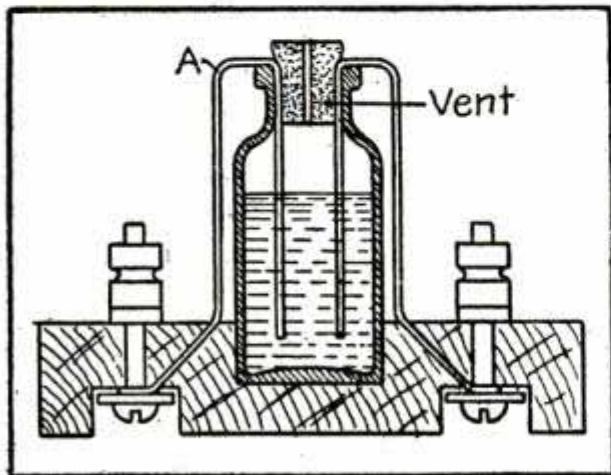
the lamp is in a hall or some place where it is hard to get at.—Contributed by Chas. Buettger, R. R. 8.

TO MAKE A CRACKED GONG SOUND

The sound may be restored to a cracked gong by sawing down the crack with a hacksaw so that the two edges do not touch. The gong will sound as well as when new.—Contributed by E. Okerlund, San Francisco, Cal.

HOME-MADE POLARITY INDICATOR

To make a polarity indicator for batteries, all that is required is some sulphuric acid, two thumb bolts and nuts, some copper wire and a block of wood 4 in. long, 2 in. wide and $\frac{3}{4}$ in. thick. In the center of the block of wood chisel a hole 1 in. square and $\frac{1}{2}$ in. deep to hold the bottle containing



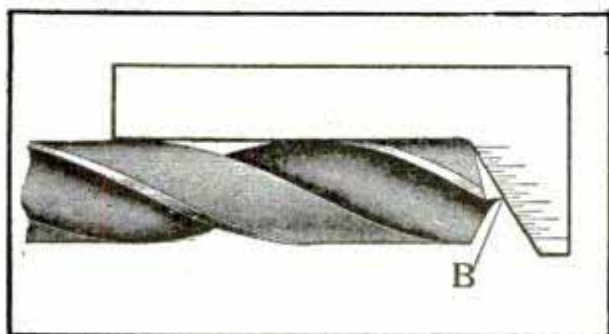
Polarity Indicator

the acid solution. On the opposite side of the block cut two $\frac{1}{2}$ -in. grooves $\frac{1}{2}$ in. from the sides. In the center of each of three grooves bore a $\frac{1}{4}$ -in. hole for the thumb nuts. From these holes drill holes to the space in the middle, as shown by the sketch. Set the bottle in the hole prepared for it, and run wires, A, to it from each thumb-screw, as shown. Fill the bottle with a solution of 1 part sulphuric acid to 4 parts water.

When the device is connected to the battery the zinc or negative pole will give off gas. This will cause bubbles in the solution.—Contributed by G. Fry and I. Van Dalsem, 903 Vine St., San Jose, Cal.

GAUGE FOR TESTING ANGLE AND CENTER OF DRILL

This device is made of sheet steel. By holding it on both sides of the drill and

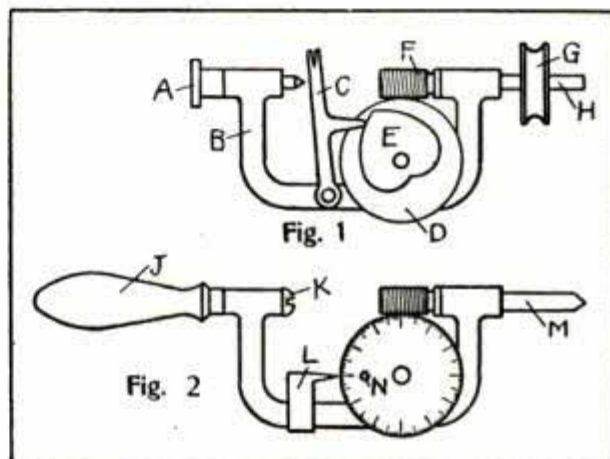


How the Gauge is Used

comparing the relative position of center to point B, one can tell whether it is accurately located. Also, if the angle of the drill coincides with the gauge, the angle is correct.—Contributed by J. Weldon, 433 Columbia St., Brooklyn, N. Y.

HOME-MADE SPEED INDICATOR

A bobbin winder from an old sewing machine, Fig. 1, will make a very good speed indicator by making a few alterations. Remove part A and C, and if possible remove the heart-shaped cam, E, from the worm wheel, D. Take off the pulley, G, and sharpen the end of the shaft, as shown in Fig. 2. Attach a small file handle, J, by means of a screw, K, and solder on the indicator, L, which may be made of sheet brass. Scratch the graduations on the worm wheel, as shown, making the total number of notches



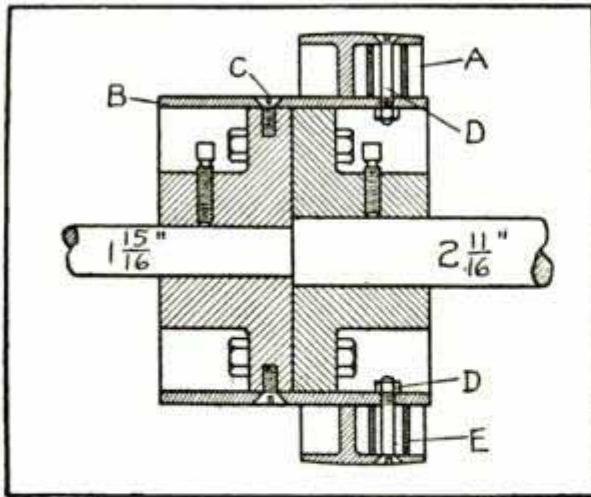
Speed Indicator Made of Bobbin Winder

equal to the number of teeth. It is well to make a center punch mark, N, to allow counting the number of revolutions of the worm wheel in taking high speeds.—Contributed by Ray Earley, New Sharon, Iowa.

HOW TO MAKE A COMBINATION PULLEY AND COUPLING

Some of the readers of Shop Notes might be interested in a problem of coupling shafting which occurred at our shop recently. I had occasion to couple two shafts of different sizes, at a point where a pulley was needed, and overcame the difficulty as follows: I setscrewed the coupling to the shaft, as shown in the sketch, and covered the setscrew heads with a piece of pipe, B, fastened with flat-head screws, C. These screws were staggered, an equal number being placed in each half of the coupling. Then I bored the

spokes on an old pulley, A, to fit the pipe, and fastened it on with bolts, D, counter-



Combination Pulley and Coupling

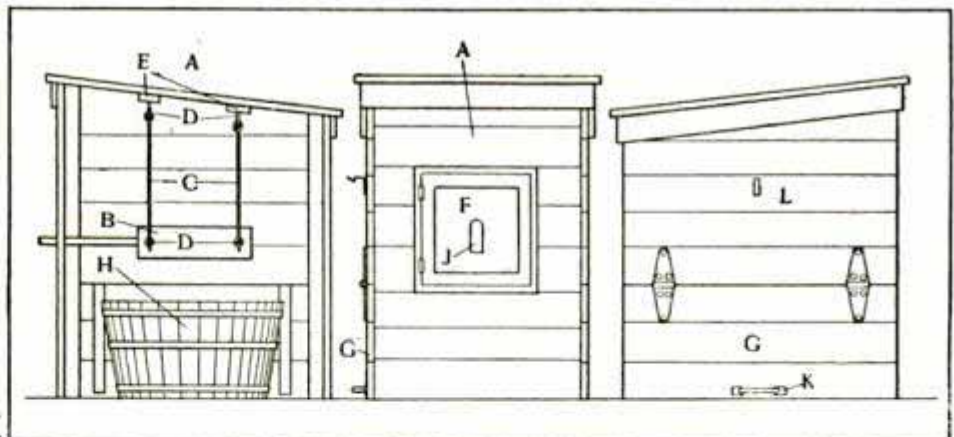
sunk in the rim and pipe separators, E. The load on the 1 15-16-in. shaft being very light, was easily carried by the setscrews, and both the coupling and pulley are now in successful operation.—Contributed by M. E. Hood, Tuckahoe, N. Y.

HOW TO MAKE AN ASH SIFTER

The accompanying sketch shows a device which will be greatly appreciated by all who sift ashes. By its use the expensive waste of coal is prevented, without incurring the greater expense of spoiled clothing. The dust arising from the ashes is confined by a housing, A, which can be built of $\frac{3}{4}$ -in. boards, or made from an old dry goods case.

An ordinary ash sifter is supported by a frame, B, which swings from the roof by the iron rods, C. These rods may be bent from old iron curtain rods or heavy galvanized telegraph wire, and are held by large screw eyes, D, in the roof and frame. Two cleats, E, nailed to the roof will distribute the weight over the entire surface.

A door, F, should be made in the front, large enough to admit the ash sifter, and another one, G, in the side should be of a sufficient size to allow removing the tub, H. The door, F, should have an opening, J, for the ash sifter handle and the door, G, ought to have a handle, K, and a spring catch, L, to hold the door up when removing the tub.



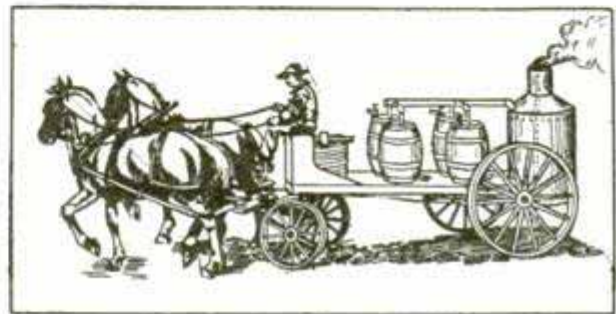
Housing for Ash Sifter

This catch may be bent out of a piece of sheet iron.

If the tub is placed on the ground it may be difficult to slide, in which case strips of wood, for tracks, should be embedded in the ground.—Contributed by Arthur W. Passage, 831 West Pierce Ave., Niagara Falls, New York.

PORTABLE SPRAY COOKER

The lime-sulphur hot sprays used by orchardists are often cooked at some central point by means of a stationary boiler, but a better device is found in the apparatus illustrated herewith.



Portable Spraying Outfit

The boiler is suspended from the back of the wagon, and the steam is carried to four barrels containing the spraying mixture. It is not necessary to buy a new boiler for this

purpose, as many discarded ones would answer. A subscriber to the Rural New-Yorker used an old fire engine boiler, which he recovered from a scrap pile.

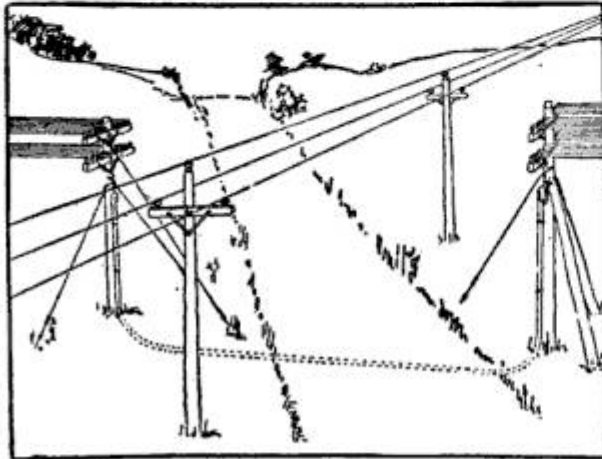
An outfit of this kind will deliver enough material to supply six or eight spraying nozzles, and the expenditure would be insignificant if divided among several members of a coöperative spraying club.

For cleansing steel articles use unslaked lime.

UNDERGROUND CROSSING FOR TOLL LINES

An underground crossing for toll lines as a method of protection against induced currents from power wires is shown in the illustration. The crossing is rather expensive, but if properly built gives good protection, says the American Telephone Journal.

An iron pipe 1½ or 3 in. in diameter, according to the wire capacity desired, is laid below the frost line from pole to pole. The usual pipe bend is made at each of the



Underground Crossing for Rural Lines

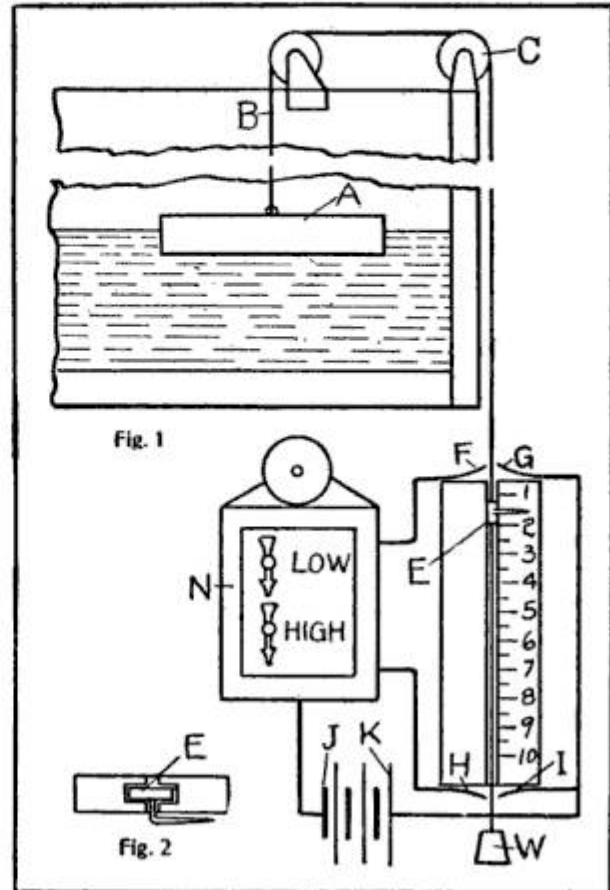
poles, which are properly guyed, and at the end of the pipe, where it runs up the pole, a goose neck is used to keep out the rain. For draining the conduit of moisture, due to condensation, a hole is drilled at the lowest point of the duct over a pocket filled with crushed stone.

No. 14 twisted pair "distributing wire" used in one of these conduits has given little trouble. The wire is fused direct to the line, without fuse or spark gap protection. Where these crossings are remote from a repair man, it is better to risk losing a pair of wires at \$1.47 per 100 ft. than to hire a team and send a man after every lightning storm.

SIMPLE TANK GAUGE WITH ELECTRIC ALARM

A tank gauge that is very easy to rig up and gives good service is shown in the illustration. A wooden or cork float, A, is attached to a chain, B, which runs over a small pulley, C, and then to the dial or gauge which may be placed on the side of the tank or other convenient place. The numbers on the dial read from the top downward. E

(see detail at Fig. 2) is a piece of metal which runs in grooves and moves the pointer along the dial according to the rise and fall of the liquid.



Simple Tank Gauge

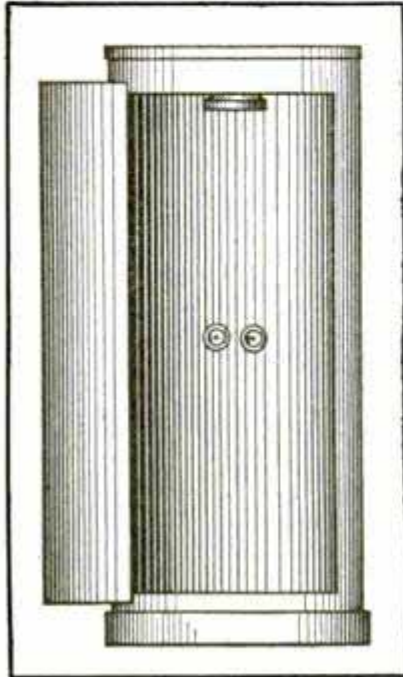
The electric alarm (Fig. 1) is for calling some person when the water gets too high or too low. F, G, H, I are brass springs projecting so that the indicator, E, will close the circuit when it reaches either the top or bottom of the gauge. J, K are batteries in the circuit, and the annunciator, N, has the words high and low marked on it in their respective places.—Contributed by John M. Singer, 5915 Wabash avenue, Chicago, Ill.

GOOD CLEANSING POLISH

A good encaustic, which will clean and polish at the same time, is composed of 1 gallon soft water, 4 oz. yellow laundry soap and 1 lb. of white wax, shaved up. Boil together, stirring well, and then add 2 oz. sal soda; put the mixture in something which can be closely covered, and stir constantly until cool. If necessary dilute with water before using; lay on with a paint brush and polish off with a hard brush or cloth. Can be used on furniture, marbles, tiles and bricks. Will remove ink stains.

HOME-MADE SHOWER BATHS FOR FACTORIES

In the majority of factories too little attention is paid to the needs of the workmen in regard to toilet facilities. This does



Enclosed Shower Bath

not mean that turkish baths and manicure parlors should be added, but in some shops, where the workmen have to wash in a trough and dry themselves in a box of sawdust, the device will be greatly appreciated.

Each bath consists of a galvanized steel cylindrical casing, having a swinging door and overhead spray

with hot and cold water supply. The tops and bottom are left open and the whole apparatus sets in a tray, which drains into an outlet pipe.

As stated in the Street Railway Journal, several shower baths of this kind were installed in the car shops of the Galveston Electric Company, Galveston, Tex., where they are greatly appreciated by the workmen, who make regular use of the facilities thus provided.

POWER IN THE JEWELER'S SHOP

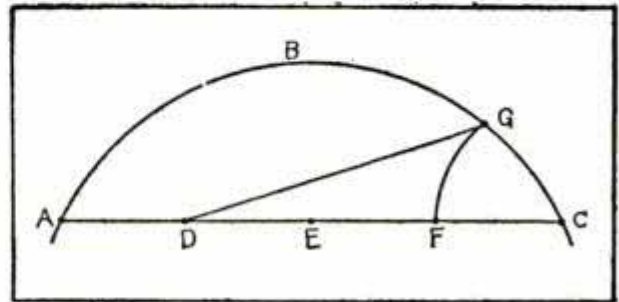
In equipping a small watch maker's workshop it is usually a mistake to put in a very small gas engine—say $\frac{1}{2}$ -hp. That may be just sufficient power at first, says the Keystone, but a machine lasts longer if it is not overworked, as a very small engine is apt to be in a growing business.

Among the handy devices for use in the power-equipped shop is a small, high-pressure blower to furnish blast for a small furnace, and an automatic blowpipe. A tin reservoir placed in the line gives an even flow of air. This reservoir should be 10 in. in diameter and 16 in. long. The pressure is regulated by two valves, one at the burner and the other where the line enters

the reservoir, allowing the excess of air to leave the pipe instead of backing up on the blower. For the air line standard $\frac{3}{8}$ -in. gas pipe, without elbows, is used. A grindstone will be found a convenience, also, as will a small generator for furnishing electric light and current for plating, coloring, etc., and for a demagnetizer.

MEASURING A CIRCULAR ARC

To find the length of the arc, ABC, first draw the line AC and divide into four equal parts by points D, E and F; then with

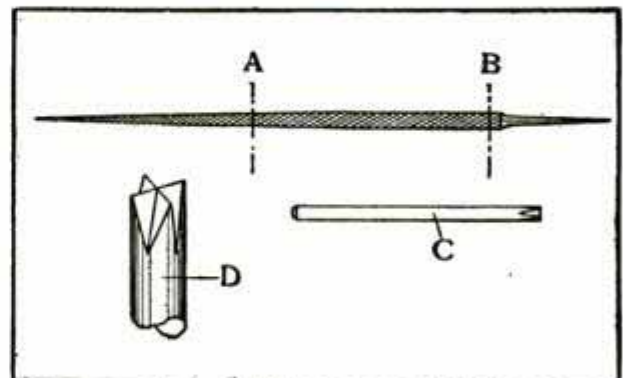


Measuring a Circular Arc

C as a center and a radius, CF, draw arc FG. The line DG is then one-half the length of the required arc.—Contributed by Chas. Walters, Lewis St., Mt. Vernon, O.

HOW TO MAKE A DRILL FOR STONE

Electricians and mechanics often find it necessary to make holes through stone or brick. A tool for this purpose can be easily made from an old rat-tail file (See Fig.). Place the file in the fire, and when red hot remove and allow to cool slowly. This will draw the temper and allow sawing off at A and B. The piece C is then sharpened at one end, as shown at D. This can be



Drill for Stone and Brick

done with either a three-cornered or square file, and after the edges are sharpened they are to be tempered. To do this heat the cutting end to a cherry red, and then plunge

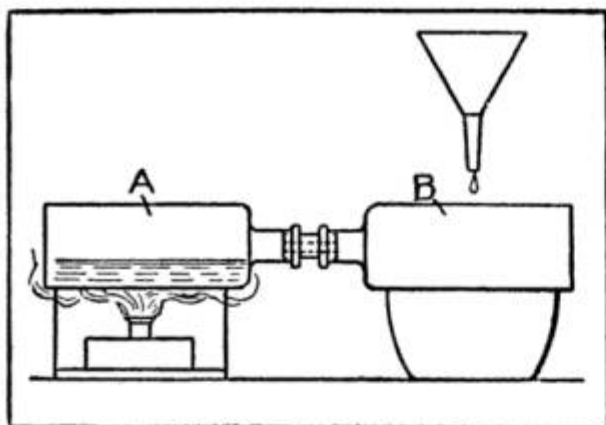
in water. Rub the cutting end with emery cloth, and then heat slowly a little way from the end. When a yellow tint appears at the cutting edge, dip quickly in water. The tool is then ready for use.

In using, the cutting end is placed on the brick or stone, and the opposite end tapped with a hammer, the drill being slowly revolved at the same time. Larger drills may be made in the same way by using an old machine drill or a round piece of tool steel.—Contributed by W. J. S., Emsworth, Pa.

HOW TO MAKE A WATER STILL

Any water containing lime or other impurities is not good for photographic work, but the water obtained by distillation will always give good results.

The still shown in the sketch is one that is easily made and inexpensive. Obtain two thin glass bottles, A and B, and join together with a cork having a hole through the center. A quantity of water is placed in bottle A, and heat is applied, which vaporizes



Plan of Water Still

the water and forces it in bottle B, where it is condensed.

The bottle A may be heated by means of a small gas stove, or alcohol lamp, and the other bottle may be cooled by water from a hydrant or from a funnel, with a piece of cloth in the mouth, to allow the water to drop slowly.

If a mixture of alcohol and water is placed in bottle A, the alcohol will evaporate first and condense in bottle B before much water has evaporated.—Contributed by Charles Lea, Brunswick, Mo.

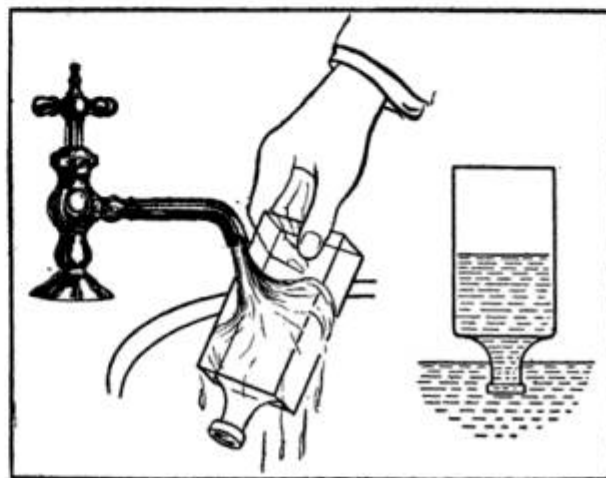
TO TIN OLD SOLDERING IRONS

Some of the readers of "Shop Notes" may have trouble with old soldering irons. To

tin same, heat well and dip in pulverized sal ammoniac a moment and then rub with solder. This operation will be effective, no matter how many pit holes there are in the iron or how dirty.—Contributed by Harry Casslebury, Altoona, Pa.

AIR AS A POWER

There are other sources of energy in air besides its velocity. The energy of the heat contained in the atmosphere is sufficient to run all the power plants in the world without decreasing its temperature any appreciable amount. The problem is to maintain a difference of temperature between two



An Interesting Experiment

places, as heat produces no energy while at rest, but only when moving from one place to another.

There are many easily volatilized liquids which would boil readily at atmospheric temperatures, and thereby produce a constant pressure in any boiler, without the use of a fire, but such liquids are very hard to condense, as it requires very extreme cold to cause them to liquefy. A new source of cold might solve this problem, but all sources of cold thus far discovered require either power for its production, or chemicals which soon cease to be effective.

When dry air is confined and heated, the increase in temperature is only 1-273 of the original pressure for each degree Centigrade, but moist air expands very much more. This may be illustrated by holding a bottle upside down, under a hot water faucet, and then dipping the mouth in cold water, as shown in the sketch. A difference of temperature of only a few degrees will cause the water to half fill the bottle. It is evident from this that moist air, heated the same amount, would double its pressure. Thus, air at atmospheric pressure would

increase to 15 lbs. above atmosphere, and air at 100 lbs. pressure would increase to 215 lbs. above atmosphere. If the air were heated twice as much, the pressure would be increased a corresponding amount, as the increase in pressure is directly proportional to the increase in temperature.

There are several varieties of hot air engines being made at the present time, but we are unaware of any attempt being made to utilize the increased efficiency obtained by the use of moist air.

It is doubtful if the weight of the air could be utilized for a source of power, although a device for doing this ought to be very powerful as a cube of air 31 ft. on each side weighs over a ton.

HOW TO MAKE AND USE A PRONY BRAKE

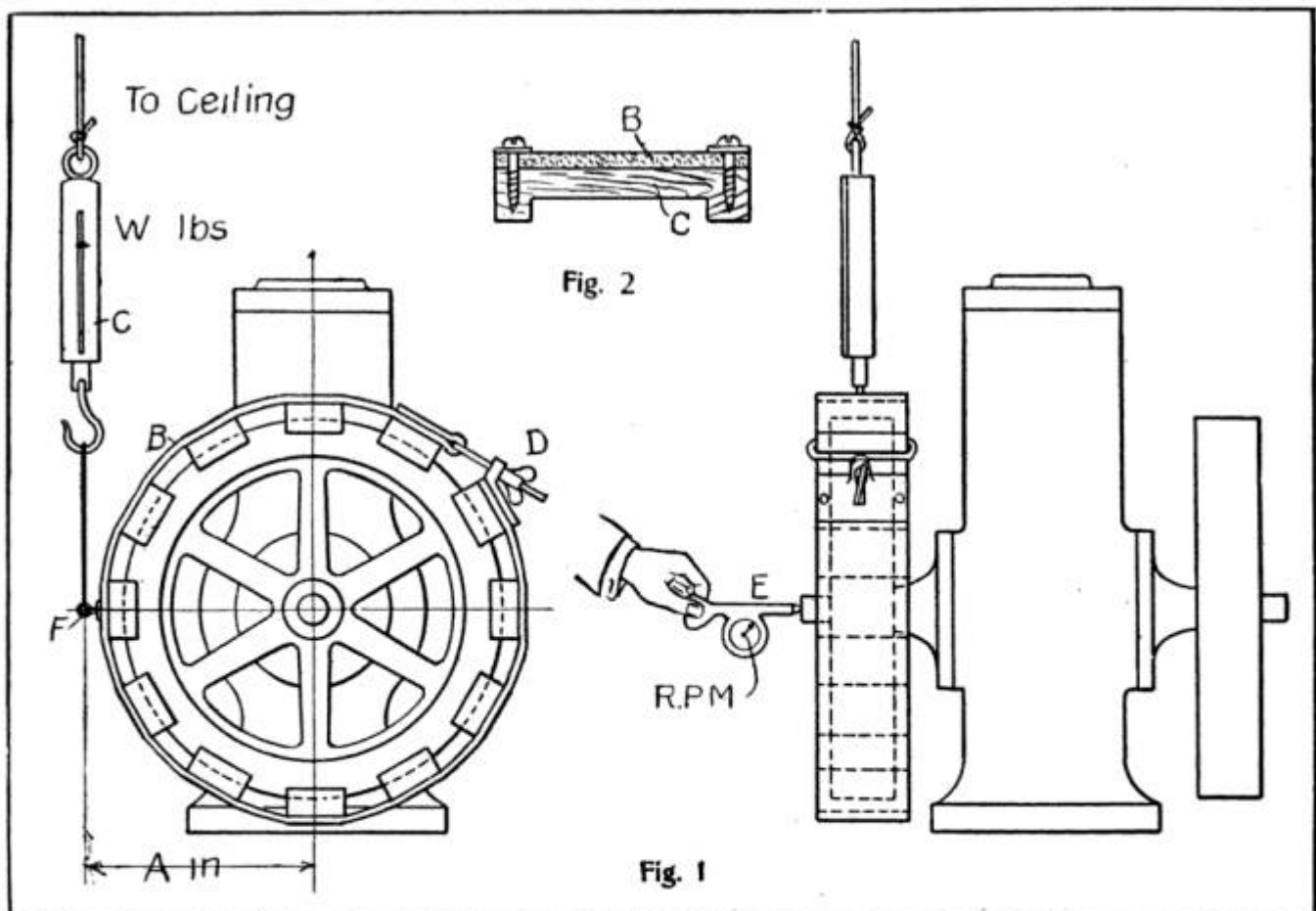
The brake shown in Fig. 1 can be made of a piece of leather belt, B, Fig. 2, with a number of wood cleats, C, fastened as

secure, and the screw eye, F, should be used to attach the spring balance, C, the other end being attached to the ceiling as indicated.

To obtain the horsepower of an engine apply the brake, as shown in Fig. 1, and take the speed in revolutions per minute (R. P. M.) with the speed indicator, E, at the same time noting the weight in pounds (W) shown by the spring balance. Measure carefully the distance from the center of the engine shaft to the screw eye in inches (A). If the values of W, A and R. P. M. are known the horsepower may be found as follows:

$$\text{hp.} = \frac{A \times W \times \text{R. P. M.}}{63025}$$

For example: If $A = 16$ in., $W = 20$ lbs., and $\text{R. P. M.} = 500$; then, $\text{hp.} = 16 \times 20 \times 500 \div 63025 = 2\frac{1}{2}$ hp. The constant 63025 is obtained by multiplying $12 \times 33,000$ and dividing by 6.2832; 12 being the number of inches in a foot; 33,000 the number of ft. lbs. per min. for each horsepower; and 6.2832 the ratio between the radius and circumference of the flywheel.

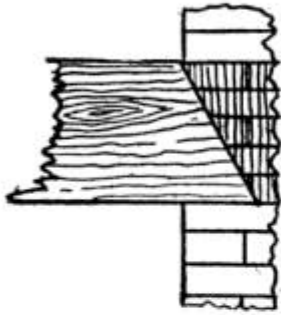


Details of Making and Using a Prony Brake

shown. A tension screw, D, Fig. 1, can be fastened by any method that will make it

To crystallize glass flow heavy alum water over it; then let it dry.

SELF-RELEASING BEAMS IN WALLS



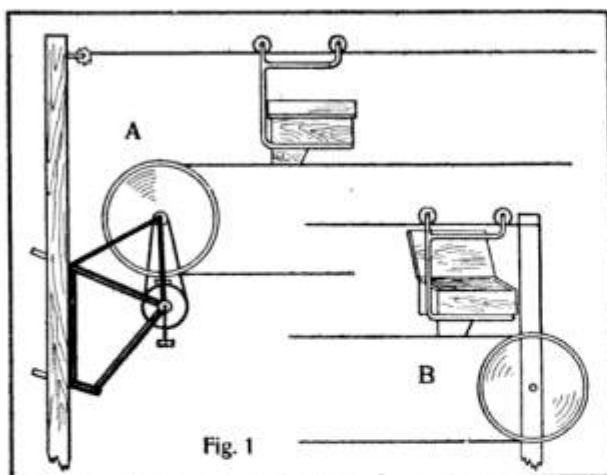
When the ends of beams that go into a wall are cut on a slant, as illustrated, a lower insurance rate can be secured. Beams so cut will fall out easily without overturning the wall in case of fire, says the Practical Carpenter.

MAIL BOX TROLLEY FOR RURAL PATRONS

Patrons of rural routes living some distance back from the road will find a trolley for drawing the mail box to the house and sending it back again a great convenience. The illustrations show such a line, which was devised by a correspondent of the Rural New-Yorker.

At the house end of the line a stout post is set in the ground and a bicycle, with saddle and front wheel removed, is fastened with pins against the post, as shown (Fig. 1), to serve as motive power. For the main wire No. 9 is the size used, and No. 17 galvanized for the belt wire. For a short line on level ground broom wire would do.

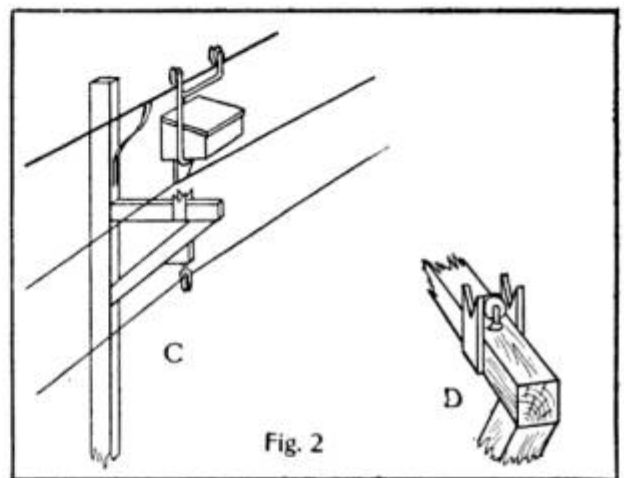
Posts are set every 50 or 60 yds. between the house and the road ends of the line. Each of these intermediate posts has a



Terminals of the Line

bracket (D, Fig. 2) of 2x2-in. stuff, and an iron at the top for supporting the main wire (C, Fig. 2). This iron is made of old spring-wagon tire with a half-round groove on top for the wire to rest in. The top wire is high enough above the notched guides below so the bottom of the box will not bump

when passing a bracket. The arrangement of pulleys and guides at these intermediate posts is shown at D, Fig. 2. The guides are of 1-in. hard wood, screwed to the arm of the bracket. The outside pulley is underneath the arm and 1 ft. distant from the other pulley, so that the wire cannot get tangled on windy days. A wire fence ratchet is used to keep the top wire tight. The post at the road end of the line has a wheel. An ordinary R. F. D. mail box is used, with a hardwood block one-half its length underneath it. The belt line starts at this block, runs the length of the line over the wheel on the post at the roadside, returns over the pulleys of the intermediate posts, passes around the bicycle wheel, and is fastened to the block under the box in a small hole in a piece of strap-iron fastened in the block.



One of the Intermediate Posts

The wheel at the road end can be the front wheel of the bicycle or an old sewing machine wheel, and a trough or support for the box is provided at this end to hold it firm while being opened or closed (B, Fig. 1). The device as rigged up in this instance cost about \$5. The line is 250 yds. long and travels uphill 75 ft. to the road. An electric alarm to let the patron know when there is mail in the box could be added by one of a little ingenuity.

TO REMOVE A BROKEN STUD BOLT

A broken stud bolt in a casting or machine part may be removed as follows:

Drill a small hole in the broken part to be removed and use a lefthand tap. If it is a lefthand threaded stud bolt use a righthand tap to get it out. Be careful not to use too large a drill, as it would leave too thin a shell to tap in, and the expansion would cause it to bind.—Contributed by G. J. Lesperance, 425 Howland avenue, Kenosha, Wis.

PORTABLE KETTLE AND FIRE-PLACE FOR GRAVEL ROOFER

Whatever thickness of metal is used for this purpose, the construction shown in Fig. 1 is suitable. The fire pot, A A, is seamed to the bottom, B B, at C C and at its top an angle iron, D D, is riveted, as shown at a a. The elbow, E, is beaded and flanged, as shown by b c; F shows the damper in position.

The angle iron, H H, riveted, as shown, supports the grate, J J, while K shows the opening for the ash pit door, around which grooves are riveted, into which the door will slide as shown by e e. The opening for the fire door is at L and around it

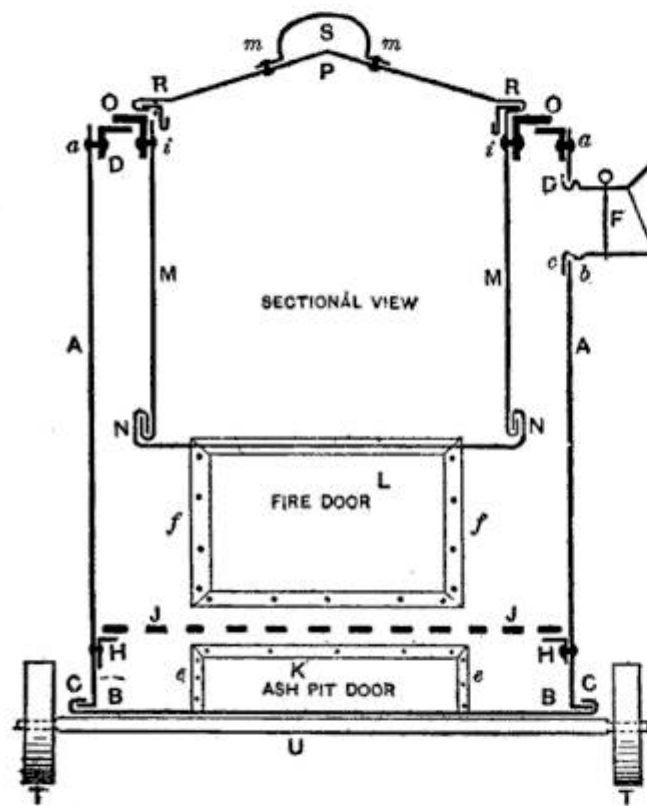


Fig. 1.—Sectional View of Fire Place and Kettle.

grooves are riveted, as indicated at f f. The tar kettle, M M, is double seamed to the bottom at N N, on the top of which an angle, O O, is riveted, as shown by i i. The pitched cover, P, is seamed to the collar, as shown by R R. The handle, S, is riveted at m m. The wheels and axle, T U T, are fastened to the bottom of the fire pot, as shown in Fig. 2, in which A is part of the fire pot and B the section of the axle, which is fastened to the bottom by means of the angle, C C, riveting at a a a a. The balance legs are shown at D D, one being fastened on either side of the fire pot and riveted at E and E, which forms a pivot.

When the fire pot is to be wheeled to a certain place, says the Metal Worker, the legs, D D, are raised, and afterward lowered, thus preventing the kettle from tipping. Fig. 3 shows how the slides and grooves for the doors, L and K in Fig. 1, are constructed, while A A in Fig. 3 shows the part body of the fire pot, cut out as shown from b to b. The riveted grooves are shown by B B, in which the door, C, slides, D being a handle riveted at a a.

Fig. 4 shows the construction of the grate, which can be made from band iron. The outside ring, A A, should be a trifle smaller than the inside diameter of the angle iron ring, D D, in Fig. 1, so that it can be removed when desired. Three of the grate

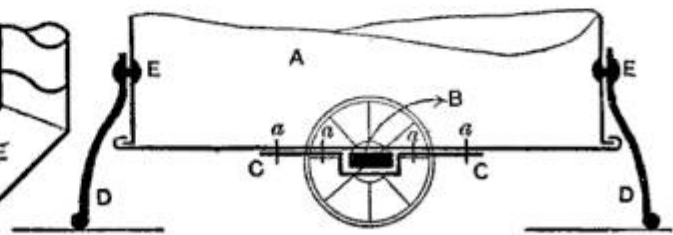


Fig. 2.—Method of Fastening Axle and Balance Legs.

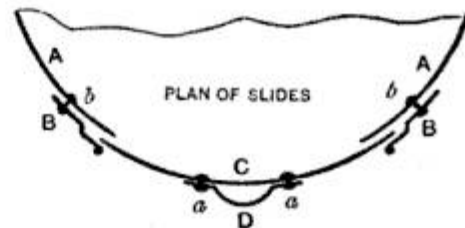


Fig. 3.—Constructing the Slides

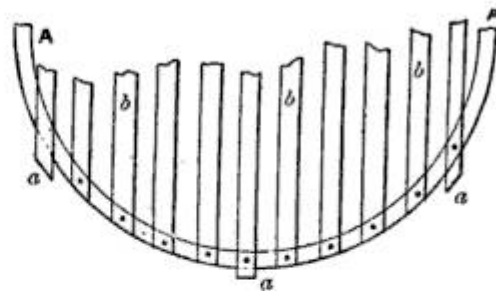
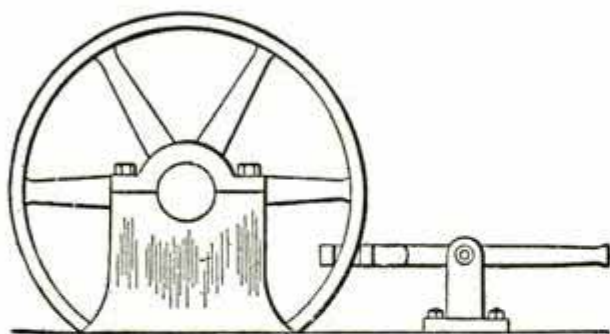


Fig. 4.—The Grate Construction.

bars, as a a a in Fig. 4, are to project over the ring, as shown, these projections to rest on the angle iron, H H, in Fig. 1. The balance of the grate bars, as b b b, etc., in Fig. 4, are riveted. It will be noticed that the angle iron ring at the top of the kettle in Fig. 1 rests upon the angle iron ring, D D, at the top of the fire pot. This allows the kettle to be removed for cleaning purposes. If desired the fire pot and kettle can be made square, using the same construction, which can be modified to suit.

ANOTHER DEVICE FOR GETTING ENGINES OFF CENTER

Fit a jaw over the rim of the wheel and pivot it to a handle or lever as shown. Se-

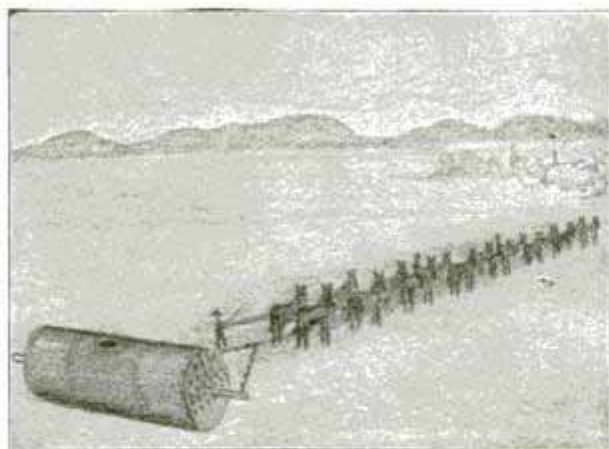


Turning Engines Off Center.

cure the handle to a block of wood, from which to get leverage. When engine is on dead center, says the Engineers' Review, place the device in front of the wheel and the jaws on the rim of the wheel and bear down on the outer end of the handle.

ROLLED A BOILER NINE MILES

A 125-hp. boiler was rolled nine miles from the railroad station to the Marine Hospital at Ft. Stanton, N. M. The process was very similar to the movement of a road roller. The roads were too soft to support a wagon with such a load, hence this unusual method of transportation was resorted to. Ryerson's Monthly says: "It was necessary to transport this boiler nine miles over the plains and mountains in order to reach its destination, and as it was found that the roads were in such condition that they would



Mules Rolling the Boiler.

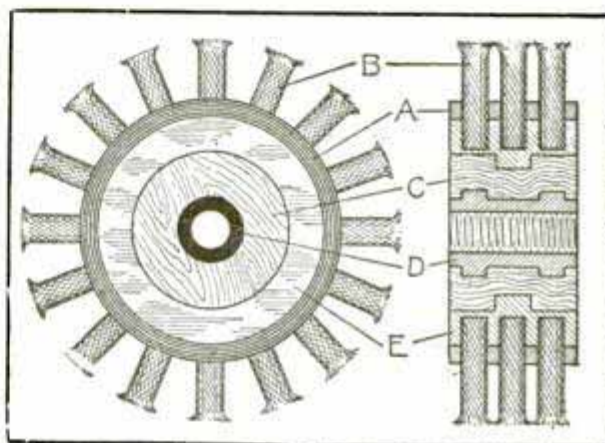
not support a wagon with any considerable load, it became a very pretty problem to solve. The boiler was finally rigged up as shown in the illustration—a heavy pipe

being used as an axle and fourteen mules furnishing the motive power, the boiler being safely rolled the nine miles from the railroad to the hospital, reaching there none the worse for the rough usage to which it was necessarily subjected.

HOME-MADE IMPROVED BUFFER

A good buffing wheel can be made of a metal band, A (see sketch), drilled to receive a number of cords, B, a hardwood hub, C, and a babbitt bushing, D. If a narrow buffer is desired, one row of cords, as shown in the side view, will be sufficient, but if a wide buffer is wanted the required width can be obtained by making several rows, as shown in the section. If more than one row is used, the holes should be drilled diagonally.

The pieces of rope may be taken from sash



An Improved Buffer.

cord, or if the buffer is intended for very smooth work a soft, braided cotton cord should be used. It is unnecessary to ravel the ends of the cord, as they will soon ravel themselves after a little use. The cords are held in by melted rosin, E, which is poured in the cavity after the other parts are assembled and carefully centered. A little beeswax, tar or paraffine stirred into the melted rosin will make it less brittle. The bushing, D, may be made of either lead or babbitt, and is made to fit the shaft of the buffing machine.

A buffer of this kind will do the work better and quicker than any muslin buffer I have ever used.—Contributed by Stoke Richards, Santa Clara, Cal.

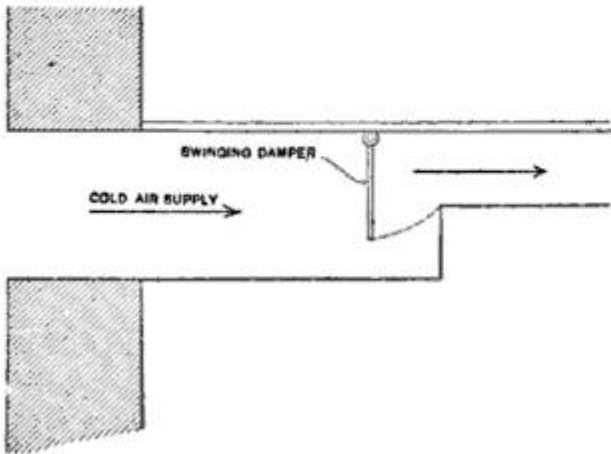
AQUARIUM CEMENT

A good cement for aquariums is made as follows: Mix 1 gill plaster of Paris, 1 gill litharge, 1 gill fine white sand and $\frac{1}{3}$ gill finely powdered rosin together, and add an

equal quantity of boiled linseed oil and turpentine, until the consistency is about the same as putty. This cement will dry hard in a few days.

GUARD FOR AIR DUCT IN HOT AIR FURNACE

When there is a strong wind from the outside blowing into the air supply duct of a hot air furnace, the swinging damper



Wind Guard for Air Supply Ducts

shown in the illustration can be used to prevent the admission of too much air, says the Metal Worker. The damper is hinged at the top and swings loosely in an enlarged entrance to the air supply duct. Under excessive wind pressure the damper is blown up against the opening of the duct leading to the furnace, closing it off and preventing the cold air from entering too freely.

DEVICE FOR DRAWING CORNERS

A device more convenient than compasses for drawing round corners and fillets of various sizes is shown at Fig. 1. Radii are

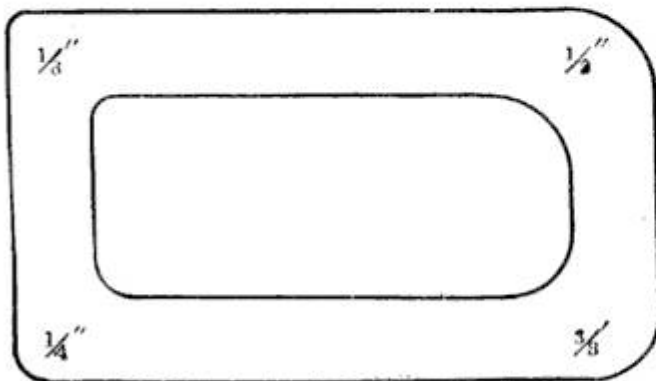


Fig. 1

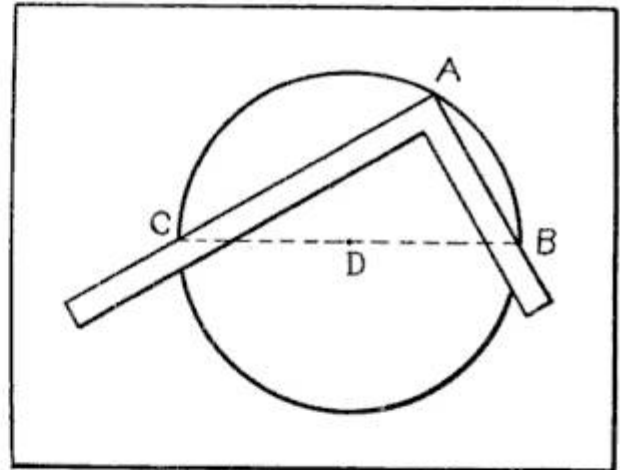
Useful for Drawing Round Corners and Fillets

marked, the outside ones being made enough smaller and the inside ones enough larger to make the corners the size indicated when drawn with a pencil or inking pen. They can be of various other radii, and if the draftsman wishes to mark what the radius of his curve is, he has the figures before him.

Sheet metal, nickel-plated or celluloid is the proper material for this instrument. It should be $\frac{1}{2}$ in. thick, beveled on one side and used flat side down for the pencil and up for the inking pen. Fig. 2 shows its application. Curves A and B were drawn by using the outside corners, says the American Machinist, and the others by using the inside corners.

TO FIND THE CENTER OF A CIRCLE

To find the center of a barrel-head or other circular object lay a steel square on the circle with the point touching any part of the circumference A. From the intersections, C B, of the two legs with the circumference



Finding the Center of a Circle

draw the line C B. Bisecting this line at D gives the required center of the circle.—Contributed by H. J. Heaton, Sidney, Iowa.

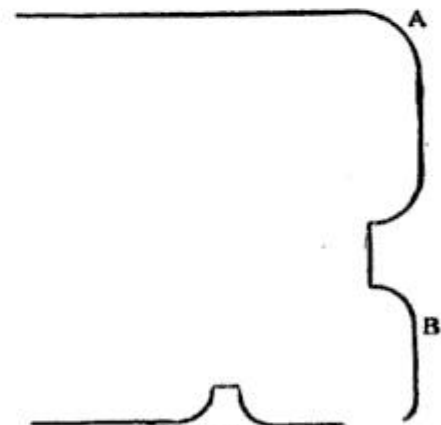


Fig. 2

TO COLOR COPPER ROOFS GREEN

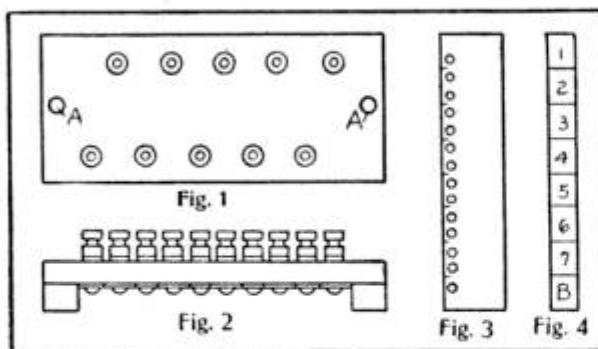
To 5 gal. water add 1 lb. sal ammoniac, dissolve thoroughly and let stand 24 hours. Then apply the solution to the copper with a brush, covering the entire surface carefully. Let it stand for one day, says the American Artisan, then sprinkle it lightly with water, using a brush. Do not use too much water or it will run the color and streak it.

The same effect can be produced by using $\frac{1}{2}$ lb. salt to 2 gal. water.

HOME-MADE LOCK-NUT STRIP

It is often handy to have a lock-nut strip to fasten wires on when testing. The diagram shows a strip that is cheaply made by using the binding posts from the carbons of old dry batteries.

Cut out a piece of $\frac{1}{4}$ -in. oak, or white wood, 4 in. long and 2 in. wide, and bore a hole, A, in the center on each end to receive screws for fastening the strip down. Bore a row of holes, $\frac{1}{2}$ in. apart, down one side and another row the same distance apart on the opposite side, so that they are on a line between the holes of the first row. Insert the binding posts, which should fit snugly, in these holes and lock them tightly with the small nut that was next to the carbon. Place two brass or copper washers on each post and screw on the thumb nuts. Place one wire under the bottom washer and the other between the two washers and fasten them down with the thumb nut. The strip can be made any length to suit the number of connections.



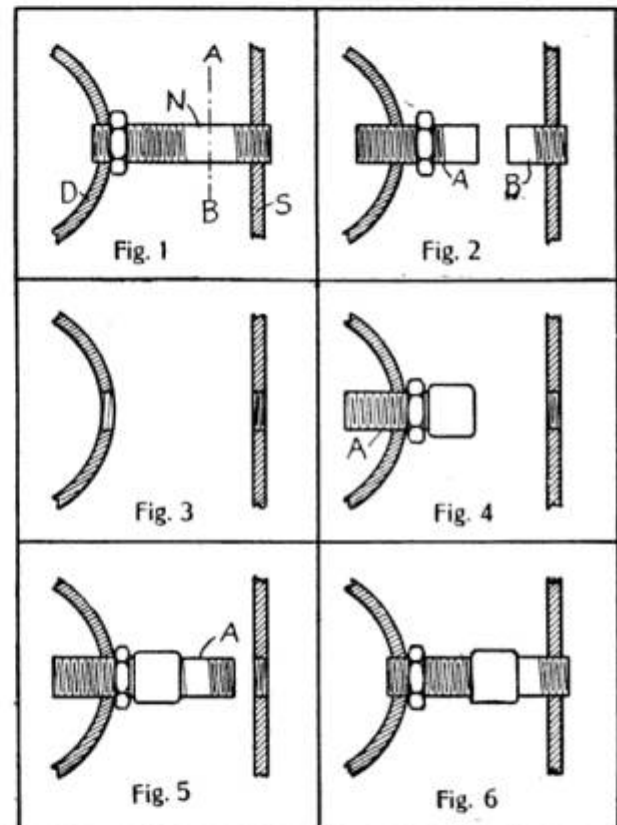
Lock-Nut and Form Strips

A form strip to go with the lock-nut strip is shown in Figs. 3 and 4. It is made of a piece of the same wood, 1 in. wide and 4 in. long. Bore holes, according to the size of wire used, $\frac{1}{4}$ in. apart, $\frac{1}{4}$ in. from the edge. Bore a hole at each end through the 1-in. way for fastening screws. Sandpaper

the face of the board and shellac it. Then with a saw cut niches $\frac{1}{2}$ in. apart across the top, so as to bring two holes in each space. Number the spaces to suit the job (Fig. 4).—Contributed by H. H. Fountain, Brooklyn, N. Y.

RENEWING A RUNNING THREAD NIPPLE—A PROBLEM IN PIPING

On testing a low-pressure boiler we had put up at Riverdale, N. Y., we found a defective nipple, N, Fig. 1, which connected the section, S, and the drum, D. The distance between S and D could not be changed,



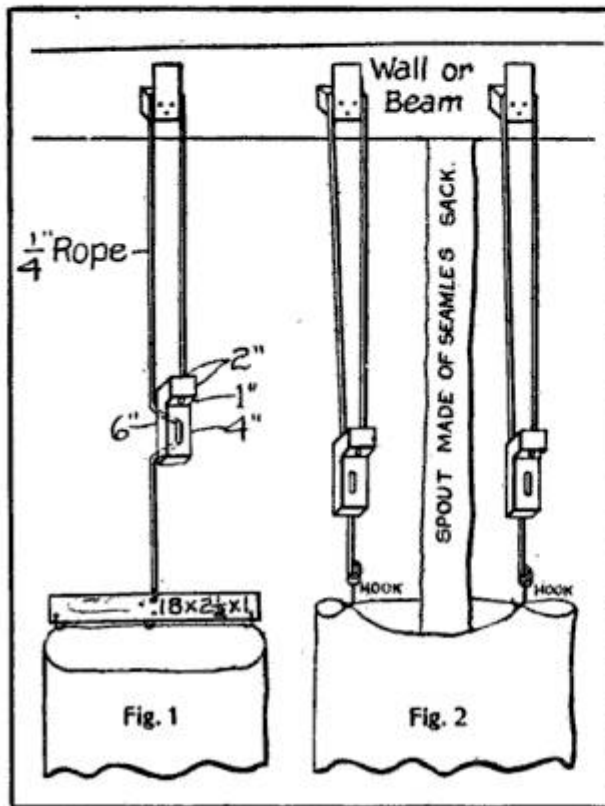
Problem in Piping

so we cut the nipple on the line A B, and ran the lock nut up to the end of the thread on piece A, Fig. 2. We then screwed the half A into the drum, far enough to remove the piece B. This made room enough to remove the half A, thus leaving both openings clear as in Fig. 3.

We then made a running thread nipple, A, Fig. 4, with lock nut and coupling attached, and screwed it into the drum as far as possible (Fig. 4). Then we screwed a short nipple, A, Fig. 5, into the coupling, and unscrewed the running thread nipple, thus bringing the connection into the section, as shown in Fig. 6. The lock nut was then screwed tightly against the drum, as shown, and the job was complete.—Contributed by Gus Cook, 153 W. 62nd St., New York City.

LABOR=SAVING SACK HOLDER

A handy sack holder, the device of a correspondent of the American Miller, is shown in the illustration. The materials used in its construction did not cost more than 25



Handy Sack Holder

cents, and yet the device saves the labor of one man.

The holder can be raised or lowered to suit the height of the sack being filled, by catching the board, or lower rope, with one hand and raising or lowering the block with the other.

HOW TO RESHARPEN OLD FILES

Clean the files thoroughly, using a scratch brush and a strong solution of washing soda in hot water, then wash off the soda with hot water.

Prepare a bath of 1 part nitric acid to 4 parts water contained in an earthen vessel. Sort and grade the files according to fineness and immerse those of each grade in the bath. The finer files should be left in the bath about a minute, and the coarser cuts five or six minutes, says the Metal Worker. After the acid bath, wash the files in hot water, dry, and grease them while still warm with vaseline.

In preparing the acid bath pour the acid into the water very slowly, as the heat action is great.

HOW TO MEASURE BELT ON PULLEY

A short rule for finding the change required in the length of belt when one of the pulleys on which it runs is changed for one of different size, is as follows: Take three times the difference between the diameters of the pulleys and divide by two. The result will be the length of belt to cut out or put in.—Practical Engineer.

FATIGUE OF MATERIALS

In a former number of Popular Mechanics, a description was given of the fatigue of metals, showing that great precaution should be used in designing machinery subjected to varying loads. The necessity of observing this property of matter has been emphasized by other examples of fatigue, which have recently been brought to our notice. It has been found that watch springs often break several hours after the last winding, although the tension at the time of breaking is much less than when wound up tight.

In larger machines the same thing often occurs. Crane hooks which have, in many instances, carried 20 to 25 tons, break with a load of 10 or 15 tons, and valves which are tested to several hundred pounds hydraulic pressure, sometimes break on less than 50 lbs. For this reason the hydraulic test used on boilers should not be carried to excess.

Probably the most remarkable cases of fatigue are found in floors. The top floor of a five-story factory building, which was heavily loaded with paper, fell in the dead of night, taking the other four floors with it, and crashing down into the basement. All the machinery in the building was in operation the day previous to the disaster, and the heavy jarring and rapid vibration would be expected to determine the time of falling, but the jarring and vibration evidently ceased slightly before the stress in the material reached the yielding point. Another still more remarkable case occurred in France a few years ago. In this instance, a ball room floor which had been crowded with dancers the entire evening, gave way with a sudden crash, after all the people had left and the only load was its own weight.

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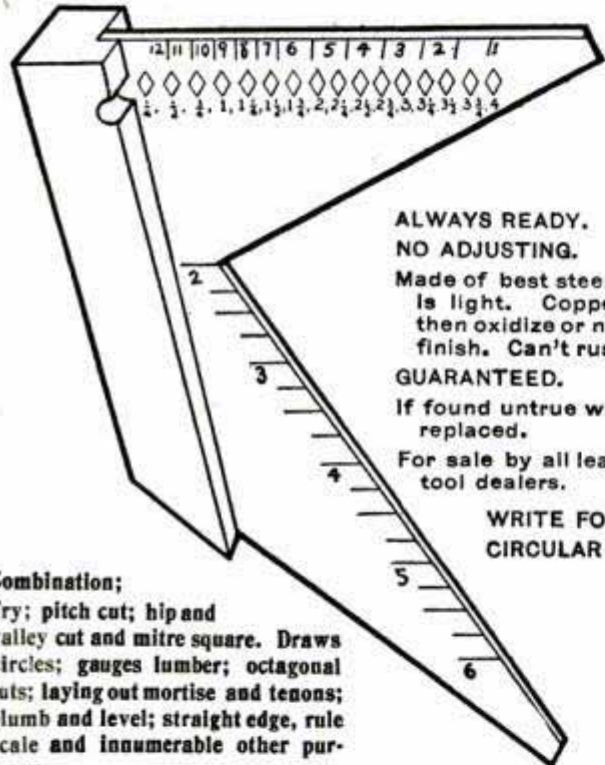
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We seldom stop to think how many articles and products enter into the construction and maintenance of the ship. Let us see: of American indigenous products and materials there are sixteen basic materials, with scores of minor materials of less importance. From the farm and plantation, ranch and garden there are over fifty products that are used on vessels; while from the factory nearly one hundred and fifty articles are furnished to ships direct; many of these being renewed frequently during the life of the ship. Scarce anything that is in every-day use on shore but is required on ship-board. The manufacturers of the country are now awake to the value of the ship as a source of direct trade for their goods, as well as a means of sending their output out into the markets of the world. The people at large want shipbuilding revived, and over-sea traffic restored and firmly established. And the only drawback to this desirable condition of maritime affairs appears to be in the efforts of the "blockaders" in Congress, for reasons not yet made public, to prevent the necessary legislation to this important end. But these obstructionists must understand that the voice of the people is for American-built ships for the American flag, and with these ships this great nation proposes to enter into foreign trade and regain its former prestige on the watery highways of the world, cost what it may.—American Shipbuilder.

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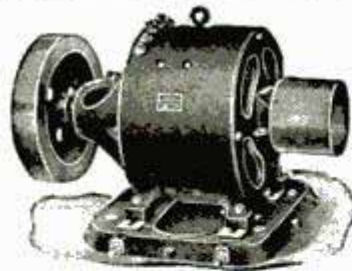
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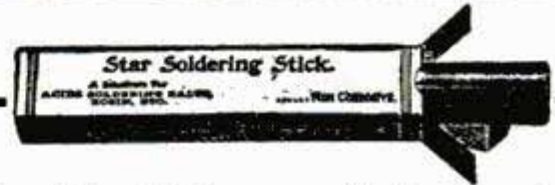
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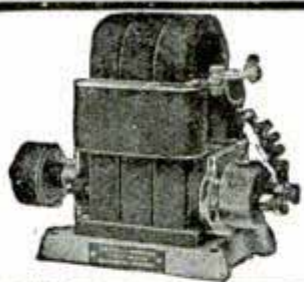
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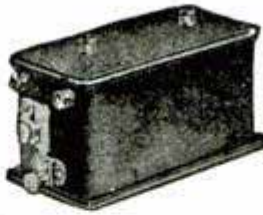


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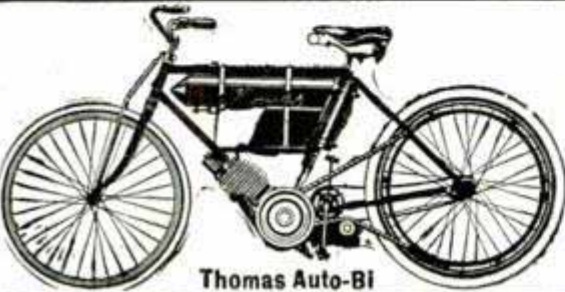
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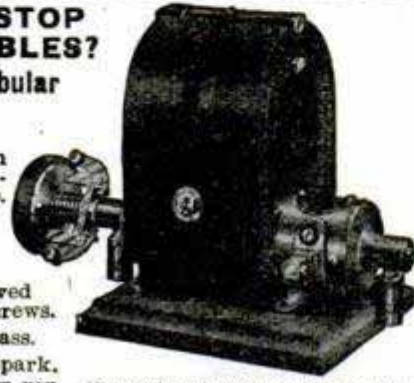
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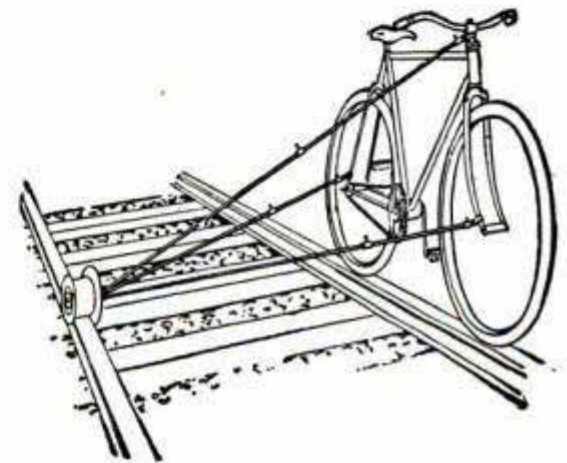
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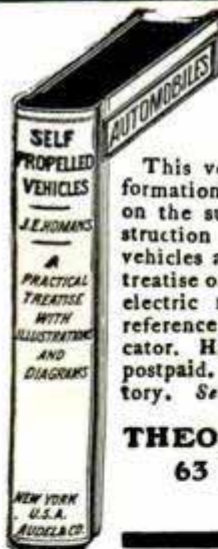
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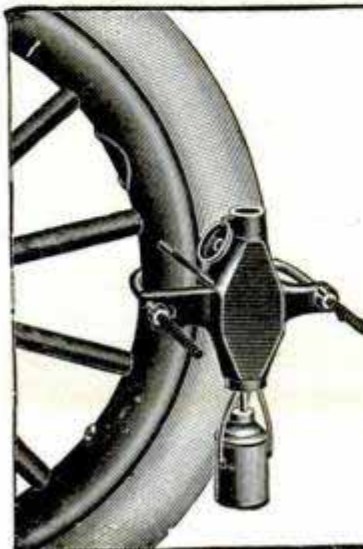
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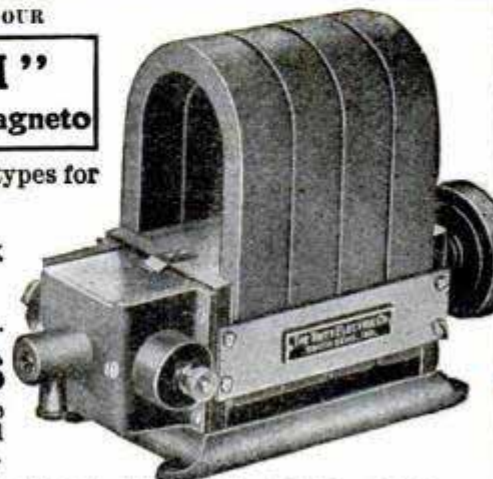
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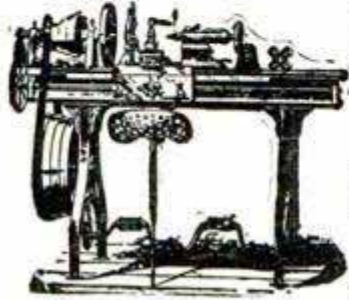
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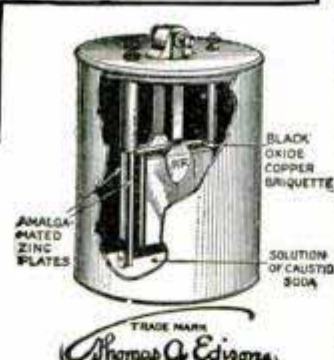
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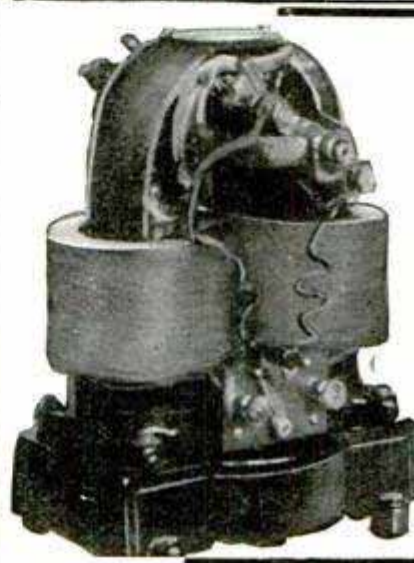


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His mate ran to a near-by farmhouse and asked for a spade.

"What do you want it for?" asked the farmer.

"Shure Mike is stuck in the bog, and I want to dig him out."

"How far in is he sunk?"

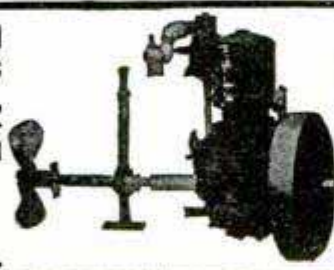
"Oh, up to his ankles."

"Begorra, then he can asly walk out," replied the farmer.

"Begorra, but he can't," retorted Pat; "he's in the wrong end up."—London Elec. Mag.

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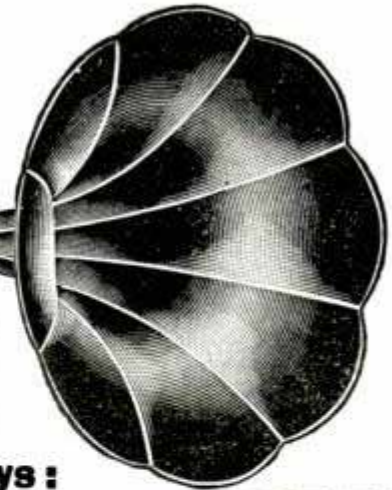
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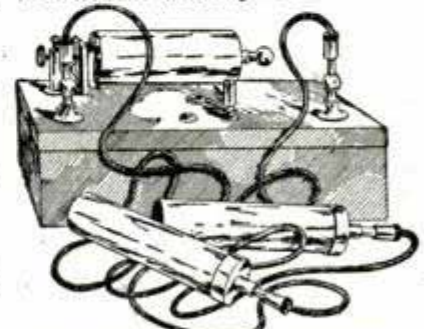
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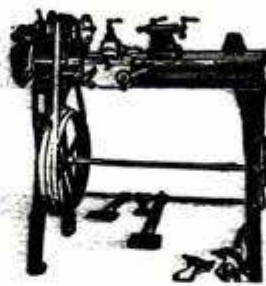
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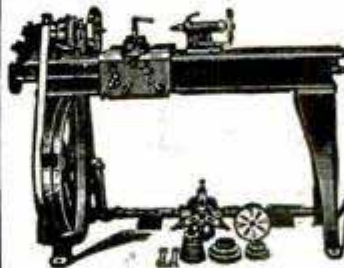


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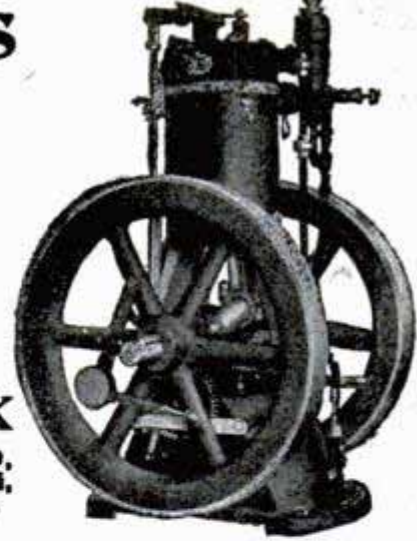
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The Ideal Lawnmower Grinder

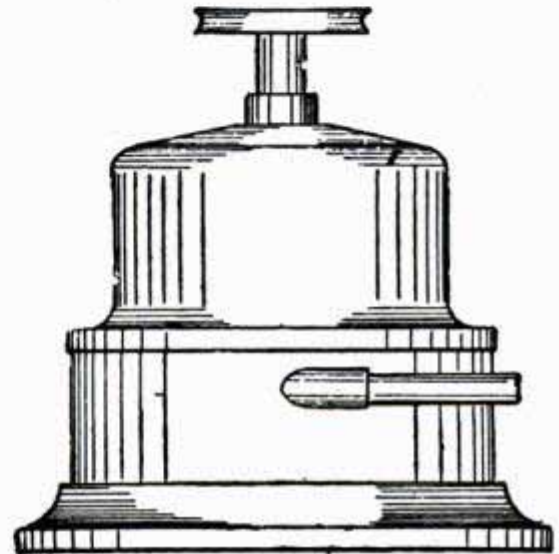


Sharpens any Lawnmower accurately in 10 to 15 minutes, makes the blades absolutely true, gives them a perfect clearance, does the work quicker and cheaper than it can be done by hand. Nothing like it on the market. Made for both hand and power use.

Write for full description and prices TODAY.

THE ROOT BROS. CO. - Plymouth, Ohio

Model Steam Turbine



We offer the first successful steam turbine for students and amateurs on exact lines and principles of large engines. Will develop as high as $\frac{1}{4}$ H. P. Runs at great speed and will drive small dynamos, small machinery, fans, etc.

We sell complete sets of castings and parts, easily finished and assembled by anyone by means of complete working drawings and instructions with every set. Work can be done on small foot lathe.

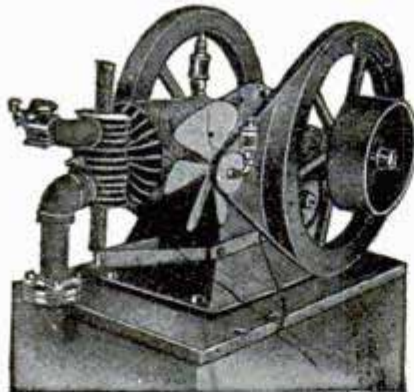
Price per set, including iron castings, brass vanes or buckets, phosphor bronze bearings, and blue prints, only five dollars, \$5.00. Weight about 20 lbs; stands about 7 inches high. Catalogue Free.

EASTERN MACHINE CO.

Nashua, N. H.

THE LARGEST AIR-COOLED MOTOR MADE 5 HORSE POWER

Bore 6x6 inches. Plenty of cooling surface. No engine ever constructed with so few working parts. You can hold your hand on the flanges after it has been working all day.



Write for Agency.

Gasoline tank in base or outside.

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

HAVE YOU USED AN "I D" EMERY HOLDER?



If not, why not? Get it now and save TIME, PAPER, and PATIENCE. The "I D" paperholder will hold either emery cloth or sand-paper, and should be used in all cases where a good finish or polish is desired. When the cloth wears out, it can be very easily and quickly replaced. (See Cut.) By using an "I D", corners and grooves can be

reached that are invariably skipped over with the ordinary "block of wood." Its uses are not confined to a shop only, but will be found very handy around the HOME or FARM for making general repairs. In the kitchen it will remove rust and soot and can be used as a knife sharpener. Has a thousand other uses too numerous to mention. Sample by prepaid mail, 14 Cents. Better order today. Snap for Canvassers.

THE I D MANUFACTURING CO., Box 300, Tonica, La Salle Co., Ill.

YOUR INTERESTS AND OURS ARE IDENTICAL

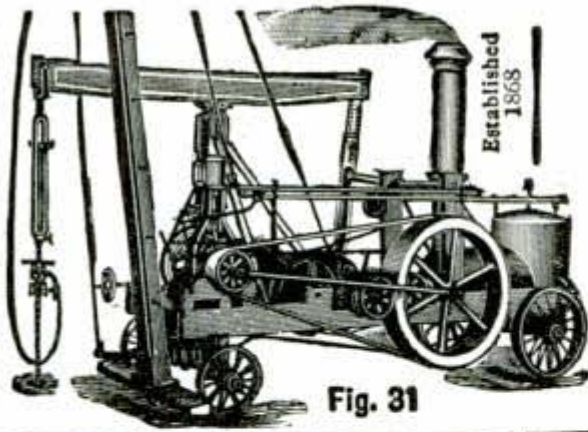


Fig. 31

**You Want Practical
WELL DRILLING MACHINERY
to develop that
Mineral, Oil or Water**

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

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

**THE AMERICAN WELL WORKS,
AURORA, ILL., U. S. A.
CHICAGO, ILL. DALLAS, TEXAS**

THE JUNIOR AUTO MARINE MOTOR.

1 1/2 H. P., Weight, 58 lbs.
Price, \$35.50 Engine Only.
2 H. P. Engine Only
Price, \$47.50



Has more good points of merit than any
Engine on earth. Fewer parts and less
complicated; runs with absolutely no vibra-
tion, is noiseless, and controlled by one lever.
Our guarantee for two years is sufficient
evidence of Merit.

Our line of Junior Stationary Engines is
equally as good. "NONE BETTER," and a
circular of either can be had for the asking.

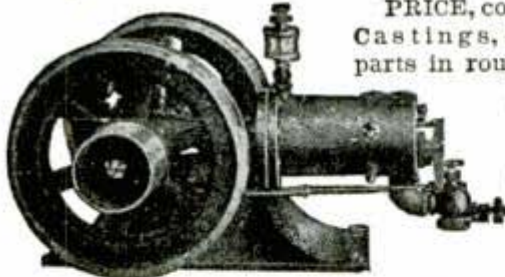
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PRICE, complete set of
Castings, including all
parts in rough with blue
prints—

\$15.00



Send for Booklet on Stationary, Marine and Bicycle
Motors. Also Castings for same.

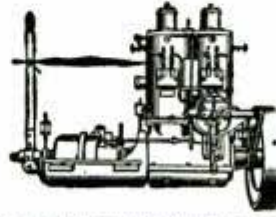
L. W. GILLESPIE & COMPANY, - Marion, Ind.

THE MIETZ & WEISS OIL AND GAS ENGINES

Stationary, 1 1/2 to 80 H. P.
Marine, 1 1/2 to 100 H. P.

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some one in every town. The price of a new mirror, 18x
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a glass of this size for 20 cents. A moment's thought
will show you the immense profits.

The expense of going into this business is but a trifle
as you have no machinery or tools to buy. The neces-
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you can do the work right at home in your own kitchen.

We have sold our renowned processes for years, hun-
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money.

Special price now 50 cents [for a short time only]
if you will return this advertisement with your order.

We also tell you, **Free of Charge**, how to Emboss,
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if you are not pleased.

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KEROSENE OIL ENGINES

MARINE. STATIONARY. PORTABLE.

No Danger, Maximum Power, Lightest Weight, Simple,
Reliable, Economical No Batteries, Self-ignition by com-
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Make Your Own Light

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

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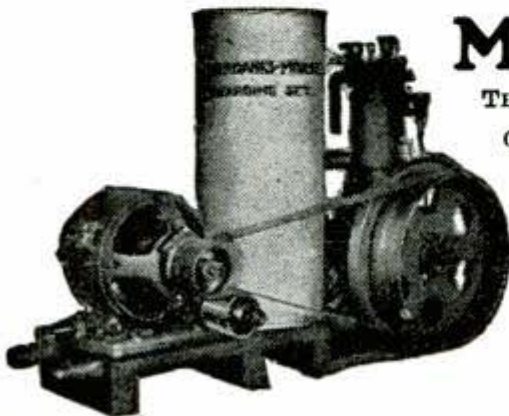
Please send me illustrated Catalogue No. C 449 Gasoline Engines

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

Name.....

Street No.....

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



OTTO ENGINES

Bought in 1895---Been Running Constantly

The Naugatuck News, Naugatuck, Conn., writing for supplies, incidentally remarks: "The engine has been a fine one, in fact the best investment we ever made." Surely a splendid tribute to pay to a piece of machinery. "Otto" design, "Otto" materials and "Otto" workmanship combine to make "Otto" excellence. "Otto" engines can never be "cheap," yet are always the CHEAPEST



OTTO GAS ENGINE WORKS, Phila, Pa.

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SEND FOR IT

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

Willis Shaw, Machinery

171 La Salle St. CHICAGO, ILL.

SMALL MOTORS

200 1-8 H.P., 110 Volt, 60 Cycle **\$13.50**
Westinghouse, Alternating Current Motors, each

90 1-8 H.P., 110 Volt Westinghouse, **\$8.00**
New, Direct Current, Shunt Wound Motors, each,

Send for our monthly bargain sheet on electrical supplies, motors, dynamos, etc. **LARGEST STOCK IN AMERICA.**

GUARANTEE ELEC. CO. Adams and Clinton CHICAGO, ILL.

HERCULES PORTABLE CRANE HOIST

Large and small concerns find it an ideal machine, filling their want exactly.

WHAT IT DOES

With the labor of only one man it picks up, transports and delivers heavy and cumbersome material to any part of the shop accessible by pathway, and tends lathe planer and such like.

No time is lost in getting ready, no other work delayed, no labor standing idle waiting—keeps them moving. Always ready, easily put aside, and does not wear the floors.

Cost trifling compared with traveling Crane-and-Trolley; maintenance nominal, dispenses with two or three laborers.

Concise, it is the odd tool that is called on to do a multitude of work, almost indispensable.

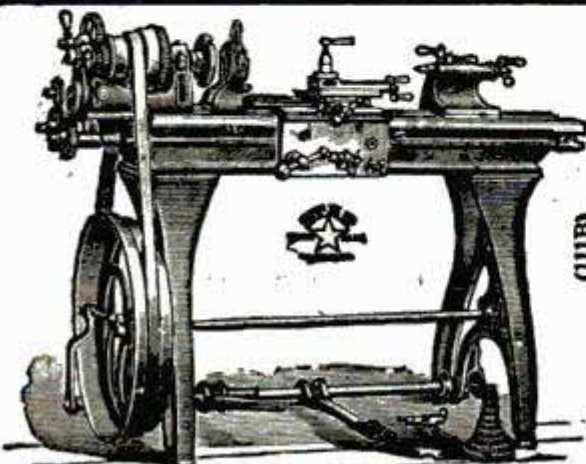
It is built in a strong, substantial manner, of best materials; steel shapes form the frame.

Sizes range from 1,000 to 6,000 lbs. capacity.



Patented Dec. 19, 1905.

MANUFACTURED SOLELY FOR
WILLIAM S. NICHOLLS,
252 Broadway NEW YORK CITY



Accurate Work on Foot Power Lathes

is considered next to impossible by many good mechanics, but such opinion is based on experience with cheaply built machines, and the amateurish reputation of foot power lathes.

IN DESIGNING AND BUILDING

STAR FOOT POWER LATHES

cuts have been avoided and "Star" Lathes are unsurpassed in these essential points, high quality of material, workmanship and of results. "Star" Lathes are shipped on approval, if they fail to give entire satisfaction, may be returned at our expense.

SEND FOR CATALOG B

THE SENECA FALLS MFG. CO.
102 Water St. - Seneca Falls, N. Y., U. S. A.

Engine Lathes, Bench Lathes, Foot Power Lathes, Speed Lathes, Wood Turning Lathes.

EVERY SMOKER WANTS ONE

The most useful pocket lighter ever invented. Throw away your matches. The "Instanto" produces a steady flame, without matches, by simply removing the cover, as shown in illustration. Lights a cigar, gas jet, kindles a fire, or shows the way in the dark. Useful every day and night of the year.



The "Instanto" Pocket Cigar Lighter

"INSTANTO"
(Trade Mark)

(IGNITED BY AIR)

"INSTANTO"
(Trade Mark)

Will not ignite unless exposed to the air. Absolutely safe. Always dependable. Conveniently carried in the vest pocket. With ordinary care is practically indestructible. Handsome Nickel Plated Lighter, 50 cents; Gun Metal, \$1.50; Sterling Silver, \$3.50. Special quotations on solid Gold and Gold Plated Cases. Sent postpaid on receipt of stamps or money order. The public and trade are cautioned against purchasing cigar lighters of a similar nature. Lawsuits are now pending.

Our Self Acting Gas Lighter

is brand new. Not a gas mantle. Cannot get out of order, as it does not rest in the flame. A simple and lasting device which when applied ignites the gas immediately. Absolutely safe. Being an article which we will guarantee as substantial and of real merit. It supersedes anything of its kind. Any reputable dealer or write us for particulars.

Send for Price List of our other Novelties.
AGENTS WANTED.

G.L. STEINREICH & CO. Room 1, 190-196 W. Broadway, New York



Pat. June 27, '05.

All infringements will be vigorously prosecuted.

1/2 Size

Shave Yourself



No Stropping—No Honing

Solid German Silver Head. Handle Heavy Nickel Plated.
12 BLADES
6 to 20 shaves from each blade. Complete set in Leatherette case. Fully Guaranteed. Price \$1.00, Postpaid.

EMMELMANN BROS. MFG. CO.,
Indianapolis, Ind., U. S. A.

WOOD AS AN EXPLOSIVE.—It would seem rather absurd to class wood as an explosive, yet gasoline is commonly spoken of in that way and it, strictly speaking, is no more explosive than is wood, says the Woodworker. Gasoline cannot explode till it is gasified, or vaporized, and mixed with a certain proportion of air, and wood, treated in the same way, is just as explosive; it takes more heat to gasify it, that's all.

The writer has a very vivid (lurid would perhaps be better) recollection of, in the early days of his apprenticeship at wood-work, filling a large box stove half full of turning shavings; this on top of a bed of live coals. After a time, as the fire didn't seem to be having the desired effect, he stooped in front of the stove to readjust the draft, just as the thing got ready to do business. The pipe was disjointed,

the covers sought the ceiling and the door, flying open, vomited forth a volume of flame which completely enveloped him, the burning cinders firing his clothes in a dozen places, while a goodly handful went down his back, under the clothing. Later in life another stove, loaded the same, robbed him of certain hirsute adornments which had cost years of careful nurture.

A man, burning shop refuse out of doors, emptied on the fire a basket of shavings mixed with a lot of dust from a sander, and was immediately completely enveloped in the flame from the dust, which burned as freely as leopodium.

Yes, wood is explosive.

PATENT OFFICE PROFITABLE.—The annual report of the commissioner of patents for the year ending December 31, 1905, has been issued. It shows receipts of \$1,806,758.14 and expenditures of \$1,479,633.22 leaving a balance of \$327,124.92, which added to the surplus patent fund now in the United States treasury, makes over \$6,000,000 which inventors have paid to the government in excess of expenses. The patent office is one of the few bureaus of the government which more than pays its operating expenses. Owing to the increase in the number of applications for patents some of the divisions of the office are several months in arrears with their work and more examiners are needed, but congress is always niggardly in its treatment of this most important branch of the government service.



ELECTRIC BOOK FREE

Interesting and Instructive

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

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Is Your Sight Failing?

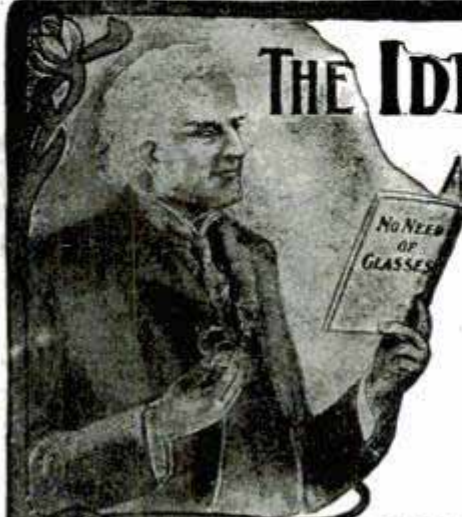
All refractive errors, muscular trouble and chronic diseases of the Eye successfully treated by scientific **MASSAGE.**

"I am in my seventy-ninth year, and have the Sight Restorer and yourselves to thank for renewed eye-sight." (Testimonial 177)

"I wish I could impress every one afflicted so they would give the Restorer a trial." (Testimonial 244)

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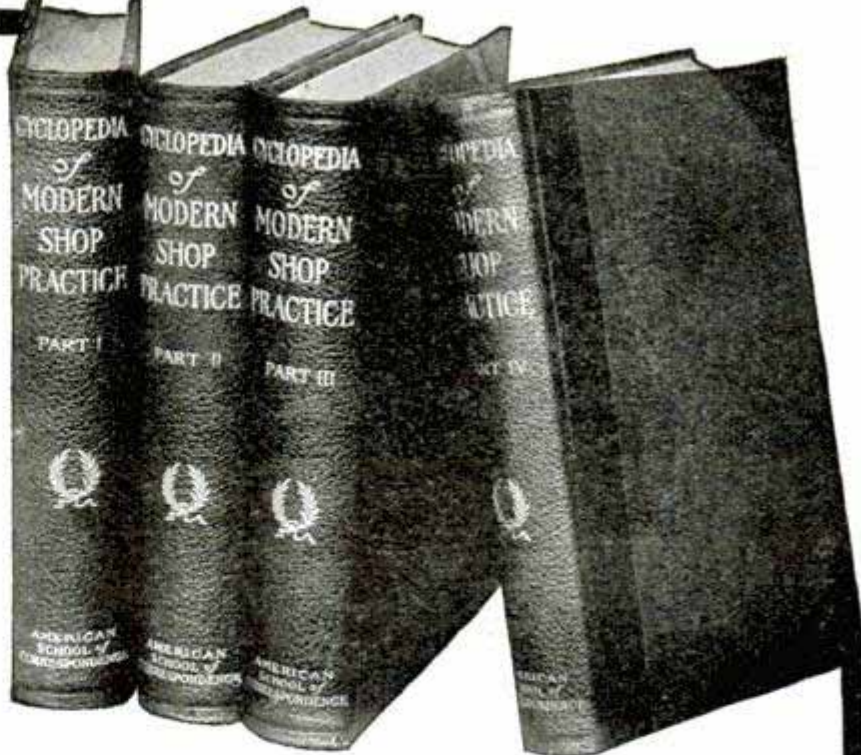
THE IDEAL COMPANY, 239 Broadway, New York.



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Vol. IV. Forging, Welding, Tool Forging and Tempering, Electric Welding, Sheet Metal Work, Tinsmithing, Mechanical Drawing, Working Drawings, Shop Drawings, Mechanism.

LONGEST UNDERGROUND TELEPHONE LINE IN THE WORLD

The longest underground telephone line in the world has recently been completed, and extends from New York City to New Haven, Conn., a distance of over 70 miles. If this system proves to be a success, its extension to other cities may be expected very soon.

The time may come when telephone poles

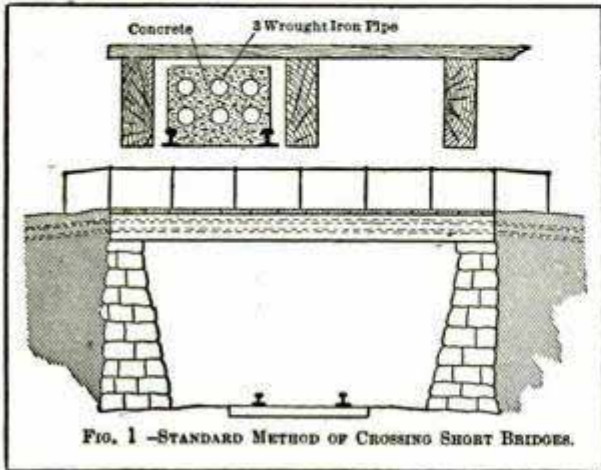


FIG. 1—STANDARD METHOD OF CROSSING SHORT BRIDGES.

in cities will be a curiosity, as the advantages of underground wires seem to more than compensate for the additional expense. The objectionable appearance of a confused network of overhead wires ought to be sufficient to condemn that system for cities, and the liability to open circuits in case of high winds, or accumulations of sleet on the wires, makes it unreliable for all places. Another objection is the danger occasioned when a telephone wire becomes crossed with a high-voltage wire. This frequently occurs in the overhead system, but when the two wires are in separate ducts a cross is almost impossible.

The underground line mentioned has wires laid in ducts, which are of several different types, preference being given to one or the other according to the physical condition of the country, the obstacles met with, and the probability of future excavating or blasting in the locality. Most of the conduit work was formed of vitrified tile sections, but where heavy rock cuts were encountered creosoted wood ducts were used, as these offer

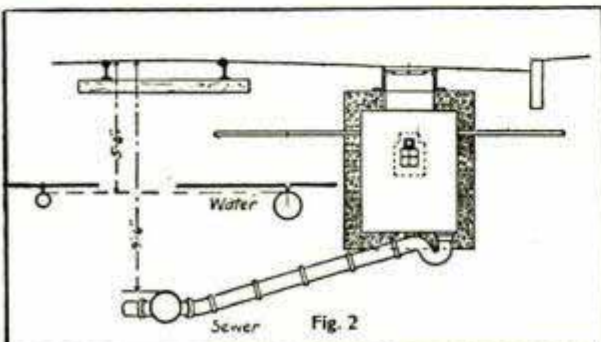


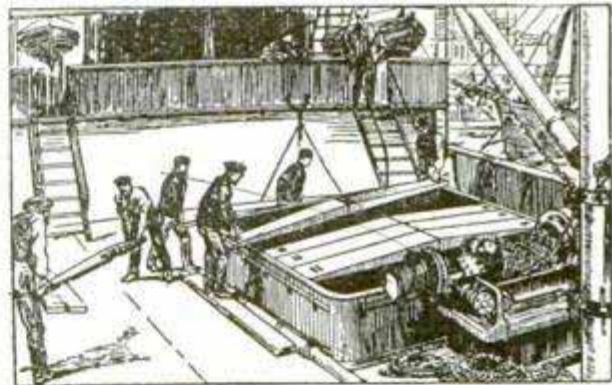
Fig. 2

less possibility of shattering where future blasting might cause trouble.

Where water was encountered the wires were either run through submarine cables, or laid in tile conduits, encased in concrete. The standard bridge crossing, shown in Fig. 1, was the method employed for crossing all the short bridges. A number of 3-in. pipes were covered with concrete and reinforced with steel rails as shown, and the wires were then drawn through the pipes. The standard street construction is shown in Fig. 2, which is a section through a manhole. This shows the ideal location of the underground service, and was used in all the city streets, except where obstacles which made this form of construction impossible were encountered.

SAFETY HATCHWAY PLANKS

One might as well fall out of the sixth story of a city skyscraper as down the open hatchway of a modern ocean steamer; the result in either case is usually fatal. An English naval constructor has devised a



New Safety Cover

hatchway cover which, being in small sections like planks, can be put in place by two men and does not involve the use of a derrick as in the case of a solid, one-piece cover.

PROFIT IN RAISING SUNKEN LOGS

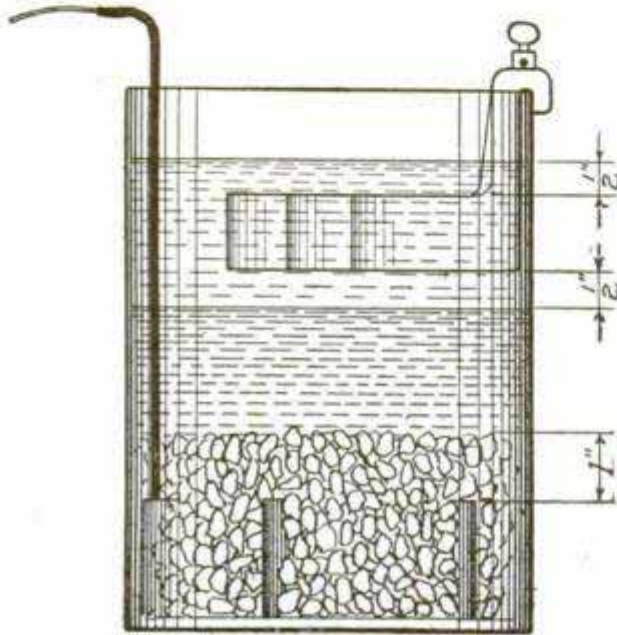
Raising sunken logs is a new industry being exploited at Beaumont, Texas. A barge 80 ft. long and 20 ft. wide, equipped with hoisting engine, derrick and swinging boom, is used for raising the logs, and three other barges are provided for receiving them. These receiving barges have timbers bolted to the deck crosswise so that they receive the logs lengthwise.

The lumber from the logs will be very valuable and the question of whether the ownership vests in the company recovering them has been raised.

then require a large number of batteries to give a sufficiently high voltage.

The directions for setting up a gravity battery are as follows: Use about $3\frac{1}{2}$ lbs. of blue stone or enough to cover the copper element one inch. Pour in water sufficient to cover the zinc one-half inch. Short-circuit for three hours and the battery is ready for use. If desired for use immediately do not short-circuit, but add 5 or 6 oz. of zinc sulphate.

Keep the dividing line between the blue



Setting up a Gravity Battery

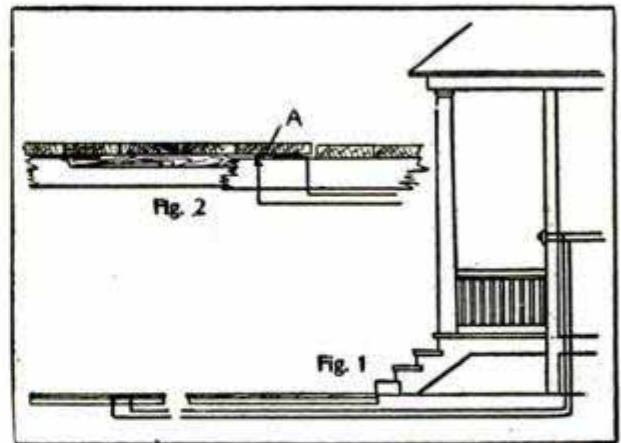
and white liquids about one-half inch below the bottom of the zinc. If too low syphon off some of the white liquid and add the same amount of water, but do not agitate or mix the two solutions. This type of battery will give about .9 of a volt and should be used on a circuit of about 100 milliamperes.

CALLERS' APPROACH ALARM

This alarm rings so that callers approaching the door may be seen before they ring the bell and one can exercise his pleasure about admitting them—as in the case of agents or beggars; it may not be desirable to see them.

If one has a wooden walk the alarm is easy to fix up. Take up about 5 ft. of the walk and nail it together so as to make a trap door that will work easily. Place a small spring under one end to hold it up about $\frac{1}{4}$ in. (A, Fig. 2). Nail a strip of tin along the under side of the trap near the spring and fasten another strip on the baseboard, so that they will not touch, save when a weight is on the trap. Connect up

an electric bell, putting the batteries and bell anywhere desired, and using rubber-covered wire outside the house, and the alarm is complete.

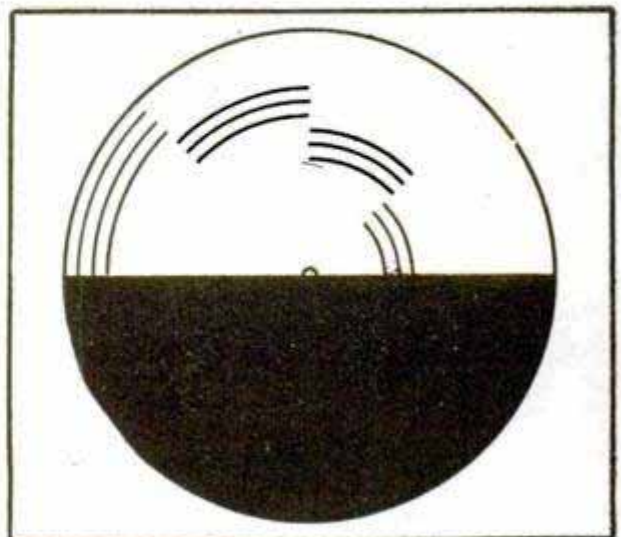


Alarm Rings When Caller Approaches

When any person approaching the house steps on the trap the bell will ring and those in the house can see who it is before the door bell rings.—Contributed by R. S. Jackson, Minneapolis, Minn.

AN OPTICAL TOP

One of the latest optical delusions, and one not easy to explain, is Benham's color top. Cut out the black and white disc shown in the figure, and paste on a piece of stiff cardboard. Trim the edges of the cardboard to match the shape of the disc, and make a pin hole in the center. Cut the pin in half and push through from the under side until the head of the pin touches the cardboard. Spin slowly in a strong light and some of the lines will appear colored. The colors appear different to different people, and are changed by reversing the rotation.

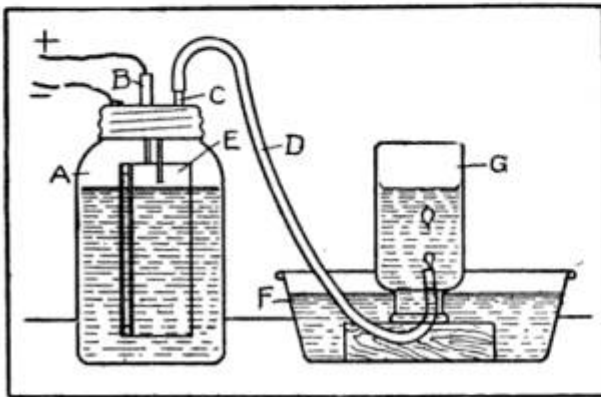


An Optical Top

powder can, or a syrup can with a top soldered to it, and is connected to the engine by a piece of rubber tubing. The heat from a small gas stove will furnish steam fast enough to run the engine very fast. This engine was built by W. G. Schuh. A. J. Eustice, of Cuba, Wis.

SMALL ELECTRICAL HYDROGEN GENERATOR

A small hydrogen generator may be made from a fruit jar, A (see sketch), with two tubes, B C, soldered in the top. The plates, E, can be made of tin or galvanized iron,



Hydrogen Generator

and should be separated about $\frac{1}{8}$ in. by small pieces of wood. One of these plates is connected to metal top, and the wire from the other passes through the tube, B, which is filled with melted rosin or wax, to make it airtight. This wire connects to one side of a battery of two cells, the other wire being soldered to the metal top of the jar, as shown. The jar is partly filled with a very dilute solution of sulphuric acid, about 20 parts of water to 1 of acid.

When the current of electricity passes between the plates, E, hydrogen gas is generated, which rises and passes through the rubber hose, D, into the receiver, G. This is a wide-mouth bottle, which is filled with water and inverted over a pan of water, F. The gas bubbling up displaces the water and fills the bottle.

If the receiver is removed when half full of gas, the remaining space will be filled with air, which will mix with the gas and form an explosive mixture. If a lighted match is then held near the mouth of the bottle a sharp report will be heard.

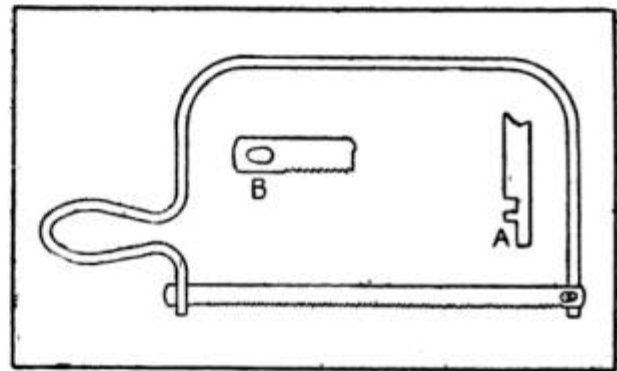
If the bottle is fitted with a cork containing two wires nearly touching, and the apparatus connected with an induction coil, in such a manner that a spark will be produced inside the bottle, the explosion

will blow out the cork or possibly break the bottle. Caution should be used to avoid being struck by pieces of flying glass if this experiment is tried, and under no condition should a lighted match or spark be brought near the end of the rubber hose, D, as the presence of a little air in the generator will make an explosive mixture which would probably break the jar.

HOW TO MAKE A CHEAP BRACKET SAW

For the frame use $\frac{3}{8}$ -in. round iron, bending it as shown in the diagram and filing a knob on each end, at opposite sides to each other, on which to hook the blade.

For the blade an old talking machine spring or a clock spring will do nicely. Heat the spring enough to take some of the temper out of it, in order to drill the holes in the ends, as



Hack Saw Frame and Blade

shown, and file in the teeth. Make the blade 12 in. long, with ten teeth to the inch. A and B show how the blade fits on the frame.—Contributed by Willard J. Hays, Summitville, Ohio.

WHY GRAVITY BATTERIES FAIL TO WORK

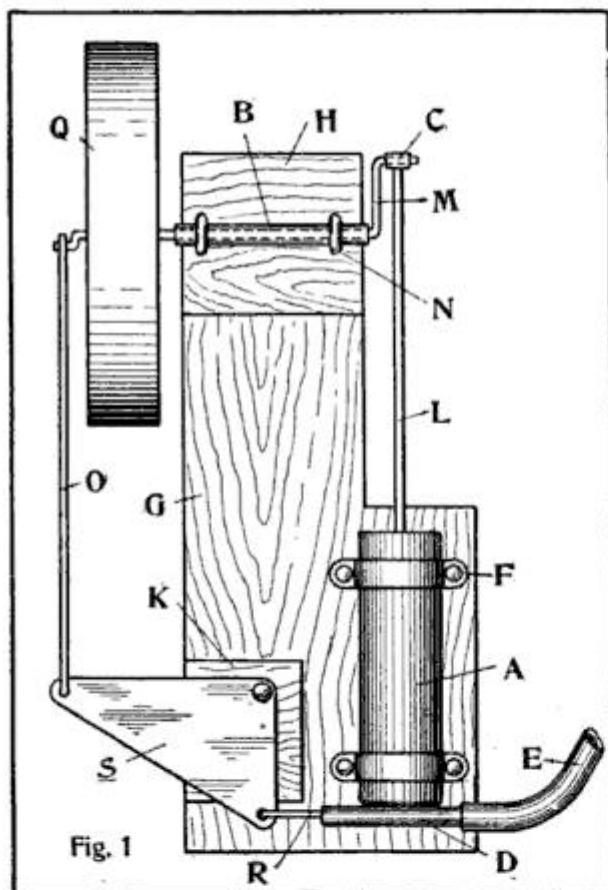
Many amateur electricians and some professionals have had considerable trouble with gravity batteries. They follow directions carefully and then fail to get good results. The usual trouble is not with the battery itself, but with the circuit. A gravity battery is suitable only for a circuit which is normally closed. It is therefore undesirable for electric bells, induction coils and all other open circuit apparatus. The circuit should also have a high resistance. This makes it impractical for running fan motors, as the motor would have to be wound with fine wire and it would

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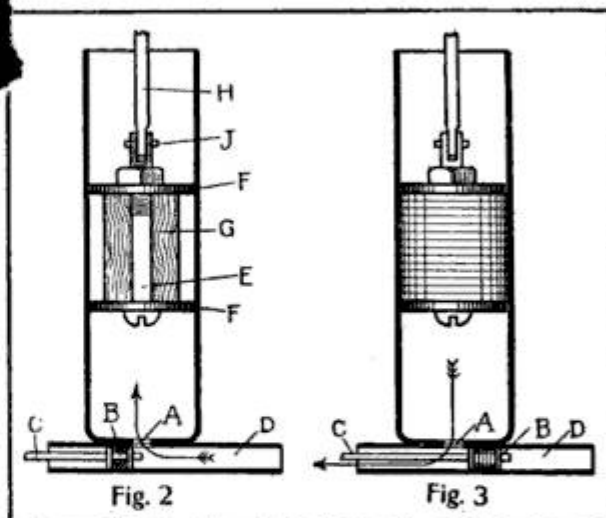
The cylinder, A, Fig. 1, is an old bicycle pump, cut in half. The steam chest, D, is part of the piston tube of the same pump, the other parts being used for the bearing, B, and the crank bearing, C. The flywheel, Q, can be any small sized iron wheel; either an old sewing-machine wheel, pulley wheel, or anything available. We used a wheel from an old high chair for our engine. If



Toy Steam Engine Assembled

the bore in the wheel is too large for the shaft it may be bushed with a piece of hard wood. The shaft is made of heavy steel wire, the size of the hole in the bearing, B.

The base is made of wood, and has two wood blocks, H and K, $\frac{3}{8}$ in. thick, to support bearing, B, and valve crank, S, which is made of tin. The hose, E, connects to the boiler, which will be described later. The clips, F F, are soldered to the cylinder,



Valve Motion And Construction of Piston

and nailed to the base, and the bearing, B, is fastened by staples.

The valve motion is shown in Figs. 2 and 3. In Fig. 2 the steam is entering the cylinder, and in Fig. 3 the valve, B, has closed the steam inlet, and opened the exhaust, thus allowing the steam in the cylinder to escape.

The piston is made of a stove bolt, E, Fig. 2, with two washers, F F, and a cylindrical piece of hard wood, G. This is wound with soft string, as shown in Fig. 3, and saturated with thick oil. A slot is cut in the end of the bolt, E, to receive the connecting rod, H. The valve, B, is made of an old bicycle spoke, C, with the nut cut in half and filed down as shown, the space between the two halves being filled with string, and oiled.

The valve crank, S, Fig. 1, is cut out of tin, or galvanized iron, and is moved by a small crank on the shaft. This crank should be at right angles to the main crank.

The boiler, Fig. 4, can be an old oil can,

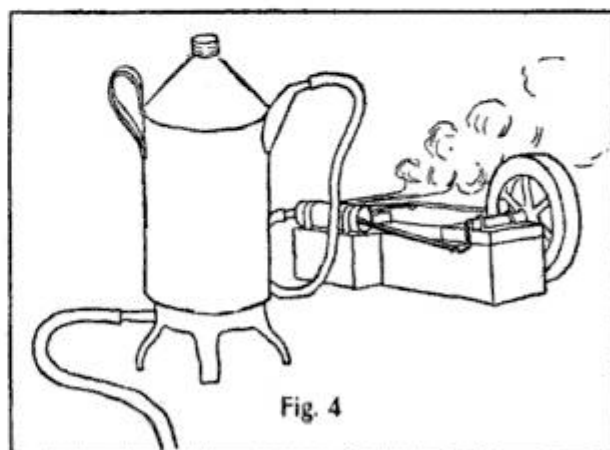


Fig. 4

Engine in Operation

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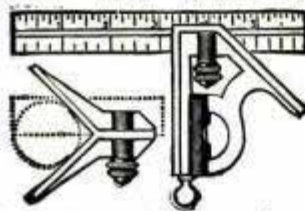


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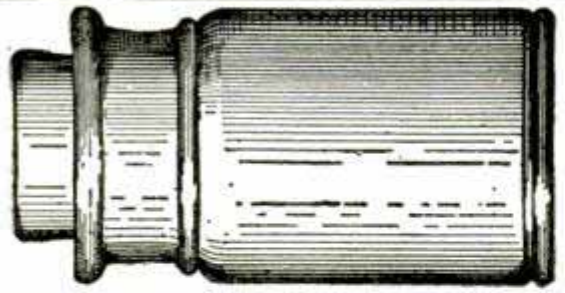
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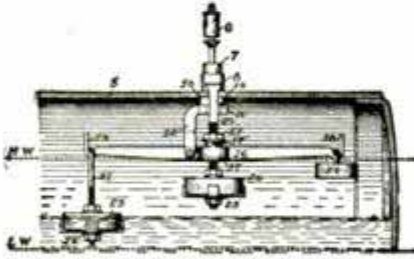
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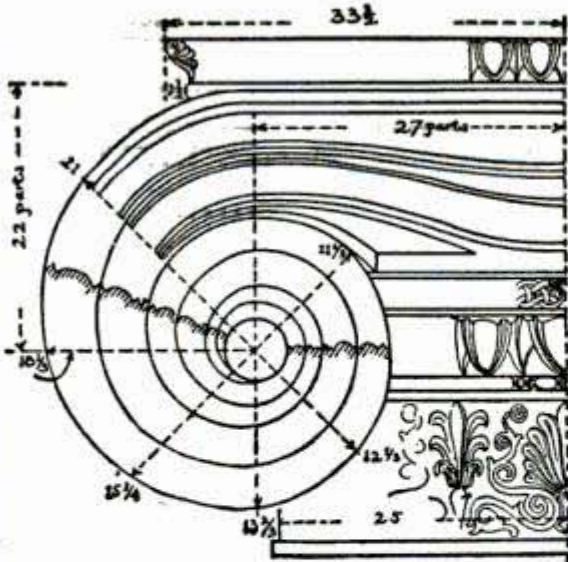
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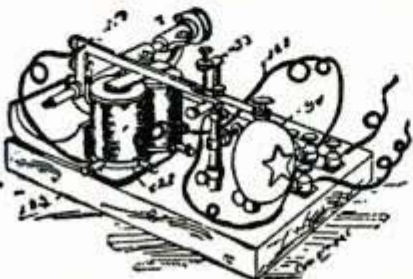
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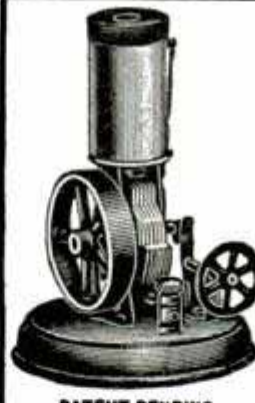
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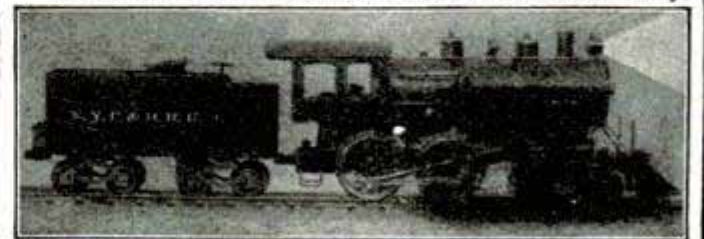
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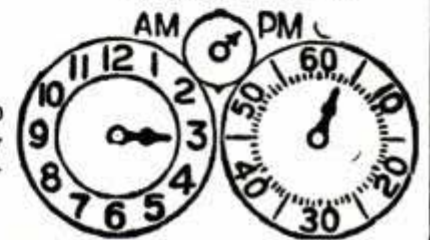
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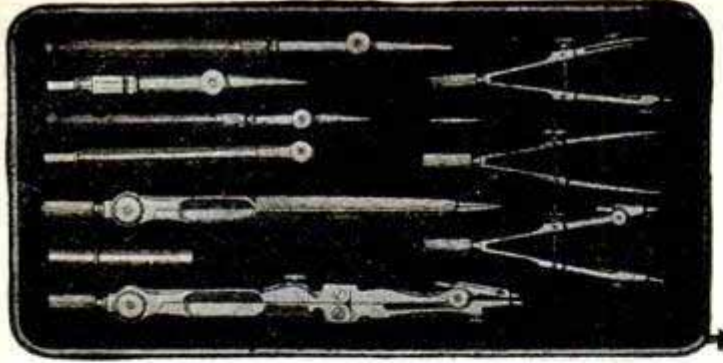
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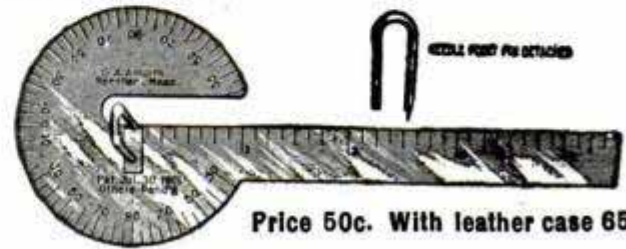
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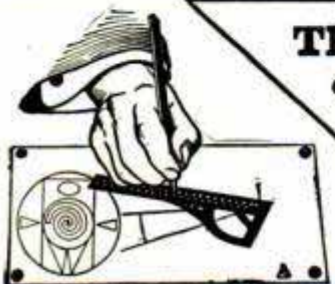
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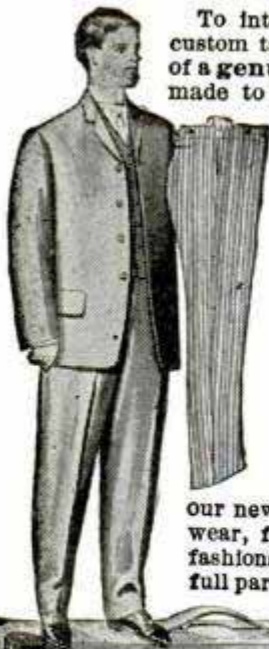


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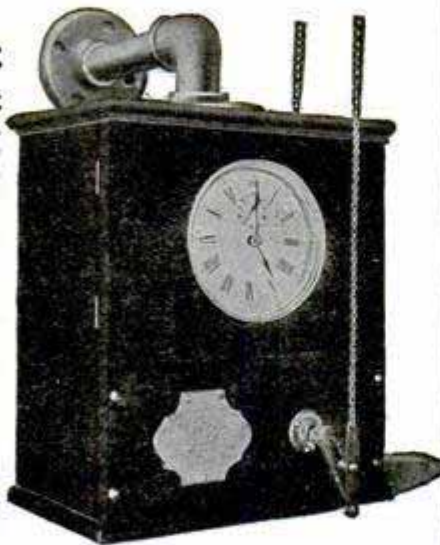


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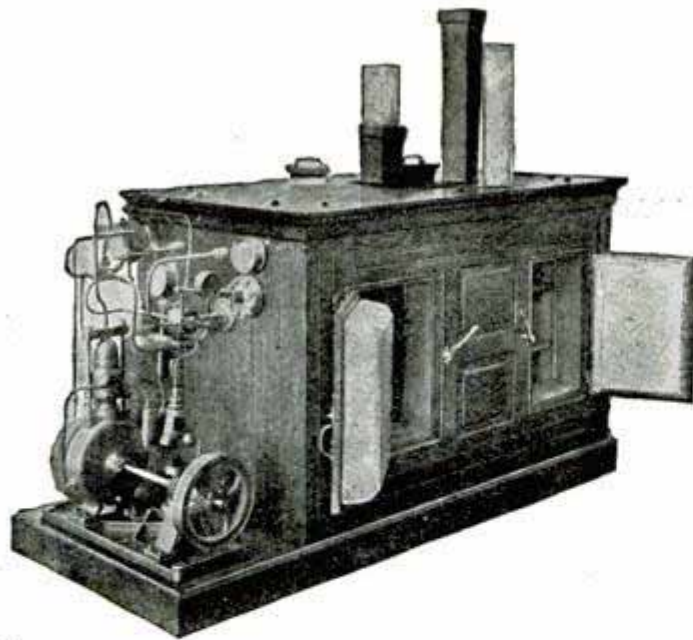
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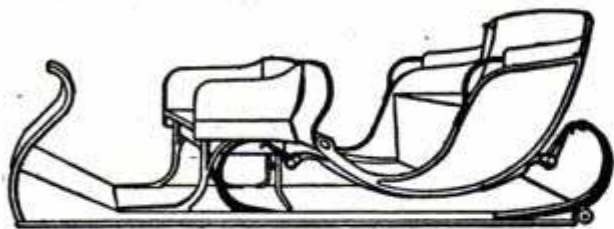
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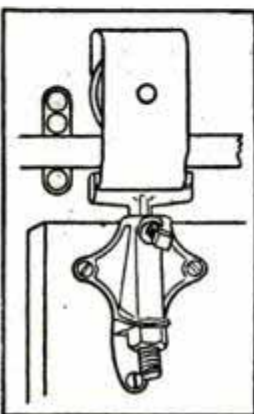
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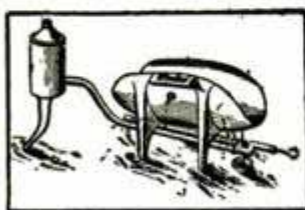
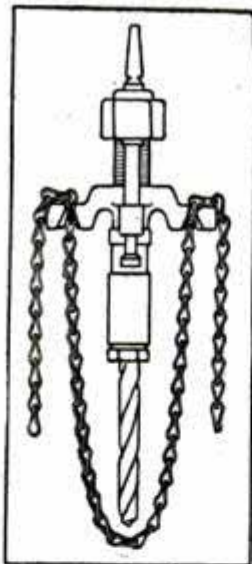
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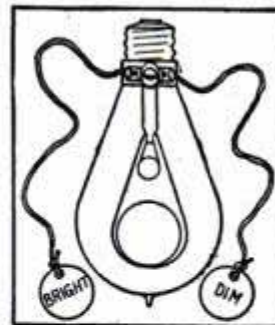


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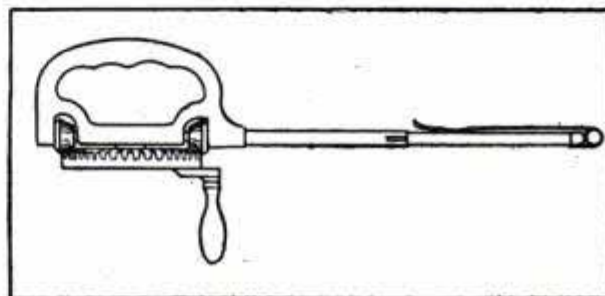
The body is made of aluminum and is provided with a recess for holding a thermometer. A gasoline burner furnishes the heat required and is supplied by means of a small tank as shown.

TURNDOWN INCANDESCENT LAMP.

By pulling disc marked "bright" the large filament is thrown in circuit, and by pulling the one marked "dim," the small filament receives the current. The small filament gives just sufficient light to distinguish the location of the various articles in a room, thus enabling a person to advance to the light without fear of stumbling over anything. It has been found very useful for halls, bath-rooms, sick-rooms, etc.



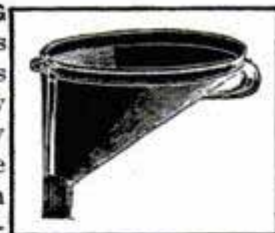
SELF-HEATING HAIR-CURLER.—The strands of hair are wrapped on small metal tubes, as many as necessary, and fastened in place by means of



spring clamps. The rubber end of curler is then inserted in each tube in turn so that the handle catches, and the small wheel on the curler is turned until the friction heats the tube and the hair wrapped on it.

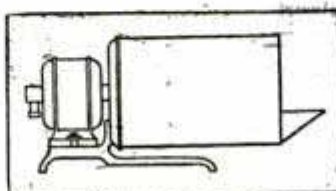
FUNNEL FOR FILLING TANKS AND BARRELS.

As the tank, barrel, keg or can is being filled with gasoline or any other liquid a bulb in a heavy glass tube from the pipe of the funnel rises and can be seen from both the inside and outside, so that there is no danger of waste or overflow. A splash guard and sieve are provided also. Not necessary to watch the bung-hole, as of old—a glance at the funnel tells it all.



ELECTRIC VENTILATOR.—Operated by a small electric motor contained in the case, with the fan.

Air is drawn in through a screen which removes all dust and dirt, and on entering the ventilator strikes a basin of water which cools and moistens the air. For sick rooms small pieces of ice can be put in the water or any desired disinfectant. If dry air is desired instead of the water or ice, use lime, which is a rapid absorber of moisture.



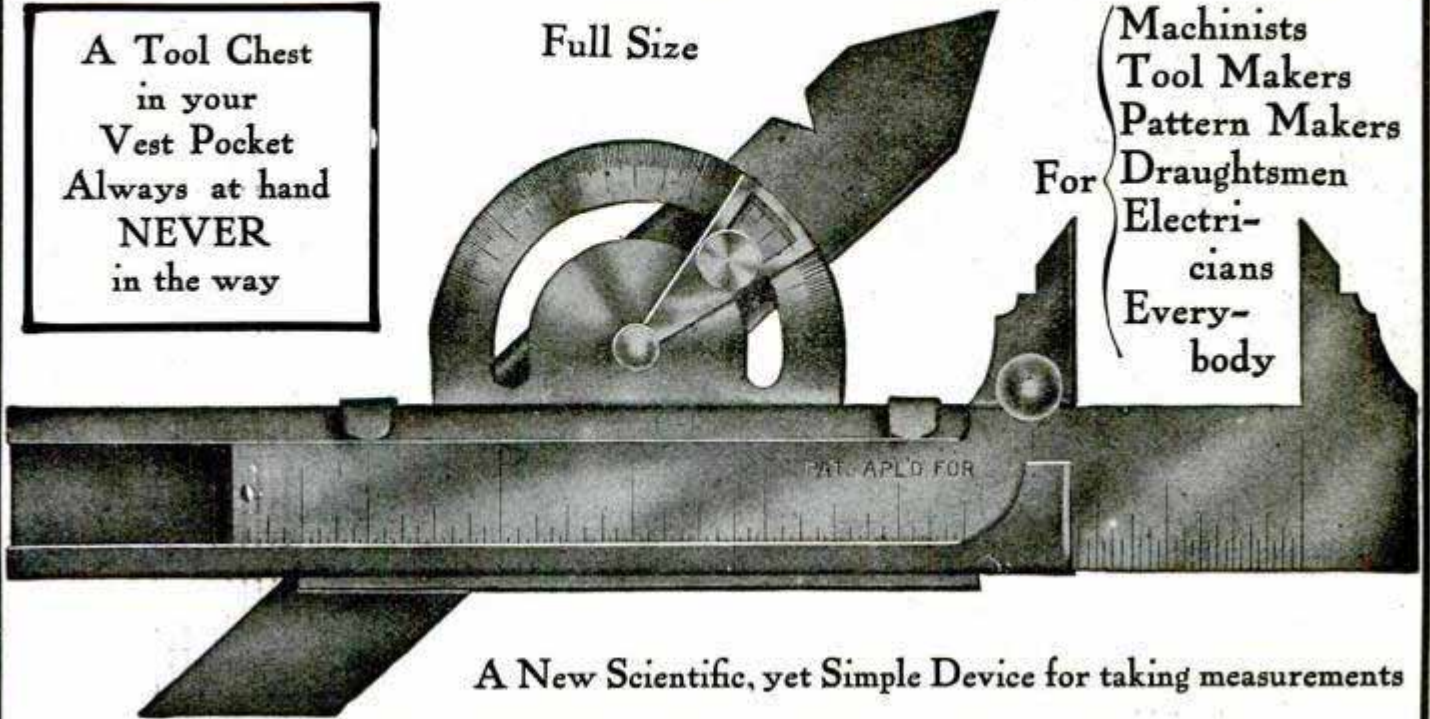
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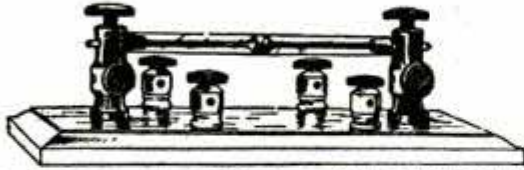
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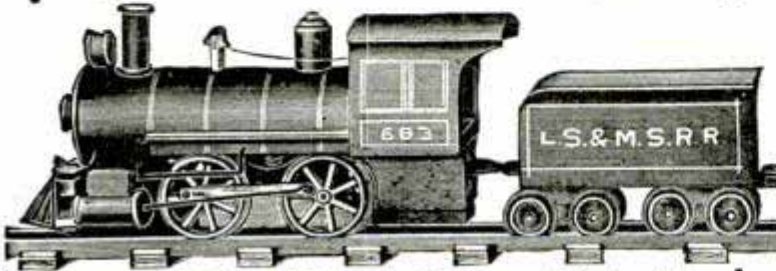
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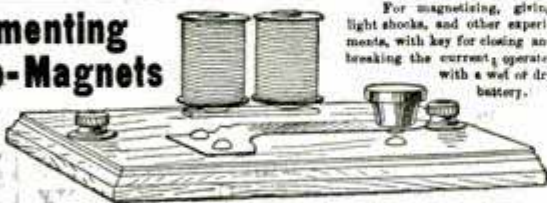
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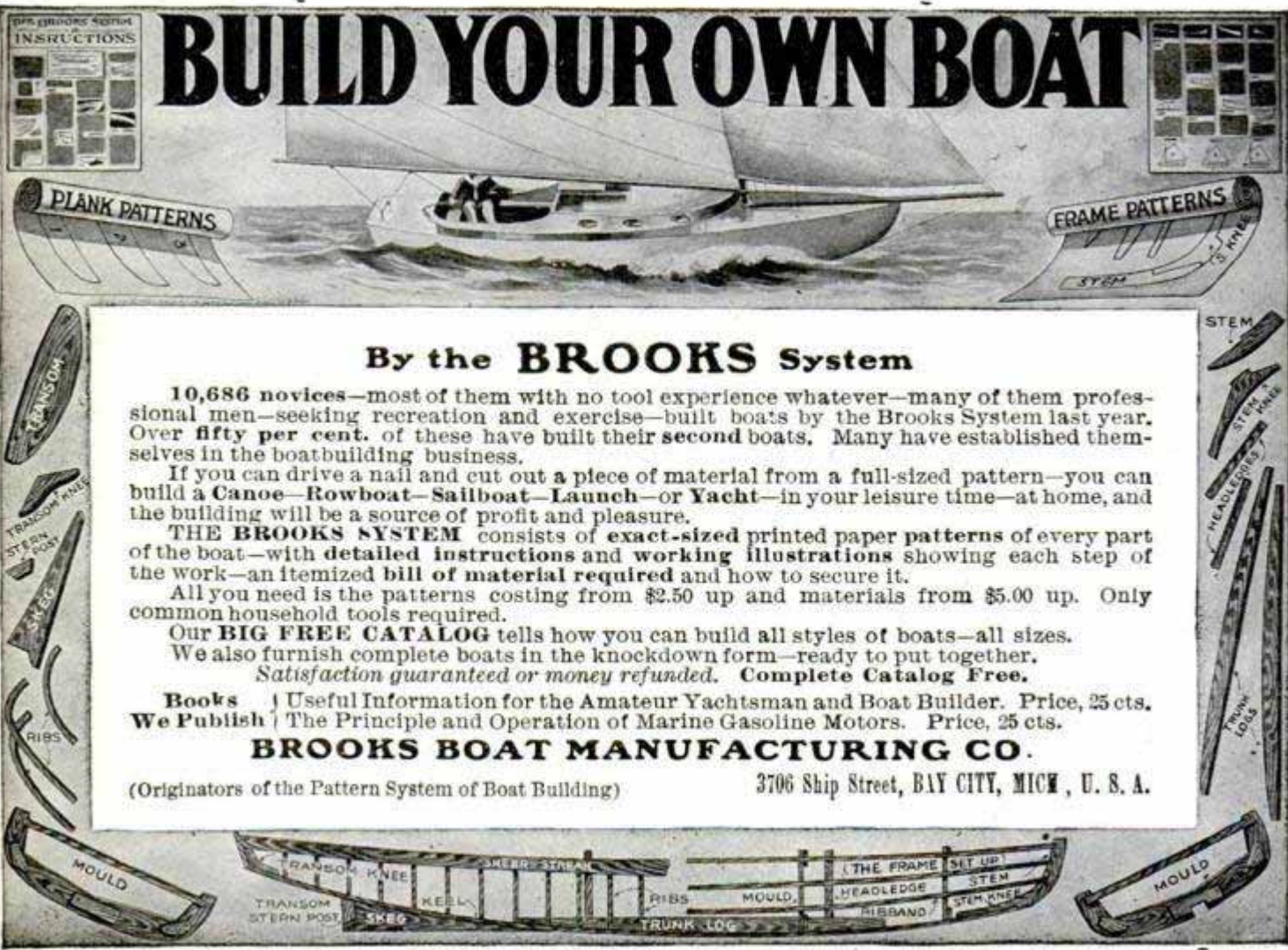
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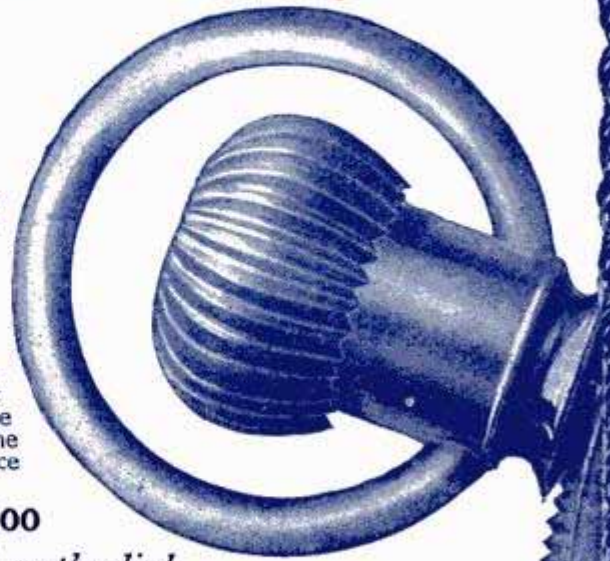
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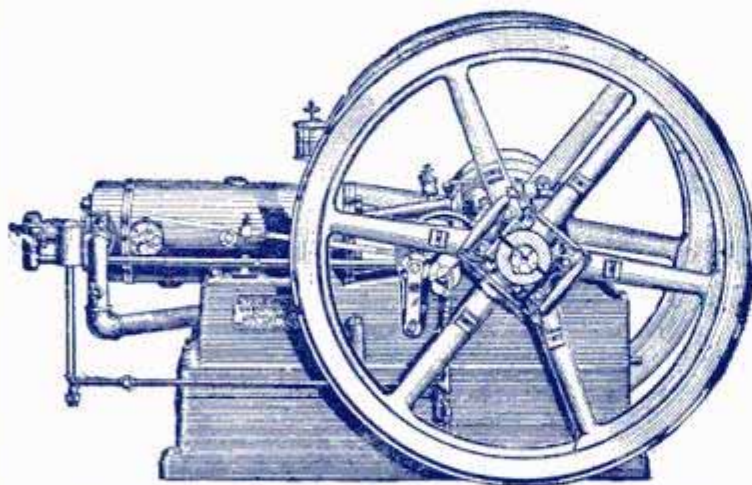


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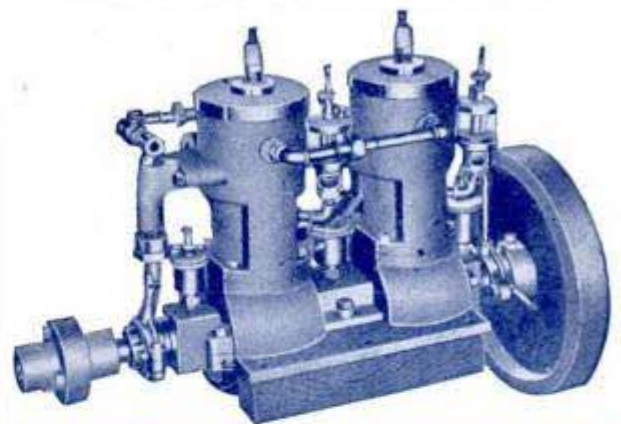
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