This Issue 75,000

JULY, 1906

VOL. VIII. NO. 7

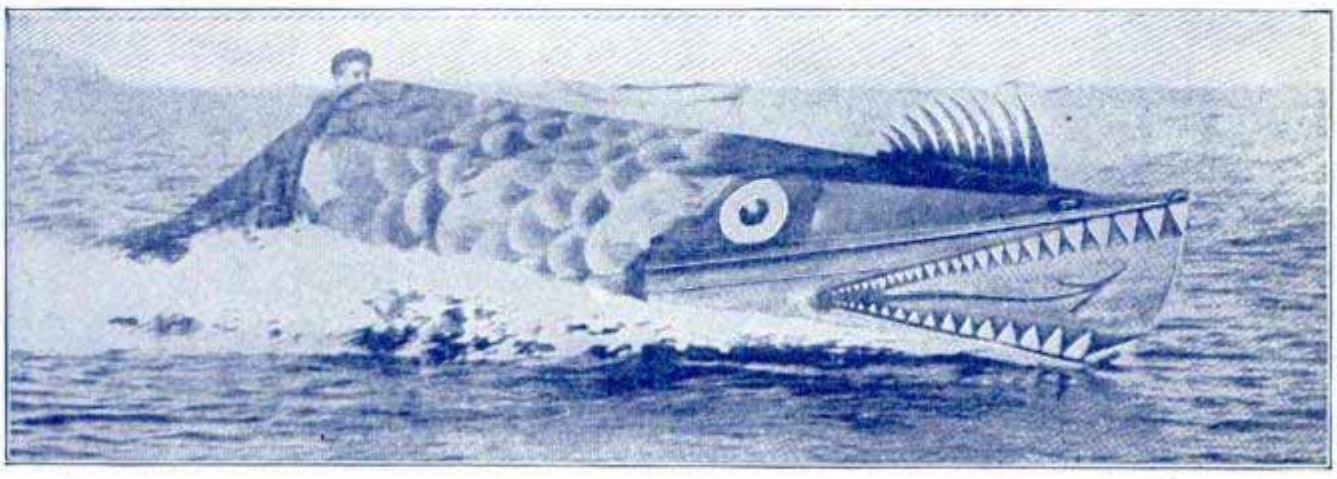
Price 10 cts.

# POPULAR MECHANICS

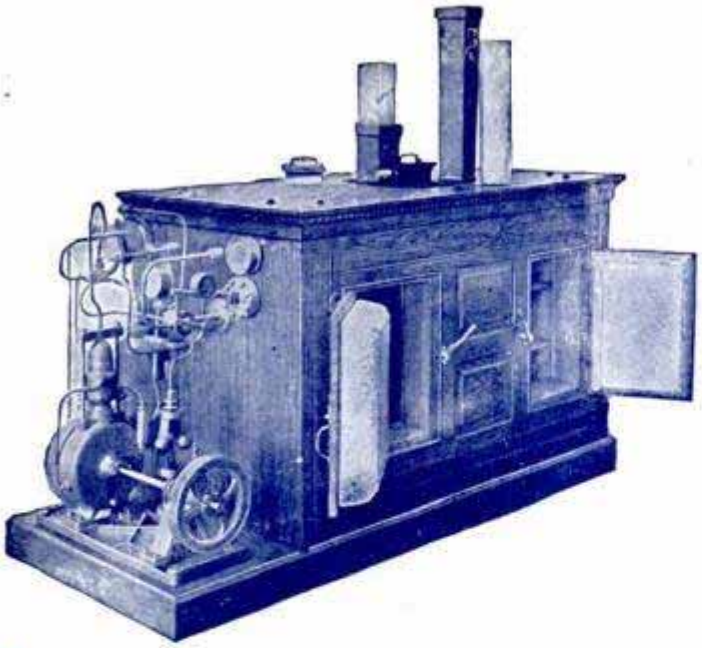
WRITTEN SO YOU CAN UNDERSTAND IT

LARGEST CIRCULATION OF ANY MECHANICAL PUBLICATION IN THE WORLD

WELLMAN AIRSHIP EXPEDITION—SIGNAL LIGHT THAT BURNS IN WATER—DESTRUCTION OF FERRIS WHEEL—TALL STACK BUILT WITHOUT SCAFFOLD—LANDING A NAVAL GUN—SLEEPING CAR BERTHS UNDER FLOOR—MODERN EQUIPMENT OF COAST PATROL—THE PACKING HOUSE SCANDAL—LARGEST AMUSEMENT STRUCTURE EVER BUILT—ALCOHOL BILL PASSES—ACETYLENE LIGHTHOUSE—CLEANING SAN FRANCISCO WITH MACHINERY—SMALLEST ENGINE ON EARTH—LATEST AMERICAN LOCOMOTIVE—REINFORCED CONCRETE DAMS—MAKING CEMENT CISTERNS—FLOOD AS AMUSEMENT SPECTACLE—ANCHORING CABLES FOR NEW CUNARDERS



New Zealand Terror that Frightened Natives—See Page 723



# SMALL
# REFRIGERATING PLANTS
FOR THE
## HOUSEHOLD, RESTAURANTS, HOTELS, SALOONS, ETC.

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

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

**E. E. SAVAGE**
Western Representative
209 State Street, **CHICAGO**

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

---

*Founded by Mathew Carey, 1785.*
*A House in touch with Three Centuries*

THE PIONEER INDUSTRIAL PUBLISHERS OF AMERICA

# HENRY CAREY BAIRD & CO.

Industrial Publishers, Booksellers and Importers,
810 Walnut Street, Philadelphia, Pa., U. S. A.

☞ *Our New and Revised Catalogue of Practical and Scientific Books, 94 pages, 8 vo. (Feb. 15, 1906); Catalogue of Chemical Technology and General Chemistry, July 1, 1905 (New and Up-to-Date); a Catalogue of Books on Metallurgy, Mining, Prospecting, Mineralogy, Geology, Assaying, Analysis, etc.; a Catalogue of Books on Steam and the Steam Engine, Machinery, etc.; a Catalogue of Books on Sanitary Science, Gas Fitting, Plumbing, etc.; and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.*

☞ **Please State the Subjects in Which Interested**

## The New Warn Sheet Metal Worker

just ready. The Sheet Metal Worker's Instructor—for Zinc, Sheet Iron, Copper and Tin Plate Workers and others. Contains a selection of geometrical problems, also practical and simple rules for describing the various patterns required in the different branches of the above trades. By Reuben H. Warn, Practical Tin Plate Worker. With an appendix containing instructions for Boiler Making, Mensuration of Surfaces and Solids, Tables of Circumferences and Areas of Circles, etc.; a new and enlarged edition, with Sheet Metal Work processes, tools, joints, solder, etc. Illustrated by 32 plates and 97 additional engravings. 252 pages, 8 vo.

*An Illustrated Circular sent on application.*

**Price, $2.50, by mail,** free postage, to any address in the world.

**HENRY CAREY BAIRD & CO.**
INDUSTRIAL PUBLISHERS, BOOKSELLERS AND IMPORTERS,
810 Walnut Street, Philadelphia, Pa., U. S. A.

---

# SEND FOR IT TODAY
OUR COMPLETE CATALOGUE
OF **BOOKS** ON
# Electric Light & Power

**The Latest Standard Works on the following Subjects**

Alternating Currents and Alternating Current Machinery.
Central Stations and Switchboards.
Dictionaries of Electrical Terms, Electrical Directories.
Dynamos and Motors.
Electric Bells and Domestic Electricity.
Electric Light and Electric Lighting.
Electric Railways and Automobiles.
Electrical Transmission of Energy.
Electricity for Amateurs.
Electro-Metallurgy, Electro-Chemistry, Electro-Plating.
Elementary Text-Books on Electricity.
History and Bibliography of Electricity.
Induction and Induction Coils.
Lightning and Lightning Conductors.
Measurements, Measuring Instruments and Testing.
Miscellaneous.
Patents, Patent Law and Inventions.
Pocket-Books, Formulæ and Tables.
Primary and Secondary Batteries.
Principles and Theory of Electricity and Magnetism.
Telegraph and Telegraph Codes.
Telephone.
Transformers.
Wiring Handbooks and Tables.
X Ray.
List of Electrical Journals.

# D. VAN NOSTRAND COMPANY
**Publishers, Importers and Booksellers of Scientific Books**
**23 MURRAY ST. NEW YORK CITY**

JULY, 1906

# POPULAR MECHANICS

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

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

SUBSCRIPTION, $1.00 PER YEAR

MAILED POSTAGE FULLY PREPAID TO ANY ADDRESS IN THE WORLD

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

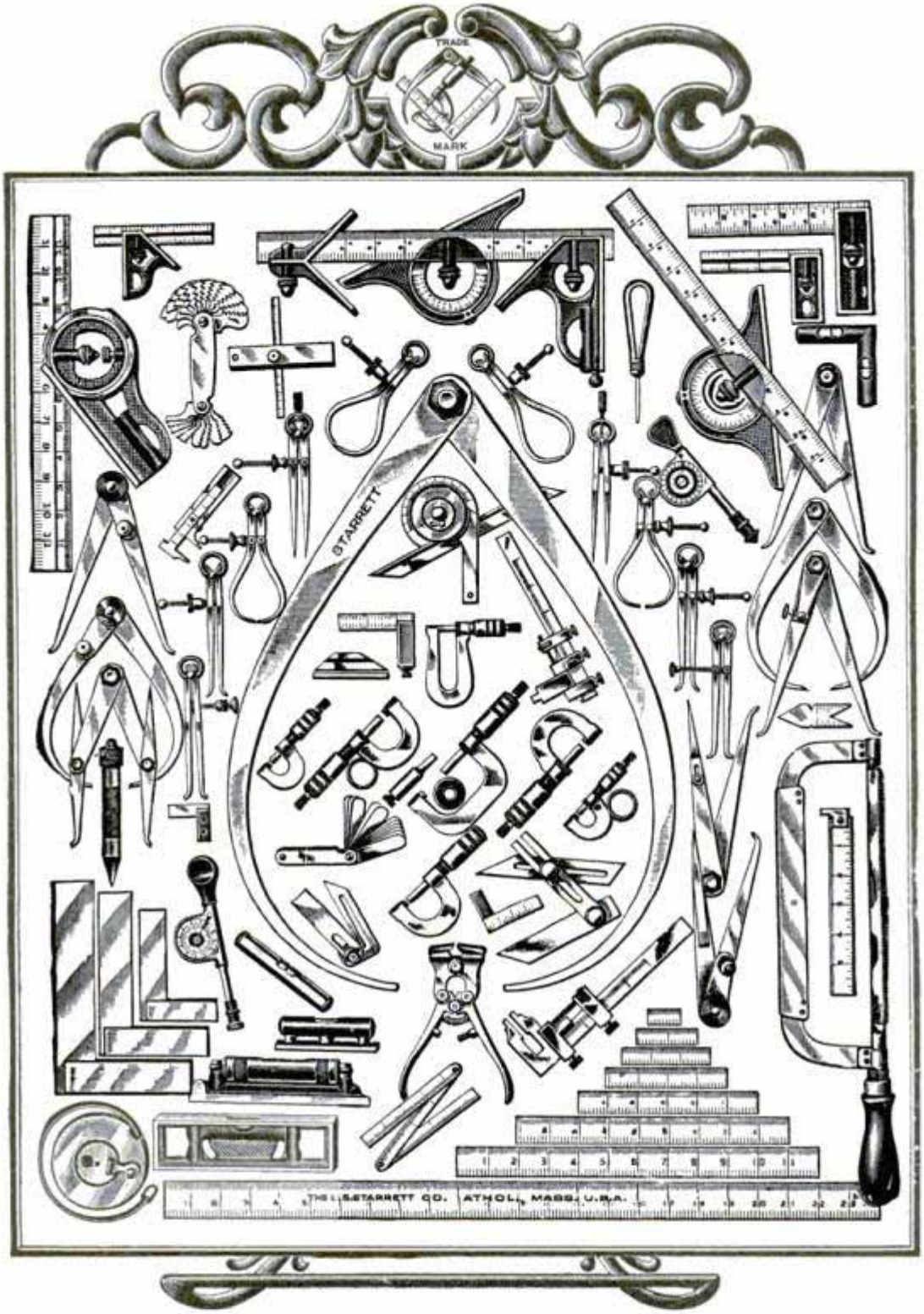
Published Monthly by POPULAR MECHANICS COMPANY
Entered as mail matter of the second class at the postoffice at Chicago, Ill.

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

## CONTENTS



### SHOP NOTES.




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

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

# THE STORY OF KORNIT

## THE EARNING POWER OF MONEY

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

**One hundred dollars invested at 15 per cent. interest will earn in a year as much as sixteen men working for you one day. It is, however, possible to make one hundred dollars do the work of ten, fifty or even one hundred men; it depends on how and WHERE you invest it.**

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

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

Pres. Charles E. Ellis

# A FINANCIAL OPPORTUNITY

### By President CHARLES E. ELLIS

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

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

KORNIT CAN BE SOLD AT TWENTY-FIVE CENTS PER POUND, and AN ENORMOUS profit can be made at this price, so that it CAN EASILY BE SEEN that where Kornit is EQUALLY AS GOOD, and AS A MATTER OF FACT, in many instances, a BETTER non-conductor than hard rubber, it can compete, in every case where it can be used, with great success on account of its price. For electrical panel boards, switchboards, fuse boxes, cutouts, etc., there are other materials used, such as vulcanized paper fibre, slate, marble, etc. A piece of vulcanized paper fibre, 3x4x1 inch, in lots of 1,000, brings 20 cents per piece. A piece of Kornit of the SAME DIMENSIONS could be sold with the ENORMOUS PROFIT OF OVER 100 PER CENT, at ten cents. The absorptive qualities of Kornit render it such that IT IS FAR PREFERABLE to that of vulcanized fibre. It will not maintain a flame. Of all the materials which are now in the elec-

trical market for supplies and insulators there is, as we have stated above, none that are satisfactory. Kornit will fill this place. Its tensile strength per square inch averages from 1,358 pounds to 1,811 pounds, which the reader can readily see IS MORE THAN SATISFACTORY. This test was made by a well known electrical engineer; who is now acting in that capacity for the United States Government, with a Standard Riehle Bros. testing machine.

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

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

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

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

## The Great Demand for Kornit in this Country

THERE is one manufacturer ALONE here in New York that uses 60,000 square feet of insulating material for panel boards every year. He is now using slate and marble, but IT IS NOT SATISFACTORY, for the reason that in boring and transportation IT BREAKS SO EASILY. KORNIT WILL ANSWER THE PURPOSE OF MANUFACTURING PANEL BOARDS VERY MUCH MORE SATISFACTORILY. On 60,000 square feet of Kornit there would be a net profit of over $30,000 or 50 cents for every square foot used. THIS ONE EXAMPLE is cited to show you THE ENORMOUS PROFITS which can be made. There are a great many other panel and switchboard manufacturers in this country. You may be interested to know that a panel board is a small switchboard. There is one or more on every floor of all large buildings where electricity is used. They each have a number of switches mounted on them, so that those in charge can turn certain lights on or off, and by these panel boards all the electrical power in the building is controlled. They must be of a reliable non-conducting material. Kornit can be used for this purpose almost exclusively. The largest electrical manufacturing concerns in Riga, Russia, ARE USING KORNIT ONLY FOR THIS PURPOSE, after having tried all other so-called non-conducting compositions. The electrical trades alone can consume a great many tons of Kornit every day in the year. If only two tons of Kornit are manufactured and sold every working day in the year IT WILL ENABLE THE KORNIT MANUFACTURING COMPANY TO PAY 16 PER CENT DIVIDENDS EVERY YEAR. Of course, if four tons a day are sold the dividends would be 32 per cent per year. THIS IS NOT IMPROBABLE. AN EXPERT ELECTRICAL ENGINEER who holds one of the most responsible positions here in New York City made the statement, after thoroughly examining and testing Kornit for electrical purposes, that in his most conservative estimation there can be ten tons of manufactured Kornit sold every working day in the first year. This would mean that the Kornit Manufacturing Company would pay a dividend out of its earnings the first year of over seventy-five per cent (75%). This is probably more than will be paid the first year, but there certainly seems to be a good prospect of paying a large dividend the first year.

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

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

# We Have a Fine Factory Complete in Every Detail

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

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

MR. KURT BIERICH, the son of the inventor, who is a graduate of FREIBURG UNIVERSITY, GERMANY, arrived here from Russia on the 12th of last month to take full charge of the scientific conducting of our factory. MR. KURT BIERICH spent two years in his father's factory at MENKENHOF, RUSSIA, and six months at the workshops in RIGA, RUSSIA, mastering every minute detail of the manufacturing and working departments. MR. BIERICH, JR., has been employed for six months recently in superintending the erection of a Kornit factory for the English company at Stoke Newington, N. London, WHICH HE BROUGHT TO COMPLETION IN THE MOST SATISFACTORY MANNER. MR. BIERICH, JR., will have full charge of the KORNIT FACTORY IN THIS COUNTRY. KORNIT WILL QUICKLY BECOME A WELL-KNOWN AND UNIVERSALLLY USED ARTICLE IN THE ELECTRICAL AND OTHER TRADES OF THIS COUNTRY, EARNING AND PAYING LARGE AND SATISFACTORY DIVIDENDS EACH AND EVERY SIX MONTHS. A few shares obtained now may be the foundation for a fortune or the much desired income for support in the unknown years that are to come. We leave it to you if it would not seem good judgment to take immediate advantage of this opportunity. Anyway, please write me at once and let me know just what you will do. If it is not possible for you to take shares now, write and tell me how many you would like and how soon it will be convenient for you to do so, provided I will reserve them for you. As soon as I receive your letter I will answer it with A PERSONAL LETTER AND WILL ARRANGE MATTERS AS YOU WISH TO THE BEST OF MY ABILITY.

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

*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 the wise thing to do, and the wise and thoughtful people who are doing it are the ones that live in case.*

our mutual benefit to watch and guard each other's interests. I WILL BE GRATEFUL IF YOU WILL WRITE ME TO-DAY, so that I may know just what you will do.

I know you will agree with me that you have never had presented to your notice a better opportunity to make an investment where such large profits can be made, because of the exclusiveness of control and the great demand and the low cost of 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. The price of Kornit shares will advance to at least twelve dollars per share in the near future.

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 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 shares that pay fifty (50) to one hundred (100) per cent dividends will readily sell in the open market for $50 to $100. THE OUTLOOK FOR THE KORNIT MANUFACTURING COMPANY is such that it seems impossible for the earnings to fall far short of these figures. If the company only makes and sells two tons of Kornit a day for the first year, and made a profit of only two hundred dollars per ton, it would mean a profit of over sixteen per cent (16%) the first year. If this business were doubled the second year, of course the earning capacity would double, and the dividends would be over thirty-two per cent (32%). Prominent and well-known Electrical Engineers assure me that this product cannot help and is bound to make enormous profits. I would recommend that you send for as many shares as you may wish at once. You, in my conservative opinion, can safely count on the large earning capacity of these shares. I will at once write you a personal letter with full information, and send you our illustrated book, "A Financial Opportunity," containing a score of photographs of the KORNIT industry taken in Russia.

Please let me hear from you.

Yours very truly,


## CHARLES E. ELLIS

### PRESIDENT

### 717 B Temple Court, NEW YORK CITY


[Mr. Ellis, besides being President of this Company, is also President of two other large and successful companies, owning shares therein valued conservatively at over $250,000. Mr. Ellis has other investments in New York City real estate, bonds, stocks and mortages 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.]

# The Wage Earners' Declaration of Independence

Everybody knows what the stroke of a pen did for this great nation.

Do you realize what the stroke of a pen or pencil will do for you?

*The Coupon shown below is the Wage Earners' Declaration of Independence.*

Signed as directed it opens the way to freedom from overwork and underpay. Because the welfare of those who sign it becomes of interest to the International Correspondence Schools; that great institution founded and maintained for the benefit of workers who would otherwise spend a life time struggling in poorly paid positions.

The signing of this coupon costs nothing, it simply gives the **I. C. S.** an opportunity to demonstrate how you may qualify for promotion in your present line of work or for a better salary in a more congenial occupation.

Is it possible that there is a small salaried man anywhere, so lacking in the desire for success, as to pass this offer made by an institution of world-wide standing, the records of which show the the names and addresses of thousands—men who have been made independent by this easy method.

**Sign your Declaration of Independence and mail it to-day.**

**International Correspondence Schools**
**Box 872, SCRANTON, PA.**

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

| | |
|---|---|
| Bookkeeper | Mechan'l Draftsman |
| Stenographer | Foreman Plumber |
| Advertisement Writer | Elec. Lighting Supt. |
| Show Card Writer | Mech. Engineer |
| Window Trimmer | Surveyor |
| Commercial Law for Corporat'n Employees | Stationary Engineer |
| Illustrator | Civil Engineer |
| Civil Service | Build'g Contractor |
| Chemist | Architec'l Draftsman |
| Textile Mill Supt. | Architect |
| Electrician | Bridge Engineer |
| Elec. Engineer | Structural Engineer |
| | Mining Engineer |

Name_____

Street and No._____

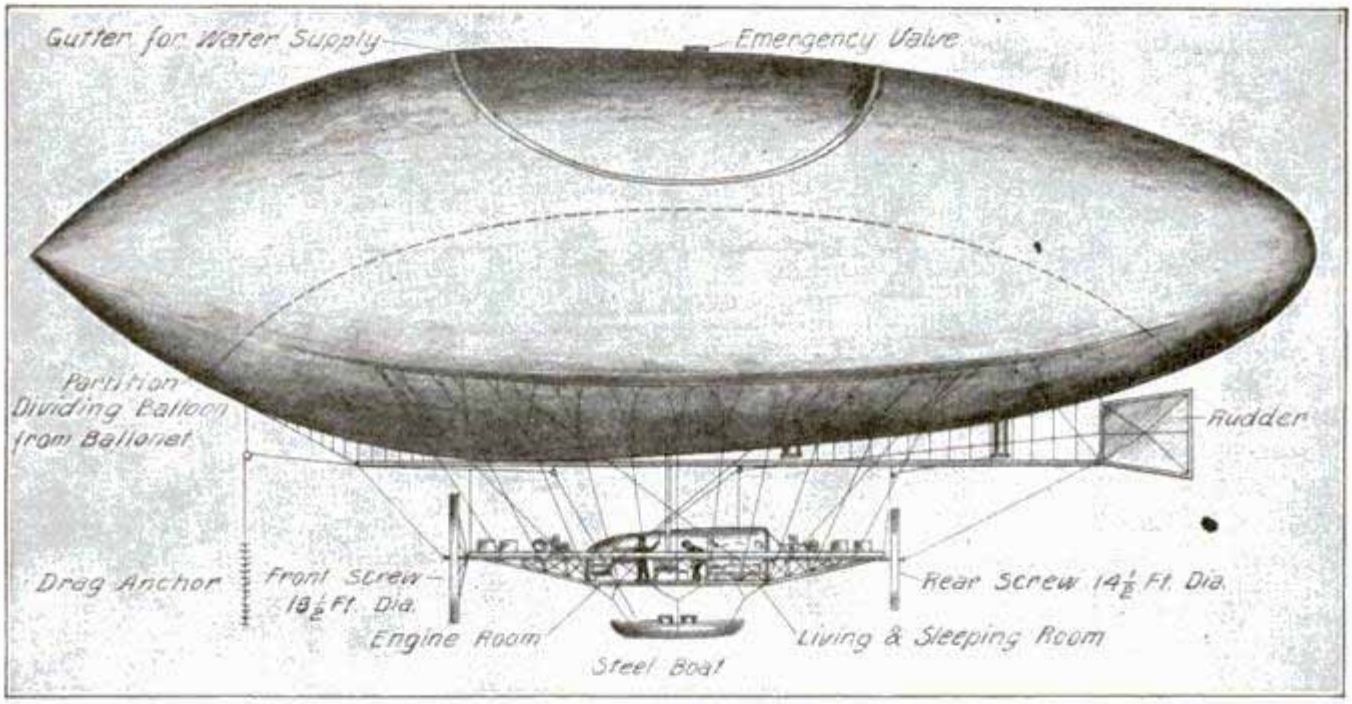
City_____ State_____

# POPULAR MECHANICS

Vol. 8. No. 7 CHICAGO, JULY, 1906. 10 Cents a copy $1.00 a year

# WELLMAN AIRSHIP EXPEDITION

**Preparations Now Being Completed at Dane's Island**



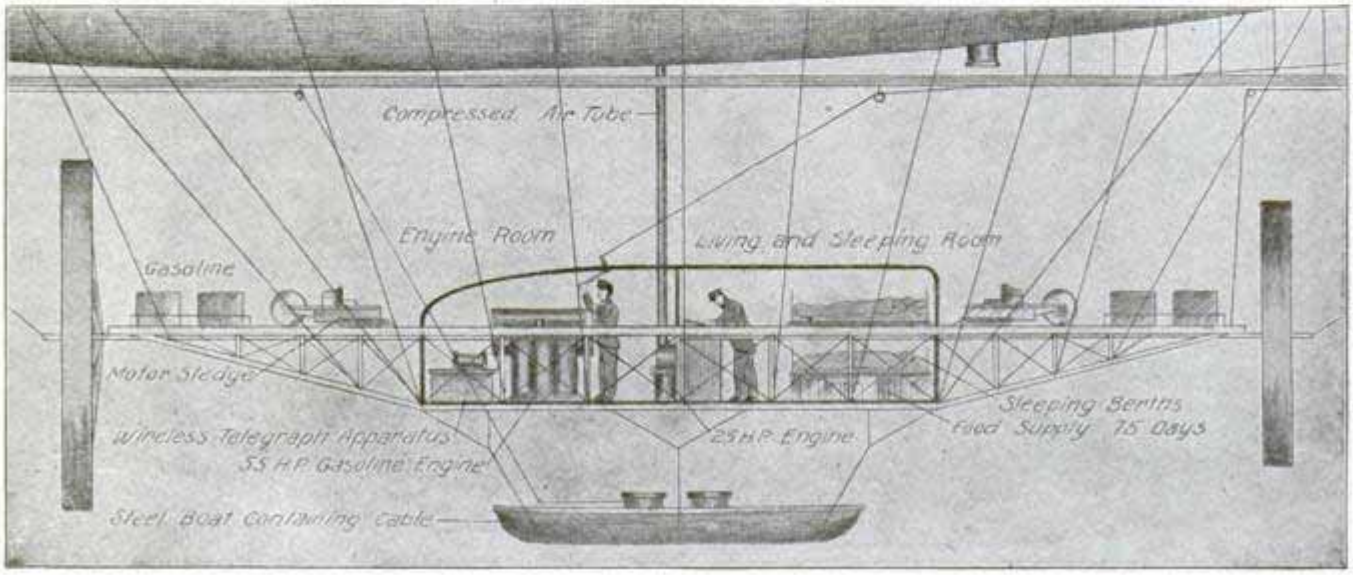

**General View of Wellman Airship**

The members of the Wellman airship expedition to the North Pole are now busily engaged in the final preparations at Dane's Island. This island is in the Arctic ocean about 600 miles northwest of Cape North, Lapland, and the same distance from the North Pole. Here, hundreds of miles from human habitation, a huge hall 200 ft. long, 75 ft. broad and 85 ft. high has been erected. The building has a canvas cover and seems too frail a structure to cope with the extreme rigors of the clime, but if its presence there seems anomalous even more so appears an evidence of man's highest scientific development—a wireless telegraph station. From this same spot a few years ago courageous André, with little save a marvelous prescience of things to come to back him, set out on his ill-fated balloon voyage to the Pole—never to return; and fitting, indeed, it is that this spot should have been chosen as the base of the Wellman-Record-Herald Expedition to the Pole—this time with a steerable airship thoroughly tested before the final dash in the atmosphere through which it must sail, and provided with all the accoutrements of modern times that will tend to make the project a success.

The huge hall was shipped in sections from Tromsö, Norway, on June 5 of the present year. Arrived at its destination the

framework was bolted together and over it stretched the canvas skin; in this building the big envelope will be inflated. The plan of procedure of the expedition is best told in the words of Mr. Wellman himself, who in an interview with the editor of the Illustrated London News, said:

"The airship itself will leave Tromsö on June 25. It is a very Gargantua of airships, and requires 224,000 cubic feet of hydrogen, to make which we take 100 tons




**Details of Machinery and Cabin**

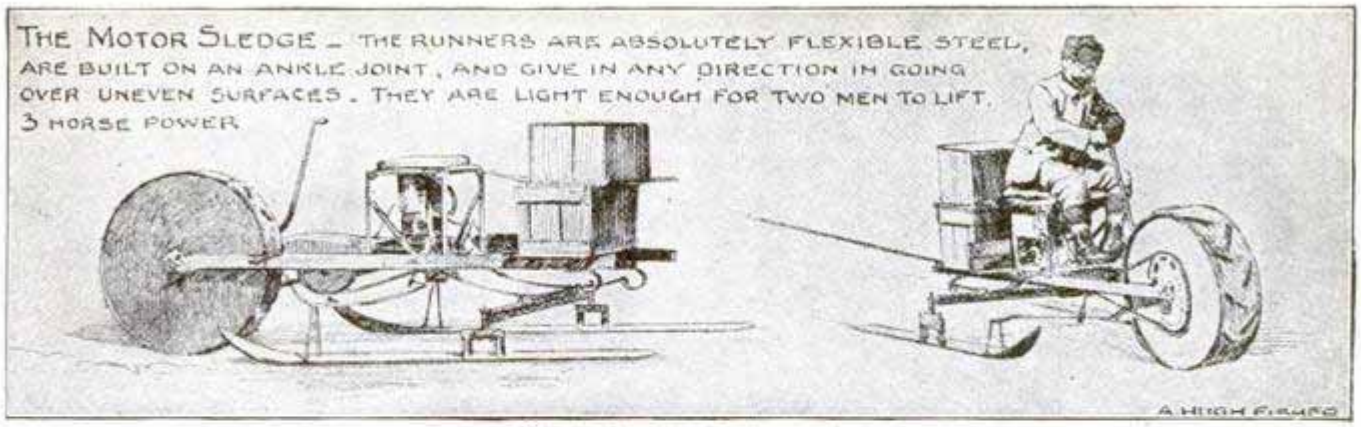
of sulphuric acid and 65 tons of iron shavings, all carefully selected and cleaned. Alexander Liwentaal, the experienced engineer, who was associated with Count Zeppelin, and who is on leave from the Admiralty, will superintend the inflation, and is now constructing the gas-apparatus. The month of July will be spent in inflation and trials, and if all goes well we shall start for the Pole this year; but we are determined not to start till we are satisfied of the perfect efficiency of all our apparatus. The expedition is designed for a three years' campaign. If we do not succeed the first year, we shall return and reconstruct the airship for a second year; and if we don't win in the second year and still live, we shall try again the third year.

"If we succeed in reaching the Pole, it makes relatively small difference to us what course we take on our return, as we have full data with us as to all land round the circle.

"At Hammerfest, Norway, in touch with the Atlantic cable, will be our wireless station No. 1. Station No. 2 will be at the expedition headquarters on Dane's Island, and station No. 3 will be on the airship. The generator is in the engine-room, belted on to the motors, and the aerial or wire is unrolled and suspended hanging down perhaps nfty yards when we wish to send a message.

"We expect the period of the whole trip by airship to be under twelve days, but if necessary it can be kept in the air as long as twenty days, because the loss of ascensional force should not be more than 200 lb. per day, through leakage of gas, while the load will be lightening all the time by the consumption of gasoline in the motors, not counting provisions eaten, and so forth. The airship, which Monsieur Godard has been making for me, is constructed to carry the car of steel, motors totaling 80 hp., motor-sledges, five men, food for seventy-five days, instruments, tools, repair-materials, lubricating oils, and 5,500 lbs. of gasoline. The pressure of the gas varies in the different "zones," and the envelope is made in different degrees of tensile strength to correspond, but is everywhere constructed to stand a strain six times the maximum pressure possible.

"It is vitally important that the rigidity and integrity of the form of the balloon should be constantly maintained. No means has as yet been found of making, with fabrics, an absolutely gas-tight reservoir, but the number of rubber coatings in the envelope of our balloon will reduce the escape to a minimum. Cold, however, contracts the gas, and on all accounts it is necessary to arrange for strict preservation of full pressure. This is done by a separate 5-hp. motor carried to compress air and throw it up into the ballonet—the lower

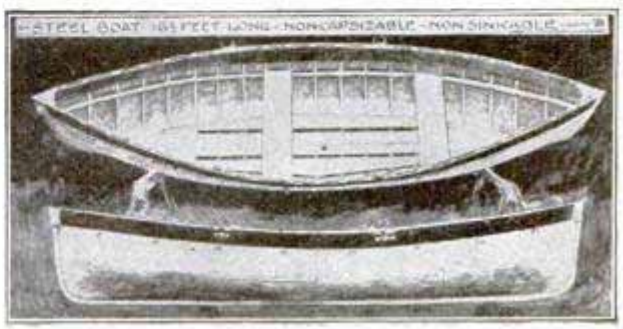



**Sleighs for Use in August**

part of the balloon, separated interiorly by a thin envelope, through which gas percolates, maintaining the pressure. The car is a strong frame of steel tubing, and the central section, comprising engine-room and living-room, is enclosed by walls and roof of fireproof fabric.

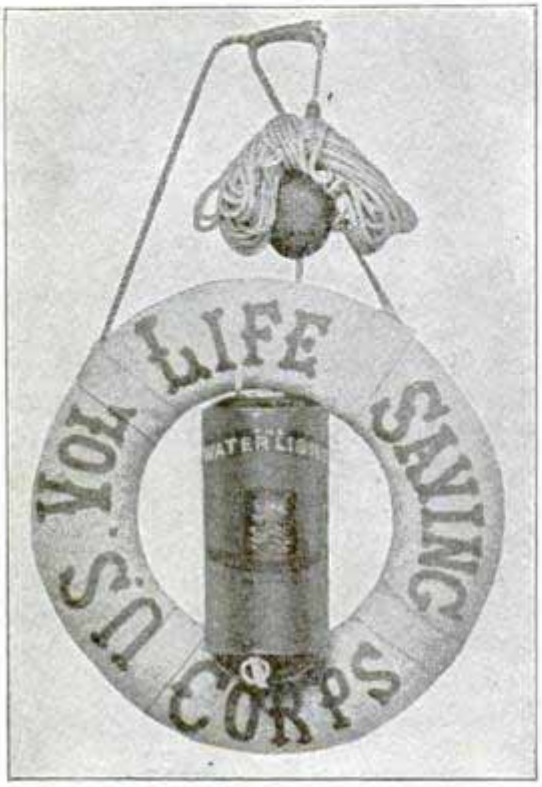
"After elaborate studies of Arctic winds I decided to construct my screws and motors, not for high speed against extreme winds, but for moderate speed against about eleven-twelfths of all the winds we should expect. We carry two motors and two propellers, and reserve parts for the larger screw. With unfavorable winds of high velocity we shall stop the motors and throw out upon the ice over which we are sailing a drag-anchor or 'retarder,' the action of which will largely neutralize the force of an adverse wind in taking us out of our course. The full value of favorable winds is on the credit side of our log, while only a part of the value of the unfavorable winds has to be put on the debit side. At first I had thought to anchor firmly to the ice by grappling-irons and steel cables, but condemned this because of the enormous increase of strength that would have been demanded in every part of the tackle to ride out a storm firmly tethered to the ground. With our retarder against a wind of ten or twelve miles per hour we shall remain approximately stationary in the air, perhaps drifting half a mile or a mile an hour. Should the wind rise to thirty miles per hour against us, the driftage should be about eighteen miles per hour, but in no case would we incur risks of breakage of our apparatus, as without firm anchorage the maximum strain provided for can never be exceeded.

"One of the chief problems is how to maintain the vertical equilibrium of the airship—avoidance of pitching up and down, and of being overweighted by accumulations of snow, frost, or moisture. We want to keep our airship at a fairly even sailing-height of from two to four hundred feet above the ice, and we are hoping to do this by a system of counterbalancing weights in the employment of a guide-rope equilebreur." The usual guide-rope is simply a line of cordage or metal trailing over the ground. When the balloon rises, more of the weight of the rope is lifted into the air and put upon the apparatus, checking the upward movement, and when it descends weight is removed, and the descent is checked. A variation of this principle is what we are employing. In our guide-rope and its accessories there will be a total of about 1,200 lbs. in weight, and it is constructed to operate equally well on water or on ice, for we shall probably have a belt of open water in July and August between our headquarters and the pack-ice covering the Arctic ocean to the northward. At the lower end of our equilebreur we have four steel cylinders, ten or fifteen feet apart, the steel cable passing through the center of each. Outside each has six wooden runners attached, and they are filled with gasoline as a reserve for the motors. They are buoyant and cannot sink. The two cables of the retarder and the guide-rope equilebreur are carried in the steel boat which is slung beneath the car. It is the lightest and strongest boat ever built. It is 16½ ft. long, carries over a ton at proper loading, and is non-capsizable and non-sinkable. Upon the deck of the car are two motor-sledges."



## SIGNAL LIGHT THAT BURNS IN WATER

A marine torch, or signal light, that bursts into a brilliant flame the instant it touches water, is a recent invention. These




**Light Attached to a Life Buoy**

signal lights can be used in many ways. One method is to attach one to a life buoy; the moment the life preserver strikes the water the light gives out a bright flame, showing its location not only to the person overboard, but marking the spot for the crew, who put back in a small boat. As the average passenger steamer cannot be stopped in much less than a mile when under full headway, the importance of the light in finding the spot is evident. The signal burns with 300 candlepower for a full hour. These lights are already in use in the American navy.

Another type is the projectile which is fired from a gun and will carry as far as an ordinary shell will go. These lights can be set to burn as they leave the gun, or not until they strike the water, where they will float and burn from one to two hours.

## WALLS OF WATER FOR FIRE PROTECTION

Among the many unusual methods for preventing a repetition of the San Francisco conflagration which have been submitted to the reconstruction committee of that city is the following:

The plan contemplates the erection every 200 ft. in the business district of standpipes connected to big water mains, which run to a high pressure pumping station. These standpipes are telescopic and in three lengths of 34 ft. each, each 10 in., 8 in. and 6 in. diameter respectively, tapering toward the top. A hand valve at the base admits the water to the standpipe which immediately extends to its full height of 100 ft. At the top are several nozzles which direct the water in all directions. A pressure of 100 lbs. at the top is contemplated, which would throw water 150 ft. into the air and cover a base radius of 250 ft. The water from one stand would thus meet the water from the nearest other stands. The fire department has the subject under consideration.

## NEW ELECTRIC LAMP

Dr. Hans Kuzel, Vienna, claims to have discovered a new method of making the filament for incandescent electric lamps, which will burn for 3,500 hours, and give a strong light to the end. The filament is said to be made from common and cheap metals and metaloids colloids in a plastic mass which can be handled like clay and which when dry becomes hard as stone. Out of this mass very thin wire threads are formed.

## GLASS FLOORS FOR SAFETY

Glass floors around electrical switchboards are recommended for safety by an English expert. Several fatal accidents have occurred on account of the operator coming in contact with exposed parts charged with current while standing on the iron or wood grating commonly used in the platform. Many English plants are now putting in the glass floors.

**Light for Firing from a Gun**

## U. S. WILL BUILD FIRST DERELICT DESTROYER

The greatest danger that attends navigation on the high seas is from derelicts. These submerged hulks, weighing thousands of tons often, are scarcely discernible by day, while at night it is practically impossible to pick them up even with a powerful searchlight.

For years navigators have urged upon the leading maritime nations to undertake the destruction of these wrecks, but it has remained for this country to take any action. A derelict destroyer is now being built at a cost of $250,000, which will be in charge of the Revenue Cutter service. With wireless telegraph to report a wreck, it will now be possible to locate and destroy it. Dynamite will be used to blow the old hulls to fragments, a specially trained crew of dynamite experts being detailed for this work. Other countries will doubtless now take similar action. Seamen declare that the derelict is the explanation of many of the mysterious disappearances of ships which have never been heard from after leaving port.

## CURIOUS SPIRAL BRIDGE OVER MISSISSIPPI RIVER

One of the most remarkable bridges to be found anywhere across the Mississippi river is at Hastings, Minn. In order to avoid the expense of operating a draw the bridge was built with a clearance which permits the steamboats to pass below. The approach from the east shore was then constructed in the form of a spiral to avoid the long drive which otherwise would have been necessary.

Photo by H. W. Crosby

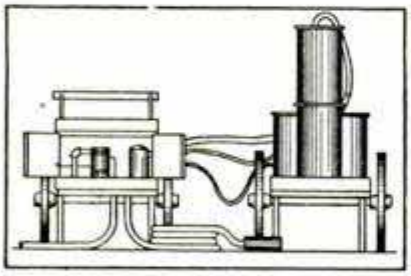
**Steamboats Can Pass Under This Mississippi Bridge**

## UNDER SEA COAL STORAGE

Nearly two years ago this magazine described an experiment of the English navy in storing coal under water. In the tropical coaling stations the deterioration of coal stored in the open air is very great, as the heat exhausts the coal. Tests have now been made of the submerged coal, and indicate that it may be preserved under water for a great length of time; perhaps indefinitely. The chief difficulty is that it must first be dried before burning, or even loading into ships, as the moisture produces spontaneous combustion. Drying large quantities in the open air is not feasible.

## PORTABLE ELECTRIC WATER STERILIZER

The sterilization of water by means of ozone generated by high-tension electrical discharges was described in our August, 1905, number. A German company has embodied the principle in several forms of apparatus — most notable, the portable outfit for supplying armies on the field with sterilized drinking water. Two of these outfits were used by the Russians in Manchuria.



The apparatus is mounted on two wagons, says the Electrical Review, London, one carrying all the moving machinery and the other the sterilizing outfit. The machinery wagon contains a gasoline motor, such as is used in automobile propulsion; an alternator with small exciter-dynamo on the same shaft, supplying low-tension current to the transformer; a small centrifugal pump, driven by belting from the dynamo shaft, by which the unsterilized water is pumped up to the tower through coarse filters; a small blower or fan which gently impels the air through a calcium chloride filter (on the machinery wagon) and thence through the ozonizers to the tower, which it enters at the base.

The "'runo-walko-rideo-driveo universal telephone,' or words to that effect," is what the Electrical Review calls the extraordinary device which eastern inventors claim to have made. It is a telephone instrument which enables any person when riding, walking or moving about in any way whatever, to put himself in communication with any telephone system.

## EARTHQUAKE WRECKED STEAMBOAT

The sternwheel steamer "Juliette," that plies daily along the Sacramento river, had just made fast to her dock in Sacramento when the great shock occurred. So violent were the vibrations that the cabins and upper works came tumbling down. The passengers and most of the crew had gone ashore, and of those remaining on the boat none were killed.

## SELLING A HOT STOVE

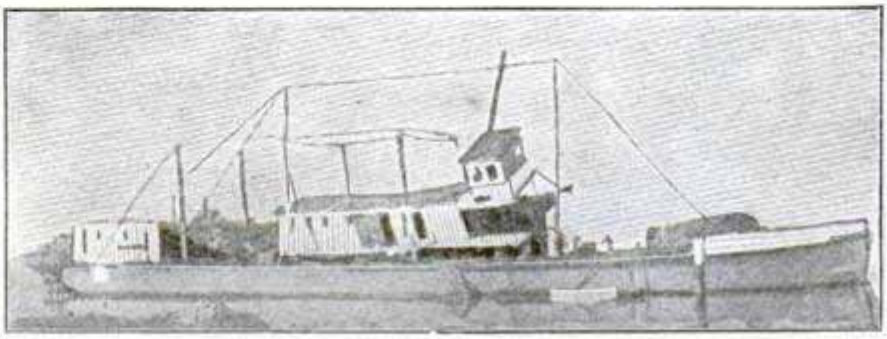
A hardware man has adopted a new method of selling cook stoves. Once each month he offers a prize for the best dish cooked at his establishment, and the ladies bring dough and all kinds of uncooked food to his store, where he has a battery of ranges fired up. He attends to the cooking himself and in the demonstration actually sells the heated stoves.

## OYSTER PLANTING IN PACIFIC

The native oyster found on our Pacific coast is extremely small—about one-fourth the size of an Atlantic oyster. Many carloads of eastern oysters have been shipped and planted in Puget sound and along the California coast. Some of the beds are just commencing to produce, one of them affording 700 sacks per day the past winter. The tongers, who gather the oysters, earn from $6 to $12 per day.

## SOME QUEER CAUSES OF FIRE

Queer causes of fires frequently come to light, some of which were intended to be forever hidden. A merchant who needed his insurance money badly removed the metal ceiling protector over a lighted gas jet, but alas! was observed in the act from a neighboring window. Another man turned on the gas in a cellar full of inflammable material and set a lighted candle on the floor, in the expectation that as the gas got denser it would sink till it reached the candle. He, too, was frustrated. A heavy wagon passing broke the underground gas main, stopping the supply, and someone visiting the cellar by chance discovered the candle and the open taps. Dry birds' nests in a church tower helped in another case. The bell bearings needed oiling and when the bell was rung the sparks produced set the nests on fire.



**The Wrecked Vessel**

# DESTRUCTION OF THE FERRIS WHEEL

Fig. 1

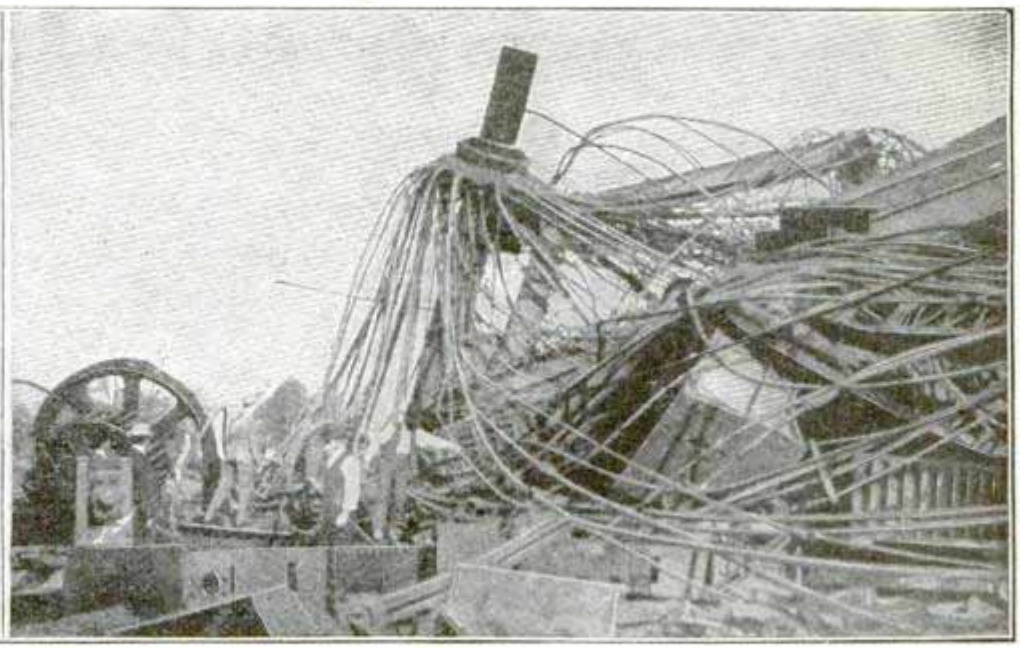


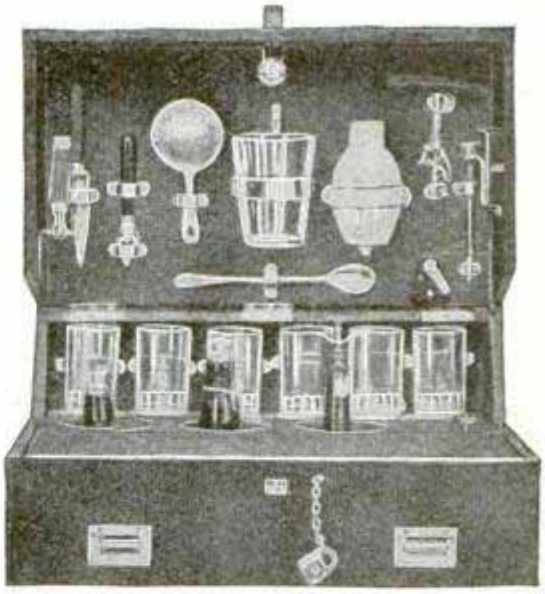
Fig. 2—Last of the Ferris Wheel

The great Ferris wheel, once the mechanical wonder of the world, was purposely wrecked with 200 lbs. of dynamite at St. Louis on May 11. The inventor, for whom it was named, built it in 1893 at Pittsburg at a cost of $300,000 as a mechanical amusement device for the Chicago World's Fair, and as a rival of the Eiffel tower. The wheel was 264 feet in diameter, and its steel shaft was the largest ever forged: There were 4,600 tons of metal in the structure. After earning $750,000 it was taken down at the close of the exposition and hauled in wagons 10 miles across the city at a cost of $40,000 and set up in an amusement park. It was again taken down in 1903 and shipped to the St. Louis World's Fair. The wrecking company decided there was most money in wrecking it for scrap valued at $8,000, and fired 100 lbs. of dynamite under it, on the first charge. The wheel did not fall, but leaned to one side as shown in Fig. 1.

When the second charge was fired later in the day, the huge monster did not fall on its side as predicted, but first seemed to quiver, then to totter, and then gradually to collapse, the action increasing until the great sections were bending and twisting like wire. Finally there came the final crash which covered the foundations with a tangled heap of iron and steel. The wheel was designed on the principle of a bicycle wheel with a double rim of bridge construction. The shaft weighing 74 tons, which will be seen at the center in Fig. 2, was driven 20 ft. into the ground.

## BUFFET FOR AUTOMOBILES

The luxuries of automobiling are constantly being increased. The latest addition is the portable buffet, the purpose and arrangements of which are fully shown in the



Portable Buffet

illustration. One packing of ice will last all day. The box is 21 in. long, 15 in. high, and 10 in. wide; a 2-candlepower electric lamp with battery is a part of the outfit, which can be fastened to the running board.

A $10,000,000 company has been organized to develop a water power of 40,000 horsepower for supplying electricity to Kyoto.

## TALL STACK BUILT WITHOUT SCAFFOLD

A great steel tunnel set on end, towering 242 ft. above the street, and large enough for a good-sized locomotive to pass through, has recently been completed in Detroit.

It is the steel smokestack of a heating company, and is 14 ft. in diameter, and 29 ft. at the top. The stack was erected without the use of any outside scaffolding, and the men working on the inside could not be seen by people in the street below. Steadily the structure grew, a few feet each day, as piece after piece of the great steel sheets were hoisted up and riveted in place. It seemed to grow by magic, and not until the great flaring bell at the top was reached was a workman visible. The picture shows a man, suspended from a rope putting on the finishing touches at the top.

In the work 27,000 rivets were used; driven tight by pneumatic hammers. The stack will be lined inside, all the way, with firebrick, and is estimated to have a life of from 30 to 40 years. We are indebted to the Detroit News for the photograph, which was taken from the sixth story of the building, or 80 ft. above the ground. The derrick seen in the engraving is being used in the erection of the building.

Without the brick lining inside engineers state the stack would last only a few years, on account of the acids in the smoke eating into the steel.

## RESTORES BURNED RECORDS

**Remarkable Success Attends Invention of California Professors**

Two professors of the University of California have discovered a chemical process by which they are able to restore burned documents such as notes, ledgers, and insurance policies. Documents which are no longer decipherable, and which crumble into ashes in ordinary hands, are by this new process restored sufficiently to enable a perfect copy being made. The restoration is made one leaf or sheet at a time and the inventors are working night and day in the transcript of valuable papers destroyed in the San Francisco fire. The documents thus restored are not durable, but last long enough to have a copy made. The courts are expected to recognize these transcripts as legal. The chemical formula which works this wonder is a carefully guarded secret.

## BIG LEHR FOR TEMPERING GLASS

A lehr is a huge heated receptacle, hundreds of feet long and equipped with traveling platforms, used in the tempering of plate glass. At the end where the glass enters the heat is intense, the temperature decreasing gradually until at the exit it is cold.

The largest lehr in the United States was recently installed at Alexandria, Ind. It is 750 ft. long, with walls 2 ft. thick, and will admit sheets of glass 12x19 ft. in size. It takes 30 days for a sheet of glass to pass through. Several motors—a 10-hp., two 7½-hp. and two 2-hp.—are used to operate the traveling platforms. The cost was $15,000.

## ILLUMINATE BOTTOM OF LAKE

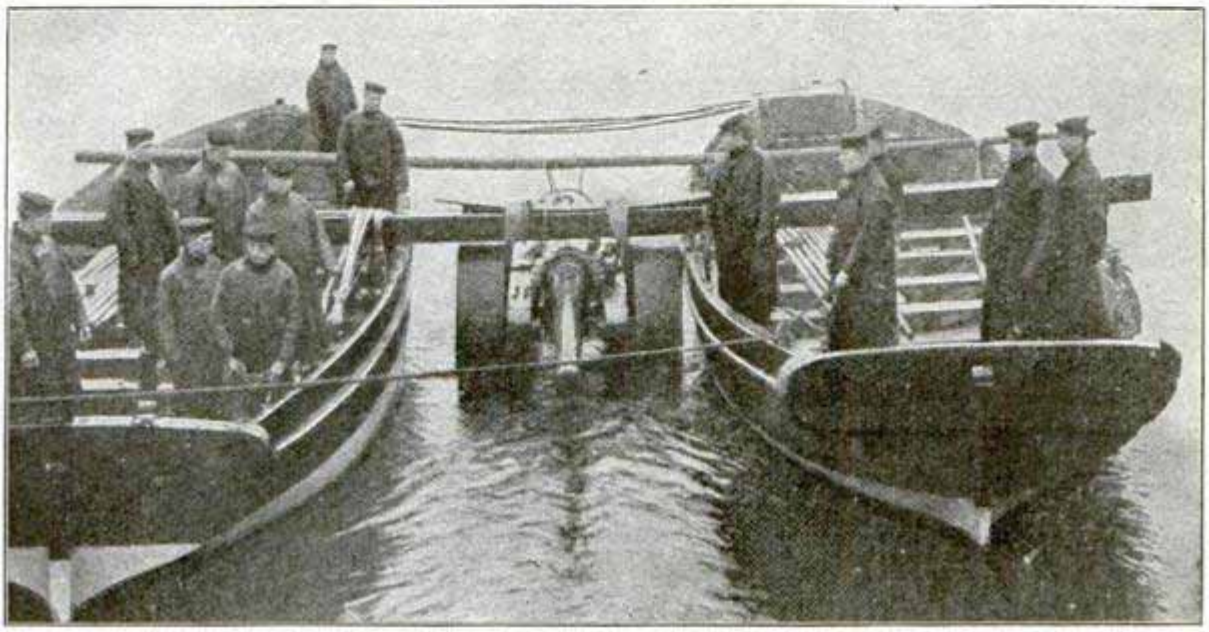
Submarine cables with several hundred electric lights attached were laid on the bottom of Union Lake, near Millville, N. J., in the effort to discover the body of a boy who was drowned. Current was obtained from the trolley line which runs to the lake, and the cables with lamps every few feet were dragged along the bottom. The plan was successful.

## WHAT IS A LOCOMOTIVE ENGINE?

The railroad definition of an engine has for years been a "locomotive propelled by steam." The American Railway Association, which establishes the definition of railroad terms, has enlarged the scope of "engine" and it now means "a locomotive propelled by any form of energy," which includes, of course, electric, gasoline and other motors.

## LANDING A BIG NAVAL GUN

The landing of a 4.7 naval gun was a feature of a war course demonstration at Whale Island recently, says the Shipping World, London. The gun mounted on its carriage was slung between two big boats and these were towed to shore by launches. The launches moved off when near shore, the lashings were cut and the gun dragged up the high hills. The difficult piece of work was admirably executed and won much praise from spectators.



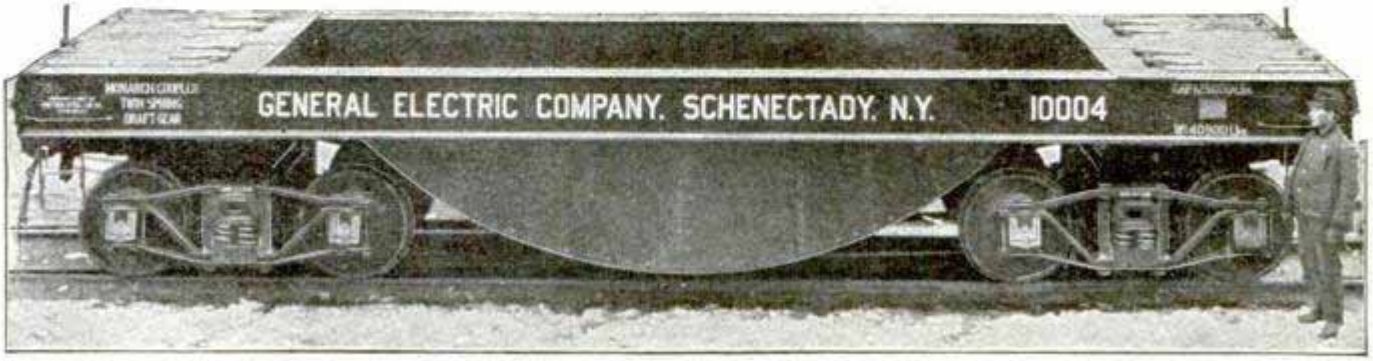
**The Gun was Slung Between Two Big Boats**

## SAND BEST FOR GASOLINE FIRES

The best way to put out a gasoline fire is to use sand. Experiments were made by the London fire department with burning shavings which had been soaked in gasoline. The sand extinguished the fire in 45 seconds; water in 4 minutes, and chemical extinguishers had little effect. If you have conditions where a gasoline fire is possible, better keep a pail or two of dry sand handy. It is inexpensive, never spoils and will do the business.

## SPECIAL FLAT CAR

Several flat cars of unusual design have been built specially for transporting the parts of big electric generators. These cars are 32 ft. long and contain a "well," there being no center sills. The principle of bridge construction has been used. The car has a capacity of 125,000 lbs., and comes down very close to the rails.




**Flat Cars for Transporting Parts of Electric Generators**

# CLEANING SAN FRANCISCO OF VAST DEBRIS

## To Remove the 10,000,000 Cubic Yards with Teams Will Take 5 Years--Plan to Do It In 15 Months

Editor's Note.—According to careful estimates, the mass of brick and other debris that will have to be removed from the burned business district of San Francisco to permit the rebuilding of the city aggregates something between 10,000,000 and 11,000,000 cubic yards. Mr. Loss declares that the removal of this vast amount of refuse material would require five years if all the work had to be done with teams alone. According to a system he has evolved, however, he hopes to see the ruins cleared up within from 12 to 15 months by means of cableways, bunkers and steam cars. One yard is an ordinary load of dirt for a team.

By C. E. Loss

The situation is one that presents a case of great urgency, but it is a matter that cannot be unduly rushed. I have evolved a system for handling all, or more, of the 11,000,000 cubic yards of debris from the business district, and it is the only one feasible scheme that can be formulated. I propose to handle all this stupendous mass by means of bunkers and cable ways. I have already secured permits for the erection of bunkers, and have ordered material and machinery which will be erected at the earliest possible date.

Briefly, our system is this: We shall erect bunkers at various convenient places throughout the burned district. The debris will be conveyed to these bunkers by cable ways, and from the bunkers will be dumped into railroad cars. As is well known, permits for the laying of railroad tracks throughout the burned district have been already granted to the transportation companies, and the work of laying temporary tracks to handle this business is now being rushed. The railroads are the only institutions that can handle this business.

C. E. Loss



One of the Hoisting Plants at San Francisco

By teams alone, it would take five years at least; that would be utterly out of the question. To handle this wilderness of debris in trainloads is the only feasible method. We shall be able to load car after car from our bunkers at a minimum of cost and with the least possible expenditure of time and the trains will then convey the refuse material to the dumping grounds outside of the city, economically and expeditiously. Before we get through we shall probably have 100 bunkers in full operation in different sections of the city.

In view of the fact that there will probably be large quantities of brick and other material that can be again used for building purposes, the insurance companies in adjusting their losses may claim all this salvage. This is a matter, however, that can probably be amicably adjusted. What the railroads will charge for removing the debris has, as yet, not been definitely decided. They should, and probably will, handle the business as they do customarily, by merely charging a switching rate of $2.50 a car.

A large force of men and a great many teams will be employed in this work, but the teams will not attempt to haul the material out of the city, or for long distances. The teams will haul the debris to piles from which it can be conveyed by cable ways to the bunkers. Under this arrangement many contractors will be able to take a hand in the work.

I might say, in this connection, that much of the brick removed from the burned district can be cleaned and made serviceable for building operations. Estimates as to the proportion of brick that can be cleaned and used differ somewhat, ranging from 50 to 70 per cent. We will have a process, however, for cleaning all good bricks by which the work can be done by machinery for $2 a thousand. All good bricks will thus be saved and reused.

## TO PLACER MINE SAN FRANCISCO

One of the romantic projects that have sprung up since the fire is that of washing the debris to recover the gold, silver and precious stones. Values running into hundreds of thousands, if not millions, of dollars, lie buried in the rubbish. The plan is to erect plants in several locations and run the debris through on the principle of washing coal.

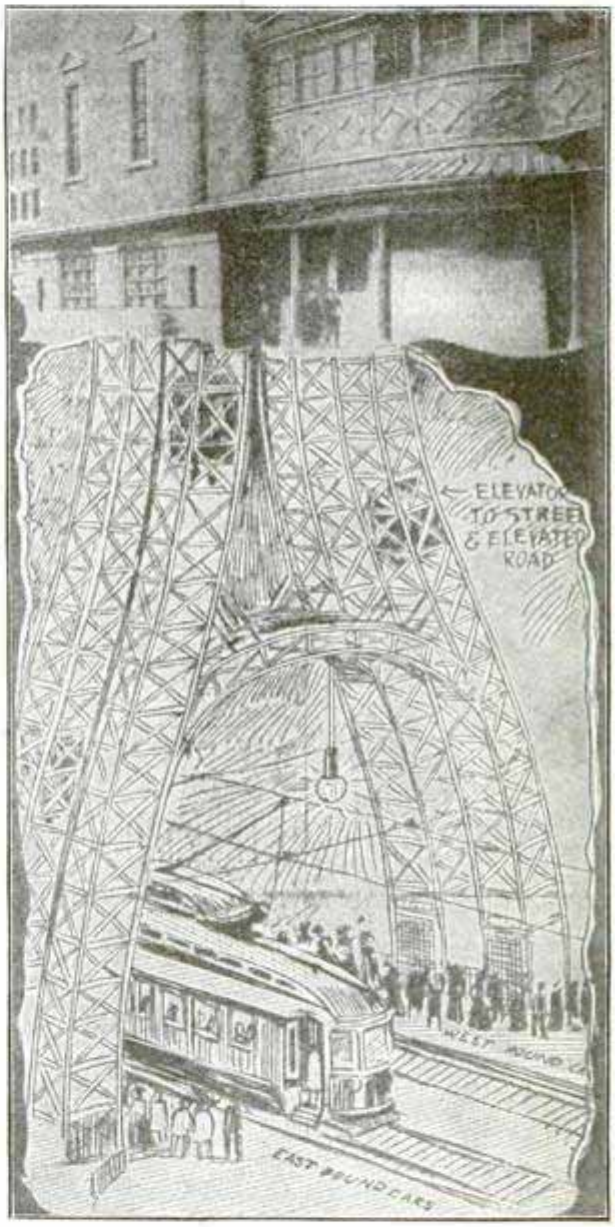
Moving grain elevators from one town to another is now frequently done.

## ELEVATORS THAT SIDE-STEP

**Boston Tunnel Elevators Most Unique in the World**

There are four elevators in Boston which do not go straight up and down, but travel 6 ft. horizontally during their ascent. The remarkable thing about them is that the elevator floor remains level all the time.

These elevators are installed at the three-story Atlantic Chambers station of the East Boston tunnel. At this point there are




**Zig-zag Elevators**

three levels where passengers go and come. The lower is where the tunnel cars are taken, the second is at the street level where the surface cars run, and the third, 56 ft. above the first, the platform of the elevated road. In taking the elevated or tunnel cars, or in transferring from any one of the three lines to either of the others the elevators are used. There are

two elevators on each side of the tracks, all operated by electricity, and are the only ones in the world which do not go straight up and down and still maintain a perfectly level floor in their passage through a curved tube. In other words, these elevators travel on an incline or zig-zag plane. Had the elevators gone straight up and down, it would have been necessary, of course, to build two station platforms at the street level, or else to have created in the street a building of prohibitive size with a waiting room beyond all requirements of the traffic.

The problem which had to be faced in the curved shaft was somewhat similar to that in the Eiffel tower, though in reality much more difficult. In the big Paris monument the lifts approach each other gradually toward the top of the tower. But the slant at no one place in the tower is so considerable as in the Atlantic Chambers, and the fact that the floor of the elevator in the tower is a little off the horizontal as the car goes up does not seriously discommode the passengers. In the Atlantic Chambers the angle is such that it was absolutely necessary to contrive a means by which the elevators going up and down inclining shafts a distance of 56 ft. and at the same time traveling 6 ft. in a horizontal direction should have level floors in their ascent and descent. Where they start at the bottom on the tunnel level they are 24 ft. apart. When they reach the street floor they are within twelve feet of each other. Although they move on inclined shafts, they are kept on an absolute level by the use of curved guides. The passenger hardly realizes that he is traveling in anything but a vertical direction, unless he looks through the iron lattice work of the elevator and notes that the lines of the shaft are all awry, and that the car started tilted at an angle of nearly 30 degrees. He starts from a platform 12 ft. across, separating the cages, and lands at gateways less than a yard apart. The cars have a maximum speed of 250 ft. per minute, each car having a platform area of about 60 sq. ft., and a capacity of from 40 to 50 passengers.

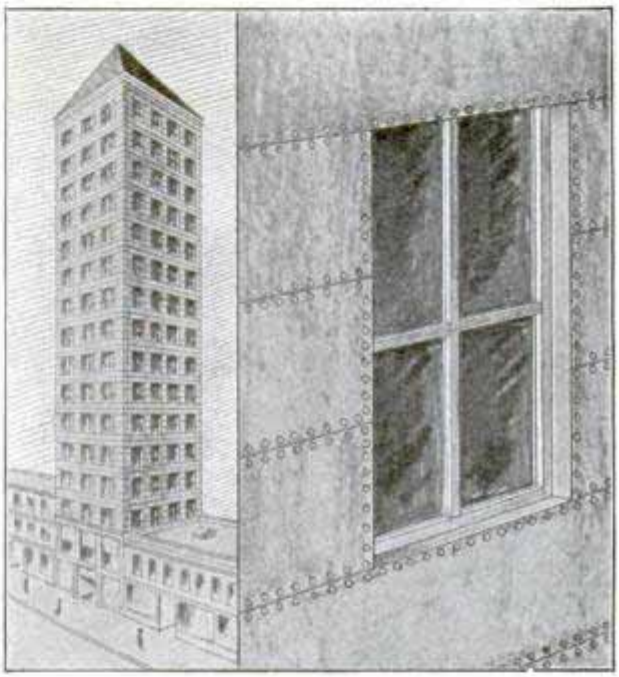
## THE BIGGEST CARPET

The biggest carpet in the world covers the floor of the London Olympia, and although it measures 63,000 sq. ft. it was only four months in making. It required 37 vans—a procession a mile long—to take it from the factory to the Olympia. Cut up, the carpet would cover 437 floors 4 yds. square.

## STEEL ARMORED HOTEL

**Building in 'Frisco to Resist Tremblors and Fire**

San Francisco will soon have one of the most unique buildings in the world; it is a hotel, and on account of its extremely slender shape has been christened the "Toothpick." The steel framework had been nearly completed at the time of the fire, and the original plan was to encase it in stone and brick. Now the skeleton, which was uninjured, will be finished, but instead of outer walls of stone, great plates of boiler iron will be riveted on in the same manner as the armor of a battleship. The building will cost $750,000 and be fire and earthquake proof.



**The Building as it was Before Quake and a Section Plated**

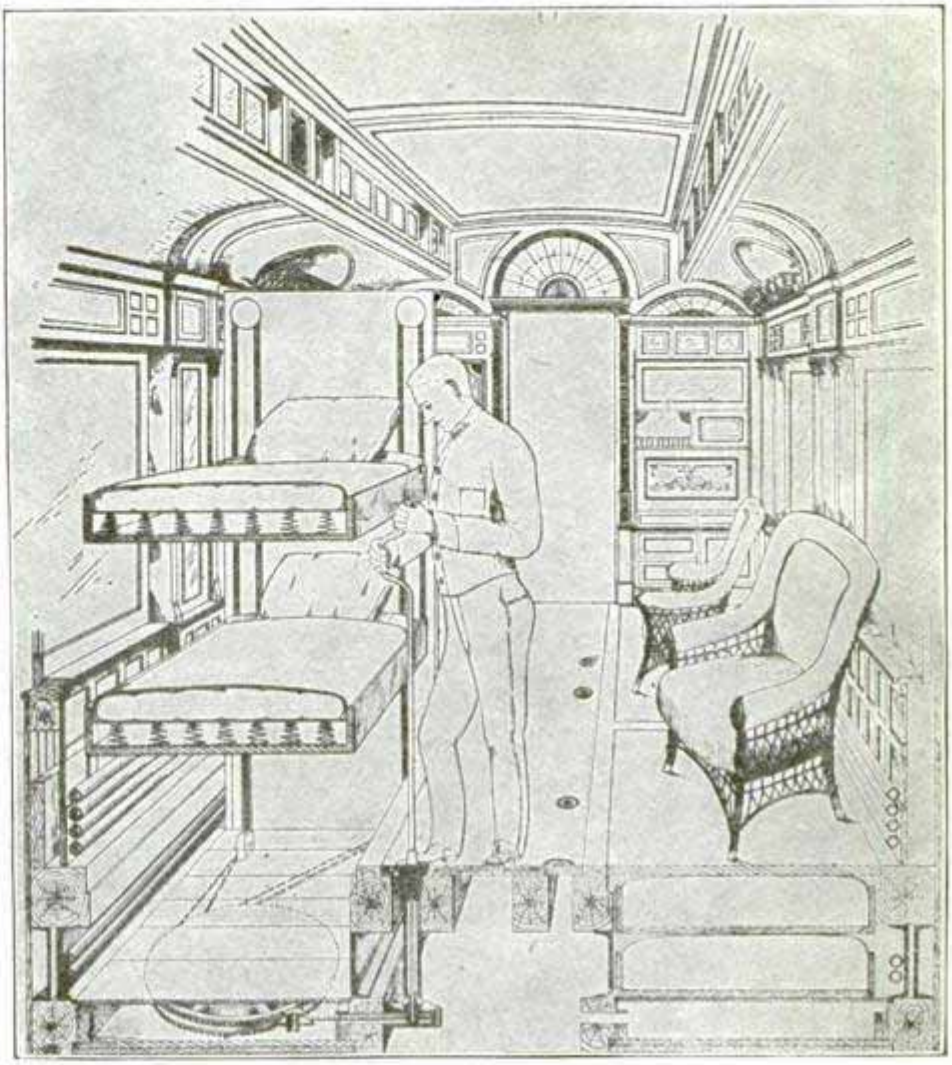
This construction appeals strongly to 'Frisco architects and already another building has been decided on to follow the same lines. The steel plates will not only greatly strengthen the structure, but cannot shake from the skeleton, and will present a smooth face, which can be painted any color, and is expected to present an extremely pleasing appearance.

When glass is in the lens of a microscope it is more valuable than gold, its value then being 50,000,000 times greater than when in the raw state.

A flagpole at St. Catherine's, Ont., is the latest adaptation of cement construction. The pole is 150 ft. high.

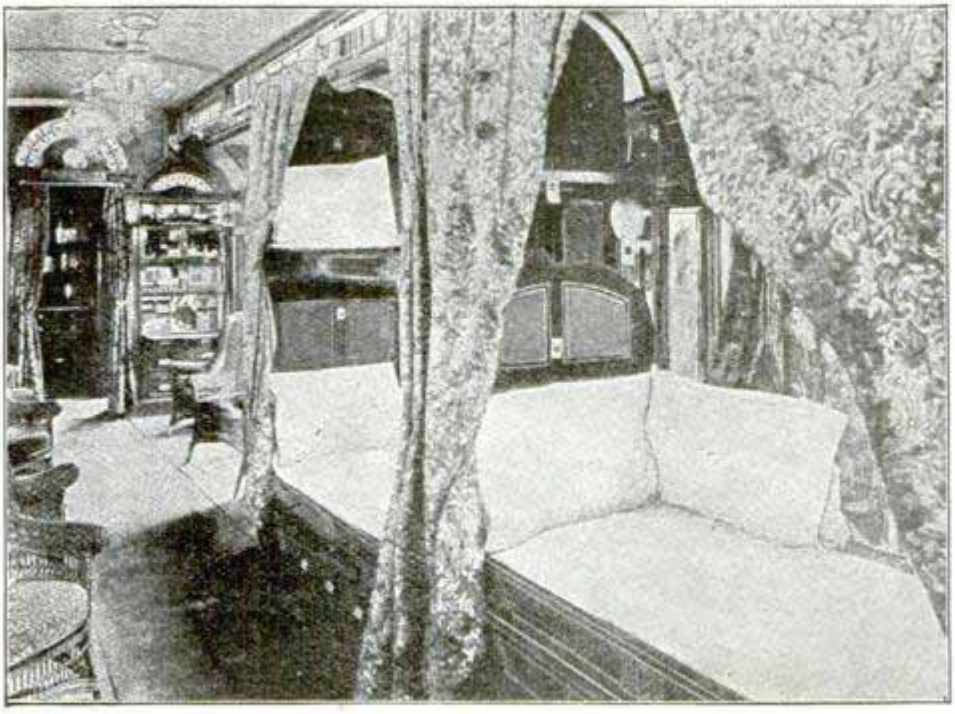
# SLEEPING CAR WITH BERTHS UNDER FLOOR

A radical change in the construction of sleeping cars is proposed, which will afford all the room and comfort of a parlor car during the day with plenty of light, and better ventilation at night. In this car the berths are entirely below the floor during the day, the space being occupied by comfortable arm chairs which may be moved about as desired. In making up a berth the chairs are removed and trap doors are raised which become the partitions between the sections, and the porter by means of a sprocket raises one or both berths into position. The berths lock securely at any desired height. The company intends to make no charge for an upper berth when it is not occupied, and in such event only one berth is raised above the floor, leaving a room unobstructed to the ceiling of the car.



Raising the Berths

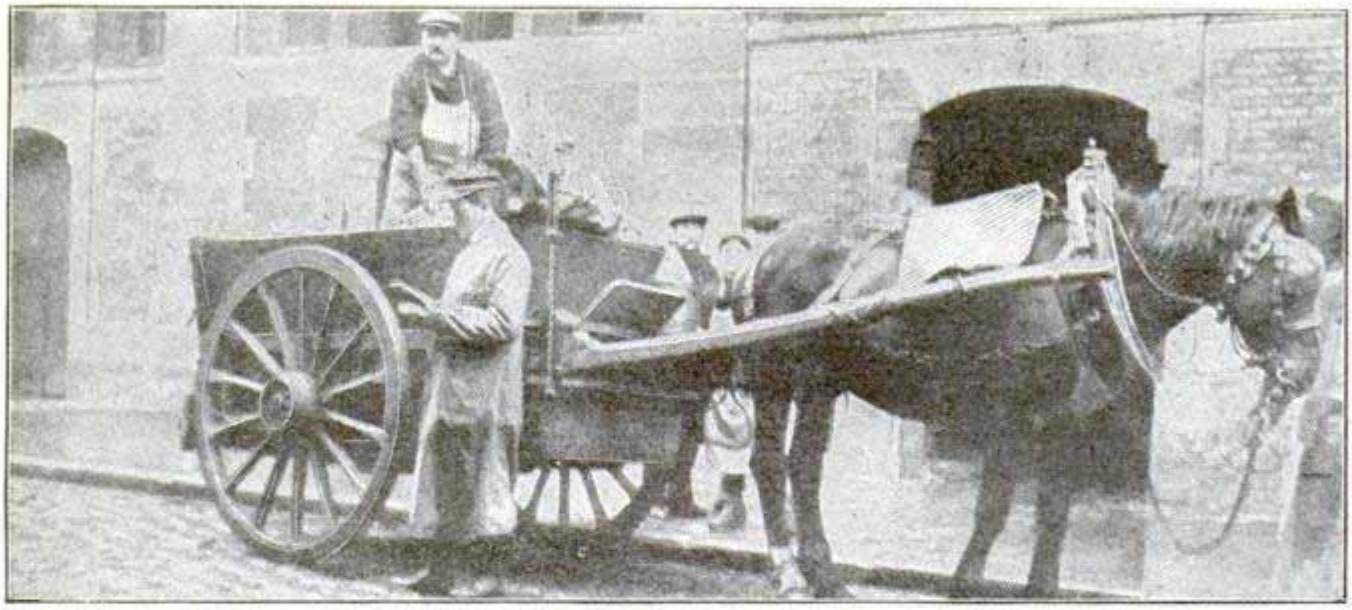
The occupant can have his berth at whatever height he desires, like a low or high bed, says Railway and Locomotive Engineering.



Berth Raised and Made Up

The new plan enables the porter to make up or put away the berths in less time than by the present system in sleeping cars. In the day, when the beds are down out of sight below the closed up floor, a current of pure outside air is allowed to get at the beds all the time. It passes through dustproof screens, and the beds get an all-day airing, and at night are sweet and clean, and moreover they are made up and ready for use the moment they are wanted.

In every mile of railroad there are 7 ft. and 4 in. that are not covered by the rail —the space left for expansion.



THIS IS A SCENE IN PARIS, WHERE CONDEMNED MEAT STAYS CONDEMNED AND ACTUALLY REACHES THE RENDERING TANKS INSTEAD OF BEING SIDETRACKED AND WORKED UP INTO CANNED GOODS FOR HUMAN CONSUMPTION. THE WAGON IN THE PICTURE REMOVES DISEASED MEAT, BUT FIRST THE INSPECTOR INJECTS IT WITH KEROSENE CARRIED IN THE CAN NEXT THE DRIVER'S SEAT. AMERICANS SHOULD BE SATISFIED WITH NOTHING LESS THAN THE PARIS SYSTEM, WHICH IS THE BEST IN THE WORLD.

# REVOLUTIONIZE PACKING SYSTEM

### "Kitchen of the Nation" Indescribably Filthy--Packers Have Now Cleaned Up a Few Rooms to Show Visitors

It begins to look as if the people were to have relief. The Pure Food bill, which was on the verge of failure in the Senate, has been revived, and under pressure of an awakened and outraged public may yet amount to something. For years new mechanical methods and applied chemistry have been made use of in a constantly increasing degree, until few of the articles of food are genuine, and many of them, while palatable, are unfit for food. Preservatives of all kinds are used in milk and meats, vinegar is made of deadly acids, butter and lard is made of "grease" and much of the grease is unfit even for soap. Much of the potted and canned meats and sausages are made of unspeakable things and by processes indescribably filthy. Even these when "spoiled" have been "recovered" by mechanical and chemical processes, and sent out again wrapped in a bright, fresh label, which gives the package a new appearance. Smoked meats by thousands of tons never saw any smoke, but are given the smoked flavor by a preparation of creosote, which is quicker and cheaper.

The lust for profit has grown to such an extent, and has been unchecked, until through immunity what was first an experiment soon became an established practice.

Much the larger proportion of meat killed by the Chicago and other large packers is healthy, and hence wholesome, but an almost incredible amount of diseased meat, absolutely unfit for human use in any form, has been going out. When cut up into steaks or roasts only a highly trained expert can detect disease.

That portion of the Reynolds-Neill report which has been given the public is true, every word of it, and conditions immeasurably worse have long existed. Just now the big packing houses in Chicago are receiving the first general house cleaning since they were established, and in full page advertisements the public is invited to call and see. But what the packers choose to allow the visitor to see is selected departments, which are not now and never were, specially offensive. In the hundreds of great buildings and pens covering a space equivalent to several hundred city blocks there are more places the visitor cannot

find and enter than those he will be allowed to see.

The packers righteously deny the accusations, but men who will deliberately deceive the public with false brands and sell diseased meat as good meat, naturally would not hesitate to deny having done so.

The system of government inspection is insufficient and does not follow condemned meat to destruction. In the past it has stopped the movement of a diseased carcass in its regular channel, only to have it continue its way to the public through other avenues. The dressed meat for export has been good, because it did not pay to send diseased meat to places where inspection would confiscate it. The result has been the domestic supply, and especially the local Chicago supply, has had to take the rejections.

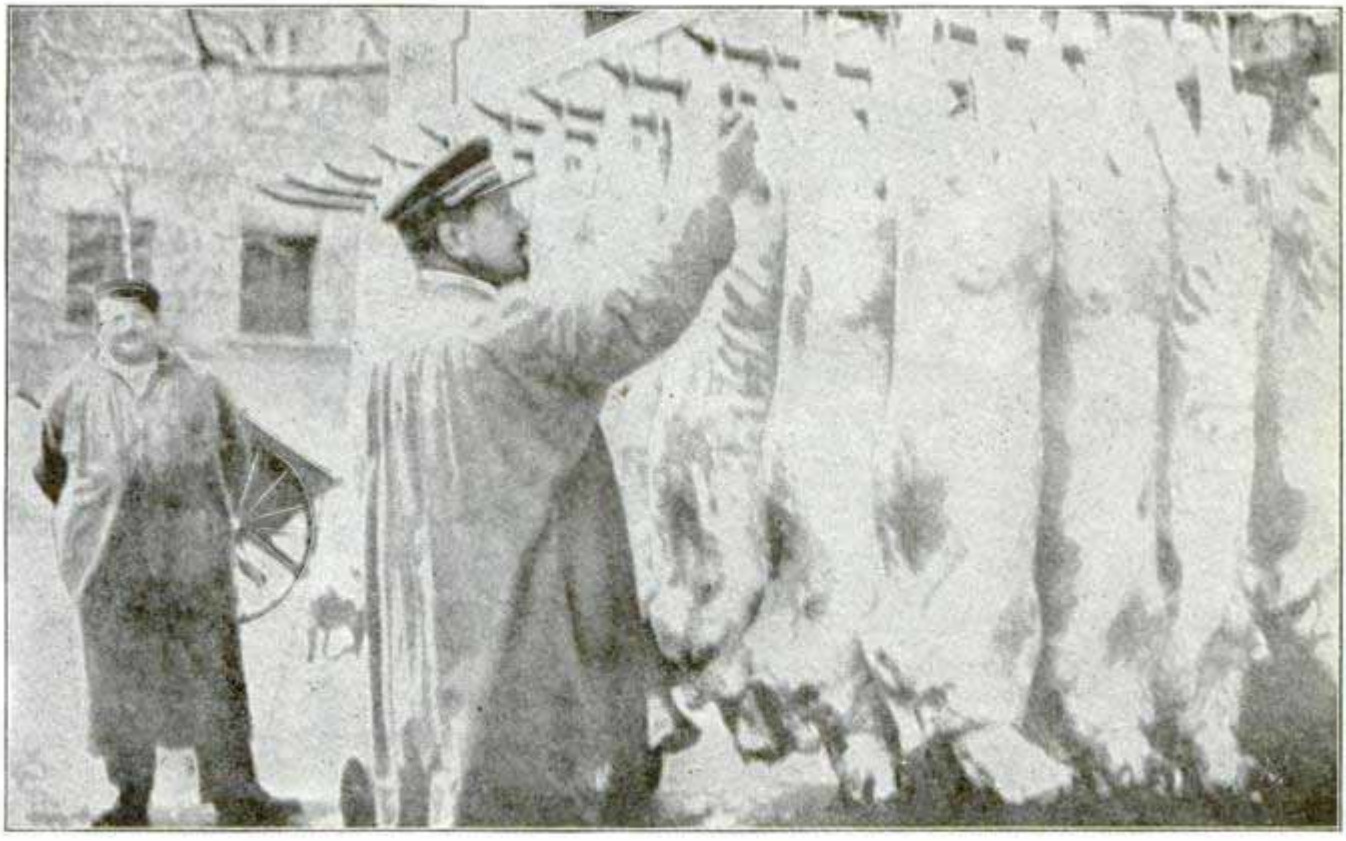
The city inspection has been especially corrupt and inadequate. What is needed is national legislation imposing heavy penalties on any one who offers for sale or transports any diseased animal or meat for food, and state and city laws which will protect the citizens of the state in which the animal is killed and its meat sold. This, with a pure food law, will make the packing industry less profitable but would enable the public to continue the use of meat instead of turning vegetarians, as it now feels almost compelled to do.

London is experiencing an awakening as to its own slaughter houses, and points to Paris as having the most perfect large system in the world. There they have an inspection which means something, and once a carcass is condemned it is used only for fertilizer or fed to wild animals in captivity.

## THRILLING RESCUE AT NIAGARA FALLS

The most sensational rescue ever made at Niagara Falls was accomplished recently, by the fire and police department. Annis Sweitzer, demented and escaped from an asylum, plunged into the rapids and was carried down until within 15 ft. of the brink of the American fall, where he landed on a small rock 35 ft. from shore. He refused to be rescued. Ropes thrown to him were cast aside and efforts to lasso him failed.

The hook and ladder company was finally called, which loaded the truck with heavy weights and ran the extension ladder out 40 ft. over the water. Fireman Conroy and Policeman Butts crawled out on the ladder and after a furious struggle with the maniac, in which they several times narrowly escaped going over the falls, he was finally secured, bound and brought ashore. The incident was the most thrilling rescue ever made by a ladder company.



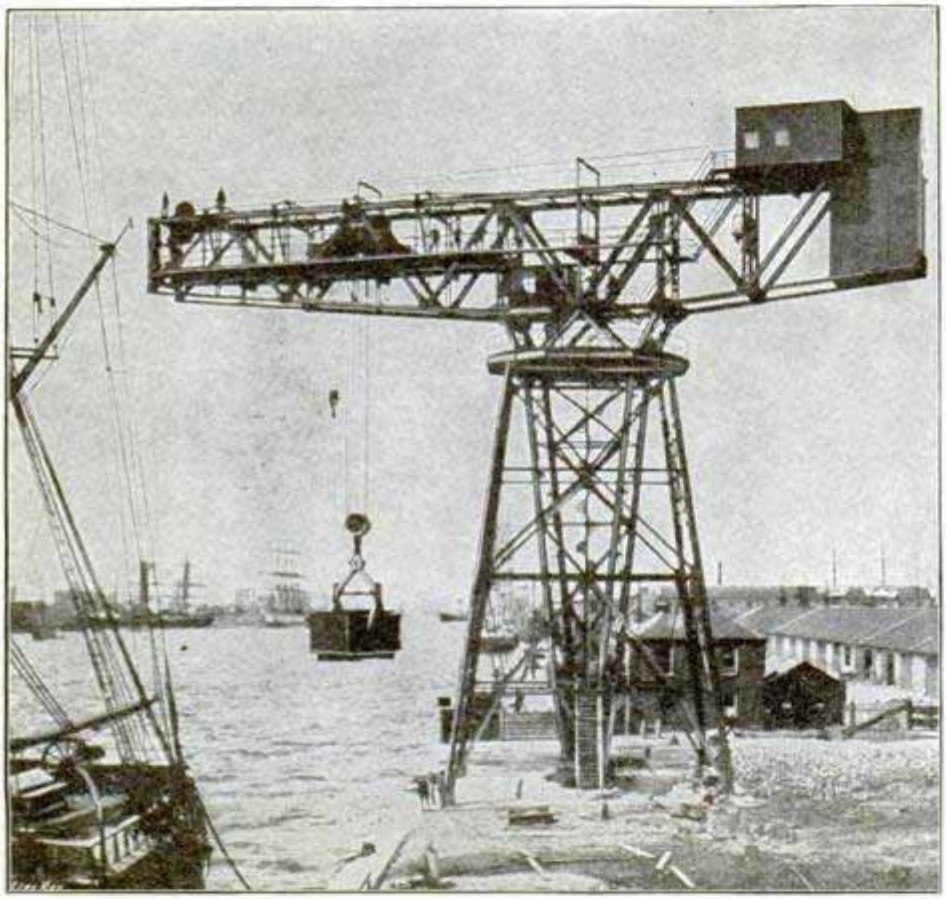
**Paris Police Inspector Stamping Good Meat--It Can Now Be Sold**

## WILL JAPAN RULE PACIFIC?

Japan is rapidly assuming the leadership as the maritime power of the Pacific ocean. In 13 years her merchant marine has grown from 180,000 tons to 950,000 tons. One shipyard alone, at Nagasaki, employs 7,000 men constantly, and more ships are constantly being secured by purchase from other nations.

## TEST FOR JOLT OF AUTOS

In a test of the best form of springs or shock absorbers for autos, held in Paris, milk bottles filled with water and left uncorked were used. A bottle was fastened to the floor in each of the side entrances of the cars, which were to travel at a given rate for a distance of about 16 miles. The car returning with the most water remaining in its bottles won first prize.



**Rotating Tower Crane at Dublin**

## AIR COMPRESSOR FOR ARCTICS

The S. S. "Arctic" now fitting out at Halifax for a North Pole expedition will carry a windmill and air compressor. The American Shipbuilder, which originated the idea of power and heat from windmills in polar expeditions, says: "The compressor is to be operated by a windmill, since it is impossible to obtain fuel for steam, and the air will be discharged into several receivers at a high pressure; the air, in turn, being used in place of steam to generate electricity."

## HUGE ELECTRIC ROTATING TOWER CRANE

For loading such heavy articles as guns, boilers, machines, etc., the Dublin Port and Docks Board has installed a powerful rotating tower crane, operated by electricity and dealing with normal working loads of 100 tons. The part that rotates consists of a vertical crane-post resting on a cylindrical bearing and supporting a horizontal braced truss. The upper horizontal thrust is borne by means of rollers on a ring bearing fixed to the trestle, surrounding the crane-post.

On the short arm of the horizontal truss are located the counterweight and the machine room, the latter housing the machinery for hoisting and for traversing the hoisting crab, which runs on the long arm of the truss between the two side girders and is provided with auxiliary hoisting gear of 20 tons working capacity and 30 tons maximum carrying capacity. The motors for operating the hoists are of 60 and 40 b. hp. and the one for traveling the crab is of 30 b. hp. The slewing mechanism is located on a platform at the junction of the crane-post and the truss, says the Electrical Review, London, and is operated by a 15 b. hp. motor. On an upper platform above the slewing gear is placed the driver's house, containing the controllers and having a good view of the working field of the crane.

The greatest height of the load-hook of the crane above the quay wall is 70 ft.; hoisting height, 100 ft.; radius for 20 tons, 80 ft.; for 160 tons, 75 ft. When hoisting 150 tons the working speed is 3 ft. per minute, and when hoisting 20 tons, 20 ft. per minute; speed of traveler, 28 ft.; eight minutes are required for a complete rotation.

# MODERN EQUIPMENT OF THE COAST PATROL

**Non-Sinkable Gasoline Lifeboats--Breeches Buoys--Work of the Surfmen**


**Life-Saving Crew and Apparatus Used in Rescue Work**

The period of activity at the Life-Saving Stations on the Great Lakes opens with spring traffic and continues throughout the season until the waters are again chained in the icy thrall of winter. On the coast—both East and West—the Service is maintained without interruption all the year round, and what the rigors of the life are cannot be told in words. To understand one must go to one of the Atlantic coast stations on a night when the wind rages and the breakers have whipped themselves to a froth upon the shoals; then let him go out with one of the brave surfmen on his long, lone beat, and when the wind has buffeted him and the sea awed him and the bitter cold numbed him and the sharp sand lacerated his face, then he will begin to understand. He may be unfitted to share the peril. When the surfboat, manned by its eight strong oarsmen, puts out across the breakers, he may only stand and watch and pray—he is sure to pray—and only then will he realize what a life in this service means.

The United States Life-Saving Service now comprises 277 stations, 200 of these are located on the Atlantic and Gulf coasts, 61 on the Great Lakes and 16 on the Pacific coast. At each station from six to eight surfmen and a keeper are employed, and these men are nightly patroling 1,000 miles of our shoreline. The patrol begins at sunset, one man, clad in oilskins and southwester, with his Coston light (described in our March, 1905, number) strung on a stout cord around his body, setting out in each direction toward half-way houses—mere huts—two miles distant, where each meets a patrolman from the adjoining station and exchanges checks with him to certify that they have met. If it is very cold they kindle a little fire and after warming for a few minutes each sets out on the return trip. Any unusual or dark object in his range of vision the life-saver turns aside to examine—it may be a body cast up by the sea. Such ghastly finds are not uncommon and the gruesome task of carrying the body to the station is by no means least among the hardships. After a wreck several years ago in which many people were lost, one life-saver, who helped recover the dead bodies, lost his reason. The first watch is back at 8 p. m., when another sets out to return at midnight; this is followed by another until 4 a. m. and this by still another till daylight.

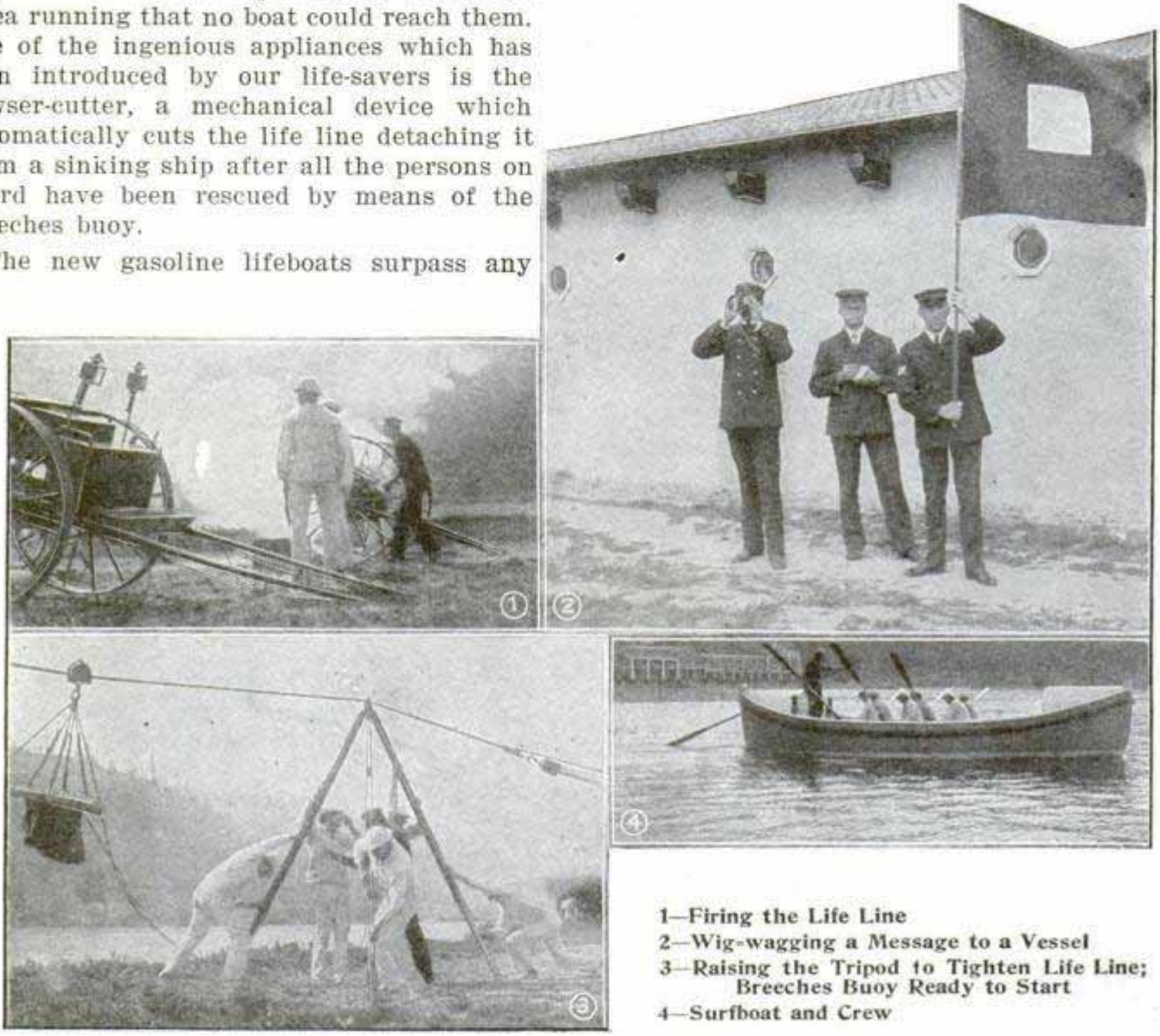
The scope of this service in the last few years has increased wonderfully, and the success in rescuing those in danger is due in large part to the modern equipment. All of the American governmental life-saving crews are now equipped with self-bailing and self-righting surf and lifeboats; beach guns for hurling lines to stranded vessels, breeches buoys for bringing ashore imperiled persons; flag outfits for "wig wag" signaling by day and rockets and colored lights for night signaling. The life-savers are also supplied with medical kits of "first aid" remedies for the resuscitation of rescued persons.

During the past year Uncle Sam's lifesavers rendered aid to 785 vessels and to more than 4,000 shipwrecked persons. Most of the rescued persons were brought to places of safety by the lifeboats or surfboats, but gasoline launches, with which some of

the stations are now equipped, rescued more than 300 persons, and half a hundred persons were brought ashore through the instrumentality of the breeches buoy after wreck guns had been used to fire lines to ships stranded in such position or with such a sea running that no boat could reach them. One of the ingenious appliances which has been introduced by our life-savers is the hawser-cutter, a mechanical device which automatically cuts the life line detaching it from a sinking ship after all the persons on board have been rescued by means of the breeches buoy.

The new gasoline lifeboats surpass any craft for this purpose ever used by any nation. They are of the self-righting, self-bailing, non-sinkable type, provided with sails, oars and 20-hp. engines as means of propulsion. Water-tight compartments filled with air tanks give them their buoyancy and all the heavy weights—aggregating about 2,700 lbs.—are placed below the center of gravity. The combined buoyancy of the air cases is 11 or 12 tons and it requires a load of 44 men of average weight to bring the deck scuppers awash. The self-bailing apparatus consists of five 6-in. copper tubes on each side through which the water escapes. Automatic valves prevent its flowing in the wrong direction. The fuel tank in the boats holds 75 gal. and there is an auxiliary tank of 25 gal. capacity. The dimensions of the boats are: Length over all, 34 ft.; beam, 8 ft.; draft, 3 ft.

Among the heart-rending stories of the life-savers' work, none is sadder than that of the brave surfmen at Monomoy Station, on the New England coast. The men, after facing fearful peril, rescued five Italians from a wrecked vessel. On the trip to shore the foreigners became frightened at the water that swept in and flung their arms around the surfmen's necks so that they could not use the oars and the boat capsized. The surfmen fought a hard but losing fight. One caught hold of a bit of loose wood on the boat and was saved—the others all were lost.



1—Firing the Life Line
2—Wig-wagging a Message to a Vessel
3—Raising the Tripod to Tighten Life Line; Breeches Buoy Ready to Start
4—Surfboat and Crew

A college of aeronautics is being established at Koutchins, Russia. The buildings include a vast hall for experimental work with air-testing devices, a great tower for testing air pressures, a laboratory and a dynamo building.

# THE LARGEST AMUSEMENT STRUCTURE IN THE WORLD

**Planned for Coney Island--To be Built of Concrete and Steel**

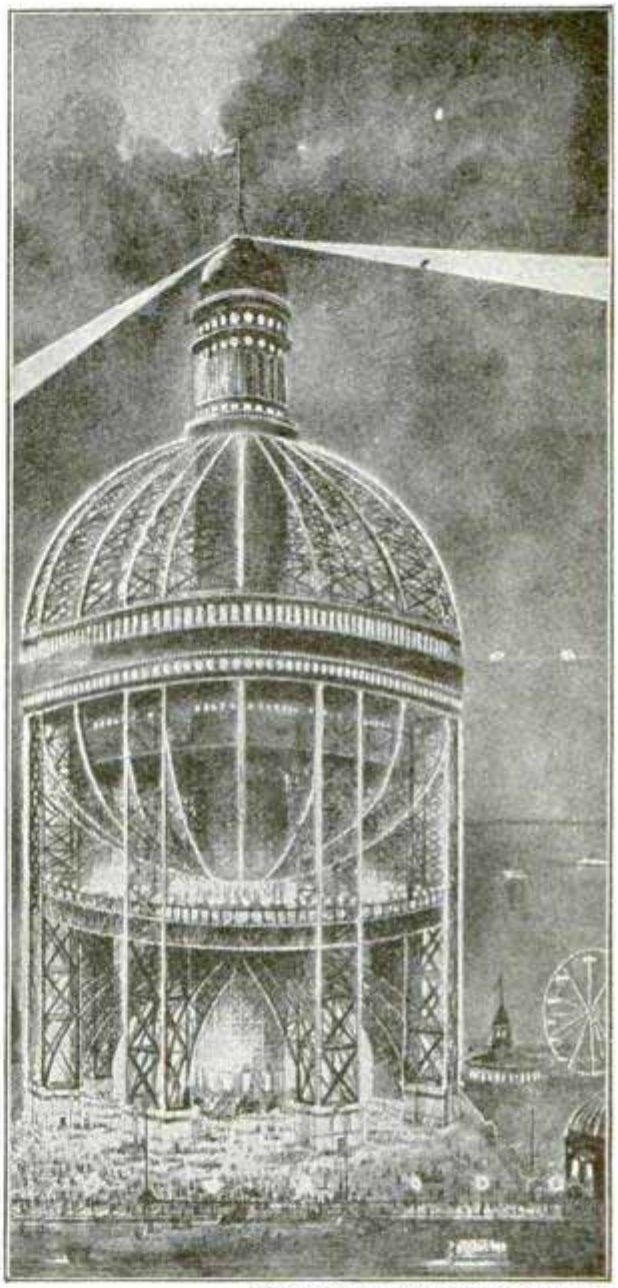
The largest steel structure in the world is to be erected at Coney Island during the next year. The building as planned will be a huge steel tower, 700 ft. high, 300 ft. across and 900 ft. in circumference at the base. It will be taller than any other building in the world with the exception of the famous Eiffel Tower and will have capacity for entertaining 50,000 people at one time.

The foundations will be of concrete encased in steel and the superstructure will be of steel with concrete floors, fireproof in every detail, and provided with ten large elevators of the safest design. It is estimated that 7,939 tons of steel will be used in its construction—more than is contained in the great Williamsburg bridge. There will be about 500,000 sq. ft. of floor space; the several stories from the ground up being devoted as follows and located at the height above ground mentioned: Auto garage, base of tower; pedestal roof garden, 150 ft.; aerial hippodrome, 250 ft.; main hall, ballroom and moving cafe, 300 ft.; aerial palm garden, 350 ft.; observatory platform, 500 ft.; hall of names 550 ft.; U. S. Observation Bureau and Wireless Telegraph Station, 600 ft.; steel flagpole, 700 ft.

The largest revolving searchlight in the world will surmount the tower and hundreds of thousands of electric lights will be used for decorative illumination.

Some of the notably high buildings of the world are as follows:

221 ft.—Bunker Hill Monument.
278 ft.—Masonic Temple, Chicago.
286 ft.—Flatiron Building, New York.
382 ft.—Park Row Building, New York.
515 ft.—Cologne Cathedral.
547 ft.—Philadelphia City Hall.
555 ft.—Washington Monument.
700 ft.—Globe Tower.
1,000 ft.—Eiffel Tower.



Copyright by Friede Globe Tower Co.

**Will be 700 Ft. High**

## RAISING SHIPS WITH ACETYLENE

In a new system for raising sunken vessels, cans of carbide are placed at various parts which are to be emptied of water and the cases are broken simultaneously by electrically fired caps. When the water reaches the carbide, acetylene gas is generated and the pressure is sufficient to force the water out of the compartment.

## BRICK FROM ASHES

Ashes combined with cement are being used in Detroit for a new process brick which is said to stand water and fire tests. The new brick is ready to use in five days and is much lighter than terra cotta.

The fire protection of Davenport, Ia., a city of 40,000 inhabitants, consists solely in the water works system. No tower is used, but the pressure ranges from 150 to 200 lbs. at all times.

# ALCOHOL BILL PASSES

Congress has passed the bill removing the tax on denatured alcohol, which will now be available for light, power and cooking purposes. In order to protect the wood alcohol manufacturers, who have some $30,000,000 invested in plants, the bill does not take effect until January 1, 1907.

Untaxed denatured alcohol is an industrial stimulus that cannot be used by mankind as a stimulant. The starch and sugar plants are the source of production—potatoes and beets being used chiefly in Europe, but in this country may be added the white potato of the North, the sweet potato, the yam, the cassava plant, waste molasses from the sugar cane and from sugar beets, and the waste product from the stalk of the Indian corn at the time of the hardening of the grain. The denaturing process consists in adding crude wood alcohol, to which has been added either a bone oil or some one of the coal tar preparations, with pyridine bases, to the pure alcohol. Wood alcohol is a deadly poison and the alcohol is thus rendered unfit for drinking purposes, and of very disgusting flavor and odor. Alcohol thus treated could not be rendered palatable without distillation, a process of purification equally as difficult as the illegitimate manufacture of alcohol.

It has been repeatedly stated that the time will come when the world will look to agriculture for the production of its fuel, its light and its motive power. Untaxed denatured alcohol is a step in this direction. It is estimated that an acre of corn will produce 130 gals. of absolute alcohol and an acre of potatoes, at 300 bu. to the acre, 255 gals. As the quality of the potato is no consideration, the variety giving the largest yield will be planted for this purpose. Thus the farmer is to be benefited by the increased demand for his products.

In Germany thousands of alcohol engines are in use, alcohol as fuel being as cheap as gasoline, far safer, and absolutely clean and sanitary. Denatured alcohol is also used for lighting purposes, and in the manufactures as a substitute for grain alcohol wherever practicable.

Manufactories for the production of the alcohol will naturally be erected not far from the source of supply of the raw material. This will mean a new industry for agricultural districts in order to save freights on the vegetable matter. Another reason is that vegetables unfit for food, such as frozen or partly decomposed potatoes, beets, etc., can be worked up into alcohol at nearby factories where they would not stand shipment long distances. Denatured alcohol promises to be the first significant rival of gasoline, and consequently of the oil trust. Unlike natural oil, the supply cannot be controlled by pipe lines as in the oil regions, and the farmer will be as free to market his product as he now is with corn or wheat.

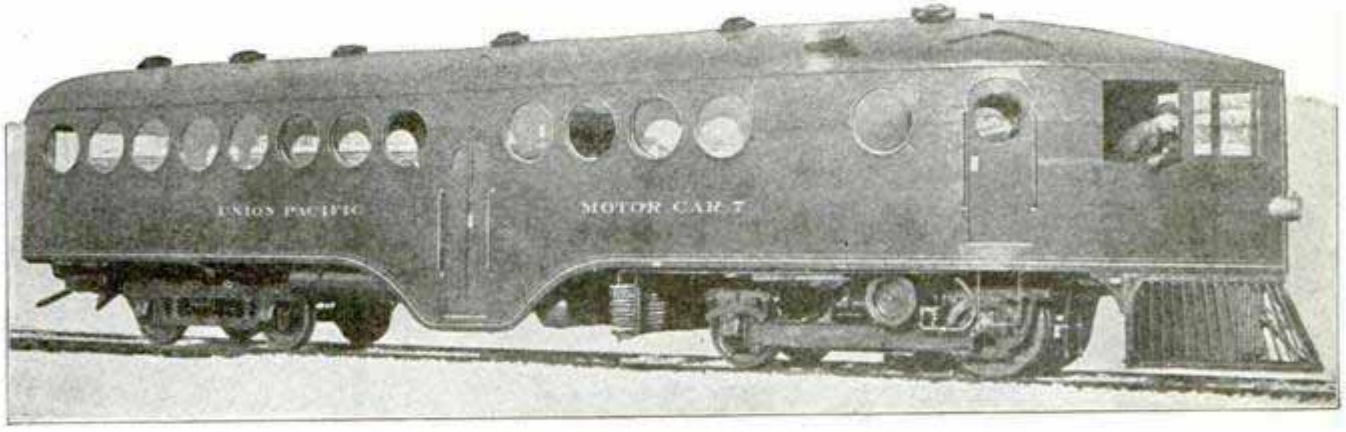
For gas engines used for all purposes, alcohol has great advantages over gasoline and can be used in the engines now installed with only slight changes in the machinery. It will not even be necessary to send the engines back to the factory to rebuild; the new parts can be sent out and the change made by engineers of ordinary ability.

In 1887 Germany removed the tax on "denaturalized" alcohol; its manufacture and use, however, was comparatively small until 1901. In that year the potato crop showed an overproduction of 48,000,000 lbs., and in desperation at the enormous loss which seemed imminent, the potatoes were turned into alcohol. This so greatly stimulated its use that the following year the government held an industrial exposition in Berlin, devoted exclusively to a demonstration of the fuel, power and lighting qualities of the denaturalized alcohol. Among the hundreds of exhibits was one 50-hp. alcohol engine running an electric light generator. Since then the industry has been an established and rapidly growing one, the price ranging from 15 to 17 cents per gallon in barrels. The government uses it in the launches and ships and boats of its navy, while throughout the country it is preferred above all other fuels for light.

Cooking stoves of all sizes, forms and capacities, from the complete range with baking and roasting ovens, broiler, etc., to the simple tea and coffee lamp, are used in homes. In this country we may expect an enormous consumption, as the alcohol has all the advantages of city gas or gasoline for cooking purposes, while it is cheaper than gas and is free from the dangers of gasoline. It also makes a more intense heat than either. A new field now opens to manufacturers, not only of the alcohol itself, but all kinds of apparatus for burning it for light, cooking and heat.

## LATEST RAILROAD GASOLINE MOTOR CAR

The Union Pacific Railroad is still pushing its demonstrations with gasoline motor cars. In the car illustrated a number of improvements have been introduced, one of which is special facilities for climbing grades. The new car is air, water and dust proof, and the vibration of the machinery has been overcome. The side entrance is something of a novelty in American construction, and portholes instead of the regulation square windows are used. The forward end is pointed as in previous cars of this kind built by this road.




**This Car is Air, Water and Dust Proof**

## GASOLINE TUG BOAT

The increasing utility of the gas engine is demonstrated in the construction of a fleet of tug boats for service on the Erie canal, and while some future president may graduate from a canal, he will not come from the tow-path: There "isn't going to be any" tow-path.

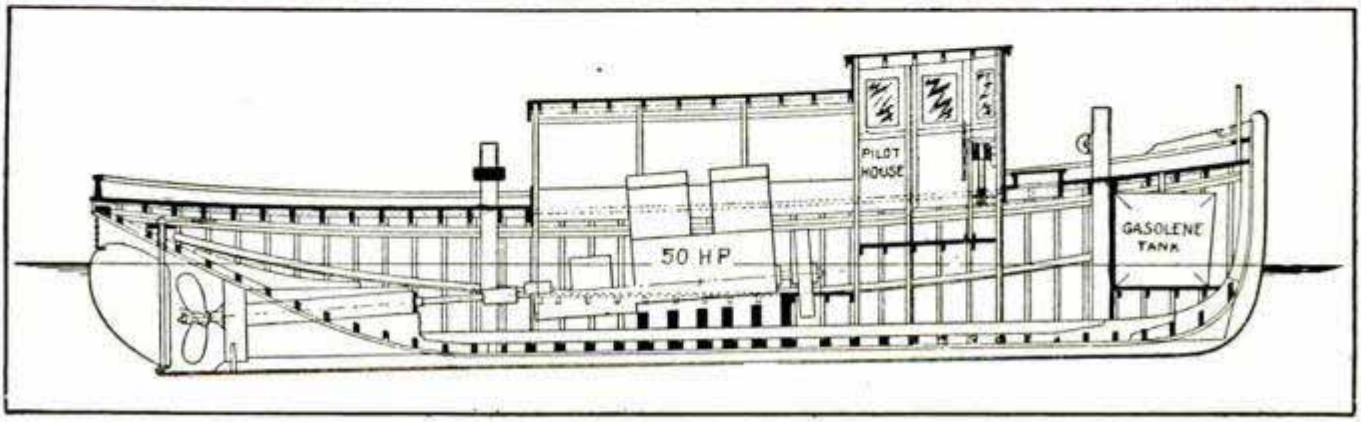
The dimensions of these tugs are: Length, 40 ft.; moulded breadth, 9 ft. 1 in.; draft, 3 ft. 10 in.; horsepower, 50; diameter of propeller wheel, 38 in. The boats are built of wood, with engine midway, and a 175-gal. gasoline tank in the forepeak separated by a heavy water-tight bulkhead. The Motor Boat says: "No sleeping accommodations are provided, as the crew will live ashore."

## STEAM LOCOMOTIVE CHEAPEST

The average steam locomotive spends one-third its time, not in bed, but in having its boiler and firebox cleaned. There are exceptions, and in emergencies the cleaning process is curtailed, but like other excesses, has to be paid for with a longer stay in the repair shop. The washing process does not consume all this time, for there is a great waste while waiting for the boiler to cool, and again in getting up steam.

An electric locomotive will stand a heavy overload, but if only required to do its normal will not heat and can be kept in operation almost continuously.

The electrical repairs are easily and quickly made as for the most part they are made by substitution; a supply of renewal parts being kept on hand, thus reducing the time in shop to the lifting out of one piece and putting back the new one, where a




**Gasoline Tug Boat for Service on the Erie Canal**

steam locomotive would have to be taken to pieces and the work done specially.

The advantage, however, is shown by the Railway Age to be misleading, for the reason that steam locomotives cost about $10 per horsepower against $65 per horsepower for an electric power station alone, or $100 per horsepower for the generating plant, transmission lines and electric locomotive. The interest on the investment is therefore ten times as much for the electric system which more than offsets the extra steam locomotives required to allow one-third of them to be out of service constantly.

There are conditions, however, such as terminal and tunnel service in large cities, in which the advantages of the electric system determine its selection regardless of cost.

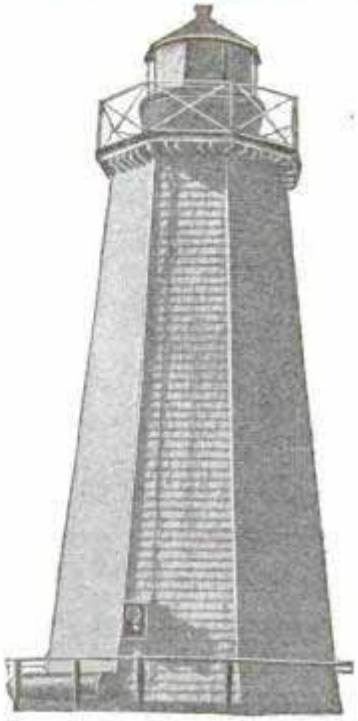
A $23,000 pick-up gear is to be added to the equipment of the cable ship "Burnside." The apparatus will enable the vessel to pick up an injured cable at a depth of 1½ miles.

Since 1902 England has removed 40 out-of-date battleships and cruisers from her navy. During the same period she has started the construction of 13 new battleships, 18 armored cruisers and four protected cruisers.

A Norwegian scientist has discovered that a common greenish-white moss makes a palatable and nutritious food. The moss is first subjected to a chemical process, then pressed and cooked. Nine ounces of the moss, costing 2 cents, will make a meal for six persons, it is claimed.

## ACETYLENE LIGHTHOUSE

An acetylene lighthouse has been equipped at Sandy Hook, to demonstrate the use of

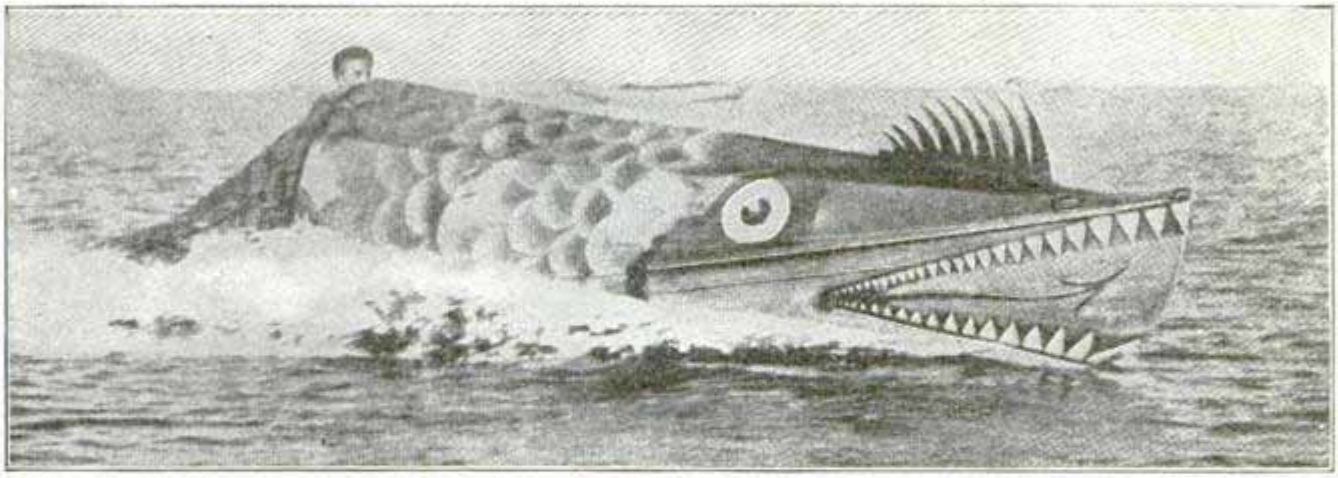


that kind of light in marine work. The light contains three burners and the tank capacity is sufficient for six months' continuous burning. The Acetylene Journal states that sailors declare the acetylene light can be seen three times as far as the oil light in a fog, and further than an electric light.

## INTERESTING ENGLISH COAL CONVEYER

The small coal conveying plant erected at the Maidstone, Eng., Electricity Works, is interesting in that one motor serves the double purpose of hoisting and moving the traveler. It is a series wound 7-hp. motor using direct current at 230 volts. A two-way cone clutch transmits power from the motor shaft to either traversing or hoisting gear, and rotation of motor is accomplished with a reversing switch. There are two elevated tracks, one of which leads into the plant and the other to the storage yard. The track switch is worked by chains from the ground. The installation was made by A. W. Empson, to whom we are indebted for the photograph.

# MOTOR BOAT THAT TERRIFIED NATIVES



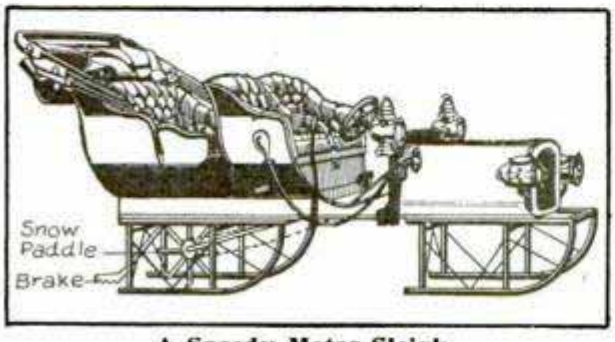
THIS IS THE "TOGA," A NEW ZEALAND RACING MOTOR BOAT WHICH THREW THE NATIVES INTO SPASMS OF FEAR. THE IDEA OF FIGUREHEAD DECORATION OF BOATS WAS WORKED OUT IN ALL MANNER OF FANCIES FROM EARLIEST TIMES, AND CONTINUED FOR CENTURIES. DURING THE PAST DECADE FIGUREHEAD CARVING HAS BEEN ABANDONED.

## MOTOR SLEIGH FASTER THAN AUTOMOBILE

A motor sleigh, capable of making 35 miles an hour on snow and up to 90 miles an hour on ice, was constructed and tested in Springfield, Ohio, last winter. The conveyance is propelled by means of a strong steel paddle wheel which successfully grips the snow or cuts the ice and pushes the sleigh ahead, faster than the speed of an automobile having the same size engine. The paddle wheel is held by a swinging frame and is pressed down by a spring which allows a vertical movement of 15 in. each way from the level.

The engines thus far experimented with are air-cooled and it is probable that the warm air from the engine could be utilized for the comfort of the passengers. A number of bells are placed underneath the sleigh for the purpose of simulating the music of a similar horse-drawn vehicle.

The speed changing levers are similar to those of an automobile, and the brake lever connects to a toothed trailing lever, which will bring the machine to a dead stop on the steepest hills.

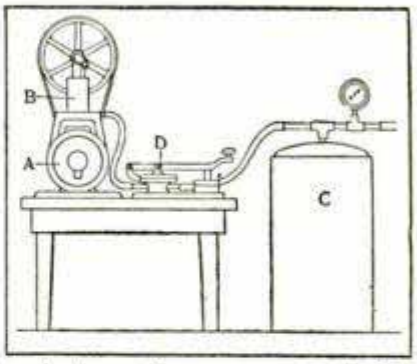



**A Speedy Motor Sleigh**

## AN ELECTRIC AUTOMATIC AIR COMPRESSOR

The air compressor here shown is very useful for barbers, physicians, art studios, and manufacturing concerns needing compressed air in moderate quantities.

An electric motor, A, furnishes power to run the pump, B, which discharges into the receiver, C. An automatic switch, D, opens the circuit when the pressure becomes sufficiently high, and closes it again before the pressure falls too low. This is accomplished by means of a flexible diaphragm which is bulged out by the pressure, thus causing the switch to open.




The motor is ¼-hp. and takes about as much current as three incandescent lamps. It will handle about 35 cu. ft. of air per minute and will give any pressure up to 75 lbs.

## THE SMALLEST ENGINE ON EARTH

**Made by T. H. Robinson, Toronto, Can.**

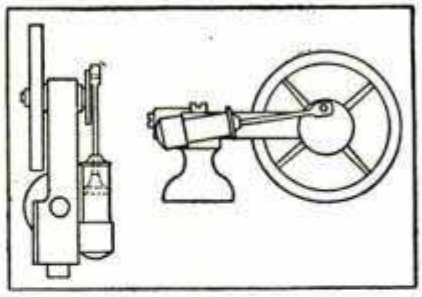
Model engine making has its attractions for those of mechanical taste. Several small steam engines have been made by watchmakers whose calling particularly fits them for this class of work. They are useful as window attractions as well as forming a good sample of work. An upright brass engine 1 in. high and weighing 4¼ dwts. (about the weight of a wedding ring) and standing on a 5-cent Canadian coin attracted a deal of attention in a jeweler's window.

But the smallest of all small engines is "Tiny Tim," made of gold and steel by a Toronto watchmaker, T. H. Robinson, of 526 Yonge street. It is smaller than a common housefly, and the smallest cartridge used in this country, the rim-fire "22 short," will easily slip over the entire engine and flywheel. The stroke is $^1/_{32}$ in.; bore of cylinder, $^3/_{100}$ in.; diameter of flywheel, $\frac{3}{16}$ in.; weight, 1 gr.; speed, 6,000 revolutions per minute, that is, 100 per second. When running no motion is visible, but the vibrating piston emits a note similar to that made by the mosquito.

**Exact Size**

The horsepower is $^1/_{405000}$ part of a horsepower, and the complete engine weighs just 4 gr., Troy weight—about the weight of a match. This means that it would take 120 such engines to weigh 1 oz., 1,920 engines 1 lb., or 3,840,000 engines to weigh 1 ton. The measurement of speed and horsepower has been made by Dr. C. A. Chant, of the physical department of Toronto University. The engine bed and stand are of gold; the piston rod, cylinder, shaft and center of flywheel are of steel; the rim of the flywheel is gold. The feed is through the stand of the engine bed, which is hollow; this is mounted on a brass tube which is encased in ebony furnished with a screw top for purpose of safety in carrying. Compressed air has been used to run it and connection is made through the ebony casing.

Two hardened and ground steel bearings are inserted in the gold engine bed for the



**Plan and Side View Enlarged**

shaft to run in. These are counterbored from the inside, which further diminishes the friction as well as forming a self-contained oil well—the oil hole being placed midway between them on top. Seventeen parts are used in making the engine.

It was shown by request and operated before the Canadian Institute, at Toronto, lantern slides being used to show its construction, and comparison with well-known objects.

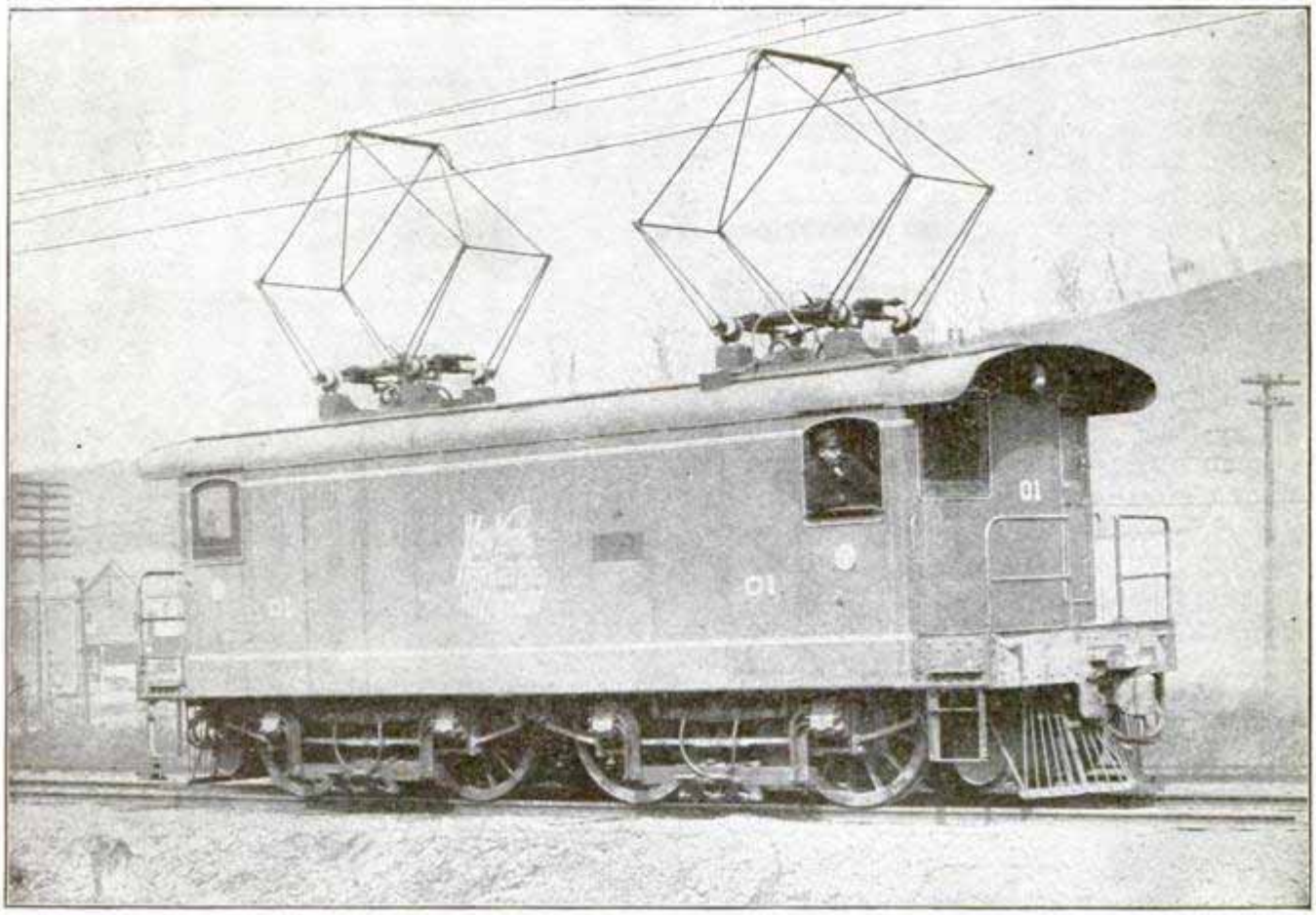
## SHIP REPAIRING UNDER WATER

A new invention by which it is possible for a man to go down and repair bad leaks while a vessel is at sea consists of a stout canvas cylinder 30 ft. long, 2 ft. in diameter, distended by hoops strong enough to withstand the pressure of the water and closed at the bottom and open at the top. This queer device is lowered over the side of the vessel, with its top well above the level of the water, and drawn close to the vessel by a line passed under the keel. The cylinder has two canvas arms let into it at just the right height for a man standing on the wooden bottom and within reach of the hands when thrust through there is an outside pocket for tools. To enable the workman to see what he is doing there is a watertight window let into the canvas.

The first device of this kind was made of a sail aboard the Liverpool barque "Birnam Wood," under stress of circumstances, says the Shipping World, London. The vessel developed a bad leak and both the hand pumps and windmill pump were going, when the captain thought of the canvas cylinder. With the sailmaker's aid it was soon in readiness and the captain descended, repaired the leak, which was 12 ft. under water, and did some other caulking. The vessel was at sea one hundred days thereafter and came into port perfectly tight.

# LATEST AMERICAN ELECTRIC LOCOMOTIVE

**Weighs 85 Tons--Speed 60 Miles An Hour--Designed for Trolley and Third Rail**



**Electric Locomotive--Speed 60 Miles An Hour**

The illustration shows the latest type of American electric locomotive, of which 35 are now under construction. They will be used in hauling passenger trains between the depot in New York City and Stamford, Conn., a distance of 33 miles. These locomotives are 36 ft. long, weigh 85 tons, run on four pairs of 62-in. drivers, with four gearless motors of a working capacity of 200-hp. each; or 800 hp. for the locomotive. This is sufficient to draw a 250-ton train on through service at 60 miles per hour. The cab is of sheet steel with windows at the end, which enable a close view of the track.

Direct current is used over one section of the road, and taken from a third rail by means of four collector shoes. From Woodlawn, N. Y., to Stamford the curent is alternating of 11,000 volts, and is taken from overhead wires, which are suspended from steel messenger wires carried by bridges reaching across the tracks at intervals of 300 ft. To collect alternating current from the high-potential overhead trolley line, the locomotive is equipped with two pantagraph-type bow trolleys, each of which has a capacity sufficient to carry the total current required by the locomotive under average conditions—two being provided to insure reserve capacity. The motors are constructed to work on either the direct or alternating current.

## CONTROLLING WIRELESS

The directing and controlling of wireless waves so that they can be aimed at a specific point—as at a ship or some particular station—is engrossing Marconi at present. He has an apparatus for this purpose in hand and expects to soon perfect it.

In 1905 the 295 box factories in New England alone consumed 600,493,000 ft. of lumber, valued at $8,831,000, of which 81 per cent was white pine.

## FIRE CRACKERS AS FIRE ALARM

By George Horton, Chief Baltimore Fire Department

The firecracker, which has been the means of innumerable fires, can be made to serve as an unfailing alarm, even though no one is in the house when the fire starts. The best detectives are the large dynamite crackers. I have these crackers distributed all over my house and have advised any number of persons to use them. The idea is decidedly practicable. One of the crackers is attached to a length of wire and it is then suspended from some place where it is likely to be useful.

I have these crackers hanging from the roof of the cellar, from the ceilings of the stairways, from under the padded seats of the chairs and sofas—every place where they can be conveniently put and are likely to be of use. The idea is simply this: If a fire breaks out, it can't make much headway before it reaches one of the crackers and the explosion gives the alarm. The idea came to me some years ago, and was suggested by a fire in a grocery store.

The fire had got considerable headway, and it was discovered by the explosion of some canned goods which attracted the attention of the people in the house. I decided that if canned goods made a good fire detective, crackers would be just as good.

There is absolutely no danger, as some would imagine, from dynamite crackers, unless the fire is there, and when a dynamite cracker—the kind I use is about two inches long—explodes, it throws itself right out with the force of the explosion. It is a good plan to keep a couple of them in a wardrobe, where there are a number of garments. The probabilities are that if a fire took place the force of the detective cracker going off would extinguish the blaze.

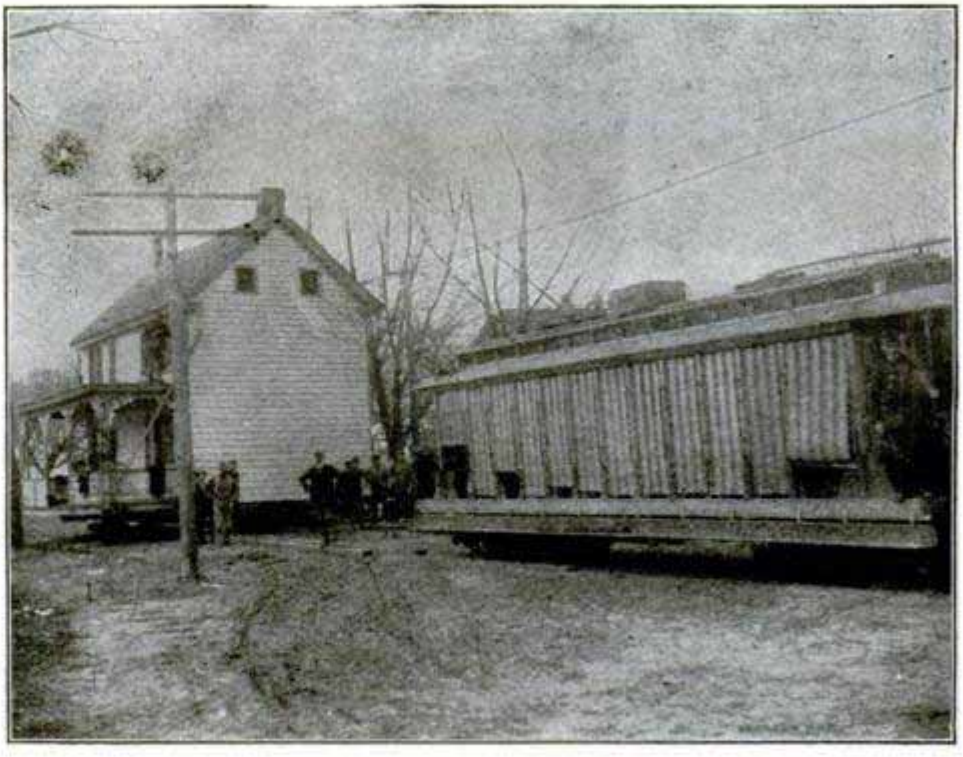
I have fixed up hundreds of these crackers for various persons and certainly do advise their use, especially in houses in the suburbs, where there are not likely to be people passing, and where a fire is, therefore, likely to get considerable headway before it is discovered.

Two great steel plants are to be built on the Pacific coast, one at Tacoma, to cost $5,000,000, and another at Seattle. The project is being financed by men who have made their fortunes in lumbering on the coast. One plant will have 3,200 acres and a mile and a half of water front on Puget sound.

## TROLLEY CAR MOVES HOUSE

One of the most unusual purposes to which a trolley car was ever put happened at Atlantic City, N. J. The building was a good sized story and a half cottage and one of the big double truck summer cars of the City & Suburban Traction Co. was substituted for horses.

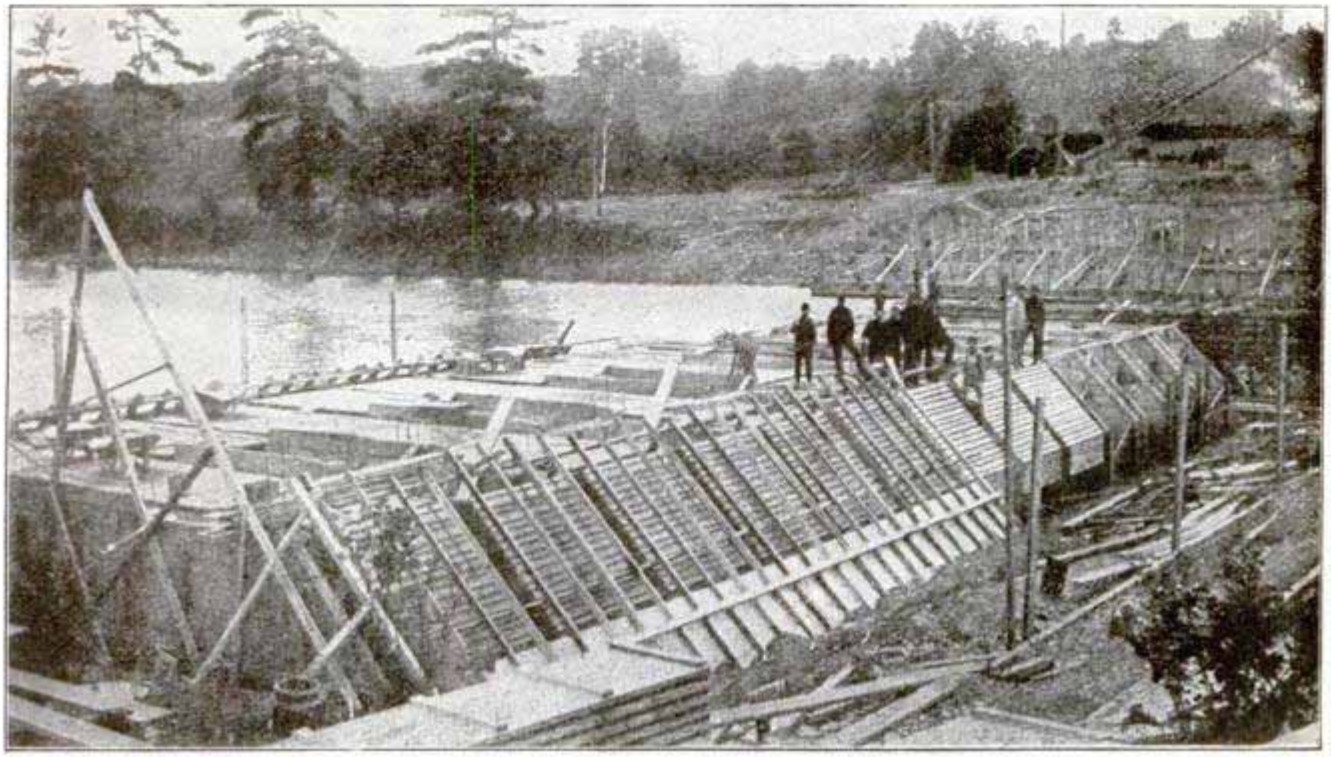
The company rendered this assistance in order to make the delay from blocking its tracks as short as possible. The Street Railway Journal says: "The span wires were taken down one at a time, and the trolley wire pulled to one side, sliding along the side of the house, two linemen taking down and putting up the wires as fast as the house was moved."



Trolley Car Moving a House

# REINFORCED CONCRETE DAMS

## Points of Superiority--Principles of Strength in Concrete-Steel Construction



Constructing the Schuylerville Dam

The use of reinforced concrete—that form of construction now lending itself to all great engineering enterprises where combined strength and permanence is desired, and especially those in which a high resistance to two great natural elements (wind and wave) is essential—presents to the engineer or architect new considerations not yet generally discerned by the law-making element of the country, and therefore inadequately covered by the building ordinances of our municipalities. In a number of instances, not recognizing reinforced concrete as a special method of construction, involving principles peculiar to itself alone, the regulations relating to ordinary steel construction have been applied without change to reinforced concrete, and the misfit, liable to result in serious loss or great danger to property and life, is apparent only to the expert, who finds himself helpless to remedy matters.

By means of reinforced concrete the world is embattling herself against Nature's stress of wind and wave and quake. For her edifices, that she would fain make permanent as earth may be, she is striking roots of concrete and steel; for her long-distance beacons—on terrible Cape Hatteras, on Mile Rock, at Nikolaev and many other mariners' death runs—she is lifting up shafts of concrete and steel; her swift rivers, given to overwhelming and devastating spring floods, she is spanning and damming with structures of concrete and steel; and she is honeycombing the earth's crust with great tubes of this same construction. Enthusiasts have declared that this is the concrete-steel age—enthusiasts, like geniuses, are wont to transcend the truth; nevertheless, the matter is sufficiently important to warrant the public's becoming acquainted with the fundamental principles involved in the strength of this form of construction.

"The strength of a reinforced concrete structure depends absolutely on the intimate union of the concrete and steel; the structure must be at the point of failure as soon as that union is destroyed." So states Walter Webb Loring, in the Journal of the Franklin Institute. Experts in general claim that the elastic limit of the metal represents the strength of the reinforced concrete structure; the inexperienced would take the assertion literally: in his mind the expert qualifies it. Take a steel bridge with an elastic limit of 30,000 or 32,000 lbs. and an ultimate of 60,000 lbs. A working stress as high as 16,000 lbs. has been permitted with safety. If, however, the structure

were concrete, reinforced with steel of the same grade as that used in the steel structure, it would by no means be safe to permit so great a stress, as the union between the concrete and steel would be destroyed. The stress in concrete due to its contraction during setting, under some conditions, is as great as that due to the working load, and this, also, must be taken into consideration. In one bar system of reinforcement, steel with an elastic limit of 60,000 lbs. is used. In calculating, the limit is taken as 50,000 lbs. and divided by four to compute the working stress—12,500 lbs. The best reinforcement is considered to be a deformed (bent or curved) bar with a high elastic limit, the shape of the bar being of the greater importance.

The construction of dams is one of the most noteworthy applications of reinforced concrete. These dams are built hollow, with a comparatively flat upstream face, so that there is no tendency to overturn, and in many cases both the gatehouse and power house are located inside the dam, greatly reducing the expense. Fig. 1 shows a section of the Oakdale power house, located within a dam, at Tippecanoe, Ind.

The concrete-steel dam has many points of superiority over both those built of solid masonry and those built of wood. The masonry dams are built with a nearly vertical upstream face, so that the water tends to overturn at the toe of the dam, the overturning moment increasing with the flood and being resisted by the weight of the dam. The dead weight of masonry required is so expensive that ordinarily a small factor of safety is allowed, and under an unusual flood, the dam gives way. The timber dam has an upstream face, making an angle of less than 45° with the horizontal, the center of pressure coming within the base, so that the dam could not possibly overturn. But, as Mr. Loring impressively states: "A wooden dam is never any better than on the day it is finished. Its deterioration commences from that day."

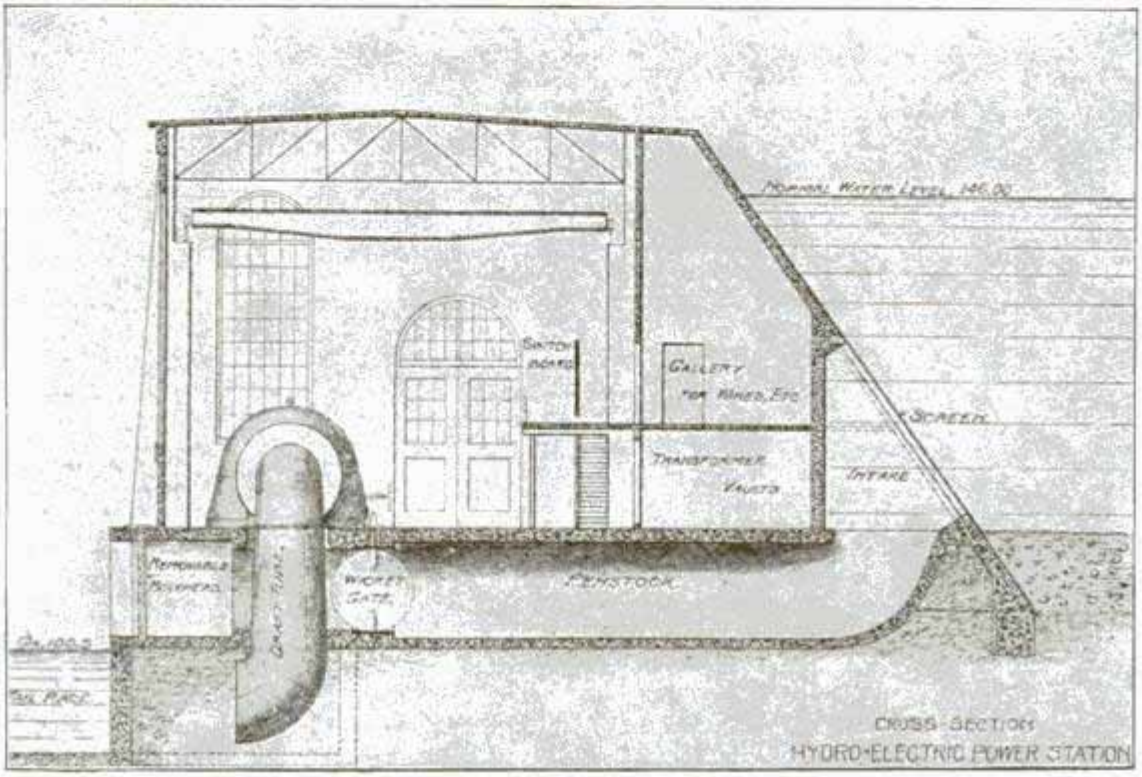



Fig. 1--Section of Oakdale Power House, Tippecanoe, Ind.

On the other hand, the reinforced concrete dam, as before stated, has no tendency to overturn, and gains steadily in strength from the time it is built, becoming like the rocks of the earth, part of the earth. The dam being hollow, can be inspected for leaks from time to time, and thus kept in absolutely certain condition. Where the soil is

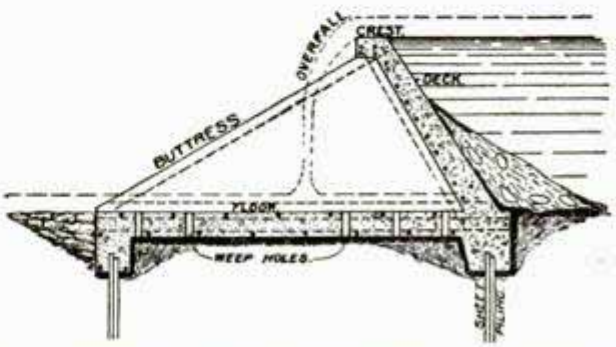
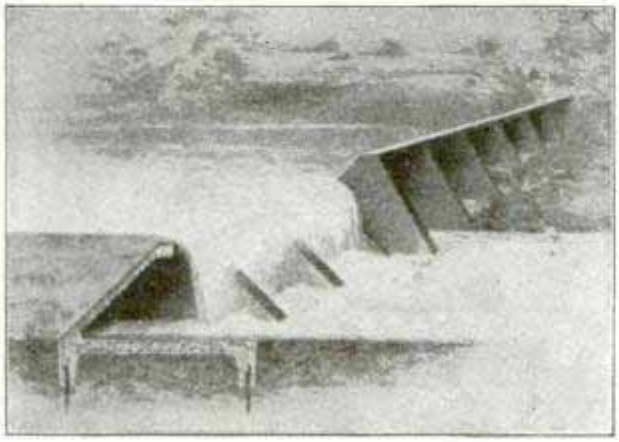



Fig. 2--Section of Dam for Low Head and Soft Bottom

porous, weep-holes (Fig. 2) are made in the bottom of the dam to eliminate any tendency to upward hydrostatic pressure. Fig. 2 shows a section of a dam located on a soft bottom. The expense of a solid masonry dam under these conditions would be prohibitive.

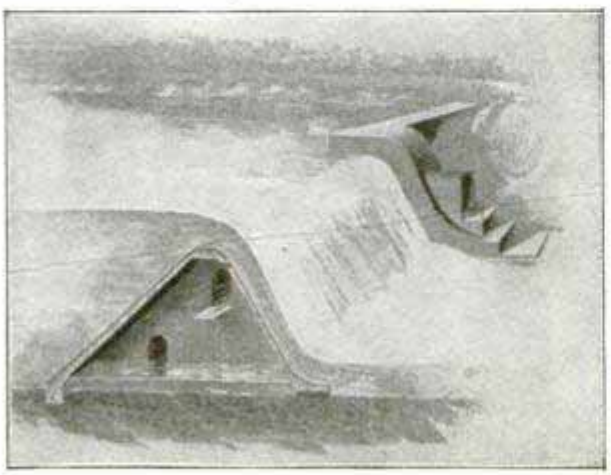
Another important advantage is the effect of ice on the dam. Where a solid masonry dam would be carried out by the pressure of a great ice gorge, or where a defective plank



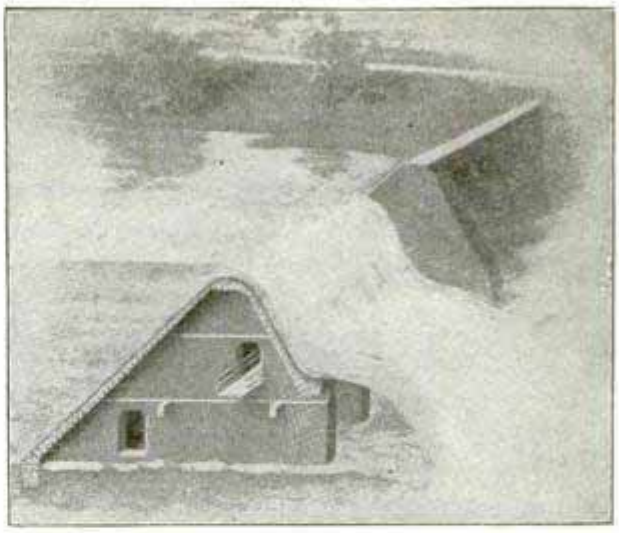
**Section of Breast Dam for Soft Foundation and Low Head**

in a wooden dam would allow the ice to bite into its surface and finally destroy it, the hard, smooth, uniform deck of the concrete dam, rising by an easy incline from the bed of the river, lifts the whole mass of ice easily to the crest and the incline of the apron drops it to the foot.

In building the Schuylerville (New York) dam the record closing time was made. Work on this dam began September 27, 1904, and was finished December 31, 1904. Until March 11, 1905, the water was allowed to flow through the channels left and then the dam was closed in just 45 minutes; a feat impossible in any other form of construction.



**Section of Apron Dam for Rock Foundation and High Head**



**Section of Concrete-Steel Dam With Half Apron**

## COMPARATIVE COST OF 50 HP. BY SEVERAL MOTIVE POWERS

The efficiency of a producer gas outfit is set forth by a writer in the Wood-Worker who says:

A party who owns a wood-working plant, now closed down, applied to me for advice as to the most economical power to install. When the plant was operated a portion of the fuel needed was obtained from the refuse, but the additional fuel required was one of the main reasons for suspending operations. He had in use an 80-h. p. boiler with a 30-h. p. engine, but wanted my calculations to consider a 50-h. p. outfit for the new conditions, and was inclined to resume operations if the cost of fuel could be brought within a reasonable figure.

After obtaining the prices of the various fuels available at that place I found the following fuel costs for operating a 50-h. p. plant for one year: Steam, $2,625; city gas, $3,240; gasoline, $2,812.50; electric motor, $2,500; producer gas (anthracite coal), $562.50, and producer gas (coke), $393.70.

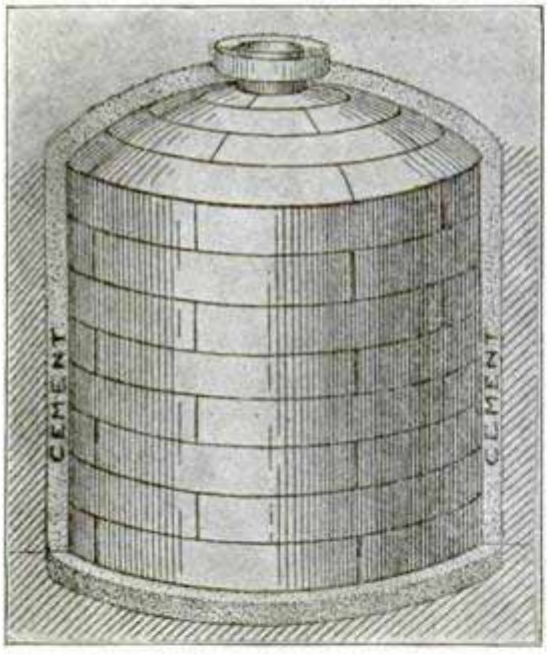
Then, taking into consideration the difference in the cost of these prime movers, I found the following comparison for operating each apparatus for a period of ten years. These figures include the original cost, 6 per cent. on the investment, repairs, fuel and attendance for ten years: Steam, $28,850, per h. p. per year $77.70; city gas, $37,720, per h. p. per year $75.44; gasoline, $33,445, per h. p. per year $66.89; electric motor, $26,300, per h. p. per year $52.50; producer gas (anthracite coal), $13,105, per h. p. per year $26.21; producer gas (coke), $11,417, per h. p. per year $22.83.

The difference between the cost of operating the steam and the producer gas apparatus with coke for fuel would produce a dividend of 10 per cent. on an investment of $26,000. In making this comparison no account was taken of such items as would be common to all the apparatus considered, such as depreciation, etc.

## MAKING CEMENT CISTERNS--A NEW INDUSTRY

Cisterns are now built of concrete, which has numerous advantages over the old style. As now built the cistern is a large jug, without seam or joint, and all in one piece. Cistern making of concrete is a new branch of work which the concrete constructor can profitably add to his cement walks, foundations, and hollow blocks.

A patent has been granted on a set of adjustable forms, which enable the cistern to be made of any size desired. The cistern can be built up one section at a time where there is seepage or danger of cave-in. In building, a 4-in. floor of concrete is first laid, then the forms are set and a thin concrete poured all around, and tamped. The proportions recommended are: 1 part cement; 2 parts sand; 4 parts crushed stone. Or, if gravel is used: 1 part cement; six parts gravel. The forms remain in place three or four days, then are removed, and the interior of the cistern given a cement wash or a coat of cement mortar. For the wash use a clean cement with 2 per cent waterproof compound. For mortar: 1 part cement, 2 parts sand, and 2 per cent waterproof compound. Such a cistern should last indefinitely.




**Form Complete**

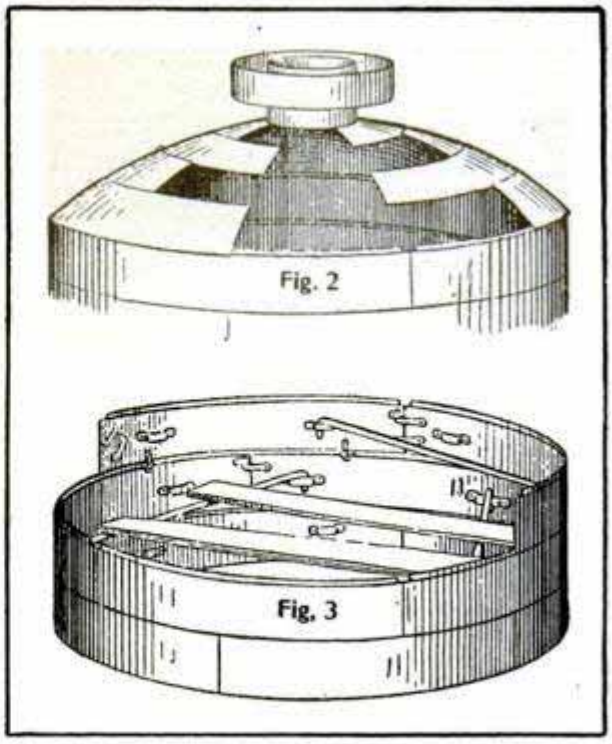
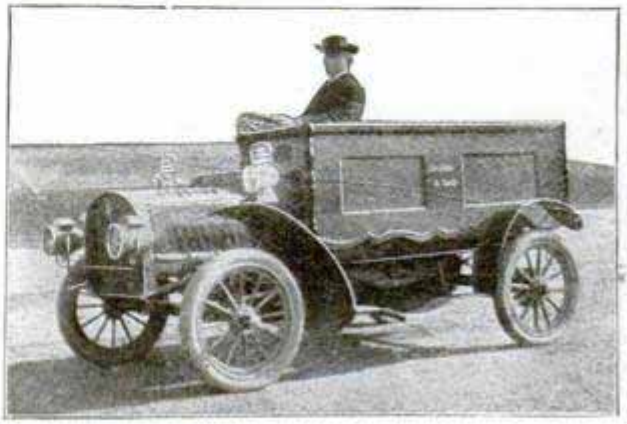


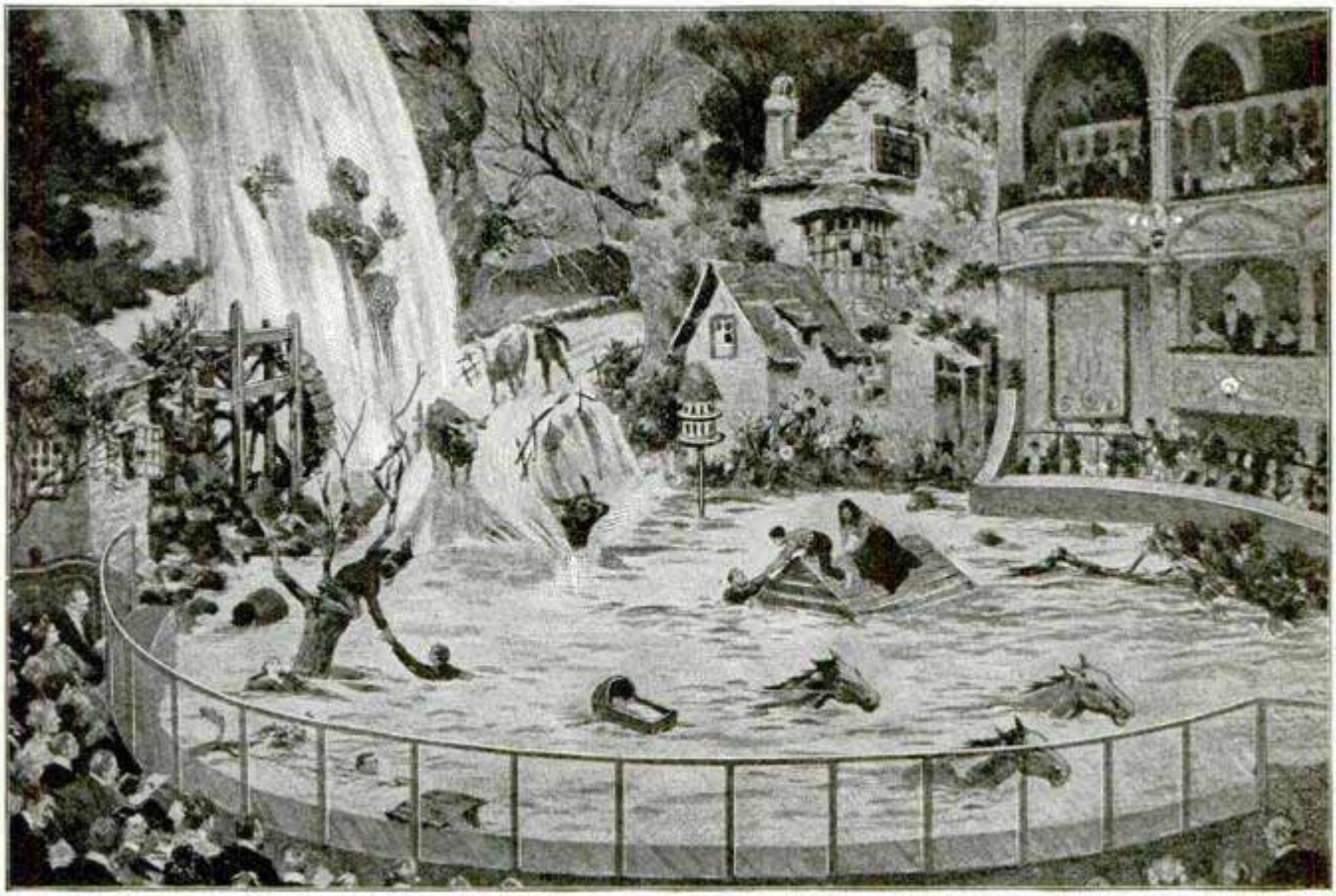

Fig. 2 shows how the arch and neck are built up; Fig. 3 how forms are braced and scaffolds placed.

## AUTOMOBILE HEARSE

The automobile hearse which has been predicted, has arrived, and is found to be extremely satisfactory. The exhaust from the engines is muffled so as to make the action of the machinery noiseless, and the silent movement of the vehicle is said to be in no way displeasing. The next advance will doubtless be a train of automobiles for the accommodation of all who accompany the hearse to the cemetery, the vehicles being covered and painted in some subdued color.



**The Auto Hearse**



## A FLOOD AS AN AMUSEMENT SPECTACLE

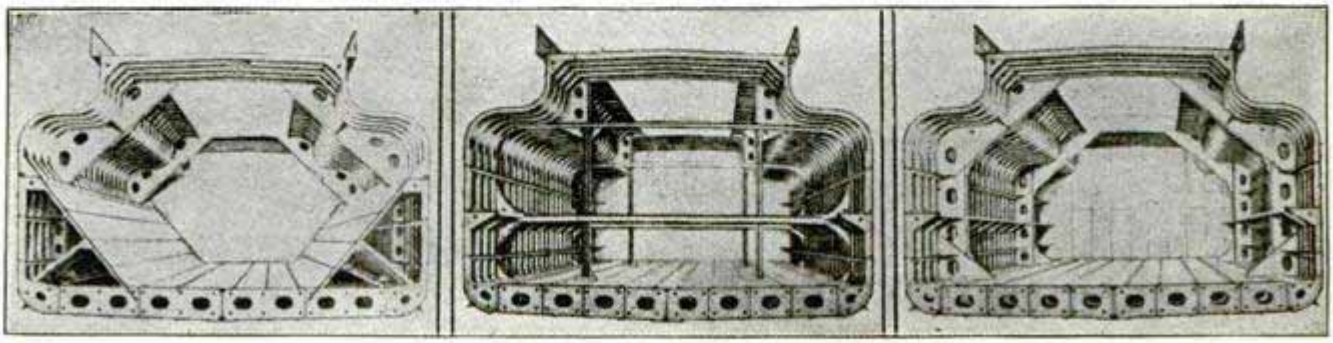
The London Hippodrome, world-renowned for its marvelous spectacles, has recently amused the English public with a flood so realistic and thrilling that spectators are thrown into a frenzy of excitement almost equal to that produced by a real flood.

A peaceful village scene, with cattle browsing in the lanes and children playing about the doors of its pretty cottages, is suddenly transformed into a place of horrors by the breaking of a dam. The little village is demolished by 300,000 gal. of water that sweeps over it carrying away bridges, trees and houses. Terrified animals rush down the hillside into the lake and thrilling rescues of human beings are effected.

## INCREASING CAPACITY OF FREIGHT STEAMERS

Ocean freight steamers are now being built after plans which a few years ago were declared impossible, and which 20 years ago could not have been constructed because the materials could not have been furnished.

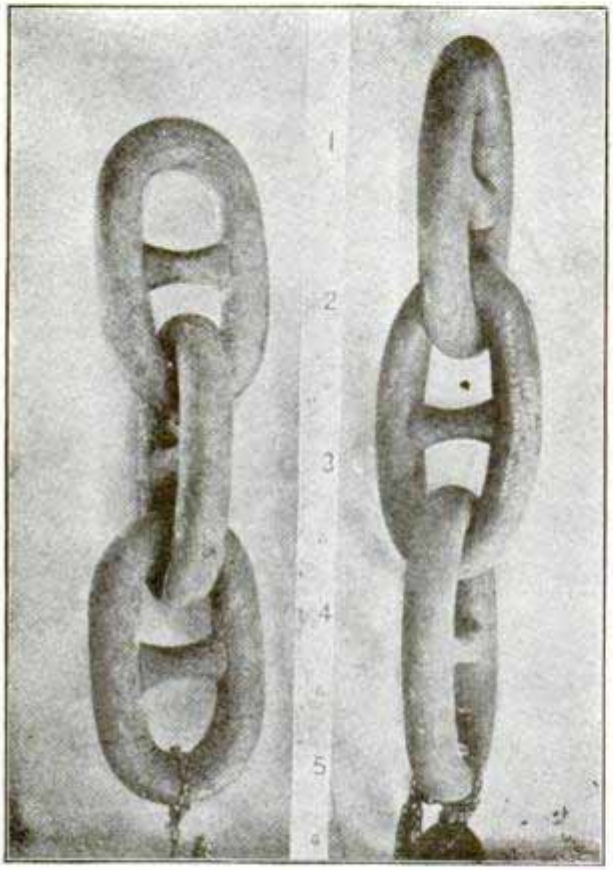
The illustrations show the ordinary type of steel hull construction as compared with the latest types. In the old the upright and cross beams seriously interfere with stowing of cargoes.



New Type Old Type New Type

## LARGEST ANCHORING CABLES FOR NEW CUNARDERS

Since 1855 until the present year the chain cables for anchoring purposes made for the "Great Eastern" have held the record for size. These cables were made of iron 2⅞ in. in diameter, and at the time were considered enormous. With the construction



**Cable Before and After Testing**

of the two new mammoth Cunarders, "Lusitania" and "Mauritania,' the anchoring cable record is broken along with many others.

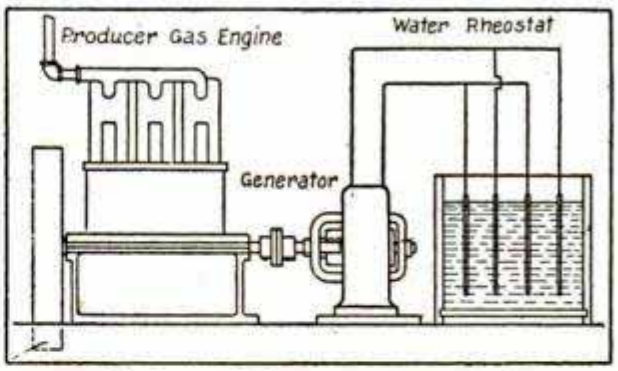
The iron used in the Cunarders' cables is 3¾ in. thick at the smallest part, or ⅞ in. larger than that used for the "Great Eastern." Each link is about 22¼ in. long, and with the crucible cast-steel stud weighs 160 lbs. The weight of the main cable, which is about 2,000 ft. long, is 100 tons, while the joining and anchor shackles weigh 500 lbs. and 840 lbs. respectively. The chain is forged throughout.

Three links of the chain were subjected to severe tests. First, to the proof strain of 189.8 tons established by the British Admiralty. This resulted in a total elongation of the three links by ¼ in. The chain then withstood the statutory breaking strain of 265.7 tons with a further elongation of ¾ in. resulting. Then the maximum capacity of the testing machine—over 370 tons—was applied and the links did not break under it, nor show any sign of fracture or defect on examination. The only result of the tests —the most severe ever applied to a chain cable—was an elongation of the three links by 6 in. above the length before testing.

## SEVERE TEST OF PRODUCER-GAS ENGINE

It is well known that the producer-gas engine is more economical of fuel than a steam power plant, but there seems to be a great difference of opinion among engineers regarding the possibility of successfully operating producer-gas plants for furnishing continuous power. As a result of this controversy, Prof. R. H. Fernald, of St. Louis, undertook an endurance test, using a 235-hp. gas engine, supplied by a pressure producer, using bituminous coal.

The engine (see Fig.) was connected to a generator, the electrical energy being dissipated by a water rheostat. The load on the engine could thus be adjusted, by increasing the surface of the plates exposed to the water, or by bringing the plates closer together. The apparatus was started on the first of April, and ran continuously for 24 consecutive days, thus affording indisputable proof of the possibility of operating producer plants continuously for power purposes.




**Engine and Generator Connected**

If other tests confirm the conclusions of Mr. Fernald, the gas producer may possibly revolutionize the modern methods of power plant construction, as the efficiency of a gas-producer power plant is about 30 per cent of the total heat value of the coal used, while a steam plant usually gives 12 per cent or less.

To cleanse zinc articles pickle in spirits of salts (hydrochloric acid) with water added for about three minutes. Then wash and dry.

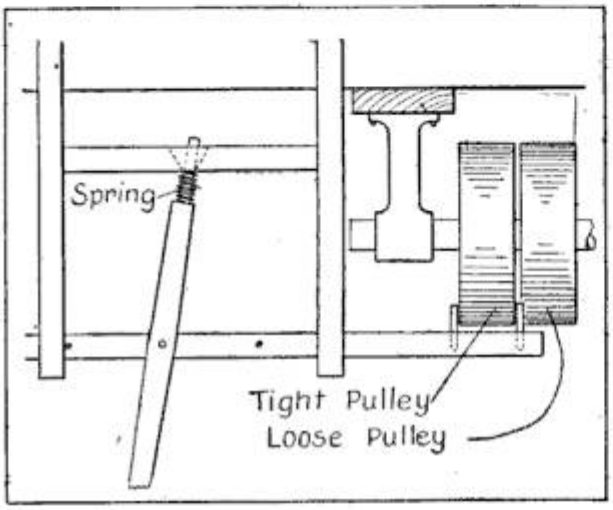
All the articles appearing in this department are reprinted in book form at the end of each year.

# SHOP NOTES

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

## TO SET A BELT SHIFTER

Anyone who has had trouble with a belt sliding over to the wrong pulley will appreciate the following device: The shifting mechanism is the same as an ordinary belt shifter with the exception of the lever, which has a spring at the upper end, as shown in

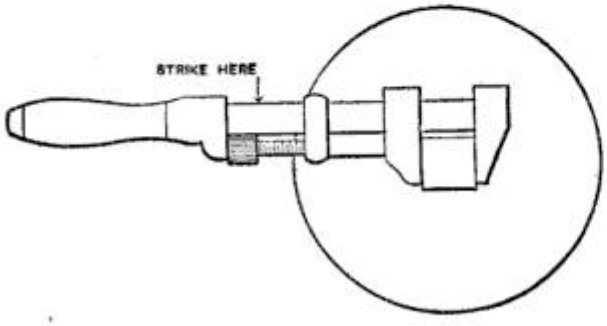



Belt Shifter

the cut. This spring, which is in compression, forces the shifter to the extreme position in either direction and holds it there.—Contributed by C. E. Holcombe, 2912 Edina Blvd., Zion City, Ill.

## STARTING SCREWS IN CLEANOUT COVERS OF TRAPS

Considerable difficulty, oftentimes, is experienced in starting the screws when removing brass cleanout covers from traps. A good way, says the Metal Worker, is to give the wrench a few sharp strokes with a hammer at the point indicated in the sketch.

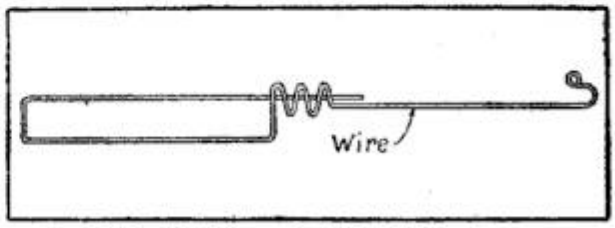



Starting Cleanout Screws

The shock will make the brass let go and the cover can be readily unscrewed.

## WIRE FOR STRINGING WATCH PARTS

A very simple and convenient device for watch repairers is shown in the sketch herewith, and is used for stringing the parts of a watch during the process of cleaning. It

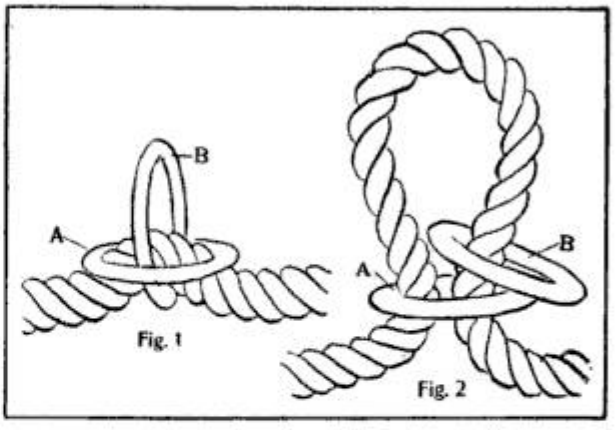



Wire Stringer for Watch Parts

can be easily made by any repairer, says a correspondent of the Keystone, and will soon pay for the time required to make it.

## ADJUSTABLE RING FASTENING FOR A ROPE

An adjustable rope fastening, such as is shown in the sketch, will be found very effective for guy-rope fastenings, derrick fastenings, jury-mast knots, temporary mast



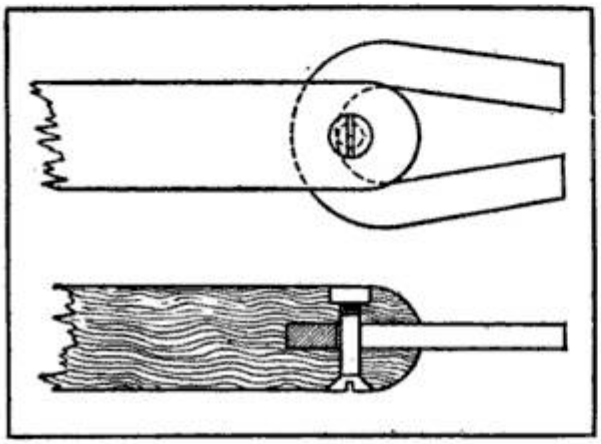

Adjustable Rope Fastening

bands, and numerous other devices where ropes are used. When used on the neck ropes of horses, a snap should be fastened to the end of the rope and hooked to the ring B. The size of the noose can then be made larger or smaller by drawing the rope through ring A, as shown in Fig. 2, and moving ring B the required distance. Then

when the rope is drawn back, it will leave the rings as shown in Fig. 1. The rings can be made of iron or steel, somewhat smaller than the diameter of the rope, and when a number of fastenings are to be placed on one piece of rope, the rings, A, should be made oval-shaped so that they may be passed over the others. When only one fastening is required both rings may be made round.—Contributed by Harry Hall, Brooklyn, Iowa.

## MAGNET FOR A BROOM HANDLE

Shop brooms equipped with the following device will be very useful for recovering brads, small screws, and other articles from the shavings. The broom handle is slotted a short distance and a magnet is held in



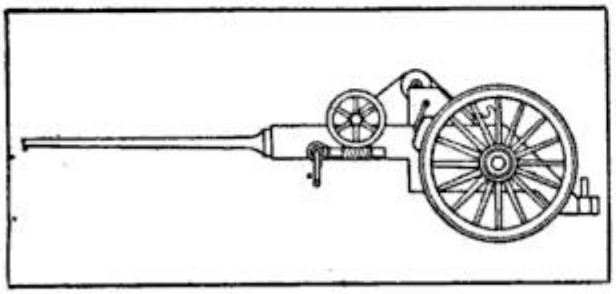
**Magnet Attachment for Broom Handle**

the slot by a $\frac{3}{16}$-in. stove bolt, as shown in the sketch. I use this device every time I sweep up, and usually find large quantities of brads, staples, and small screws. I upset a box of brads once and they fell in a lot of shavings and dust, but were quickly separated with the magnet.—Contributed by Edwin Howland, Baltimore, Md.

## CABLE DRUM CARRIAGE

This device is used for holding the large spools, upon which is wound the lead-covered cable used in electrical work. The handling of these reels of cable, which has always been very difficult, owing to their great weight, can be done by one man when using this device. With it the cable can be unwound either backwards or forwards and the drums can be easily raised by means of the powerful worm gear.

With the exception of the shafts and wheels the apparatus is built entirely of steel and is designed to carry varying sizes and weights of drums.



**Cable Drum Carriage**

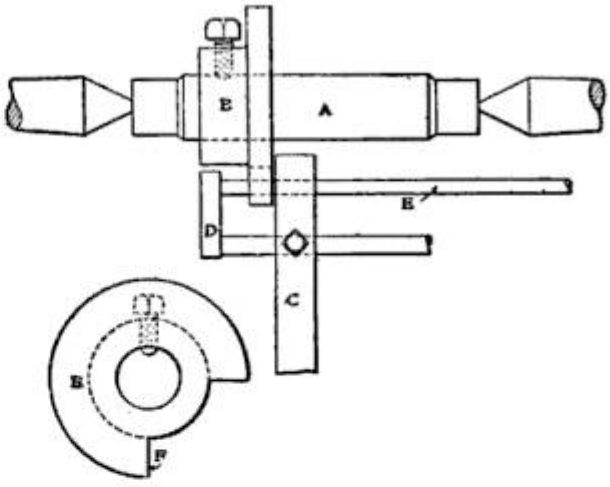
## IMITATION ROSEWOOD STAIN

Put 1½ lb. logwood chips in a gallon of water and boil until reduced in volume to 2 qt. Apply boiling hot, says the Master Painter, and if several coats are necessary, let each coat dry before applying the next. Grain the finished surface with a camel's hair pencil dipped in logwood infusion containing the sulphates of iron and copper.

## HOW TO SHEAR WIRE IN A LATHE

Instead of having a shaper rigged for shearing, this work may be done on the lathe, says the American Machinist.

Swing the mandrel, A (see sketch), which has a circular shear, B (made of tempered tool steel), on it, between the centers. Fasten a tool-steel piece, C (drilled for the wire, E, to be sheared and for the stop, D,



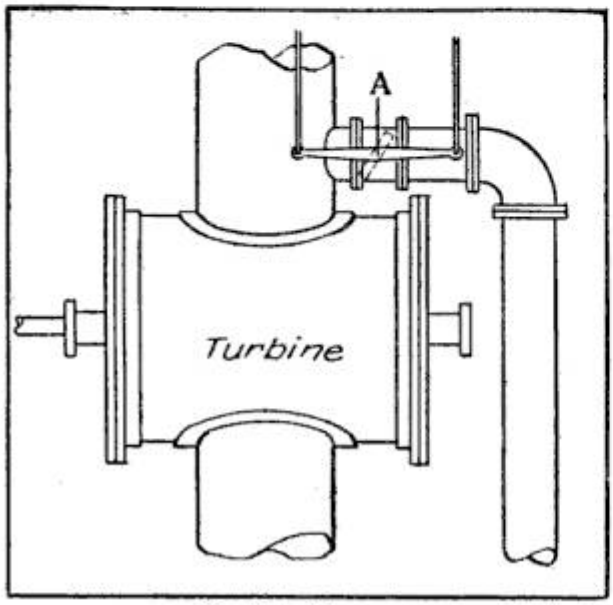

**Shearing in a Lathe**

which determines the length of the pieces to be cut), in the tool-post.

Operate as follows: Start the lathe, enter wire, E, in the hole in C, and press toward stop, D; when opening, B, is opposite the hole in C, press the wire up against D, and cutting edge F will shear it off. The piece C can have a series of holes in it to suit different sized wires. The circular shear, B, will last for a long time as there is plenty of stock for grinding.

## A NEW METHOD OF TURBINE CONTROL

In a paper read before the American Institute of Electrical Engineers, Mr. Lamar Lyndon describes a form of governor bypass shown in the sketch. It has been found that when the supply of a turbine is suddenly checked, the momentum of the moving column of water causes an enormous increase in pressure, which would probably burst the pipe if it were not for the relief valves, which open and thus allow part of the water to escape.

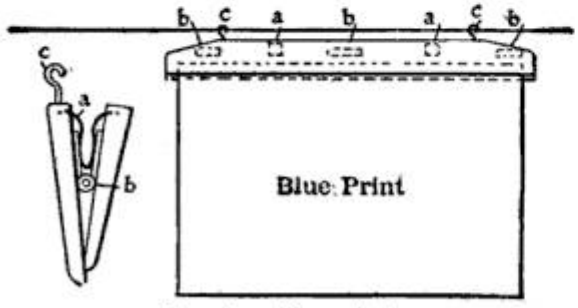



Turbine Governor

In the new method the relief valves are replaced by the compensating valve, A, which operates in connection with the governor. This arrangement prevents the oscillatory movement of the governor, and gives a more uniform speed in the turbine.

## HANGER FOR BLUEPRINTS

In hanging blueprints on the line to dry, they are apt to be torn or hung so that they dry unevenly. The hanger illustrated eliminates this difficulty. The blueprint is clipped with the hanger while in the water, says a writer in the American Machinist, and the whole thing is then lifted out easily.




Hanging Blueprints

## HOW TO LEVEL AN OILSTONE

For use in properly truing up oilstones provide a block of cast iron 1½ in. thick, 9 in. wide and 12 in. long, with a projecting ledge ½ in. wide and ½ in. high on one side, this to keep the block from slipping when on the bench. Plane the block up true on both sides and the three edges, says the Patternmaker, and place on the bench convenient to sink water; also provide coarse and fine emery powder.

To true up an oilstone or slip, place a small quantity of the coarse emery powder in the middle of the block, pour on a little water and rub the oilstone back and forth until its surface is level; then repeat the operation, using fine emery powder with water. To true the round side of a stone, and preserve its original radius, turn the stone while rubbing.

This method will entirely remove all the glaze, so objectionable in oilstones, and leave a nice surface similar to that obtained by grinding.

## PUMPING TO A 100-FOOT ELEVATION

With two piston type steam pumps for tank service, either of them able to discharge sufficient water to a 50-ft. elevation with a nominal lift of, say, 10 to 15 ft., it is possible to force water 100 ft. vertically by the following method:

Connect the suction of one of the pumps to the water supply and the discharge to a receiver capable of holding the required pressure, in this case 21.7 lb. Connect the suction of the second pump to this receiver also and connect the discharge to the main that carries the water to the 100-ft. elevation. To steady the action of the pumps, says a correspondent of the Engineer's Review, the receiver must be fitted with a good-sized air chamber.

In operating keep the steam valve on the first pump open full and control the speed with the steam valve on the second pump. The second pump not having any lift will be able to overcome the increase of friction in the discharge main. Any boiler will do nicely for a receiver, but it would be better not to use too large a receiver.

This scheme will work on rotary pumps as well, but not on plunger pumps. The two-pump scheme can be worked very nicely for fire service at a distance and in a great many other ways as well.

## BENDING AN OIL CAN SPOUT

To make a bend in a spout for an oil can or a machine oiler proceed as follows:

Form the straight spout in the regular way over the blowhorn stake and solder the seam. Plug the small end of the spout with a piece of wood and pour melted resin into the spout until it reaches the point where the bend is to be made. Let the resin cool till solid, then make the bend over the round stake or mandrel to the desired form without a buckle.

Heat the spout gradually over an oil torch, says a writer in the American Artisan, until the resin again melts and runs out.

## A NEW WAY TO BEND TUBES

The principal difficulty in bending tubes is the tendency to buckle and wrinkle. This has been overcome in some instances, by pouring melted resin into the tube before bending, and while this method prevents the tube from wrinkling in long radius bends, it has been found unsuitable for making sharp bends or for making bends in which the exact diameter of the tube is to be maintained. The tube is also slightly flattened at the bend, and is therefore not perfectly round.

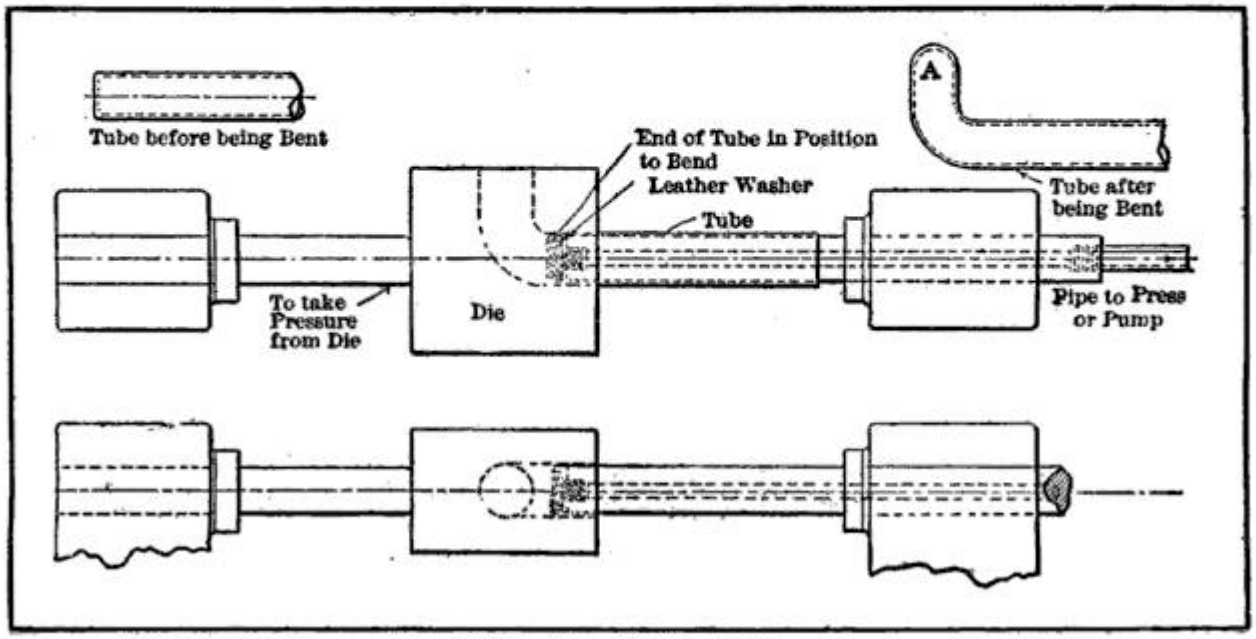
It being required to bend a number of brass tubes through 90° without any wrinkles, creases, or change in section, a correspondent of the American Machinist made use of the "fluid punch" principle. The tubes were forced through a die, as shown in the sketch, and a water pressure of 6,000 lb. per sq. in. applied to the inside of the tube. The tube being closed at the end was forced through the die by the pressure of the water, and as the diameter of the die all around the bend was the same as the tube, there was no place for the metal to go except in the desired direction. The diameter could not be increased because the walls of the die prevented this, and it could not be decreased at any point on account of the high pressure within.

In using this device the end, A, became rounded as a result of the pressure, and was afterwards cut off. If the die is supplied with a liberal amount of oil it will last a long time and do good work.

## TO REPLACE A BROKEN CASTING

When a cast-iron part of a stove or other article is broken the following method is usually the cheapest way to replace it: Take the broken casting to a foundry and have a new casting made, using the original as a pattern. The molder can easily place the broken parts together so that the duplicate casting will be perfect unless it is very complicated.

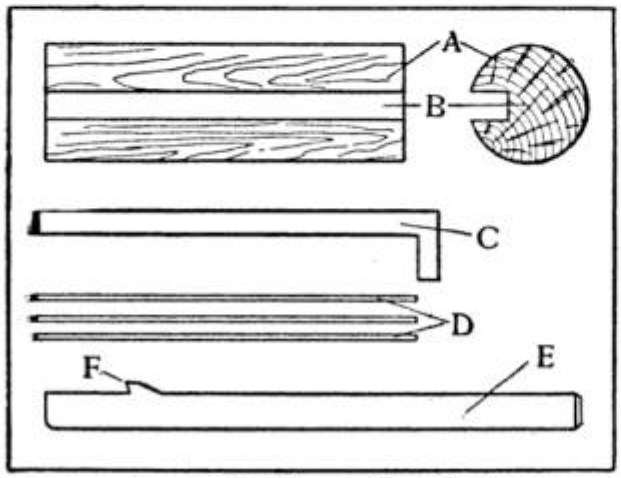
The duplicate casting will be a little smaller than the original as cast iron shrinks about ⅛ in. in a foot in cooling. If the shrinkage should be an objection it may be partially overcome by annealing, as suggested by a correspondent of Machinery. To anneal the casting, heat it in a slow charcoal fire to a dull red heat, and then cover it over about 2 in. with fine charcoal. Sprinkle several inches of dry ashes on top and allow to cool slowly. This will permanently expand the casting which will then be very nearly the size of the original.




A New Way To Bend Tubes

## CUTTING A KEYWAY WITHOUT A MACHINE

A keyway can be cut in a pulley, gear, or other piece of machinery without the use of a planer or slotting machine by the tools shown in the sketch, and a hammer. The cylinder, A, is made of hard wood and turned up to fit the bore of the pulley. The groove, B, is the same width as the




Home-Made Keyseating Tools

keyway required, and deep enough to receive the iron piece, C, and the steel chisel, E. The piece C has the end bent over as shown to prevent it from sliding out of the groove. The shims, D, can be made of galvanized iron, thin strips of hard wood, or almost any material obtainable.

To use these tools put the cylinder in the bore of the pulley and put piece C in the bottom of the groove. Drive the chisel through the bore and then shim up with the strips, D, driving the chisel clear through each time.

About six shims will be required for making most keyways, but it is well to have more as the depth of the groove, B, will not then have to be an exact dimension.

## TO KEEP PLASTER OF PARIS FROM HARDENING QUICKLY

In the May number G. M. Backus says: "To keep plaster of paris from hardening so quickly, use vinegar instead of water for mixing." That depends on how long you wish to keep it from hardening. After thirty years' experience with plaster of paris I find that mixed with clear vinegar it will not harden in six hours, but will work like putty.

The better way is to add one-fourth, or possibly one-half vinegar to the water. If wanted for stopping cracks in walls, one-half vinegar will give all the time required and will make a better filling than when all vinegar is used; one-fourth vinegar will give ample time and make a still better stopping.—Contributed by W. C. Bunker, D. D. S., Oregon, Ill.

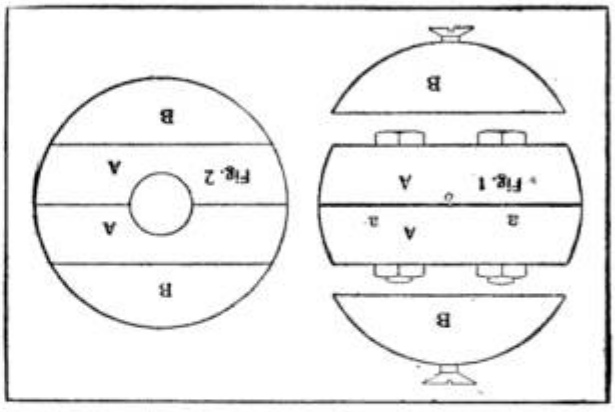
## HOW TO MAKE A SMALL SPLIT PULLEY

To make a small split pulley up to 10 in. in diameter, the following method is excellent, says a writer in the Wood-Worker:

Take two pieces of firm stock, A A, as long as the desired diameter of the pulley, plus a little to work off, and as wide as the desired face. Join them up and make a light saw mark across the center, as in making a wooden box, then bolt them together with a piece of heavy cardboard or very thin wood, a a, Fig. 1, between. This cardboard or wood should be cut through at o, so that there will be a hole there for the worm of the bit to follow.

Having bolted the pieces together, bore a hole of the size of the shaft. Now take two pieces, B B, of the right thickness to complete the circle, saw roughly to size, fit them over the bolt heads and nuts, and screw on, being sure to countersink the screw heads sufficiently to allow for the turning. Mark piece B, which covers the nuts, so that the pulley may be taken apart by removing that piece only.

Having built up the rough pulley in this way, take off the piece B, remove the nuts



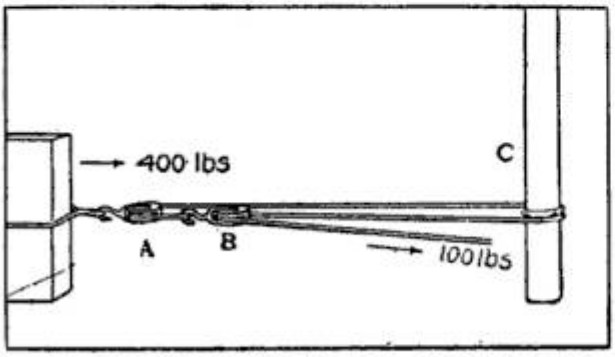

Small Split Pulley

from the bolts, take apart the pieces A A, remove the thin pieces—you have no further use for them—and having made a wood mandrel of exactly the size of the shaft, clamp your pulley on it, and turn as desired. The pieces A A need not be of especially hard wood; white pine has been used with perfect success, and they are doubtless the

better for being thin enough so that when the bolts are drawn up they will have a slight tendency to spring, thus bringing the end grain to bear on the shaft and clamping it tighter than if they were rigid.

## PROBLEM IN ARRANGING PULLEYS

In the ordinary method of using two single-block pulleys, the pulling force is only doubled, but by arranging the pulleys and rope, as shown in the sketch, the force is increased to four times that of the power



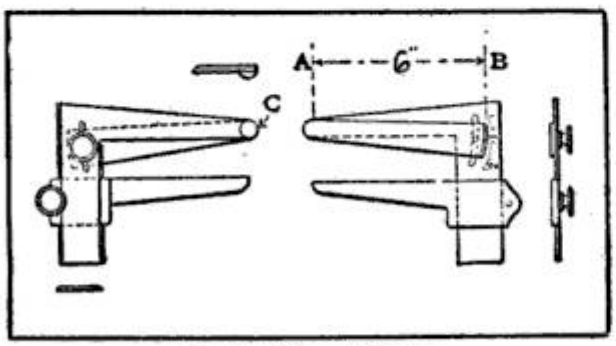

**To Get a 4 to 1 Pull With Two Single Block Pulleys**

applied to the end of the rope. The pulleys A and B are connected, as shown, and the rope is then given one turn around a post, tree or other object, C.

When the pulley B reaches the post C, loosen the rope and slide pulley B back to pulley A, which will have traveled half the distance traveled by pulley B.—Contributed by A. D. Newlin, Dunlap, Cal.

## A MACHINIST'S TAPER GAUGE

The sketch shows a taper gauge made by a correspondent of the American Machinist, and found useful for measuring the taper of lathe centers and other tapered work. The principle used is the same as that found in the taper attachments of a lathe. The lower jaw slides up or down to adjust the work; the upper one swings on a stiff joint, C, to adjust the taper; both jaws are locked with thumbscrews.




**Useful Taper Gauge**

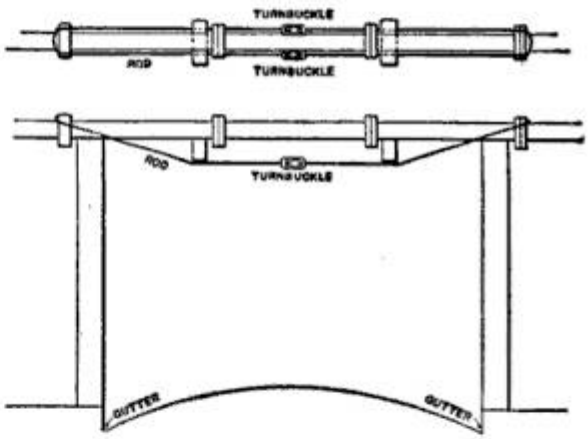
As it is half a foot from A to B, the graduation is made one-half size, so that a distance of ½ in. on the scale should read 1 in., which gives the taper in 1 ft.

## SUPPORTING LONG LINES OF PIPE

Often it is not desirable to support long lines of heavy piping with trestle or bridge work. A correspondent of the Metal Worker describes his method in such case.

Three lengths of 6-in. iron pipe, each about 14 ft. long, were to be used in crossing a street, leaving an unobstructed clearance of 15 ft. The pipes were arranged to rise in a vertical line above each sidewalk and near the riser were placed two 10x10-in. posts to support the pipe line and the weight of water in it. The three lengths of pipe were joined together with flanges, giving the abutting ends maximum bearing surface and assisting materially in keeping the line rigid.

A block of wood was placed toward each end of the line and over these were passed




**Trussed Pipe Line**

two ½-in. round iron rods, bearing underneath two other blocks 6 by 8 in. in size, placed as shown. The rods were screwed together by turnbuckles. The size of the rods is determined by the length of the span and the bends they are to be given.

## TO CUT INDIA RUBBER

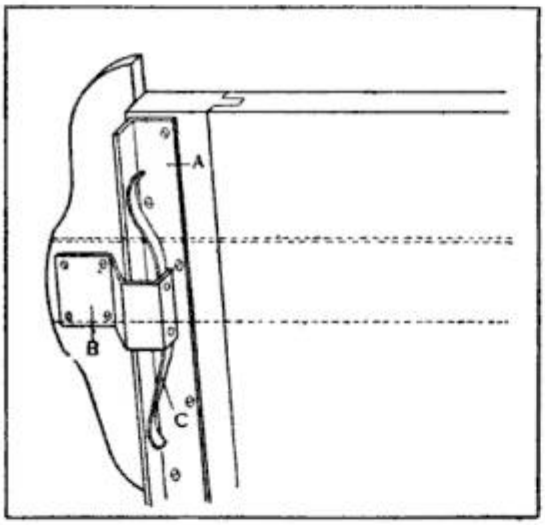
Those who have had to cut heavy gaskets or other rubber articles have found that substance an unpleasant material to work. The cut can be made neat and clean, says a correspondent of Machinery, if the knife be kept wet; and if conditions permit, this can be best effected by doing the cutting under water, as good housewives know to do when peeling onions. Potash water is better than plain.

## BORING A HOLE IN A CEILING

A man who wanted to bore a hole through the ceiling in his house, accomplished the task without getting any plaster or chips on the carpet, though his wife had told him he surely would, says American Machinist. He thrust the bit through the bottom of a pasteboard box, mounted a stepladder and bored the hole, catching all the litter in the box.

## T-SQUARE ATTACHMENT

The device shown in the sketch will keep the T-square true at all times, and saves many movements of the left hand when working near the end of the blade with a triangle. A piece of angle brass, A, is screwed to the drawing board near the left-hand edge on the under side. A piece of sheet brass, B, is bent, as shown, and screwed to the head of the T-square. A steel




**T-Square Attachment**

spring, C, is fastened to B and slides on the brass angle, A, thus keeping the square true at all times. The sketch shows a view of the under side of the drawing board.—Contributed by A. L. T., Lansing, Mich.

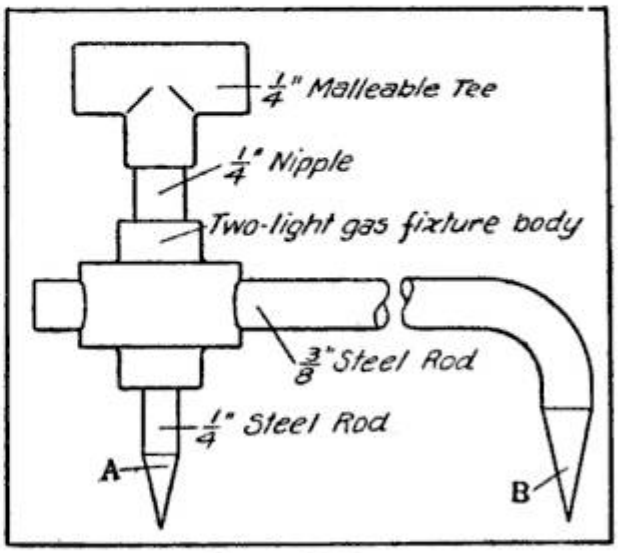
## CHALK IN THE SHOP

A good way to keep a file from filling up with the metal being filed is to rub it with chalk; especially is this good, says Wood Craft, in reducing a shaft by means of a file.

Chalk makes a good oil extractor for old belts, also. Rub the chalk into the belt thoroughly, then pack the belt in chalk and let stand for a day or two. The capillary action induced will draw the oil from the belt into the chalk, and enough will be removed to make the belt fit for service.

## EASILY MADE TRAMMEL POINTS

A trammel point in which no fine adjustment is required, can be made from pipe fittings and a steel rod, as shown in the sketch. The device can be made with either one traveling point, A, and one stationary



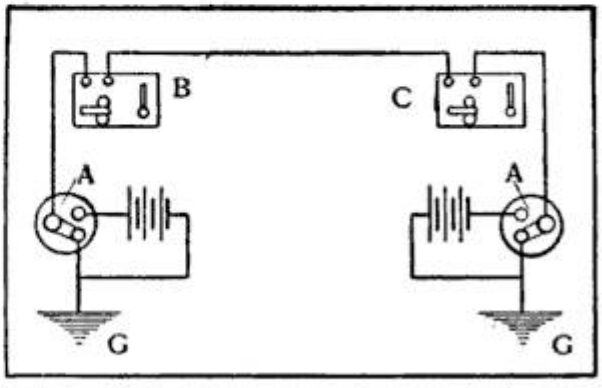

**Trammel Points**

point, B, or with two traveling points, as may be desired.

In making the traveling point a two-light gas fixture body is drilled to receive the ⅜-in. rod, and tapped for the steel point, as shown. The ¼-in. nipple acts like a set-screw, and the ¼-in. malleable tee serves as a handle. The ⅜-in. steel rod can be made any length desired and can be bent either hot or cold.—Contributed by Geo. A. Madison, Baltimore, Md.

## KINK FOR TELEGRAPH LINE

A friend and I use the accompanying kink on our telegraph line, doing away with the dirt and cleaning of gravity battery; we use dry cells instead. A A are two-point switches; keep the switches on left-hand point when not in use. When B calls C simply put switch on right-hand point

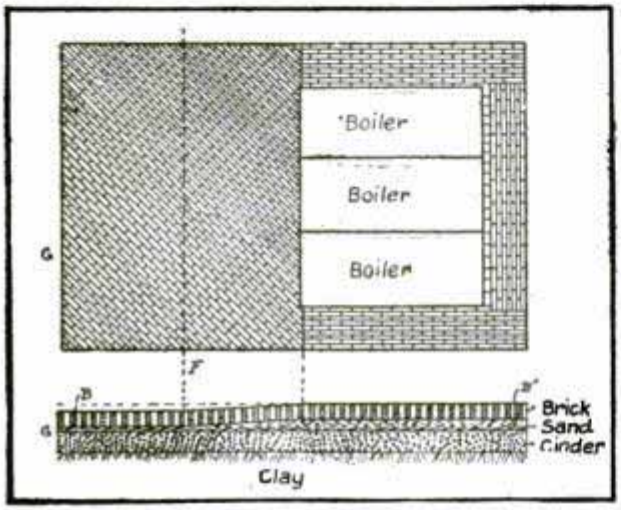



**Wiring Kink for Telegraph**

and call as usual. In connecting up the battery, observe that the positive pole is connected to switch at one station, while the negative pole is connected to the switch at the opposite station, giving a chance to use both batteries, if desired.—Contributed by F. L. Wheeler, Cliftondale, Mass.

## LAYING A FIREROOM FLOOR

The fireroom floor should be planned not only to give good wearing value, but for comfort as well. The following plans, with modifications to suit the individual needs, is excellent:




**Laying a Fireroom Floor**

First provide a supply of material: bricks, cinders, sand and cement, then proceed to excavate the part of the fireroom where the bricks are to be laid to a depth of at least 15 in. below the door sill. In this excavation lay a course of cinders 8 in. deep (see sketch); the cinders should be slightly wet and tamped in place thoroughly with tamping tools. Follow the cinders with a layer of coarse, sharp sand 4 in. deep at B' and 2 in. deep at B. In part of the fireroom the brick should be laid diagonally, but as there is considerable waste in making broken joints, they may be put in straight at the sides of the floor and the rear of the boiler.

In front of the boilers the floor should slope slightly so that water from the ashpit which comes out with the ashes when the fireman is cleaning fires will not form small pools which do not conduce to comfort. The heaviest work of the fireroom comes on the space between the boiler fronts and the dotted lines, FF, therefore the brick should be thoroughly grouted in there. To do this, mix up clear Portland cement with water, very thin and pour in all the joints. When the joints are full to overflowing, spread the cement all over the space with a coarse broom. Cover that portion of the floor from the dotted lines FF to the outer wall at G with very fine sand, tamping thoroughly; then when all the joints are filled, sweep off the sand. Vitrified brick, which is very hard, should be used for laying the floor. A correspondent of the Practical Engineer says that a floor laid in this way will give excellent satisfaction and last a great while.

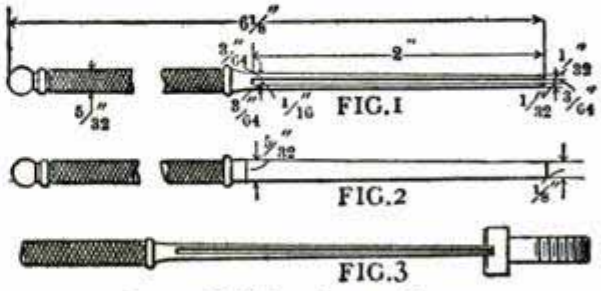
## CEMENT BLOCKS CURED BY STEAM

Cement blocks or bricks made by the dry process may be cured by steam, says Municipal Engineering. Where the block plant is operated by steam, the exhaust steam can be used for curing and the extra cost is very small. It is necessary to use a closed shed for storing the green blocks until they are ready to be removed to the curing yard. This is less convenient than the open shed, but if cars for handling the blocks and holding them while in the steam were provided, there would be no difficulty in this respect.

## SCREWDRIVER THAT HOLDS THE SCREWS

For very small screws the screwdriver illustrated is convenient, especially, says American Machinist, for putting screws in place in the interior of typewriters, adding machines and the like.

The side view, Fig. 1, shows two prongs on which a slight pressure is exerted when a screw is to be held; as soon as the pressure is removed the prongs spring back gripping the screw firmly. The handle of the rod is knurled to afford a good grip for




**Screw-Holding Screwdriver**

the fingers in turning. Spring steel rod is the material used for this device. The ends are made quite thin in order to have the spring as sensitive as possible. The method of using the driver is shown at Fig. 3.

## RECIPE FOR MARINE GLUE

One part of pure india rubber dissolved in naphtha. When melted add 2 parts of shellac. Melt until mixed. Pour out on tin until cold. Melt and use with a brush at water-bath heat.

Or take a handful of quicklime and 4 oz. linseed oil. Boil, and pour out on a plate until hard. Melt and use.

Or take 1 lb. of common glue—not fish glue—in 2 qt. of skim milk. Soak and boil.

All these are good.

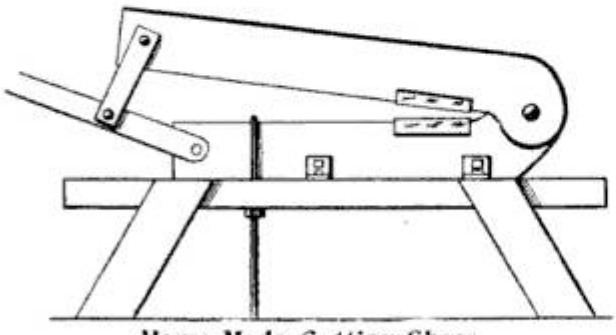
## HOW TO MAKE A CUTTING SHEAR

A very handy cutting shear can be made at little expense and requires little more than a couple of hours' labor, says a correspondent of the American Blacksmith.

Make the stand or bench of 4x6-in. oak lumber, similar in construction to an ordinary work truss, and 4 ft. long. Secure two cutter-bars from an old reaper and bend the end of one up and the end of the other down and rivet the two bent ends together. Make the lever or handle of ½-in. stock 4 ft. long. Split one end of this piece so as to evenly distribute the strain on the rivet by which the lever is hinged to the lower blade or jaw About 5 in. from the split end drill another hole. Cut two pieces of stock, 1 by ½ by 6 in. long and drill a hole in each end of both pieces and rivet one on each side of the upper blade or jaw and connect them in turn to the lever or handle.

Fasten the lower jaw to the bench or stand with two or four brackets, one or two, as the case may be, on each side of the jaw and bolt firmly to the wood base.

Forge a hook on the end of a piece of ½-in. round stock, run the straight end down through the bench, hook the other end over the top edge of the lower jaw and bolt

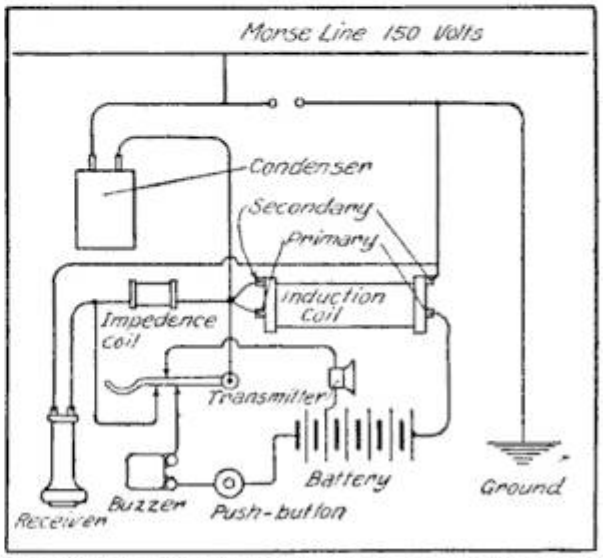


**Home-Made Cutting Shear**

the lower end firmly to the floor, thus holding the shear rigid. This tool can be used to cut flat stock ¼ by 3-in. or ½-in. round rods.

## COMBINATION TELEGRAPH AND TELEPHONE LINE

The accompanying diagram shows a system which I recently installed in Kansas for simultaneous telegraphy and telephony and which is giving as good results as could be had were they entirely separate. On account of its simplicity it can be made by




**Wiring for Combination Telegraph and Telephone Line**

anyone for less than the cost of any standard telephone made.

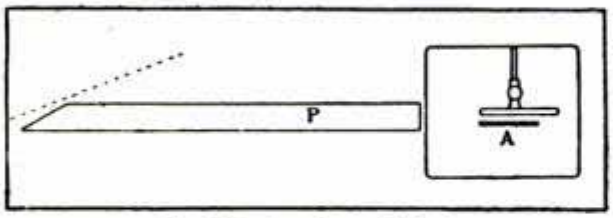
A word explaining its operation may prove useful. When receiver is on the hook in its normal position, the pushing of the button completes the circuit of six cells through an ordinary buzzer, primary of induction coil back to the battery, thus giving an interrupted direct current through this circuit and generating an induced alternating current in the secondary of the induction coil which passes out over the line, actuating the diaphragms of all receivers and vibrating them in unison with the buzzer of the ringing telephone. Receivers in this way act as "howlers" in addition to their usual function.

The condenser of course prevents the Morse current from reaching or working through the telephone to ground. The impedence, or retarding coil, may be made by using one of the coils out of an ordinary Morse relay (150 ohms), as its resistance is 75 ohms. Where Morse sets come between telephones on the line, both key and relay of the set should be completely bridged across with a condenser of small capacity. Where it is possible to use two telegraph wires and make a metallic circuit, a 1 micro-farad condenser on each side of telephone will serve the purpose of the 2 micro-farad condenser shown in diagram.—Contributed by C. V. Patterson, Independence, Kan.

## DEVICE FOR RIPPING LONG STOCK

Long stock for moldings, etc., is easily ripped when a device like the one illustrated is used, says a correspondent of the Wood-Worker.

In the sketch, A is a plan view of the

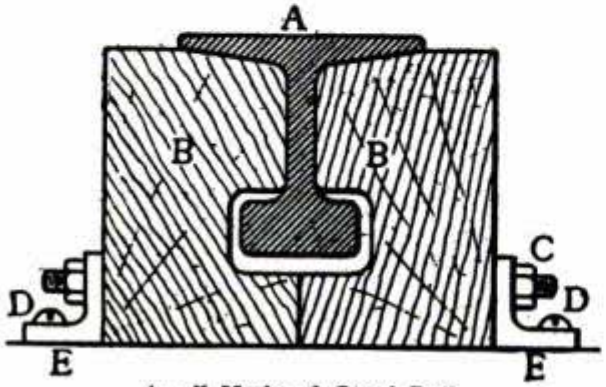



For Ripping Long Stock

saw table and P is the top of a bench, or trestle, for the stuff to run out on. This top, P, may be independent of the saw table, and made with four legs adjustable to height, if the saw table is adjustable, or it may be secured to the saw table at the one end and have a leg at the other. The entire efficiency of the device lies in having it a little over half the length of the longest stock to be worked, say 10 ft. long for 16-ft. stuff, and having the outer end cut on a long bevel, as shown. A strip being ripped off, it will lie on the table till the next pushes it along; then when the center passes the end of the bench, it will tip and slide off the bevel end, falling to the floor in the position indicated by the dotted line. With a device of this kind one man can rip molding stock very nearly as fast as two could do it without.

## ANVIL MADE OF STEEL RAIL

The amateur blacksmith can make himself a very satisfactory anvil of a piece of steel rail—often to be found at the junk shop. A in the sketch shows the rail; BB, two blocks of wood just the length of the rail, used to prop it; C, two bolts; DD, four long screws, and EE, two pieces of angle iron of the same length as the piece of rail. The Model Engineer, London, says this makes a strong and useful anvil.

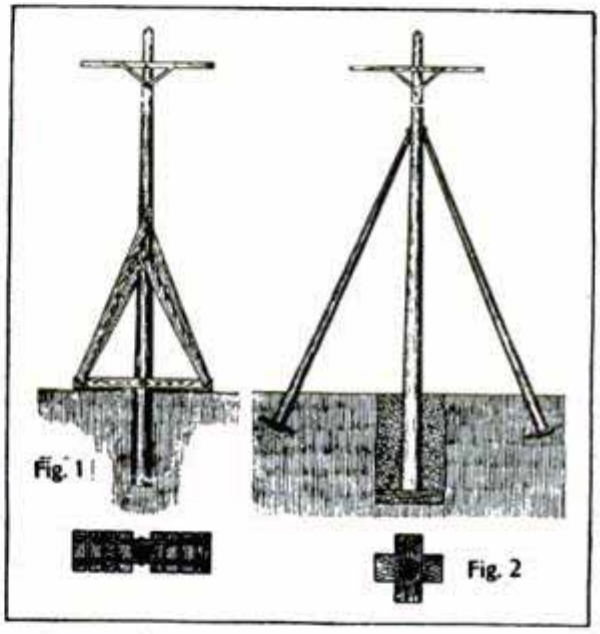



Anvil Made of Steel Rail

## SUPPORTING POLES IN SWAMPY GROUND

In setting telephone poles in swampy land where the mud is too soft and deep to give a solid bottom, a cheap and easy method of supporting them is shown at Fig. 2. Bolt to the foot of the pole two pieces of creosoted pine planking, crossing at right angles. Reinforce the pole, if necessary, by putting in a push and brace, with planks bolted at the foot the same as at the base of the pole. Where the line will be exposed to strong winds fill a hole around the base of the pole with concrete, says the American Telephone Journal.

Where the ground is too soft for this




Setting Telephone Poles in Swampy Land

method to be successful, plant the pole and bolt to it just above the ground and at right angles to the line, two pieces of planking about 10 ft. long (Fig. 1). Nail short pieces of planking 3 ft. long to these 10-ft. planks and at right angles to them. Then on each side of the pole fasten two pieces of planking to extend from a point on the pole about 5 ft. above the ground to the ends of the 10-ft. planks.

## TO CUT HARD RUBBER

Hard rubber in sheets is very difficult to cut under ordinary conditions, but by placing in hot water it becomes soft like a piece of leather and may then be easily cut in any shape desired by using ordinary shears. When it begins to cut hard dip in water again and continue until the cutting is done. Then lay on a flat surface and allow it to remain there until cold.

## ETCHING ON BRASS OR STEEL

In the usual method of etching on tools or instruments of any kind, the article is covered with melted paraffin and then marked with the name, monogram or other inscription, by means of a pin or scriber of some kind. In a new method, described by a correspondent of Machinery, a rubber stamp is used in place of a scriber, and asphaltum varnish is used as a "resist" in place of paraffin. If the stamp has a fancy border it will add greatly to the appearance. The varnish is used on the stamp in place of ink and the impression is then made on the article to be etched. When the varnish has dried, apply the acid, which will eat into the metal at the exposed places and leave the letters in relief.

The following acids for etching will be found to give good results:

IRON AND SOFT STEEL.—Nitric acid, 1 part; water, 4 parts.

HARD STEEL.—Nitric acid, 2 parts; acetic acid, 1 part.

DEEP ETCHING.—Hydrochloric acid, 10 parts; chlorate of potash, 2 parts; water, 88 parts.

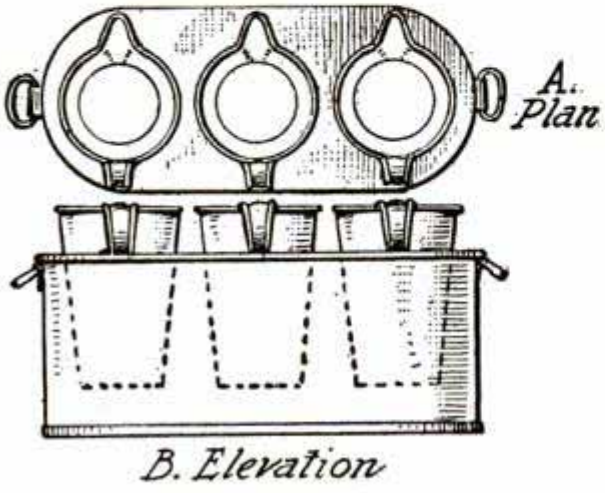
ETCHING BRONZE.—Nitric acid, 100 parts; muriatic acid, 5 parts.

BRASS.—Nitric acid, 16 parts; water, 160 parts. Dissolve 6 parts potassium chlorate in 100 parts of water, then mix the two solutions and apply.

## BOILER FOR HEATING GLUE SIZING

For this device use No. 24 galvanized iron, making the boiler 13 by 30 in. and 13 in. deep. Double seam the bottom like a wash-boiler and pane the top on and solder it.

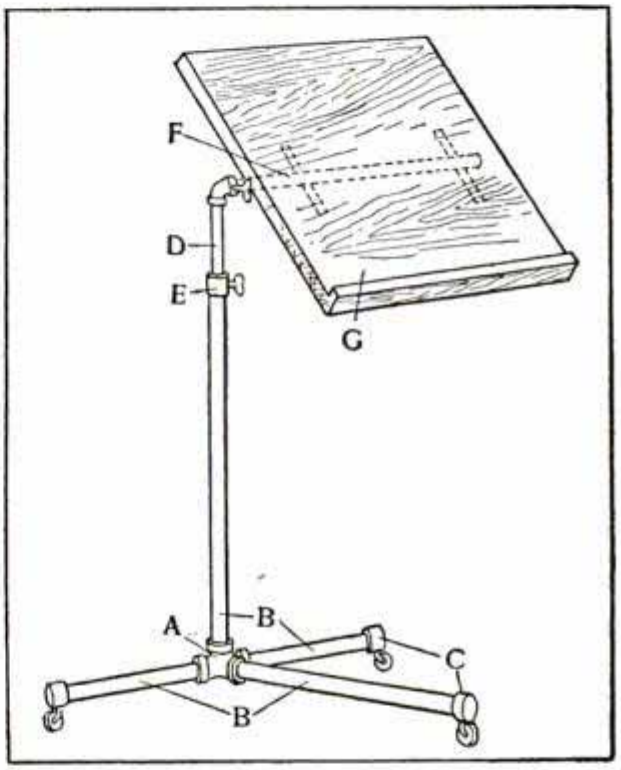
Make the three pitchers about 9 in. at the top, 5 in. at the bottom and 14 in. deep, and fit them into holes in the top of the boiler so that the bottoms of the pitchers are 2 or 3 in. above the bottom of the boiler. The pitchers should have a large solid lip like camp coffee pots, says the American Artisan, so that the glue will not clog when pouring. Wire the handles heavily and place them so as to just rest on the top plate of the boiler.




**Boiler for Heating Glue Sizing.**

## HOW TO MAKE AN ADJUSTABLE DRAWING TABLE

An adjustable table, which can be used for either drawing, reading or writing, can be made as shown in the sketch. The ¾-in. side outlet tee, A, unites the four ¾-in. pipes, B B, and the three caps, C, are drilled to receive castors, as shown. The cap, E, is drilled for the 13-16-in. rod, D, and tapped for a thumb screw. The ½-in. pipe, F, holds the board, G, and if necessary should have holes drilled and rods passed through, to prevent board from twisting. A narrow strip of wood, screwed on at the lower edge of the board, G, will prevent the drawing board or other article from sliding off.—Contributed by Subscriber, N. H.




**Adjustable Drawing Table.**

## EXAMINING PRINTS WHILE DEVELOPING

During the development of a print do not take it out of the solution to examine it. It is entirely unnecessary and is liable to result in stains and discolored lights.—Photographic Times.

# THE SLIDE RULE A COMPLETE WIRE TABLE

By S. H. Graf, Corvallis, Ore.

Since the slide rule is now recognized as a necessary adjunct to the practical engineer's equipment, the following directions for readily finding the properties of copper wire, as given in the common wire table, will perhaps be appreciated by those engaged or interested in electrical work:

In the October, 1905, issue of the Electric Club Journal there appeared an article giving a method for finding the resistance per thousand feet of any size of copper wire. This article led to further study of the subject and brought about the discovery of methods for finding the other equally important properties recorded in the wire table. In order to make the list here complete, and owing to the fact that the method for finding the number of feet per pound is based on the rule given in the article spoken of, it will be well to give in brief this rule.

To find the resistance in ohms per thousand feet (at 20° C.) of a given size of wire, draw out the slide until the right hand index on the under side of the rule is at the units figure of the given number on the equally divided or logarithmic L scale; that is, for No. 18 place the index on 8; for No. 9 place it on 9, etc., and multiply result by 10. Example: Required ohms No. 18 wire (1,000 ft.). Set slide (holding rule upside down) at 8 on the logarithmic L scale, then (holding rule right side up) read on scale D the number .632. Multiplying by 10 gives 6.32 ohms for the resistance of 1,000 ft. of No. 18 wire. The exact resistance as given in the tables is 6.35 ohms, the difference being less than one-half of 1%.

In order to know where to place the decimal point, it will be necessary to remember the following:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| The resistance of No. | 0 | wire is | .1 | ohm | per | 1,000 ft. |
| " | " | " | 10 | " | 1 | " | " | 1,000 ft. |
| " | " | " | 20 | " | 10 | " | " | 1,000 ft. |
| " | " | " | 30 | " | 100 | " | " | 1,000 ft. |
| " | " | " | 40 | " | 1000 | " | " | 1,000 ft. |

Sizes between those given have proportionate resistance, and if the order is observed it will take but a minute to memorize the little table above.

To find the number of feet per pound, simply multiply the number of ohms per thousand feet, as found above, by the constant 10 $\pi$ [or 31.4 approx. (10 $\pi$=10×3.1416 =31.4)]. The following shows where to place the decimal point:

No. 000000..... 1 ft. per pound
No. 5..... 10 ft. per pound
No. 15..... 100 ft. per pound
No. 25.....1000 ft. per pound etc.

The rule for finding the diameter in inches of any size wire is not quite as simple as the above, yet it can be mastered with very little effort.

The diameters of the wires, Nos. 2, 6, 10, 14, 18, 22, 26, 30, 34 and 38, may be found directly by placing the right under index on the units figure of the number as before and reading the result over the left hand index of the slide on the A-scale. For wires larger than No. 11 place a decimal point before the value read: as for No. 2 we have .258; for wires larger than No. 31 but smaller than No. 10 place a decimal point and one zero before the significant part of the result; and for wires smaller than No. 30 place a decimal point and two zeros before the answer.

The diameters of the sizes not given in the series must be found by interpolation. This may be done very readily on the slide rule. For example, suppose we wish to find the diameter of No. 15, B. and S.: Place the right under index on 4 (for 14), then, as No. 15 has a smaller diameter than No. 14, move the slide back or to the left one-fourth of a whole division and read over left top index of slide as before; the result is .057. The same result could have been obtained by setting the index on 8 (for 18) and moving the slide to the right three-fourths of a division. Try it.

To find the diameters in millimeters, multiply the results obtained by the last method by 25.4. This merely reduces inches to millimeters.

To find the area in circular mils, square the diameters in inches and multiply by 1,000,000.

The other measures, such as feet per ohm, ohms per pound, etc., are so simple that anyone familiar with the manipulation of the slide rule can find them from what has been given, without further directions.

The mastery of these few simple rules, a task of less than an hour, is equivalent to memorizing more than four hundred three- or four-place numbers, a practically impossible task. Also, as will be evident, the rules are not limited to copper wire alone, for the resistances of wire made of any given metal may be found by multiplying the resistance of a copper wire having

the same cross section area by the specific resistance of the given metal as compared to copper.

The results obtained by means of the slide rule in the manner described are very nearly correct for the larger sizes of wire, and the error is in no case greater than 3 per cent. This gives as great a degree of accuracy as is ordinarily required. In case it is required to know the number of feet per pound more accurately than the rule already given will permit, multiply the number of ohms per thousand feet by the following instead of by 31.4 for all sizes:

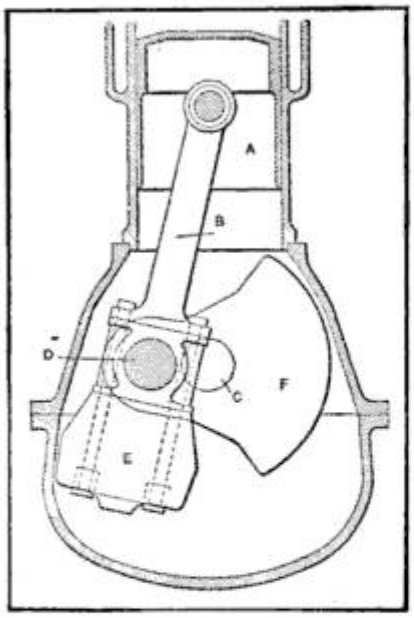
For sizes up to No. 10 multiply by 31.4.
For sizes from No. 11 to No. 20 multiply by 32.0.
For sizes from No. 21 to No. 30 multiply by 32.6.
For sizes from No. 31 to No. 40 multiply by 33.2.

The constant is seen to increase by .6 each tenth size.

To conclude, it might be added that these rules are really practical, and will, when mastered, be found of great advantage, as those engaged in any branch of electrical work will readily realize.

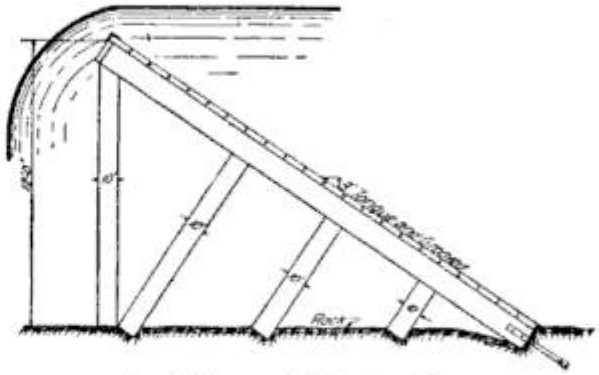
## A NEW METHOD OF BALANCING ENGINES

Many attempts have been made to balance reciprocating engines, so that no vibration would be produced, but none, so far, has been successful. A new method has recently been patented, which consists principally of a cast-iron weight, E (see cut), so proportioned that the center of gravity of the weight and connecting rod combined is located at the center of the crank. The counterweight, F, is of sufficient size to just balance the weight of the connecting rod and attachment, so that the center of gravity of all revolving parts is at the center of the main shaft, C. This device, if effective, would be invaluable for all gas engines and high-speed steam engines, as the vibration of these engines is always a great objection.




## DURABLE WOODEN DAM

A good type of wooden dam and one that when well constructed of sound material will last upwards of a half century is shown



Good Type of Wooden Dam

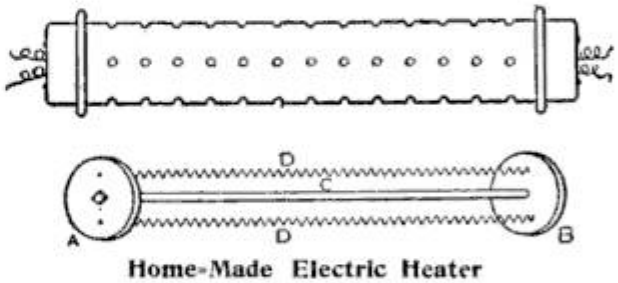
in the illustration, taken from the American Miller.

The dam has a plank face supported by stringers, the latter being held by supports carried to the rock. Ice is about the only thing that can damage such a structure.

## SIMPLE ELECTRIC HEATER

A good electric heater is made as illustrated. A and B are two porcelain disks. Through a hole in the center of these run an iron rod having bolt threads at the ends. Hold the bolt firmly, says Practical Machinist, by a ½-in. iron pipe covering it and forming a butt at each end.

Use German silver wire for the coils; its resistance is 13.91 ohms and by sending a current of electricity through the coils, three times as much heat is generated as with galvanized iron coils; it requires more current to heat the German silver coils, however. Nos. 13 and 15 or Nos. 12 and 14 wire is suitable.




Home-Made Electric Heater

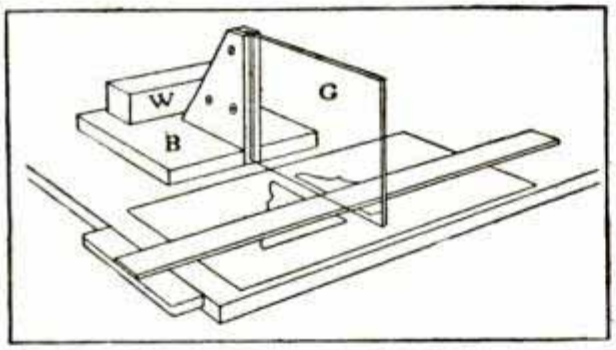
Thread both ends of a suitable length of 1¼-in. loricated conduit pipe to fit 1¼-in. caps and drill ¾-in. holes, 2 in. apart, around the circumference of the pipe for its full length. Fit this over the heater passing the feed wires to heater through ¼-in. holes in the caps.

## HOW TO MAKE AN INVISIBLE PATCH IN TRACING CLOTH

A method of making invisible patches in tracing cloth, the discovery of a correspondent of the American Machinist, is as follows: The portion to be cut out is laid on a piece of plain tracing cloth, and both pieces are cut at the same time with a sharp knife. This makes a patch the exact shape of the hole. The patch is then placed in the hole, and the edges coated with liquid court-plaster. The butt joint thus formed is flexible, tough, and so transparent that the patch is practically invisible in the blueprint.

## USEFUL DEVICE FOR MAKING SYMMETRICAL DESIGNS

In making mechanical or artistic designs it frequently happens that right- and left-hand views are required of the same figure.




**For Reversing Figures**

A mechanical drawing having this requirement, usually necessitates considerable time for duplicating all the dimensions, and a freehand drawing gives even more trouble, as it is almost impossible to make two figures symmetrical by using the eye alone as a guide.

The apparatus shown in the sketch can be made by almost anyone and enables a person to make a symmetrical duplicate of either mechanical or freehand designs, without taking a single measurement. The piece of glass, G, is held by the wooden base, B, so that the lower edge of the glass is about ⅛ in. from the drawing board. This allows room for the paper and T-square blade underneath. A heavy weight, W, prevents the apparatus from tipping forward. The glass should be firmly fastened to the base and if a large piece is used a quantity of bicycle rim cement should be used to fasten it in the groove. If desired, holes may be drilled in the glass to receive screws. In drilling glass use an ordinary twist drill and keep the point moist with turpentine. In mounting the glass be sure that the surface is exactly perpendicular with the base; otherwise the two figures will not be symmetrical.

In operation the lower edge of the glass is placed directly over the axis of symmetry, and the reflection in the glass will then reverse any figure on the paper underneath making it appear reversed on the opposite side of the glass. The glass being transparent enables the operator to look through and trace the reversed image without any difficulty.

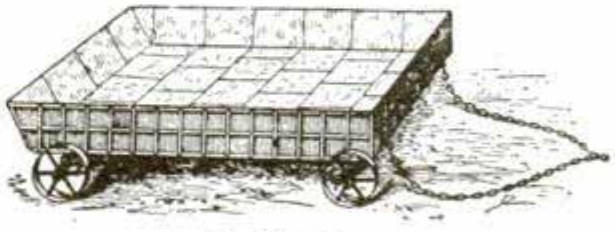
## OIL FINISH FOR WOOD

A good, durable finish for wood can be obtained by soaking the article in linseed oil for a week and then rubbing with an oil-soaked cloth a few minutes each day for about two weeks. This solidifies and preserves the work, says a correspondent of Machinery, and gives a much more durable finish than French polishing.

## PORTABLE BONFIRES FOR BURNING BRUSH

An Oregon orchardist who found it required a great deal of time and labor to haul away his orchard prunings, rigged up a portable brush burner which is drawn by horses down the rows of trees and consumes the brush as fast as it is thrown in.

He made a frame or running gear of four poles about 6 in. in diameter, using two 7-ft. ones for axletrees and bolting the other two (10. ft. poles) on top of these near the ends to form a rectangle. To the under side of one he fastened a round iron rod and used the projecting ends as spindles for two old farm implement wheels 1 ft. in diameter. The wheels were held in place by 8-in. pins put through holes made in the



**Bonfire Wagon**

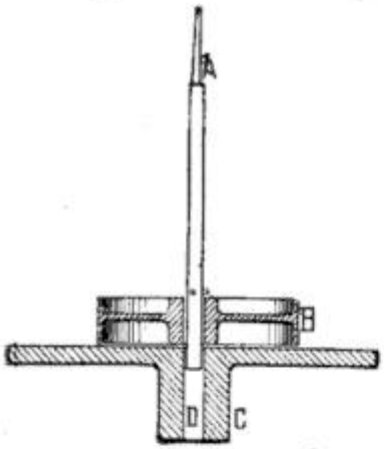
ends of the spindles. The burner proper, says the Rural New-Yorker, was a huge iron basket or crate 6 by 10 ft. on the bottom and 2 ft. deep, made of old wagon tires

riveted together. The meshes of this crate were nearly a foot in diameter but close enough to hold the brush. To keep the coals of fire from falling through, the bottom was covered with old sheet iron scraps. At the front end to which the team was hitched the crate was sided up with sheet iron to screen the horses from the heat, and chain or iron rods extended 10 ft. forward to give the team plenty of space between it and the fire.

As this vehicle passed through the orchard the brush was piled on the fire kindled in it and immediately consumed. Not enough brush was burned at a time to hurt the trees.

## KEY-SEATING WITH THE DRILL PRESS

In cutting key seats through long hubs the drill press can be used to an advantage; for rapid work the lever should be used.




Referring to the sketch: A is a bar with the cutter the required width; B is a pulley bolted to the drill faceplate; C-D is the hole through the faceplate for which bushings can be made to fit any size bar. After each stroke of the lever, tap the work, B, with a hammer, which will move it enough for another cut.

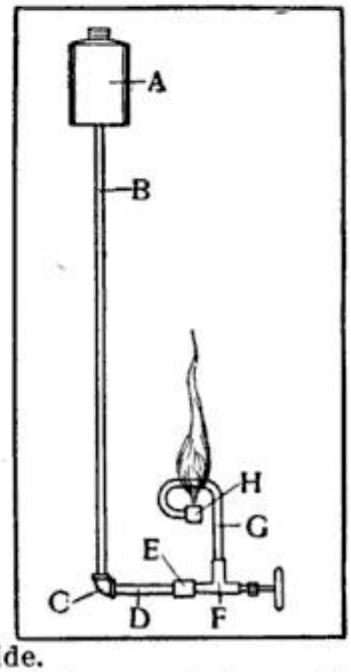
This does better work than can be done with a hammer and chisel and is a time-saving device. For tapered key seats tip the work by means of a piece under one side.—Contributed by Paul S. Baker, Muscatine, Ia.

## A GLASS HONE

Take a piece of plate glass, 2 in. by 6 in., the usual size of a hone, and rub the surface thoroughly with a similar piece of glass with emery flour (the finest powder of emery) and water until the surface is evenly ground, then wash the surface with water. Hone the razor in the usual way from heel to point, using a lather made by rubbing the surface of the hone with an ordinary slate pencil and water. The lather should be of the consistency of thick cream. Follow this by stropping in the ordinary way. The surface of the hone will become smooth in course of time, but can be reground as before. Try it.—Contributed by Dr. W. H. Mayfield, 722 First St., Louisville, Ky.

## HOW TO MAKE A SMALL GASOLINE BURNER

I have found a small gasoline burner, like the one illustrated, very useful for melting babbitt and lead. An old coffee flask, A, is soldered to a piece of ⅛-in. pipe, B, about 2 ft. long. This is screwed into a ⅛-in. elbow, C, which holds a ⅛-in. by 3-in. nipple, D. A ⅛-in. coupling, E, connects this to a ⅛-in. needle valve, F, which holds a piece of ⅛-in. pipe, G, 10 in. long, bent as shown, and covered at the end by a ⅛-in. cap, H, with a 1/32-in. hole drilled through the upper side.




In making this device be sure to have all the joints screwed up tight, and a good soldered joint between the flask and vertical pipe, as a small leak might result in an explosion.—Contributed by A. Laughlin, Winona, Minn.

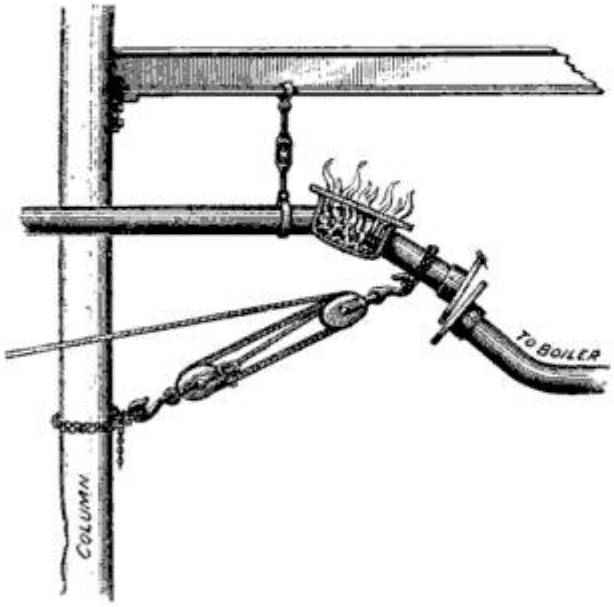
## TIGHTENING BRISTLES IN PAINT BRUSHES

Any person who uses a paint brush has suffered annoyance from the brush losing bristles. A good remedy is to stand the brush, handle down (in a vise, if convenient), separate the bristles with a knife blade and pour in a small quantity of shellac varnish, just enough to saturate the bristles at the base only. Leave the brush in that position until dry.—Contributed by Andrew Whiton, 9 Kinsley St., Hartford, Conn.

Rust spots on marble may be removed by applying a mixture of 1 part nitric acid and 25 parts water, then rinsing it off with 3 parts water and 1 part ammonia.

## HOW TO MAKE A SLIGHT BEND IN LARGE PIPE

In installing an 8-in. main pipe to lead from a boiler and swing by two easy bends to a higher level, it was found necessary to




**Making Slight Bends in Large Pipes**

bend the pipe a trifle more than had been expected, in order to bring the ends together for bolting through the flanges.

The pipe was anchored securely and fastened overhead with a hanger, which in turn was fastened to a strong beam. A basket of charcoal was then placed at the joint and a fire started. The basket was made of sheet iron with holes in the bottom to induce a draft and was supported on the pipe by pieces of small-size wrought-iron pipe. The heat of the fire softened the metal sufficiently, says the Metal Worker, to permit the joint to be drawn up by means of a block and fall. The chain, as is absolutely necessary, was fastened to some strong object, in this case a column.

## LAWN ROLLER MADE OF KITCHEN BOILER

A good lawn roller can be made of an old kitchen boiler. If the boiler is too long, cut it to the desired length. Run a piece of pipe through the center lengthwise, allowing it to protrude about 6 in. Then fill the boiler with concrete and if it has been cut short, block up the end. Then attach a handle to the pipe ends.

A roller 3 ft. long and 1 ft. in diameter is made of a piece of heavy galvanized iron 36 in. wide and 40 in. long. Roll it so as to make a 2-in. lap and rivet. Block in one end, put a pipe through, fill with concrete, and block up the other end. When the concrete hardens you have a good, heavy, durable lawn roller at little expense.—Contributed by W. S. Barrows, 628 Dover Court Road, Toronto, Canada.

## OILER FOR WORKBENCH USE

Take a can about 2½ or 3 in. in diameter and cut it off smoothly about 1½ in. from the bottom. Cut a strip of old ingrain carpet, felt or other suitable material, about 2 in. wide, and roll up enough of it to fill the can tight. Saturate with oil and you have a handy oiler to keep on the workbench for oiling saws, etc.—Contributed by P. P. Simmons, La Jolla, Cal.

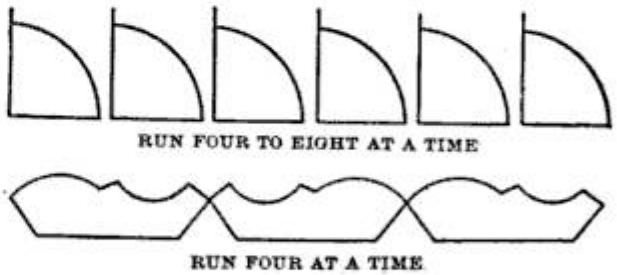
## FINDING SHORT CIRCUITS

To find a short circuit in a lighting system, screw in a plug on one side of the cut-out and an Edison base lamp on the other side and turn off at the socket all the lamps on that circuit. The pilot lamp will remain lighted until the short circuit is found. When the pilot lamp goes out it shows that the circuit is clear.

An open circuit may be found by the same method: have the lamps all turned on at the socket and the pilot lamp will light up when the circuit is closed through the load. This method is also useful in finding a ground that blows the fuse. The system can only be used with Edison cut-outs. It requires no special apparatus and the necessary materials are at hand on any job.—Contributed by A. T. Senecal, Watertown, Ill.

## HOW TO MAKE QUARTER-ROUND MOLDING

The sketch at the top shows how to run quarter-round mold, four to eight at a time, on a 14-in. machine. Let top head cut en-




tirely through on thin stock, says the Wood-Worker, and on thick stock nearly through, the bottom head finishing the cut. Crown mold is run four at a time and practically the same way.

## TESTING CONDENSER WATER PIPES FOR ANIMAL INCRUSTATION

An electric station at Galveston, Texas, takes salt water for condensing purposes from a bay through a 10-in. iron pipe about 3,700 ft. long. Screens, strainers and other precautions are used at the intake end, but despite this, a large amount of oyster and barnacle spawn and spats is drawn up by the suction and these attach themselves to the inside of the pipe and build their shells. In time this incrustation would reduce the carrying capacity of the pipe, if it were not carefully watched and removed when necessary. The Street Railway Journal describes the method of determining the inside diameter of the pipe.

Copper balls of different sizes and having very thin shells, so that they will crush easily, are used in the tests. These balls are inserted at the intake end of the pipe and allowed to be drawn up by the force of the water. The test begins with balls 2 in. in diameter, followed by 2½-in. balls, and increasing sizes. Each ball as it comes up is carefully examined for scratches and when these begin to appear the largest ball passed through is taken as the minimum size of the opening of the pipe. When other balls are not obtainable, copper balls are borrowed from steam and water traps in the power house and replaced after the tests.

One of the means employed to kill the crustation-forming spats is by feeding creosote, by means of an injector lubricator, drop by drop into the condensing water at a point just inside the intake end. This kills the spats before they form their shells.

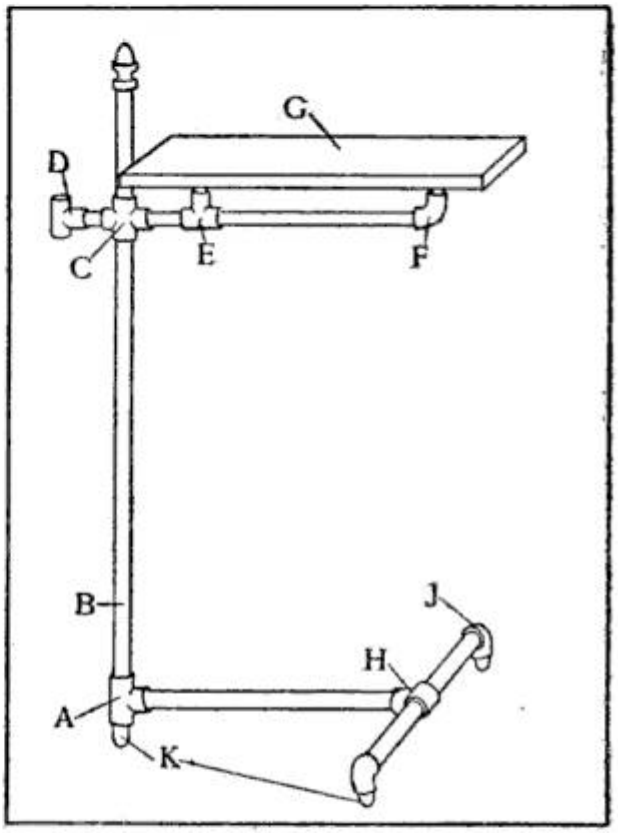
## TO REDUCE THE SIZE OF A HOLE IN IRON OR STEEL

When a hole has been bored out too large by mistake, if the shape of the piece will allow, the following method may be used to reduce the size of the hole, says a correspondent of Machinery:

Heat the piece red hot, and dip in water up to the center of the hole. Half of the metal around the hole will become cold and shrink. The other half, that is still red, will shrink while hot, being pulled together by the cold part, and when it gets cold will shrink still more, becoming smaller than the original size. Heat the piece again and dip the other half in water. Repeat this operation, dipping each end alternately, until the size of the hole has been reduced enough to allow a nice cut to be taken to bore it to the right dimension.

## A BED-TABLE MADE FROM PIPE FITTINGS

A bed-table will be found a most convenient article for the sick room, or for those who wish to read in bed. The table may be made to hold the book or dishes, as




**Adjustable Bed Table**

the case may be, in any desired position without the slightest effort on the part of the patient or reader.

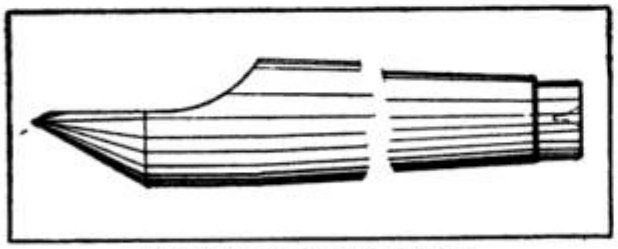
In the sketch, which shows the assembled table, A and H are ½-in. tees; B is a ½-in. pipe; C is a ¾x⅜-in. cross; D is a ⅜-in. tee used as a handle to tighten the short nipple, L, which acts like a set screw; E is a ⅜-in. tee; F is a ⅜-in elbow, and K, knobs of hard wood driven into the fittings, as shown.—Contributed by H. N. Barth, Chicago.

## FOR CLEANING OLD BRASS

A good formula for cleaning old brass is as follows: Take 1 oz. of oxalic acid, 6 oz. rottenstone, ½ oz. gum arabic, all in powder; 1 oz. sweet oil, and sufficient water to make a paste. Apply a small portion, and rub dry with a piece of flannel or soft leather.

## HINTS ON LATHE WORK

DRILLING IN THE LATHE.—In boring holes in work held in the chuck it often happens that the hole must go through solid stock. In this case it is desirable to take out most of the stock to be removed with a drill held in a chuck, or other suitable holder, fitting the tail stock. It is the general practice to make a countersink in the work with a tool held in the tool-post (called a centering tool) to insure the drill



**Half Center for the Lathe**

starting and keeping in the center of the work. This involves accurate grinding and setting of the tool, and, except in certain cases, is unnecessary. A very quick and accurate method of centering the drill in the work is to face the work off square, not making any countersink at all; place the drill in the chuck or holder with the point as near the center of the work as convenient; select any lathe tool that is fairly square across the back end and clamp it in the tool post so that the square end nicely clears the work and is in such position that when pushed forward by the cross feed-screw it will bear against the lip of the drill; start the lathe and feed the drill in a little, then push the tool against the lip of the drill until the drill appears to be central; back the tool away from the drill and if it is central, proceed to drill the hole; if not, repeat the operation. After a little practice one will generally be able to center the drill the first time. The method only holds good, however, until the drill begins to cut full size, unless the drill is very small or the work projects so far from the chuck that it will spring.

A HANDY CENTER FOR THE LATHE.—A very handy center for facing the ends of work held between the centers is shown in the accompanying sketch. It can be made in the same way that an ordinary lathe center is made, or an old center may be cut or ground away in the manner shown. To use it, place it in the tail stock with the part cut away toward the front side of the lathe. This center will allow you to use most any kind of a facing tool and leave a clean end with no fin or ridge at the center to be taken off afterward.

A RAPID WAY TO CUT THREADS IN THE LATHE.—(This method applies to lathes with a compound rest only.) To cut an ordinary V-thread of 60° angle, loosen the compound rest and swing it around 30° and clamp it fast; clamp an ordinary threading tool in the tool-post at right angles to the work to be threaded; if a stop is available, push the tool up to the work with the cross feed-screw and set the stop so that it can go no farther; proceed to cut the thread in the usual manner, only do not move the stop, but feed for each cut with the compound rest screw. As the compound rest is at an angle equal to one side of the thread, the tool will cut on one side and not on the other and still preserve the shape of the thread. As the tool only cuts on one side, the tendency to dig in and tear is relieved and a fairly heavy cut can be taken. When the thread is well roughed out, a few light cuts may be taken over it, feeding with the cross feed-screw, thus giving a good finish to both sides of the thread. In cutting threads of a coarse pitch it is well to use two tools, the first one with a little top rake away from the cutting side, the other ground in the usual manner for finishing the thread.

The writer does not claim that the methods of doing the work described are original, but that they are not as generally known to lathe hands as they should be.—Contributed by "Tap."

## RENEWING SCREWDRIVER EDGE

When the point of a screwdriver is worn away so that it jumps the nick in the screw, the edge can be renewed as follows:

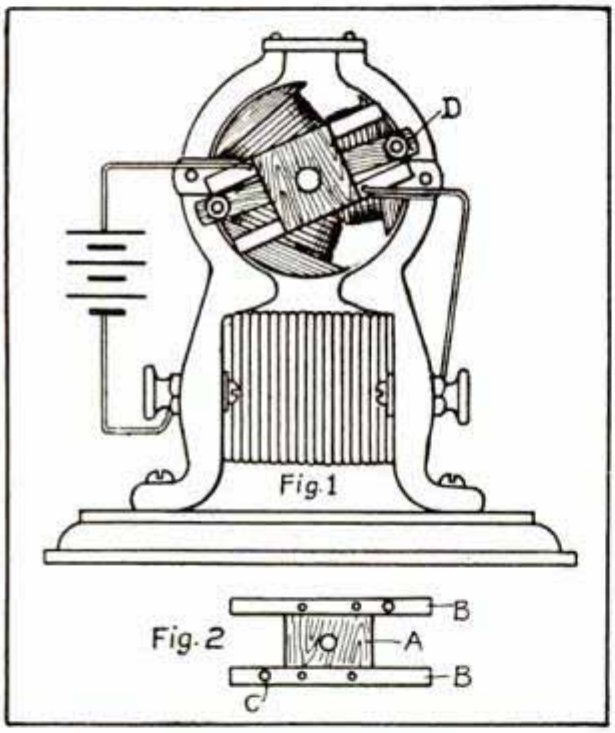
Hold the screwdriver in the vise with the bevel of the point lying horizontal and projecting above the surface of the vise jaws; then use a medium flat file on it, giving a forward thrust only, and keeping a horizontal position throughout, directs the British Optical Journal. Turn the driver over and repeat the operation until the edge becomes very thin. Then file it down to a perfectly straight margin and regulate its width for the size required. This method is more satisfactory than truing up the point on a grindstone.

A great difficulty in the production of power from peat gas is the rapid formation of tar. This has to be separated and constitutes a serious loss of heat.—The Engineer.

# MECHANICS FOR YOUNG AMERICA

## DIRECT-CONNECTED REVERSE FOR SMALL MOTORS.

A simple reverse for small motors can be attached directly to the motor as shown in Fig. 1. Fig. 2 shows the construction of the reverse block: A is a strip of wainut ⅝ in. square and ⅜ in. thick with strip of brass or copper (BB) attached as shown. Holes (CC) are drilled for the wire connections and they must be flush with the surface of the block. A hole for a ¼-in. screw is bored in the block. In Fig. 1, D is a thin strip of walnut or other dense hard wood fitted



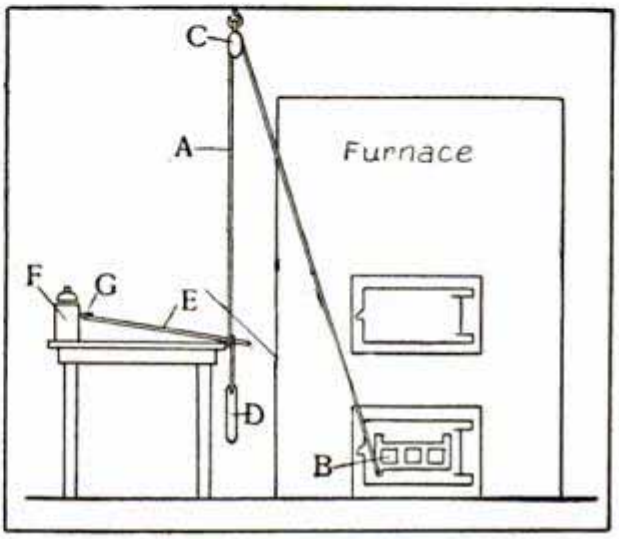

**Direct-Connected Reverse.**

to the binding-posts of the brush holders, to receive the screw in the center.

Before putting the reverse block on the motor, remove all the connections between the lower binding posts and the brush holders and connect both ends of the field coil to the lower posts. Bend the strips, BB (Fig. 2), to the proper position to make a wiping contact with the nuts holding the strip of wood D, Fig. 1. Put the screw in tight enough to make the block turn a little hard. Connect as shown in the illustration. To reverse, turn the block so the strips change connections and the motor will do the rest. —Contributed by Joseph B. Keil, Marion, Ohio..

## ALARM CLOCK TO PULL UP FURNACE DRAFT

A stout cord, A, is attached to the draft, B, of the furnace, run through a pulley, C, in the ceiling and has a window weight, D, attached at the other end. A small stick

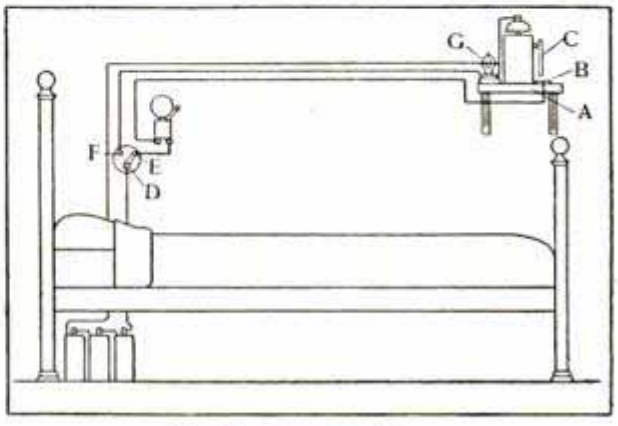



**Automatic Time Draft-Opener.**

is put through a loop in the cord at about the level of the table top on which the alarm clock, F, stands. The other end of stick, E, is placed under the key, G, of the alarm clock. When the alarm rings in the early morning, the key turns, the stick falls away, releasing the weight, which pulls the draft open.—Contributed by Edward Whitney, 18 Gorham St., Madison, Wis.

## HANDY ELECTRIC ALARM

An electric alarm which may be turned off from the bed without one's arising and also having a light which may be turned




**Handy Electric Alarm.**

on and off from the bed, so one can see the time, is the device of H. E. Redmond, of Burlington, Wis.

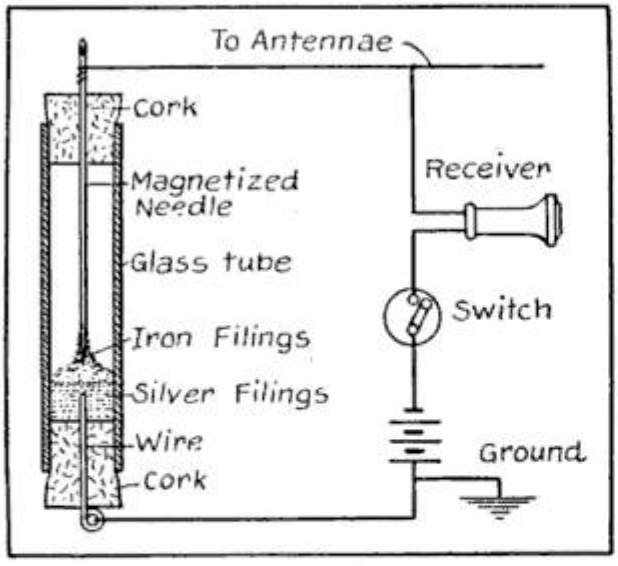
The alarm clock rests on a shelf, A, which has a piece of metal, B, fastened in such a position that the metal rod, C, soldered to the alarm winder, will complete the circuit and ring the bell. The two-point switch, D, is closed normally at E, but may be closed at F any time desired, thus turning on the small incandescent light, G, which illuminates the face of the clock. When the alarm goes off, the bell will continue to ring until the switch is opened.

## EASILY MADE WIRELESS COHERER

A good wireless coherer may be made with very little expense, the only materials necessary being a glass tube, two corks, a magnetized needle and a quantity of iron and silver filings. Push a piece of wire through one cork and place in the bottom of the tube, as shown in the sketch.

Pour in the filings and insert the top cork with the needle pushed through from above. The point of the needle should barely touch the filings and by slightly agitating the tube the iron filings will separate from the silver and cling to the magnetized needle, as shown.

In operation the device must stand on end and should be connected in the circuit,



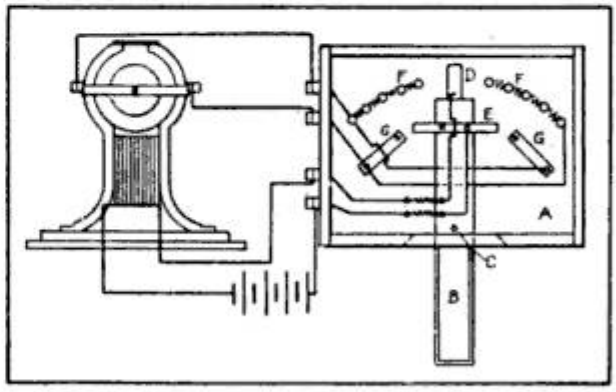

**Details of Coherer**

as shown in the sketch. When the electrical waves strike the needle the conductivity of the filings is established and a click is heard in the receiver.—Contributed by Carl Formhals, Garfield, Ill.

## CONTROLLER FOR A SMALL MOTOR

An easy way of making a controlling and reversing device for small motors is as follows:

Cut a piece of wood (A) about 6 in. by 4½ and ¼ in. thick, and another piece (B) 6 in. by 1 in. and ¼ in. thick. Drive a nail through this near the center for a pivot (C). To the under side of one end nail




**Reverse for Motor**

a copper brush (D) to extend out about an inch. On the upper side at the same end, nail another brush (E) so that it projects at both sides and is bent down to the level of the end brush. Then on the board put a semi-circle of brass-headed tacks as shown at F, leaving a small space at the middle and placing five tacks on either side, so that the end brush will come in contact with each one. Connect these tacks on the under side of the board with coils of German silver wire, using about 8 in. of wire to each coil. Fix these by soldering or bending over the ends of the tacks. Then nail two strips of copper (G) in such position that the side brush will remain on the one as long as the end brush remains on the tacks on that side.

Put sides about 1½ in. high around this apparatus, raising the board a little from the bottom to allow room for the coil. A lid may be added if desired. Connect up as shown.—Contributed by Chas. H. Boyd, Phila., Pa.

When filling nail holes in yellow pine use beeswax instead of putty, as it matches the color well.

The Boston & Maine Railway is trying peat fuel in one of its locomotives and, it is said, with good results. Maine has vast peat bogs.

# HOW TO PREPARE AND USE FUNGICIDES

The intelligent use of fungicides as a means of preventing diseases of fruit is quite as possible to the owner of a few trees, planted on his town lot, perhaps, or his little suburban plot, as it is to the prosperous orchardist operating on a large scale. Too often, however, the former neglects this means of grace, with resultant loss of his cherished fruit crop.

The most valuable fungicide is the Bordeaux mixture. There are many variations of this mixture for special purposes, but for general use the 5-5-50 formula is reliable. This consists of 5 lbs. copper sulphate, 5 lbs. lime and 50 gals. water. To mix, the bluestone solution and the milk of lime are prepared in separate vessels, then a man at each tub dips a bucketful and the two pour the solutions simultaneously into a larger receptacle—either a barrel or a spray tank. It is always necessary to strain the solutions through a wire strainer. Fig. 1 shows a good home-made strainer for this purpose. Procure a box 1 ft. square, with a heavy hardwood bottom, in which bore a hole to receive a piece of 1½ or 2 in. gas pipe, 8 to 12 in. long. Just inside this box fit a second and lighter box, open at the top. Nail a strip at the top to overhang the first box and so support the second. Have the bottom of the inner box slope at a 30-degree angle, making it of wire screen. The spray is not apt to clog in this screen and the inner box can be removed and washed. The mixture when prepared should be a brilliant sky-blue in color. Air-slaked or otherwise inferior lime will give it a greenish cast and the spray is apt to injure the foliage. Insecticides may be added to the mixture when required. The proper proportion of Paris green is ¼ lb. to 50 gals. of the mixture.

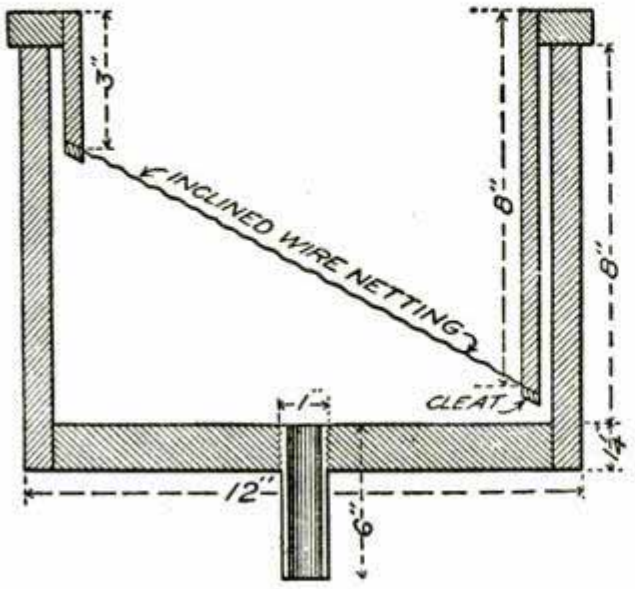



**Fig. 1—Strainer Used in Preparing Bordeaux Mixture**

**Fig. 2—Applying the Dust Spray in a Peach Orchard**

The liquid spray is considered the better, but where it is not convenient or possible to obtain the large quantities of water required in its preparation, many orchardists substitute the dust Bordeaux mixture, prepared as follows:

Dissolve 4 lbs. copper sulphate in 4 gals. water and slake 4 lbs. of lime in 4 gals. water. When cool pour the two solutions together simultaneously into a tub. Allow the resulting precipitate to settle, decant off the liquid, pour the wet mass of material into a double flour bag, and squeeze out as much water as possible. Then spread out the dough-like mass in the sun to dry. After a day's drying it can easily be crumbled into an impalpable powder by crushing with a block of wood or even with the hand. This powder should be screened through a sieve of brass wire having at least 80 meshes to the inch and should then be thoroughly mixed with 60 lbs. of slaked lime dust. To prepare the slaked lime dust slowly sprinkle a small quantity of water over a heap of quicklime, using barely enough water to cause the lime to crumble to dust. When the heat generated has driven off the excess of moisture pass the dust through a screen having 80 meshes to the inch. Where desirable 4 lbs. sulphur and 1 lb. Paris green may be added to each 60 lbs. of Bordeaux mixture dust. Fig. 2

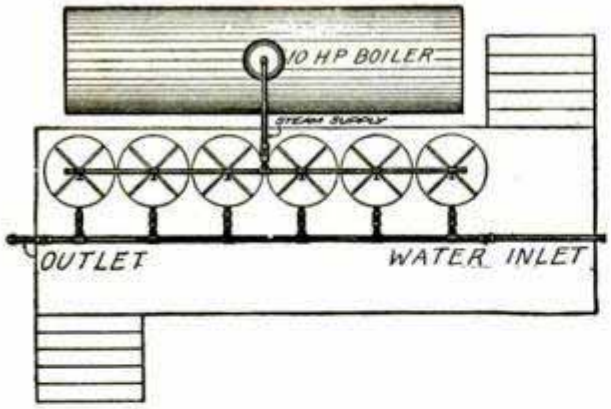



**Fig. 3--Steam Spray-Boiling Outfit**

shows the method of applying the dust spray.

Another important fungicide is the lime-sulphur-salt wash, an excellent formula being: Lime, unslaked, 20 lbs.; sulphur (flour or flowers), 15 lbs.; salt, 10 lbs.; water, 50 gals. To prepare in small quantities, put 10 gals. water in an iron kettle over a fire, make the sulphur into a paste with a little water and when the boiling point is reached add the fresh lime and the sulphur together. Stir the mixture constantly and continue the boiling for 40 to 60 minutes. Add the salt at any time during the process of boiling. It is easiest to apply the wash warm, though it is equally effective when cold.

For preparing this wash in large quantities, special apparatus is necessary. A steam plant with barrels and tanks is provided and the spray is boiled by steam. A top view of one of these boiling plants, with six barrels, is shown in Fig. 3. The 10-hp. boiler rests on the ground and the barrels and water supply pipe are on an elevated platform. The outlet end is about 8 ft. from the ground and terminates in 3 ft. of flexible hose. The steam pipe from the boiler is the same size as the outlet of the boiler; the two branches somewhat smaller in size, but of the same total capacity. The vertical pipes are ¾ in. or less and may be arranged in either of the ways illustrated in Fig. 4. At A the pipe enters from above and terminates in a double T, with perforations on the arms; at B it enters through the barrel near the bottom and forms a circle. The perforations are ⅛ in. The water-supply pipe extends on to the platform alongside the barrels, having a branch running into each barrel. This pipe should be about 1½ to 2 in. in diameter, and the arrangement of the valves should be such that fresh water can be turned into the outlet pipe, which extends over the end of the platform and turns downward a foot or so. It has 3 or 4 ft. of hose to lead the liquid into the tank, which is driven underneath.

Outfits from a small hand bucket with a spray pump to the big gasoline power sprayer with a 300-gal. tank and an elevated platform, the whole mounted on a truck may be procured. In the latter the elevated platform is for use in spraying tall trees. Anyone can find apparatus adapted to his requirements and an ingenious person could devise his own outfit.

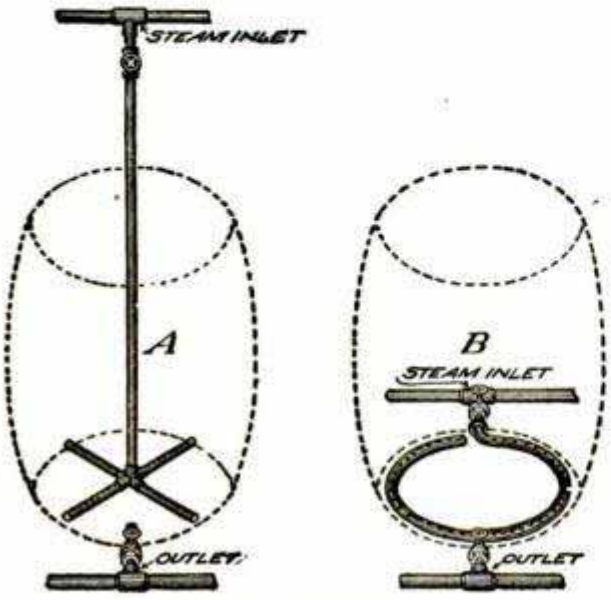
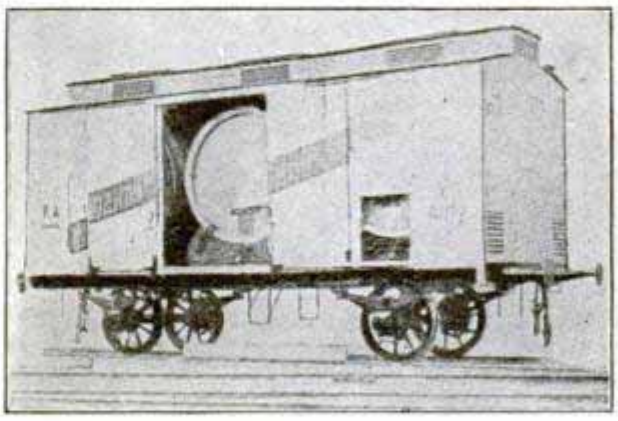



**Fig. 4--Steam Coils in Barrels**

## HUNGARIAN WINE CAR

**Ventilated Body--Holds 1,188 Gallons**

In Hungary wine is transported in special cars with space for three casks, each of 396 gals. capacity. The car is 24½ ft. long, 9 ft. wide, and has a load weight of 15 tons,



**Capacity for Three Casks**

says Railway and Engineering Review. The casks are covered by a ventilated car body, making it possible to maintain a fairly equable temperature.

# ATKINS

TRADE SILVER-STEEL MARK

# SAWS

"Finest on Earth"


Made for Good Mechanics
Who Want the Best Tools

## E. C. Atkins & Co., Inc.

Largest Saw Manufacturers in the World

Factory and Executive Offices, Indianapolis, Ind.

BRANCHES: — New York City, Chicago, Minneapolis, Portland (Oregon), Seattle, San Francisco, Memphis, Atlanta, New Orleans, and Toronto (Canada)

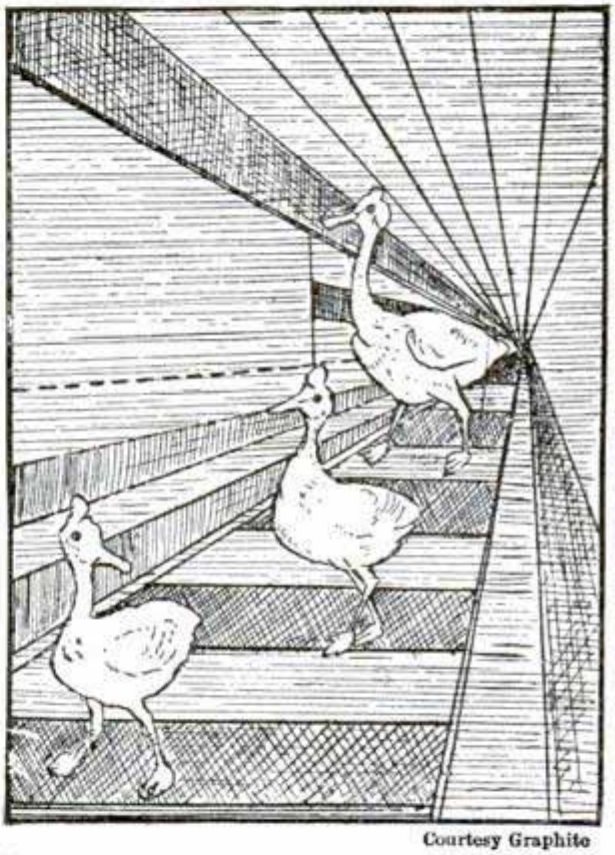
# HOW SEEDS ARE PUT IN PACKETS

Should you purchase several packages of one kind of garden or flower seeds, put up by the same firm, and compare the contents of each tiny bag, you will be surprised to find how uniform in quantity is each packet. This result is not accomplished by hand, but is the rapid work of an extremely interesting machine which is the invention of a Vermonter.

The packeting machine is entirely automatic in its action, and all the operator has to do is to keep the hopper full of seeds, and supply and remove the little bags. The machine is operated by a ⅛-hp. electric motor, and is adjusted for each change of seeds or size of packets. When once started, says the Weekly Florists' Review, it will fill 3,000 packets an hour, and in doing so it measures the seeds, opens the bag, fills it, gums it, turns the flap, presses it hard down and holds it until it sticks fast, making the packet secure for even the smallest seeds. A counter registers the number of bags.

"It Will Fill 5,000 Packets an Hour"

## ILLUSION OF PERSPECTIVE



Courtesy Graphite

Here is an illustration of how the untrained eye can be deceived. The goose at the rear appears much larger than the one at the front. But is it?

FATHER KNEW.—"Pop." "What is it, Johnny?" "Why is the head of a bedstead always higher than the foot?" "For the same reason that the rear wheels of a wagon are always bigger than the front ones, Johnny." "Thanks, pop."—Kansas City Times.

A HARD WORKER.—Casey: "Ye're a har-rd worruker, Dooley. How many hods o' morther have yez carried up that laddher th' day?"
Dooley: "Whist, man—I'm foolin' th' boss. I've carried this same hodful up an' down all day, an' he thinks I'm worrukin'!"—Cleveland Leader.

SMOKE CONSUMER.—A smoke consumer which is said to show fine results is being tested by government officials at Washington. The device is on the plan of the bell burner in an oil lamp. Should further tests warrant, a demonstration will be made on a warship. A system of preventing smoke being seen when a fleet of warships are moving would be of incalculable value to any navy: Their smoke reveals their location when it otherwise would not be discovered.

# Barker's

THE PLACE TO BUY MACHINISTS TOOLS

## Pocket Scriber 20 Cents Delivered

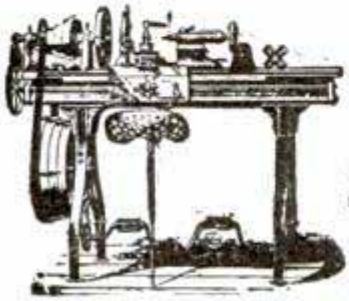
APPRECIATED BY ALL MACHINISTS.

Is reversible, telescoping into the stock; as safe to carry in the pocket as a pen knife. Send your orders to me for Machinists' Tools. My Prices are right.

J. A. BARKER

FULTON BUILDING, - PITTSBURG, PA.

---



# LATHES

*9 to 13 inch Swing*

List price, $65.00 and up according to size. When ready to buy send for Lathe Catalog and prices

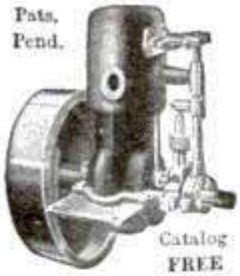
W. F. & John Barnes Co.
100 Ruby St., : : Rockford, Ill.

---

# "LITTLE SKIPPER"

## MARINE ENGINE

H. D. Baird's Latest and Greatest Two-Cycle Gasoline Engine. Makes a speedy little Launch from an ordinary Canoe or Row-boat.




**2 HP Actual Bare Engine $24.90**

**Engine complete with accessories and boat fittings, $39.**

Simplest, strongest, most powerful and speedy engine of its class. Drives Canoe, Row-boat or 12 to 20 ft. Launch 6 to 10 miles per hour, or 35 ft. Sailor 3½ to 4 mi. per hour as an auxiliary. Reversible, anyone can install and run it, always safe and certain to go.

SOLD UNDER 5 YEAR GUARANTEE.

**ST. CLAIR MOTOR CO., Dept. 33 Detroit, Mich.**

---

# No. 602 "NAPANOCH"

## Pocket Knife Tool Kit.

MADE IN AMERICA.

Everyone has use for a **Knife, Reamer, File, Saw, Chisel** or **Screw Driver.** This outfit is practical, yet so small, being contained in a **Leather Pocket Book** 4¼x3¼ inches, that by carrying it in your pocket it is always at hand for immediate use, whether **Camping, Boating, Teaming, Driving,** in the **Shop, Factory, Office, Store, Warehouse, Automobile,** on the **Farm, Bicycle,** or around the **Home.** Any **Tool** firmly attached or detached to the **Pocket Knife** in a second.

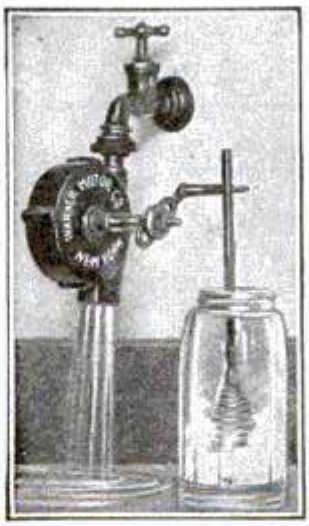
Sent postpaid on receipt of price, **$2.25.**

**Use it five days, and if not satisfactory, return it and I will refund your money.**

U. J. ULERY CO., 7F Warren Street, New York, N. Y.

---

# 6 WONDERS IN 1



"Turn the faucet—that's all"

I Do you want to clean bottles, tumblers and lamp chimneys automatically?

II Do you want a perfectly noiseless and effective cooling fan in the kitchen to make the hot season bearable?

III Do you want a magic egg-beater which will beat eggs whip cream or salad dressing by itself while you attend to other things?

IV Do you want a self-operating emery wheel on which to sharpen and clean your knives, scissors and edged tools?

V Do you want a splendid cotton polishing wheel revolving so fast that you can make your silverware and cutlery shine as it never shone before?

VI Do you want a powerful little motor for 20 useful ends about the home, to run sewing machine, meat chopper, small dynamo, cooling fan, etc.?

If interested in any of these remarkable claims you want our **"Little Wonder"** WATER MOTOR which will attach to your water faucet, smooth or threaded, in a jiffy. A line from you brings our attractive FREE descriptive booklet telling all about it. Don't be deceived by cheap, worthless imitations.

## WARNER MOTOR CO.

DEPT. 14

FLATIRON BLDG., N. Y. CITY

MFRS. OF WATER MOTORS 1-16 TO 10 H.P.
WATER FANS & ACCESSORIES

---

# FREE 600 PAGE CATALOG

## Why Not Buy at Wholesale Prices?

Over 20,000 labor saving, money saving articles for the shop, home or farm, fully illustrated, described and priced in our **new 600 page catalog, No. 90.** Also a larger variety of **mechanics' tools** of all kinds at **lower prices** than heretofore shown in any catalog ever published.

No mechanic should be without this valuable book. If you have not received our catalog, write us to-day and it will be sent you **free of charge.**

Send for our new **premium list,** containing 100 useful and valuable articles given away free. Most wonderful offer ever made. **Send for it to-day.**

**Freight Rates are lower from New York than elsewhere**

**BUY IN NEW YORK**

## White, Van Glahn & Co.

Dealers in Reliable Merchandise
Since 1816

30 Chatham Square NEW YORK CITY

**OLDEST MAIL ORDER HOUSE IN AMERICA**

MYSTERIOUS TELEPHONE GAME.—The telephone now has a new use. It has become a mind reader and may yet puzzle men into paresis. Bolognesi, Hartfield & Co., 29 Wall street, are about as well known as any bankers in New York. When a Wall street man wants relief from mental strain he invents a new gambling device or perpetrates a joke. William Hartfield caught several friends in the Stock Exchange the other day and suddenly broke out with: "By the way, do you fellows know that the telephone is doing mighty stunts just now? Why, it can tell exactly what you are thinking about! Don't believe it? Well, just put your mind on a certain card and do some hard thinking. The wire will do the rest."

The great majority of men, being curious, will "bite." Captain Casey (of Casey at the Bat) was the first willing victim. "I'm thinking of the ace of diamonds," he said. "All right," replied Hartfield; "just call up 1111 Morningside and ask for Sanderson and tell him you have something on your mind." Casey called. "Hello! Is that Sanderson? Yes? Well, I've got something on my mind." Sanderson's voice came back—"It's the ace of diamonds; good-by." It cost Casey nearly a day's profits in Steel. Jack Cooper was asked to think of a card. "The deuce of spades." "All right; call up 2222 Broad and ask for Burrill and tell him you have something on your mind." Cooper called. "Hello, is that Burrill? Yes? Well, my name is Cooper; I have something on my mind." "I know," said Burrill; "it's the deuce of spades." Collapse of Cooper.

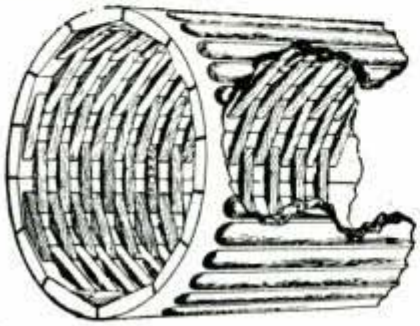
I assume that the trick is 1,000,000 years old to some of the smart alecks who know everything before it happened. But it is most amusing and confusing. Until let into the secret you never would or could guess the modus operandi. Like all other things in life, when you understand thoroughly it is simplicity itself. Fifty-two jolly chaps who rent telephones have entered into a compact. Each represents a certain card in the ordinary deck of fifty-two, and each of the conspirators carries in his pocket a printed guide to all of the subscribers. For example: Upjohn, 3333 Cortlandt (of course, I am using fictitious addresses), is the king of hearts; Billtow, 4444 Franklin, is the ten of clubs; Calbach, 5555 Gramercy, is the five of diamonds, etc.

Hartfield, let us say, after learning that Hooper Jones has selected the king of hearts, surreptitiously glances at the printed guide in his pocket, instructs Jones to call up "Upjohn, 3333 Cortlandt," and say he has something on his mind. Of course, Upjohn replies without hesitation, "Oh, yes; I know; the king of hearts." And the victim is lost in wonderment. The chief operator in the joke has a lot of fun; but who are these amiable fellows who do not mind being called up a dozen or a hundred times a day as a mild joke?

WANTS A SMOKE CONSUMER.—The city council has just passed an ordinance, requiring all manufacturing concerns using boilers to consume their smoke, as it were, completely; and I wish to obtain the aid of some of the readers of Popular Mechanics, who have had experience in this line, in devising a smoke-consuming apparatus for an 18 H. P. boiler, 36-in. shell (57-2 in. by 5 ft. flues) upright. I have not seen anything in the past that was a success at consuming smoke, and would be pleased to hear from the readers of Popular Mechanics, in the way of enlightenment upon this subject.—G. W. Aiken, East Toledo, O.

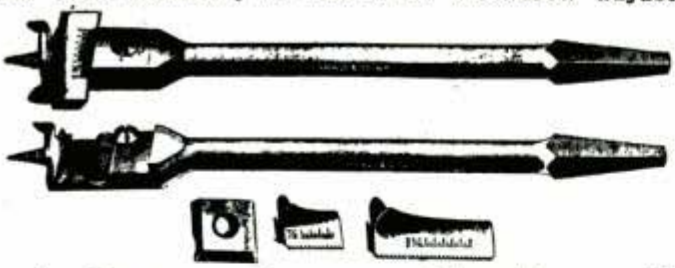
HOW MONEY GROWS—I have recently seen the books of a battleship which showed that 236 of the crew had money on deposit, and she was what is known as a "happy ship." One man was getting interest on $400. On another ship a bugler deposited in fifteen months $358, on which the interest was $16; a fireman in nine months deposited $27 per month, and a petty officer in eighteen months deposited $365, on which he received $39.16 interest. These are but a few of thousands of cases that might be cited, and such men are, as a rule, among the best behaved and contented of a crew.—Chaplain C. Q. Wright, in the Blue Jacket.

**ORNAMENTAL COLUMNS.**—Ornamental columns and posts for interior decoration of houses and buildings, or for colonial effect in front, are now made in factories quicker, cheaper and better than is



done by hand. These columns can be ordered in any size length and diameter and plain or ornamented. The carving is done by machinery at one-twentieth the cost of hand work.

**EXPANSIVE BIT.**—The advantage of this bit over those formerly in use is in the screw adjust-



ment. By means of a screw driver the movable cutter may be set more quickly and accurately than with the fingers.

### THE CAPTAIN AND THE AUTO.

Captain Bluewater now retires
And to the country wends his way,
His coxswain he as coachman hires
And takes a ride 'most every day.

One eve as homeward go the pair,
The coxswain driving on the box,
The captain dozes, free from care,
As one who fears no storm or rocks.

When quick, ten cable lengths alee
The coxswain sights two auto's eyes;
They are the first he e'er did see
And loud he to the captain cries:

"A light upon each bow does rise!"
The captain has no sooner seen 'em:
"'Twill be a d——d close shave," he cries
"But port your helm and—go between 'em!"

Jay Elless in the Bluejacket.

NOT A COW CATCHER.—"Is Mike Howe on board of this train?" asked a man approaching an engineer who was oiling up his locomotive.

"I don't know anything about your cow," replied the engineer sharply. "I am the engineer and not the cow catcher on this train."

In Africa the telegraph service frequently suffers interruption because of giraffes becoming entangled by their necks in the wires. Elephants, too, are at times responsible. This disturbance has occurred on the Victoria Falls line six times.

# Telegraph Instruments
## AND OTHER
# Electrical Supplies

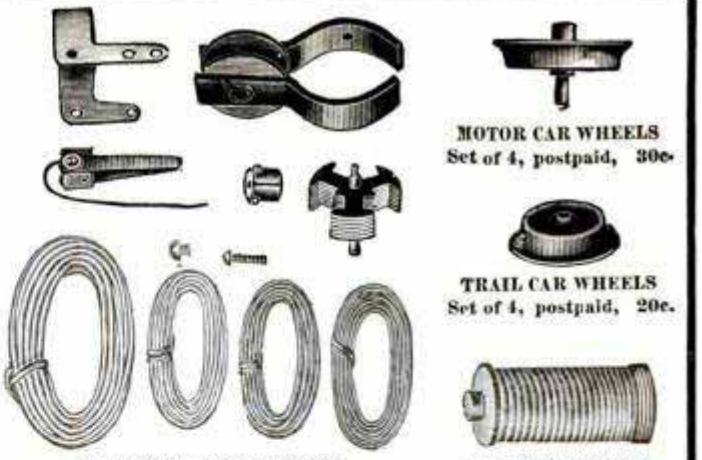
Being large manufacturers of telegraph and telephone apparatus and electrical supplies of every description, purchases can be made of us to the very best advantage. Our goods are standard and first class in every respect—guaranteed. Send us your orders—buy direct and save money.

Upon receipt of price shown, we will send any of the following articles, all charges prepaid, except those marked †. Send us a trial order.

| | |
|---|---|
| Steel Lever Telegraph Key (leg) | $0.95 |
| " " " " (legless) | .98 |
| Improved Giant Sounder | 1.72 |
| " " Combination Set | 2.60 |
| Standard Pony Relay | 1.85 |
| Snapper Sounder | .12 |
| Eureka Telegraph Set | 1.60 |
| Mechanical Telegraph Instrument | .95 |
| Union Lightning Arrester | .45 |
| Crow Foot Battery Complete 6-8 | .55† |
| Mesco Dry Battery | .15† |
| Series Telephone | 5.25† |
| Short Line Telephone | 2.50† |
| Electricians Pocket Tool Kit | 3.50† |
| Burglar Alarm Trap | .19 |
| Fire Alarm Box | .40† |
| Electric Call Bell Outfit | .60† |
| N. P. Electric Bell | .34 |
| E. R. Electric Alarm Clock | 1.40† |
| A. D. Medical Apparatus Complete | 2.00† |
| Induction Coil | 1.09 |
| Gem Motor | .90 |
| Electric Top | .91 |
| Universal Battery Guage | 3.29 |
| Ruby Lamp for Dark Room | 2.00† |
| Eureka Search Light | 1.43 |
| Vest Pocket Light | 1.00 |

† Purchaser must pay expressage.

**MANHATTAN ELECTRICAL SUPPLY COMPANY**
32 Cortlandt Street, New York City
188 Fifth Avenue, Chicago
Factories, Jersey City, N. J.



MOTOR CAR WHEELS
Set of 4, postpaid, 30c.

TRAIL CAR WHEELS
Set of 4, postpaid, 20c.

LAMINATED MOTOR PARTS
Postpaid, 70c.

ELECTRO MAGNET
Postpaid, 15c.

LAMINATED MOTOR AND PINION
Postpaid, 85c.

SET OF 4 TRAIL WHEELS AND TRUCK. Postpaid, 40c.

MOTOR AND DRIVE WHEELS
Postpaid, $1.10

MOTOR CAR WHEELS—Gear, 30
REAR WHEELS—no Gear, 20c

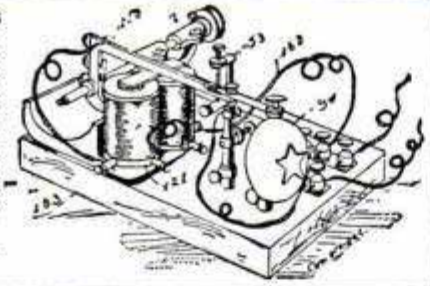
Send 4c. Stamps for Large Catalog

**NEW YORK ELECTRIC WORKS**
234 Broadway, NEW YORK.
AGENTS WANTED.

Please mention Popular Mechanics when writing to advertisers.

**DEMAND for ELECTRICIANS GREATER THAN SUPPLY.**

**Learn Electricity at Home,** with improved apparatus. Own your own Laboratory. **We offer a Complete Electrical Laboratory** with Illustrated Manual of Instructions at a price within the means of all. Write for our proposition and a copy of the Manual. **COLUMBIA SCHOOL SUPPLY CO.**
Indianapolis, Ind.



## MULTIPOLAR DYNAMO OR MOTOR

Will light three 110 v. lamps, ¼ H. P., complete set castings and all necessary stock, rough. **Price $6.00.** All kinds of special apparatus built for amateurs, inventors and experimenters. Light manufacturing. Everything electrical in any quantity.

**Send for our Second-hand Bargain List and Catalog.**

T. BINFORD ELECTRIC WORKS
26 CLARKSON COURT, CHICAGO, ILL.

## WE ARE SELLING

If it's Electric We Have It

| | | |
|---|---|---|
| Fan Motors, all kinds, all prices | $2.00 to | $20.00 |
| Toy Electric Railways | 3.00 to | 60.00 |
| Electrical Books | .10 to | 5.00 |
| Necktie and Cap Lights | .75 to | 5.00 |
| Battery Table Lamps | 3.00 to | 10.00 |
| Carriage and Bicycle Lights | 3.00 to | 6.00 |
| Lanterns and Pocket Lights | .75 to | 3.00 |
| Battery Motors and Fans | 1.00 to | 12.00 |
| Electric Door Bells Complete | .75 to | 1.50 |
| Telephones Complete | 2.50 and | 5.95 |
| Telegraph Outfits Complete | 1.75 to | 2.50 |
| $8.00 Medical Batteries | | 3.95 |
| $12.00 Electric Belt with Suspensory | | 2.50 |
| Dynamos and Motors | 1.00 to | 1,000.00 |
| Gas and Gasoline Engines | 3.00 to | 1,400.00 |

OHIO ELECTRIC WORKS CLEVELAND

**We Undersell All. Want Agents.**

Catalogue Free

**OHIO ELECTRIC WORKS,**
**Cleveland, Ohio.**

# PRESSED STEEL SHOP PANS

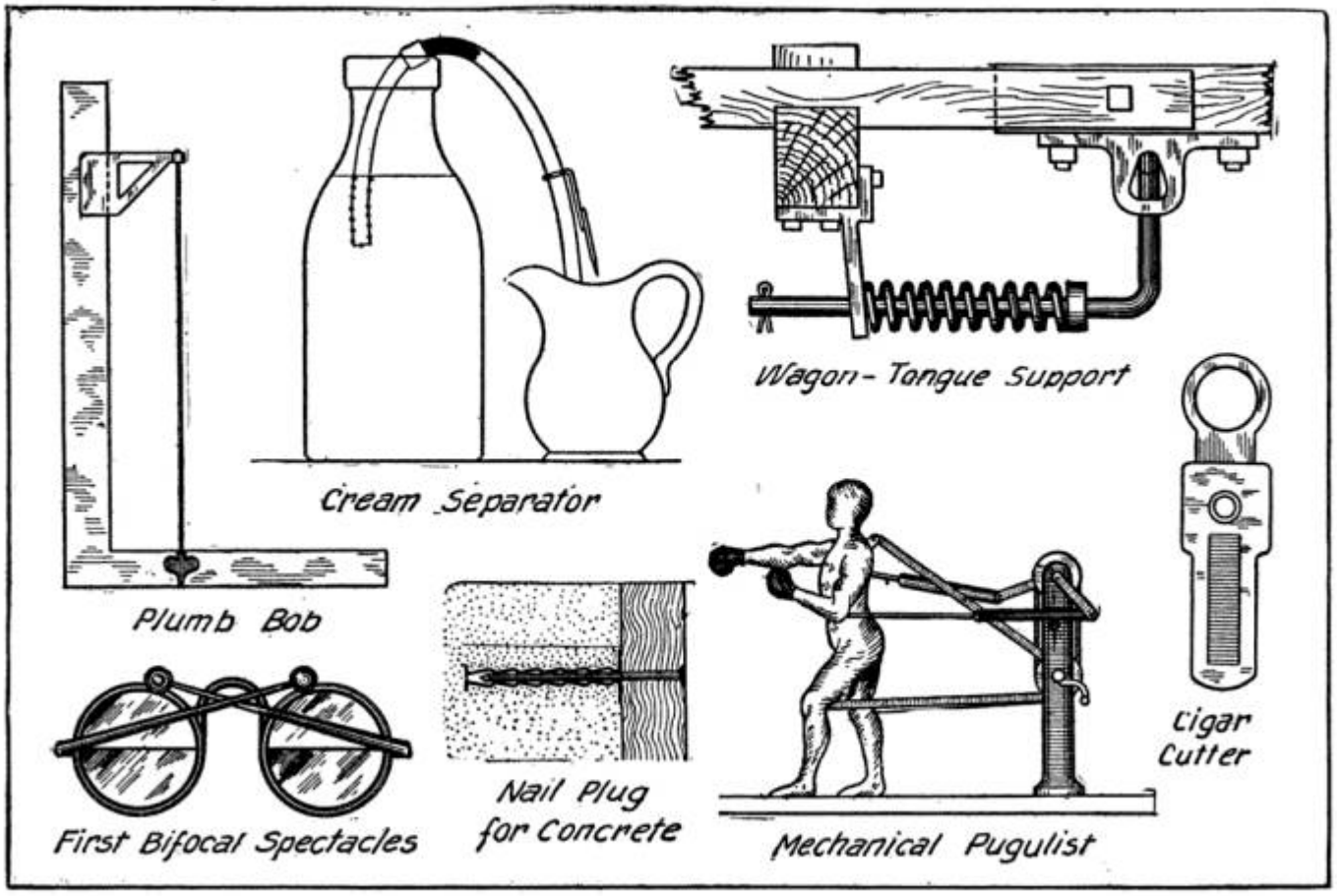
For Machine Shops and Foundries, Bolt Works, Etc.

**THOUSANDS IN USE. DURABILITY AND SATISFACTION GUARANTEED.**

Made of any Gauge of Sheet Steel desired. Never goes to pieces, and always gives entire satisfaction. Try samples and you would not be without them at any price. Suitable for handling bolts, rivets, nails, screws, nuts, washers castings, ore, quartz and other substances, and for use under lathes and drill presses to catch the turnings, trimmings, borings, oil drippings, etc.

**KILBOURNE & JACOBS MFG. CO. - Columbus, Ohio**

# WHAT THE INVENTORS ARE DOING




**NAIL PLUG FOR CONCRETE.**—The almost impossible operation of fastening nails in concrete has been solved by embedding corrugated metal plugs in the concrete as shown in the sketch. By using these for nail holes, the moulding or other woodwork may be fastened without any difficulty.

**THE FIRST BIFOCAL SPECTACLES.**—Persons enjoying the use of double-lens spectacles are to a certain extent indebted to Franklin, who invented the device in 1785 and had a pair constructed as shown in the sketch; the lower lenses being made for reading and the upper ones for distance. Bifocal lenses are now made in one piece, thus eliminating the objectionable line which divides the two lenses.

**ICE POCKET IN PITCHER.**—A new form of water pitcher has a pocket for chopped ice instead of putting the ice directly into the water. Many times pure water is contaminated by the ice placed in it, or given a disagreeable taste due to the ammonia used by the ice manufacturers. The ice receptacle has a narrow mouth opening just below the handle of the pitcher.

**ELECTRIC HORN.**—The sound is produced by a vibratory diaphragm like that in a telephone. A battery furnishes the power, and a push button does the rest. Makes a distinct and musical sound. Designed for automobile.

**"POP" IN INDIA.**—"Your magazine is a most refreshing one for me out in this land where machines are of the crudest kinds, save where introduced by the white men."—Saml. D. Bawden, Ougole, Gunten Dist., India.

**FOR INFORMATION** about the following new inventions address Patent Bureau of Popular Mechanics. The patent rights on some of these devices are for sale, and we will be glad to introduce intending investors to the inventors.

**THE IDEAL PUGILIST.**—This mechanical boxer can hit harder than Jeffries, has more science than Corbett, never talks about what he can or will do, and is always sober. If you think you can defeat him, his creator, Chas. Lindsley of Connecticut, is willing to back him to fight at any weight for two-thirds of the gate receipts. This ideal pugilist is giving exhibitions through New England and so far has licked everything that has come up against him. For state rights on this machine address Sale Dept., Popular Mechanics.

**CIGAR CUTTER.**—This useful smokers' tool has been recently patented by Willard L. Door, of Illinois. It fits the vest pocket, cuts the cigar tip off clean and saves the trousers in that it furnishes a better frictional surface for igniting matches. It can be made of silver and makes a nice present for a big brother or beau. By a simple change it can be used as a key ring, and one side can be used for advertising matter.

**CREAM SEPARATOR.**—Carl F. Heinrich, of Illinois, has solved the problem of getting cream from the top of the milk in an ordinary jar. He siphons it out with a rubber tube which extends down into the cream at one end, and at the opposite end into the pitcher. On the side of the tube is a little device for removing the paper caps from the bottles, and it also serves to hang up the tube.

**TONGUE SUPPORT.**—John C. Lambert, of Illinois has produced the practical wagon tongue support shown in this sketch. Its construction and operation are plain, and when properly adjusted it will take off all weight from the horses' necks and will hold the tongue up at all times. It consists of but two castings besides the wrought iron bar and coil spring.

**PLUMB BOB.**—William Loeven, of Chicago, is the inventor of this very handy tool for carpenters' and bricklayers' use. The bracket which holds the plumb line and bob is simply clipped on the square, and the print of the bob will show whether the surface on which the square rests is level, or the vertical side is exactly perpendicular. It costs but a few cents to manufacture and readily retails for 25 cents. Carpenters who have used these devices say they are the handiest thing in their box.

**INVENTING IS A SCIENCE.**—"The Art of Inventing," a paper presented to the American Institute of Electrical Engineers' convention in Milwaukee, by Edwin J. Prindle, exploded in a measure the old theory that an inventor is born to his work. Mr. Prindle believes there are many persons possessed of the inventing faculty, and that all this faculty needs is development.

"There are many kinds of invention," he said. "The poet, the artist, the novelist, all exercise invention in the production of their works. The merchant may exercise invention in devising a new method of selling goods. The department store was an invention of this class.

"There is an enormous amount of wealth in this country that is based upon patents. As an instance might be mentioned the fact that the United States Shoe Machinery Company is, by means of patents, able to control the sewing machines upon which 90 per cent of the welt shoes of the United States are sewed. The Bell Telephone Company and the Westinghouse Air Brake Company and many other corporations of the first importance built themselves up on patents. Many concerns keep a corps of inventors constantly at work devising improvements to place them ahead of their competitors. The large percentage of inventors in this country compared with all other countries shows that the inventive faculty is one which can be cultivated. The encouragement of our patent laws has stimulated this.

"Inventing has become so much of a science that if one is willing to spend sufficient time and money to enable a competent corps of inventors to go at the matter, almost any possible invention involving but a reasonable advantage in the art can be perfected."

**SUBMARINE CABLES.**—There is in all 225,000 miles of telegraph cable at the bottom of the sea, representing $250,000,000. Each line cost about $1,000 per mile to make and lay, and the average length of life of a cable is between 30 and 40 years. About 15,000 messages a day are transmitted.

"THE RECEEPROCATIN' MON."

(By Robert Burns and others, including Gavin Hamilton.)

Oh! woesome 'oor that saw the birth,
O turbine thochts in Pairsons heid.
I weesh that I wis aff the earth,
Or else the turbine men wis deid.

I'm a receeprocatin' mon;
I luve tae hear the bearin' bump,
Or yet, the piston groan and grunt
That's religated tae a pump.

This whurligeegin' thing I hate,
For whutna gude is it tae dae?
Tae sae the fearsome thing gyrate
Gars me piur stummuck glang agley.

I widna care if it had ocht
Tae need a tender fitter's haund,
But it rins sae weel sin it was bocht
I hivna had tea slack a glaund.

I hate the tribe o' whurligeegs,
It's jist a pinch o' steam, then "Scatt!"
I'm a receeprocatin' mon,
I stann or fa' wi Jeemie Watt.

—Marine Review.

### THE VANITY OF WEALTH.

We ain't as rich as some folks are, and can't put
on much style;
Ma says pa's income don't go far when things cost
such a pile.
Our house is little and the street we live in ain't
so grand,
And ma cooks what we have to eat and buys
things secondhand.
But still I don't see why it is that she should be
so sad;
We've got three dogs, and that's two more than
Frank Gill ever had.

Ted Brewster's just as old as me, and his pa owns
a mine
And has a private car and gee, but where they live
it's fine!
Ma says that they're as rich as sin, their house is
built of stone,
And Ted has ninety dollars in the bank that's all
his own;
But still I don't see where they get so much the
start of us;
We've got three dogs, and Ted he ain't got none,
poor little cuss.

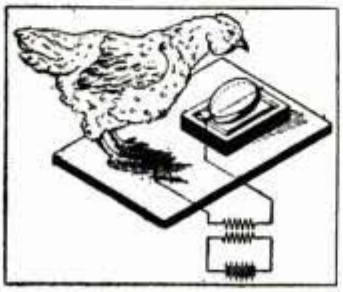
Sometimes, along to'rds night when pa comes home
and plays with Jip
And Tige and big old Nero, ma she kind of curls
her lip,
And says she's glad he feels like play, and wishes
that she'd die,
And when I hear her talk that way it nearly makes
me cry;
The Brewsters they got rich in mines, the Gills in
corn and hogs,
But still they needn't feel so proud—we beat them
all on dogs.

—E. Kiser.

**HAIR-DRYING COMB.**—The above sketch represents a useful toilet article recently patented by U. L. Berger through Popular Mechanics Patent Bureau. It consists of a light metal frame adapted to be attached to the back of an ordinary hair comb. In one end of the frame is partially enclosed a rubber bulb which, upon being squeezed, forces air

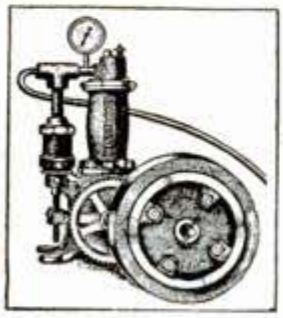
along the back of the comb, and down the teeth, thus serving to quickly dry the hair after a shampoo. The frame is made from a simple piece of metal stamped in the form required, and can be detached from the comb when not in use. The bulb has an inlet valve in its outer end and an exit opening in its neck which leads to the passageway along the back of the comb.

**SHOCK THE EGG-PECKING HEN.**—We have given several descriptions of electrical devices for the correction of garbage-eating cats and dogs, but here is one for some of the smaller "fry"—in other words, the hen that likes her own eggs to eat.



A metal receptacle holds an egg invitingly and a connection is arranged for passing a current through the egg receptacle and the baseplate on which the hen must stand in order to reach the egg. The shock should not be strong enough to hurt the hen—merely give her an unusual sensation. The device is patented.

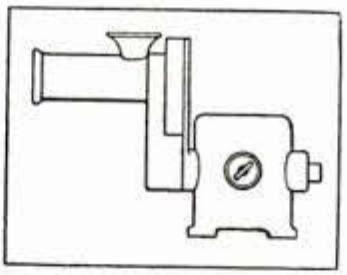

**NEW TELEPHONE STATION RECORD.**—The very latest in automatic pay stations is a device which records the tolls paid by units of 5 cents. Where a three-slot instrument is used only one of the coins can pass through at one time; and a winding paper tape moves up one figure for each nickel or its equivalent. Hence a dime rings the signal bell twice and advances the tape two counts; a quarter rings five times and moves the tape five counts. At the end of the month the portion of the tape which has been used is cut off and taken to the office with the cash contents.



**AUTOMATIC AIR BRAKE.**—Consists of four parts; automatic compressor, operating valve, storage tank and cylinder. When the desired pressure in the tank is reached, the air in this cylinder overcomes the adjusted spring resistance and automatically brings the pulley out of engagement from flywheel. When the air is used for braking or other purposes the spring overcomes this cylinder pressure and instantly brings the pulley into engagement again.



**ELECTRIC MEAT CHOPPER.**—Driven by a ¼-hp. electric motor with current through a flexible line which attaches to a wall socket. The cutter can be used in any part of the room and put away when not in use. The cutter will chop 6 lbs. of meat per minute. The knives are easily removed for cleaning.



**OPPORTUNITY FOR INVENTORS.**—One of the most promising fields for inventors today is in the perfection of a suitable burner which will use crude petroleum. The advancing price of gasoline, and the low cost of crude oil combine to produce a very large and urgent demand. The burner should be so constructed as to use sufficient air to insure perfect combustion and prevent all smell or smoke. The purposes to which the invention can and would be applied are very large, ranging all the way from light and cooking ranges to furnaces for heating houses and large buildings. The ideal method will store the oil in a tank outside the building, from which it will be drawn in a small pipe. The extreme ease with which such a fuel can be controlled makes it very desirable. For instance, on a cold day when hot fire is wanted for heating, all that would be necessary is a slight turn of the valve controlling the supply of oil; while on a warm day it is as easily cut down to a very small flow and consequent small heat. There certainly will be some large fortunes made from this idea before long. The shipment in tank cars of crude oil is so easy that the burners will find ready sale, hundreds of miles from the oil fields.

## WILL THE LIGHTS BE WHITE?

Oft when I feel my engine swerve
As o'er strange rails we fare;
I strain my eyes around the curve
For what awaits us there.

When swift and free she carries me
Through yards unknown at night;
I look along the line to see
That all the lamps are white.

A blue light (rep track) crippled car;
The green light signals slow;
The red light is the danger light,
The white light let her go!

Through the open fields we roam,
And when the night is fair,
I gaze up at the starry dome
And wonder what is there.

For who can speak for those who dwell
Behind the curving sky?
No man has ever lived to tell
Just what it means to die.

Swift towards life's terminal I trend;
The run seems short tonight;
God only knows what's at the end,
But I hope the lamps are white.

—Locomotive Fireman's Magazine.

MR. KURT BIERICH, JR.

An important event in the history of manufacturing, in this country, occurred on May 12th, when Mr. Kurt Bierich, Jr., arrived in New York on the Hamburg-American Steamer *"Rhein."* Mr. Bierich comes direct from his home in Russia, where he has spent two years in his father's factory, having entire charge of the manufacturing and producing of Kornit. He has also recently erected a Kornit Factory and brought the same to a state of perfection in England. Mr. Bierich comes here to represent his father's interest in the factory of the Kornit Manufacturing Company at Newark, N. J. (Belleville Station). He will remain in this country and see that Kornit makes the same great financial success that this product has already attained in Russia and England.

Mr. Bierich is a graduate of the Freiberg University in Germany and is a chemist in high standing. Popular Mechanics' readers will become very familiar with the name and fame of this young genius, for he cannot help making his mark in this country with the product with which his father has been so successful. A brilliant future is predicted for Mr. Bierich and Kornit.

Teacher—"Johnny, what happened on July 4, one hundred and thirty years ago?"

Johnny—"I dunno, ma'am. I ain't but ten."—Cleveland Leader.

WHERE SOME CIRCULARS GO.—The Grain Man's Guide tells of a Chicago commission house which received a consignment of one car of hay a number of years ago. He was placed on the free mailing list for market reports which have been going ever since, although the shipper never sent another consignment. The writer of the article accidentally discovered the man had been dead some years, the reports being gratefully received by his widow.

In answer to the question, "Why do you not have the letters stopped?" the poor creature replied, "Oh, it makes me think of the time when John was alive."

BREAKING IT GENTLY.—"I hev come to tell yez, Mrs. Malone, that yer husband met with an accident."

"An' what is it now?" wailed Mrs. Malone.

"He was overcome by th' heat, mum."

"Overcome by th' heat, was he? An' how did it happen?"

"He fell in the furnace over at the foundry, mum."

A JOKE ON THE OLD MAN.—We got a joke on the "Old Man" last week that was too good to keep. A joke on one of the boys is all right, but when the "Super" bites it off, it is better still.

Down at one end of the press-room is a drop-press driven by a rope-lifter. The countershaft is up near the wall, and one end runs through the partition, and the driving pulley is on the other side. Bill was doing a lot of flat dropping and he was making the hammer fly (it was a piece work job). The "Old Man" came into the room and stood watching him. Bill run off a lot, shut off the power and went away from the drop. The "Old Man" did not notice there was a driving belt, in fact he couldn't see it, as it was on the other side of the partition. He went down the room, went up to the drop and tried to raise the hammer. It weighs about 150 pounds, and it wouldn't raise worth a cent. He put his foot in the loop at the end of the rope, put his whole weight on it and drew it up about a foot, let it drop and went out. The next day he came in and went up to the foreman and said, "That man Bill is the strongest man I ever saw. He can handle that 150-pound hammer like a toy. Ain't he worth a quarter more a day?" "Sure thing," said the foreman. "Put in a slip," said the "Old Man," "and I'll pass it." Bill got his quarter raise, but the joke leaked out and it has cost Bill more than the quarter per day to keep the boys quiet about the joke. Bill is afraid that if the "Old Man" gets word of it his cake will be dough.—Machinery.

PIGS INSTEAD OF GARBAGE PLANT.—A novel scheme for the disposal of garbage is under consideration at East Orange, N. J. It is proposed to establish a municipal piggery, comprising 2,500 hogs, the garbage to be collected in wagons and hauled to the tract where the hogs are kept. A similar project carried out at Brockton, Mass., nets that city $16,000 a year, it is said.

HOW TO TELEPHONE.—During the course of our daily routine in this office we have occasion to talk over the telephone just about forty or fifty times a day to as many different people, says the Hudson (N. Y.) Journal. It may be our fault and it may not be, but it is a cinch that some of us don't know how to manage the machine. It usually happens this way. We sit at the desk with our brows drawn in deep and penetrating thought—trying to bisect the angles of a hydrant, or draw smoke through a stopped-up pipe. There is a violent ringing of the telephone bell which would make your hair curl; we make a dive for the receiver and with a scowl say pleasantly:

"Hello."

"B-m-j-ll-ky-cz," comes the answer, as though the victim on the other end were talking from a dentist's chair and had a file, a drill, several sheets of rubber and an ulcerated tooth in his mouth. Again we scowl and say pleasanter than before: "No, he isn't here today. He'll be in the first thing in the morning." Or we take a chance and say, "It will cost you twenty-five cents an insertion."

"X-yl-k-m-u-gg-sqpvzy," says the other end, and we hang up the receiver convinced that we have done about fifteen dollars' worth of business and reduced our stock of patience fifty per cent. We'll be willing to gamble, and take the short end of it, too, that Job never had a telephone in his office. Now, if all would talk like the charming young ladies at central, all would be well, but they don't. May we offer a few hints for making yourself perfectly plain over the 'phone?

If you are near the larder, run and get a big mouthful of cake or pie before you start to talk. You will find that it will facilitate matters greatly.

If the larder isn't convenient, stick your nose in the transmitter and yell at the top of your lungs into your vest pocket. Of course, the man on the other end can't hear you, but think what a lot of fun you are having yourself.

Another good way is to get as far away from the transmitter as possible and talk as though you were in the last stages of consumption, or were dying of locomotor ataxia in your thorax.

Don't on any account get a reasonable distance away from the transmitter and speak your words clearly and distinctly, for in that case someone might be able to understand you, which is not the end to be desired at all.

**"Want" and "For Sale" Ads. 3 cents per word, payable in advance. Replies may be sent to a number care Popular Mechanics, and will be forwarded without extra charge.**

### AUTOMOBILES.

AUTOMOBILE SCHOOL.—Chicago School of Motoring; the original automobile school in Chicago. One hundred and eighty graduates the past year, to whom we refer upon request. Automobile owners, prospective buyers and young men wanting to become expert chauffeurs will save a great deal of money and a lot of worry by studying the mechanism, care and repair of gasoline automobiles, in our shop, where all parts are open so you can see how they are made, and how they operate. We give thorough and practical instruction. Competent chauffeurs supplied. Address, Chicago School of Motoring, Dept. B., 264 Michigan Ave., Chicago, Ill.

FOR SALE—Four-passenger Pope-Tribune automobile, 1905 model; has never been run 50 miles and has proved entirely unsatisfactory; no reasonable offer refused. Address R. E. Exchange, New London, Conn.

LET THE ENGINE DO THE WORK—Write for literature on our attachable motorcycle outfits. They fit any bicycle. Shaw Mfg. Co., Dept. B., Galesburg, Kan.

FOR SALE—3½ H. P. water cooled, jump spark igniting motor for stationary, auto or marine use. New and very cheap. Geo. Townsley, Alexis, Ill.

GREAT SACRIFICE of second-hand autos to quick buyers. Olds runabout, $100; 6 H. P. Woodruff runabout, $125; Searchmont runabout, $150; $900 steam surrey, $175. These are only a few of our many bargains. Also have large stock of motors, gears, bodies, etc. Stamp brings No. 10 Bargain Sheet, just issued. T. S. Culp, Canton, Ohio.

FOR SALE—The H. Dolnar specifications, 4½"x4", 2 cycle marine motor drawings, price $1.50. Address G. Case, Box 372, Knightstown, Ind.

FOR SALE—1905 touring car, 18 H. P., oil and gas lamps; top. Very good condition. Cheap. P. O. Box 396, Johnstown, Pa.

FOR SALE OR EXCHANGE—For second-hand auto. One West's Automatic Tapering Lathe for turning paper or straight wood handles; one Screw Feed Cathead Lathe, turns to pattern; one set, Barrel Hoop Saw. Pioneer and Coiling Machines. H. L. Chapman, Marcellus, Mich.

FOR SALE—Two-cylinder air-cooled motor opposed complete, $55. Write for prices on supplies that you need. Auto Parts Co., 47 and 49 So. Canal St., Chicago, Ill.

### BUSINESS CHANCES.

FOR SALE—1,100 acres pine timber; modern mill; new machinery; cheap. Inquire J. J. Patterson, Eagleville, Modoc county, Cal.

WHY WORK FOR OTHERS?—Start a business of your own right at home during your spare time. Our book, "Business Opportunities," will enable any intelligent person to establish a money-making business, either with or without capital. Price, $1.00. Special introductory price, only 50 cents. Money back if you are not pleased. G. L. Patterson & Co., Chicago, Ill.

A FEW DOLLARS will start a prosperous mail order business; we furnish catalogues and everything necessary; by our easy method failure impossible. Milburn-Hicks, 358 Dearborn St., Chicago.

PROTECT YOUR IDEAS to improve your position. Patents and Patent Causes, Trade-Marks, Copyrights, etc. Write for Free Advice and Information. I. S. Prenner, E. E., Attorney-at-Law, Technical and Legal Experience. Highest References, 1108 Betz Building, Philadelphia, Pa.

PATENTS SOLD ON COMMISSION. If you wish to buy or sell a patent write to E. L. Perkins, President Inventors' Exchange, 84 Broad St., Boston, Mass.

CONTROLLING INTEREST in high grade inventions to business people with capital to patent and promote same in U. S. and foreign countries. Practical invention. Address 7510, Popular Mechanics.

LOCATION? I have the best location for a good blacksmith. Address T. O. Brown, Broomfield, Colo.

FOR SALE—Machine Shop in good northeastern Indiana town; plenty of work; good reason for selling. Further particulars, address 7512, care Popular Mechanics.

$25 FOR 25C—A crackerjack money making plan, sample and 75 guaranteed formulas—sold by leading experts at 50c each—for only 25c postpaid. Fred G. Nadler, Shelton, Conn.

FOR SALE CHEAP—Machine shop centered in the oil and gas field of Indiana; consists of both iron and woodworking machinery, also a quantity of small tools; the only machine shop in thriving town of 1,500; plenty of work and good prices; reasons for selling, have other business which calls for my attention. For particulars address No. 7517, care Popular Mechanics.

## BLACKSMITHS.

BLACKSMITHS, NOTICE—Be an up to date mechanic and an expert steel worker. Don't waste valuable time learning the trade the old-fashioned way; buy 40 years' experience by using Toy's Treatise on new steels explaining how to work them, with 75 new methods for working all difficult jobs. Ten receipts for making your own compounds for welding different kinds of steel solid. Thermite welding fully explained; also two colored tool tempering charts; chart A explains all annealing and hardening; chart B explains both scientific and plain tempering to a standard. All the above for $1.00. Valuable samples free. W. M. Toy, Sidney, Ohio.

## EDUCATIONAL.

STUDY CHEMISTRY AT HOME. "Fun with Chemistry" contains over twenty articles, including illustrated book of instructions, chemicals, test-tubes, adjustable ring-stand, litmus paper, filter-paper, glass tubing, etc. Forty-one fascinating experiments. Price, post-paid, 65c. Catalogue "PC" explains this and other remarkable offers. Thomas M. St. John, 848 Ninth Avenue, New York.

ARE YOU MAKING less than $25 or $30 per week? Mechanical and Structural Drawing taught by experts. Send for circular. Low tuition, including Free Books, Drawing Instruments, etc. Columbia Correspondence School, Drexel Building, Philadelphia, Pa.

"LETTERING," 25c; "TINTING," 30c. Dimensions of Pipe, Fittings and Valves, 50c. "Wireless Telegraphy," 30c. Browning's Industrial Magazine, 4 months, 25c. Browning Press, Collinwood, O.

TRIGONOMETRY SIMPLIFIED, 50c; Lutes and Cements, 10c; Cement-workers' hand book, 50c. The National Book Co., 408 Park Bldg., Cleveland, O.

LEARN PAPER HANGING, painting, frescoing and designing. Reeve's Practical School of Paper Hanging, Painting and Decorating, 3636 Finney Ave., St. Louis, Mo. Free catalogue.

BOUND VOLUMES OF "Popular Mechanics" for 1905. We have on hand a few volumes handsomely and durably bound in half leather, with complete index included—price prepaid, $2. Popular Mechanics, 160 Washington St., Chicago, Ill.

ROOSEVELT, Lincoln, Washington, small plastopaper heads in relief, 6c each postpaid. J. Kiola, Engraver, R. 59, 155 W. Madison St., Chicago, Ill.

FOR SALE—Complete I. C. S. mechanical drawing course, including 1 set of German silver drawing instruments in morocco case, 2 transparent celluloid triangles, 1 transparent celluloid irregular curves, 1 triangular rosewood scale, 1 protractor, 1 drawing board, 1 T square, 1 set of bound volumes, 1 sheet plate book; good as new and will sell for $20. Address 7514, care Popular Mechanics.

WANTED—Structural or architectural engineering course, I. C. S. or A. S. C. State particulars. John Laughley, Ft. Barry (Sausalito), California.

TELEGRAPHY—Circular free. Wonderful automatic teacher; five styles, $2 and up. Omnigraph Co., Dept. J., 39 Cortlandt street, New York.

INVENTORS—If you are an inventor, send for our free Booklet B, containing a list of "What to Invent and What to Avoid;" "Patent Facts vs. Patent Fancies," and "The Inventor's Harvest Season." Address Patent Bureau, Popular Mechanics, 160 Washington St., Chicago.

START A MIRROR FACTORY—We teach and trust you. Sample and particulars, 10c (none without). Hullinger's Mirror School, Francesville, Ind.

PLUMBING SCHOOL—We teach you the plumbing trade. Pays best wages, insures steady work, makes you independent. Write today. Plumbing School, Minneapolis, Minn.

ENGINEERS, ELECTRICIANS, MANAGERS OR SUPERINTENDENTS—Did you ever try to do something in your line of work and get stuck; then sit up late at night, reading books, data, etc., trying to find the information that would put you right, and go to bed no wiser? Next day say, "I wonder who could enlighten me on this subject." If you send me one dollar I will give you the desired information *correctly*, and written in plain language, or sketched so that you can understand it. I have had 23 years' experience in above professions, and am confident I can supply your wants. Give me a trial. If you think you did not get your money's worth, I will refund it promptly. Address 7550, Popular Mechanics.

## FOR SALE.

FOR SALE OR TRADE—A steam Electric Lighting outfit; for lathe or gasoline engine; capacity, ten lights. Installing larger outfit. Photograph at request. Owen A. Swain, Engineer Water Works, Middletown, Ind.

CASTINGS TO BUILD a Yacht Cannon, 2x4 Steam Engine, 6" Lathe, Countershaft, Turbine, Grinder Head, Drill Press and 1x2 Oscillating Engine. Send stamp for particulars of what you are interested in. Salineville Model & Machine Works, Salineville, Ohio.

Power and Foot Power Barnes Former with thirteen knives. $20 cash takes it. 1257.

Write 1257 for Bargain List of fine tools, wood and metal working machinery.

FOR SALE—Induction coil seven-inch spark. Sell cheap or trade for motor cycle. What have you? Address 7515, care Popular Mechanics.

FOR SALE CHEAP—Gasoline engine, 1½ H. P.; 2 condensing lenses, plano convex, 4½ in.; one Ajax carpenter's boring machine; one 8 in. blacksmith's blower. W. R. Dine, Zoar Station, Ohio.

HERE'S YOUR CHANCE—A six horse, two cycle, marine engine, in fine running order, with pump, spark coil, carbureter and batteries, for $90 or trade. Address, at once, Lock Box 69, Mt. Carmel, Ill.

Electric, power and 20-light motor. A bargain. 1257.

FOR SALE—One 15 volt dynamo, $7; one 7 volt dynamo, $6; ¼"x⅜" Ruhmkorff coil, $5. Fine condition. Address 7511, care Popular Mechanics.

FOR SALE—Complete electroplating outfit, including one 500 ampere dynamo, one 5 and one 10 horse power motor, 500 volt direct current; two cedar and three iron tanks, together with nickel, brass, bronze and copper anodes, rheostats, switches, grinding and polishing lathes, carborundum, bull neck, canvas, felt and cotton wheels, power press, wood pulleys, shafting, hangers, belting and supplies. Jim Bowstead, Room 6, New Kiley Block, Marion, Ind.

FOR SALE—110 volt, 100 light dynamo, $50 off. E. W. Williams, Iola, Wis.

That 6-inch Power Wood Planer is a dandy bargain. 1257.

FOR SALE—10-in. screw cutting lathes at wholesale; also tools. Send 10 cents for set of Magic Rolls to Tibbetts, Putnam, Conn.

FOR SALE OR EXCHANGE—Gasoline tour boat, 12 H. P., for large engine, pumps and other machinery for 3 H. P. H. E. Robinson, Vicksburg, Miss.

Fine Post Drill Press and Chuck, cheap.

One each Power and Foot Power Mortisers. Big bargains. 1257.

FOR SALE—Two 6 H. P., two 2 H. P. gasoline engines, two 4x5 cylinders (rough), two 3x30" fly wheels, two 2½" throw crank shafts, one 4 throw crank shaft, one complete set of patterns for 1, 2 and 4 cylinder gasoline engines, one second hand 8 H. P. portable steam engine and boiler, 300 lbs. extra fine babbit metal, also gasoline engine connecting rods, shafts, etc. Address Fred J. Volgt, Mt. Carmel, Ill.

FOR SALE—One rebuilt 22 H. Com. Gaar-Scott coal burner. Price reasonable. Oscar Giloth, Baraboo, Wis.

12 cents; a gallon of gasoline, 14 cents. The kerosene engine will do more work; it is the coming power. Will pay you to at least study the subject. Full details on request. Write B. H. S., care Popular Mechanics.

FOR SALE—Complete outfit for making cement or concrete building blocks; also a steam automobile cheap. E. A. Wright, Canton, Ohio.

FOR SALE—$25 set of Mechanical Engineers' text books (5 vols., bound in morocco), for $6; or will trade for stenographer's chair or offers. Address Clarence D. Skinner, 611 Quincy St., Topeka, Kan.

FOR SALE—1,000 steam and water gauges at $1.00 each. Send for list to J. L. Lucas, 2 Fox St., Bridgeport, Conn.

## WANTED.

SECOND HAND BAGS. Will buy any kind, any quantity, anywhere. I pay freight. Write for prices. Geo. T. King, Richmond, Va.

WANTED TO BUY a second-hand one, two or three H. P. Gasoline Marine Engine complete, with propeller, etc. Must be in good running order. Address B. F. Burnett, Eufaula, Alabama.

WANTED A HUNDRED Firemen and Brakemen on Indiana, Illinois and other railroads. Age 20 to 30, strong, good sight and hearing. Experience unnecessary. Firemen, $80 to $100 monthly, become Engineers and earn $200. Brakemen, $70 and $80 monthly, become Conductors and earn $150. Positions awaiting competent men. Send stamp for particulars. Name position preferred. Railway Association, Room 174, 48 E. Van Buren St., Chicago, Ill.

WANTED—Manufacturer for compound scaling ladder, made in two sections, operated from the ground; weight less than 100 pounds; new in principle. Sure to have a large sale. Patents just issued. Address 7516, care Popular Mechanics.

"THE NOVELTY NEWS"—AN IDEAL ILLUSTRATED NOVELTY TRADE NEWSPAPER. Especially valuable to Manufacturers' Agents, Manufacturers and Dealers in Novelties, Mail Order, or anyone desiring to keep in touch with all kinds of money-making novelties. Trial 3 months, ten cents. "The Novelty News Co.," 604, No. 171 Washington St., Chicago.

WANTED—Mechanical salesmen to handle territory for sale of new boiler room device which sells for $50 and pays for itself in a short time. Great labor saver in boiler room. Every engineer wants one when he sees it. An unusual opportunity for good men. Address 4059 Popular Mechanics.

WANTED—Practical machinist to handle men and get out work economically. One taking small interest in the business preferred. A capitalist desiring good investment can secure controlling interest in profitable manufacturing business paying dividends for last seventeen years. Address "Good Chance," care Popular Mechanics, Chicago, Ill.

WANTED—Electrical workers and students to subscribe for Electrocraft. Correct wiring methods plainly told. Useful diagrams. Send ten cents, sample copy. Electrocraft Pub. Co., 93 Griswold St., Detroit, Mich.

## MISCELLANEOUS.

MYSTIC TRICK TACK. Send with catalogue, six cents. Morse Novelty Co., Newark, Ohio.

WANTED—High grade Microscopes and Accessories, Talking Machines and Technical Books; when wishing to buy, sell or exchange, address The Art and Science Exchange, Lock Box 1699, Pittsburg, Pa.

FOR SALE—1 motor cycle, 2 H. P. gasoline engines, also pattern and castings for same; 2 emery stands; patterns for two sizes of emery stands. J. F. Schulz, Box 176, North Chicago, Ill.

SILVER PLATING—By a newly discovered process the plating becomes a part of the metal itself, making it durable and lasting. No battery, mercury or acids used. One dollar's worth of material does twenty dollars' worth of work. Full instructions, 50 cents. Address E. S. Karns, 1006 East 55th Pl., Chicago, Ill.

intending to sell goods in Australia should subscribe for the Journal of Commerce, Melbourne, Australia. Price, $1 per year.

MONEY IN NOVELTIES—Our advertisers and readers are looking for good new novelties to put on the market. They have money for the right inventions in utility, amusement and advertising novelties. What have you got that's good? Reach this field through "The Novelty News," 171 Washington St., Chicago. Trial 3 months, 10 cents.

FOR SALE—$1,000 cash will buy new, high-speed motor airship, ridden by me several exhibits, New York and Texas. Patent portable gas works included. All good condition. Any size airships or gas balloons built. Several light weight gasoline motors, cheap, 1, 2 and 4 cylinder, and 2 and 4 cycle. Carl E. Myers, Balloon Farm, Frankfort, N. Y.

MACHINE REPAIR SHOP—Consists of two lathes, 2 drill presses, 1 planer, 1 shaper, and many other tools. Shop especially adapted to manufacture of gasoline engines. Will sell at bargain. Reason, owner unacquainted with business. Will trade for a good tract of timber land in Tennessee or Kentucky. Address Fred J. Voigts, Mt. Carmel, Ill.

MUST SELL—Two H. P. Pelton water motor; cost $40; good as new; $14. Also ⅓ H. P. Sprague electric dynamo or motor; cost $40; sell for $15. W. B. Garrett, Ashton, Lee Co., Ill.

WANTED—Second hand Hall Clock Movement, Osborne Make. Box 21, Wilson, Pa.

**A WOOD MINE.**—One of the most curious mines that are worked is in Tonquin, China, where in a sand formation at a depth of from fourteen to twenty feet there is a deposit of the stems of trees. The Chinese work this mine for the timber, which is found in good condition and is used in making troughs and for carving and other purposes.

## A City Water Supply

# For Your Country Home

IF you live in the country there is a way for you to enjoy *all* the comforts and conveniences of *a city water supply*, without a penny for water tax.

It is accomplished by the **Kewanee System.**

With the **Kewanee System** you get even *more* than city service, because, in addition to every benefit the latter affords, you may have—

—*Soft water* in your bathroom and laundry.

* * *

The old-fashioned gravity system meant pumping water *up* in order to get it *down* again.

Now, to give the necessary pressure for fire protection and service, the elevated tank must be located on top of a tall tower. This is expensive, unsightly, and unsafe.

The water freezes in winter, becomes warm and stagnant in summer, and repairs are a big item of expense.

The attic tank doesn't give sufficient pressure for fire protection. Its weight is apt to crack the plastering, and when it leaks (as it is pretty *sure* to do) your house is flooded. Just one such expensive accident may cost you many times the price of a **Kewanee Outfit**—

—Which *cannot* flood the house because the tank is resting on *solid ground*, where it can do no damage.

The installation of a **Kewanee Pneumatic Tank** and **Outfit** in the **cellar** (or in the ground) means:

—Plenty of pure, fresh water,
—Cool water in the summer,
—No freezing water in winter,
—Absolute protection from fire,
—Decrease in insurance rates,
—A plant that will last a lifetime,
—No expensive repairs,—
—It solves the country water problem completely.

The **Kewanee System** will take care of *all* your needs,—for home, garden, lawn, stables, poultry house, etc.

* * * *

Our Kewanee Outfits are *complete.*

Not an engine only;—which in itself cannot give you a water supply,—nor a tank only, which is useless unless you have some form of pumping power—

—But, we furnish the *whole* thing,—*a complete system* of water supply.

Our engineering department is prepared to solve your water problem,—no matter how difficult that problem may now appear.

**Kewanee Outfits** are made in sizes, suited to the smallest cottage or largest building,—or group of buildings.

We guarantee every **Kewanee Outfit** to give *perfect service.*

**Send for Catalogue No. 14, which gives names.**

## Kewanee Water Supply Co.,

**Drawer P.** **Kewanee, Ill.**


*THE mate for beauty should be a man and her adornment, a diamond. Answer her silent, persistent, ardent wish. Make up your mind to act forthwith.*


Let us send you a beautiful diamond (a half carat is just the size that satisfies). You do not need to consult your pocket-book. Pay now and then.

Our liberal plan will at the same time enable you to get a diamond for yourself as well.

Send first payment with order, or if you prefer, we'll ship diamond C. O. D. $16.00, subject to your examination.

Our Catalog will interest you whether ready to buy or not. It tells how to judge diamonds; names eight different qualities and gives weights with prices of same. Besides, watch cases and movements are separately priced. Write today for this valuable FREE Catalog No. W71.

**Herbert L. Joseph & Co.** DIAMOND IMPORTERS Watches, Jewelry

**215 (W71) State Street, CHICAGO**

Established 1882

# "THE CHICAGO"

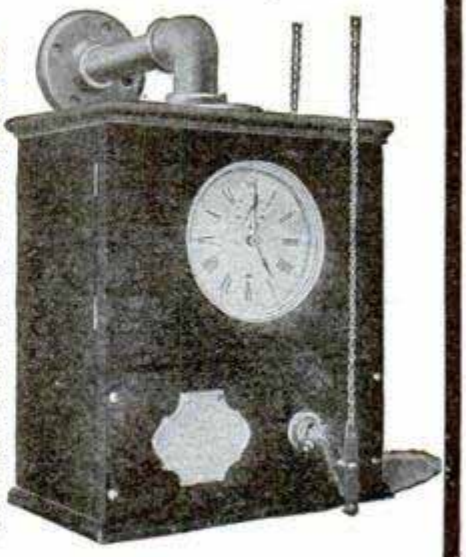
AUTOMATIC TEMPERATURE

# REGULATOR

The best device for controlling your Furnace, Hot Water or Steam Boiler. It is automatic and a fuel saver. **Easily installed.**

## Time-Set Attachment

Is a device which we attach to our **Regulator** in order that when the purchaser does not want to maintain the regular temperature during the night, but wants it to become warmer towards morning, he can set the Attachment so that it will automatically adjust the drafts at any given time. It is contained in a cabinet and set in the same manner as an alarm clock, but it has not an alarm.

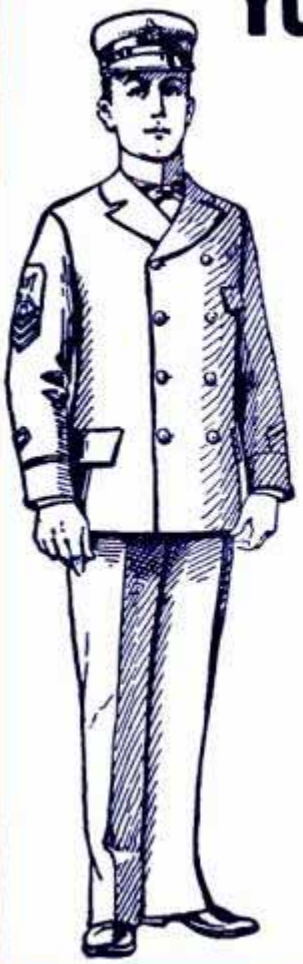


**Write for Prices and Further Particulars.**

## CHICAGO HEAT REGULATOR CO.

**40 Dearborn Street, Chicago.**

# YOUNG MECHANICS WANTED FOR THE NAVY



The recent addition of several large vessels to the Navy has created a demand for mechanics. Good opportunity for promotion to capable men. Outfit of clothing FREE on first enlistment. Rations, lodging and medical attendance in addition to pay. Age limit for mechanics, 21 to 35 years.

The pay in different trades is as follows:

| | | | |
|---|---|---|---|
| **MACHINISTS,** | **$40 TO $70** | **PLUMBERS AND FITTERS,** | **$45** |
| **ELECTRICIANS,** | **30 TO 70** | **COPPERSMITHS,** | **55** |
| **CARPENTERS,** | **25 TO 70** | **BLACKSMITHS,** | **50** |
| **FIREMEN,** | **30 TO 35** | **SHIPFITTERS,** | **$40 TO $55** |

Young men without a trade, if between 17 and 25, can enlist as apprentice seamen and be sent to a Training Station and fitted for the duties of the Seaman Branch, and for the lower ratings of the Artificer's Branch.

Extra pay for continuous service, Honorable Discharge, extra duty, etc.

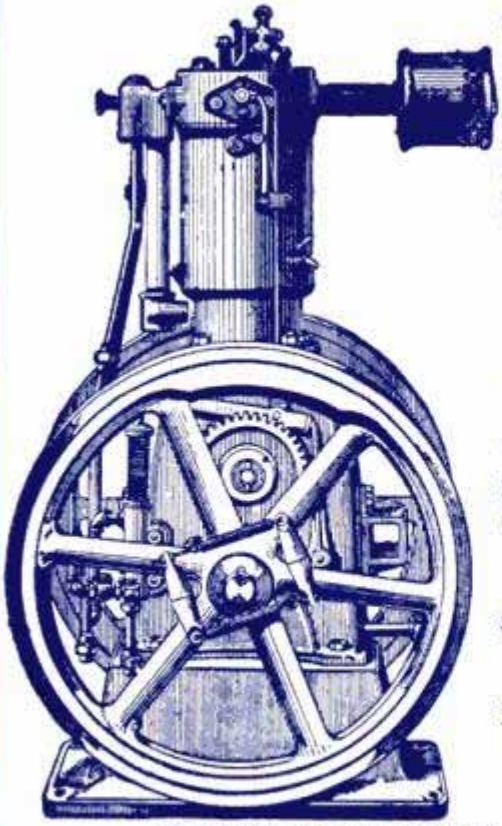
Only American citizens of good character are accepted.

**Application can be made at any Navy Recruiting Station or by letter to the**

BUREAU OF NAVIGATION,

**NAVY DEPARTMENT, WASHINGTON, D.C.**

# A WELL CHOSEN POWER



saves a world of annoyance to the operator. A power is not well chosen that is not simple, reliable, ample for needs, easily kept in order, economical in operation, etc.

Then it makes a difference what your work is. There are many styles and sizes of engines. See that the one you buy is adapted to the work in hand.

## The I.H.C. Gas and Gasoline Engine Line

meets all requirements. Neat appearing, easy running, take little fuel for power generated, so simple they cannot get out of order, so easily understood that anybody can operate them.

**An I. H. C. Engine always responds. Make sure of getting the dependable kind.**

You'll find the style and size that will exactly meet your wants. Horizontal, Stationary and Portable in 4, 6, 8, 10, 12 and 15 h. p. Vertical in 2, 3, 4 and 5 h. p.

*Write for catalogue and investigate.*

**THE INTERNATIONAL HARVESTER COMPANY OF AMERICA (Incor.)**

**No. 7Q MONROE STREET, CHICAGO ILL.**

## DIVINE'S WATER MOTOR

Will grind table knives, carpenter knives, butchers' cleavers, etc. Will run sewing machines, lathes and all kinds of small machines, polish silverware, etc. Every man and woman should have a Divine Motor. Can be used for 1,000 different purposes, at any place, any time. Our free booklet will convince you of its advantages.

WE GUARANTEE Divine's Motor will give more power and is better in every way than any other faucet water motor.

PRICE COMPLETE, including faucet connection, emery, pulley and polishing wheels, polishing composition, etc., $4.00. This ad and **$3.50** will get the motor.

**Divine Water Motor Co.** 108-110 Duane St. **New York**

References: Dun or Bradstreet and Oriental National Bank, New York City.

## THE GAS CANNON

The **most remarkable** toy ever invented. Loaded with a harmless gas. Discharged by pressing an electric button. Fires 12 shots a minute, **One cent's worth of gas** will fire one thousand shots. **Absolutely** safe—thoroughly practical. This cannon will bring more fun to the American boy than any toy ever invented. Can be fired with perfect safety in the house. Makes a deafening report yet you can hold your hand across the mouth of the cannon as it is fired, without the slightest harm; this shows the entire lack of danger. Out of doors makes a report like a good sized dynamite fire cracker; shoots a cork or wooden projectile across the room with great accuracy, a loud bang, a puff of smoke, yet there is no powder, no offensive gunpowder smell, and best of all **absolutely no danger.** Why risk your boy's eye-sight or even his life? Both amusing and instructive. Our booklet explains every feature clearly and concisely.

**FOURTH OF JULY IS COMING!** If you order **now** we can make immediate shipment. Send us remittance for $5.00. We will ship promptly by express, **all charges prepaid,** one cannon outfit complete with all extra parts. We guarantee the cannon to be absolutely **safe and satisfactory,** or money refunded. Further particulars on request. Agents wanted. A tremendous seller.

**WARNER MOTOR CO.**
**Dept. 4**
**Flat Iron Bldg., New York City**

## No. 50—UTICA SIDE CUTTING PLIER

THE BEST, THE STRONGEST and Easiest Cutting Tool of its kind.

EVERY TOOL GUARANTEED

USED THE WORLD OVER

**Sample by Mail** to any address in United States

**4 inch 55 cts.**
**6 inch 75 cts.**
**8 inch $1.15**

Prices on other Sizes quoted on application

**UTICA TOOLS**

are known for their superior quality

The leading Hardware and Electrical Supply Houses handle them.

If your dealer has not got them, write us

**Ask for UTICA Brands**

**Take No Substitute**

ONLY THE GENUINE BEAR THIS MARK

UTICA TRADE MARK

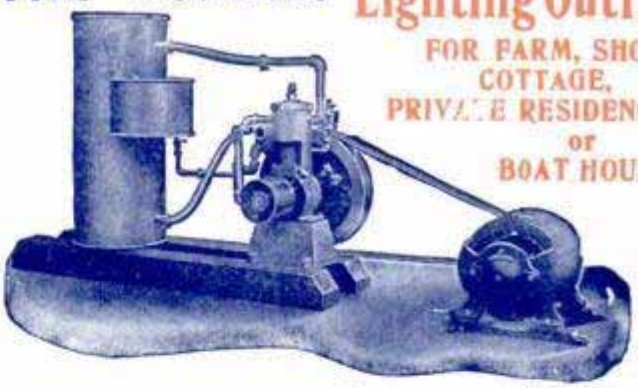
WRITE FOR "PLIER PALMISTRY"
A discourse on Pliers and Nippers

**UTICA DROP FORGE & TOOL CO.**

**73 Genesee Street** **UTICA, N. Y.**

## THE WONDER Lighting Outfit

FOR FARM, SHOP, COTTAGE, PRIVATE RESIDENCE or BOAT HOUSE



We are the first to manufacture a complete line of these, and we offer them at such a low price that any one only using a few lights can install their own outfit and make it pay for itself. Think of it—only one-tenth of a cent per hour for 16-C. P. lamp! At this rate you can run ten lamps ten hours for ten cents. This is less than one-half of what it would cost you for current from lighting companies. We manufacture in sizes from 6 to 100 lights. A little engine of this kind will saw more wood in one day than two men will saw in a month. At a cost of less than two cents for fuel, it will pump 1,000 gallons of water. It will operate your cream separator and churn for less than a quarter of what it will cost you to operate them by hand. There is no limit to the number of places where these little outfits of this kind can be used. They give you a reliable power during the day, and at night, in connection with our generators, they will transform your country home or cottage into a luxurious city residence. Now, what is the use of doing by hand what a little outfit of this kind would do for you at one-tenth the cost and in a quarter of the time? You cannot afford to buy a power and lighting outfit until you have carefully looked over our catalogues and our prices.

**Send for complete information. Agents wanted everywhere.**

**The R. M. CORNWELL COMPANY**
**408 SOUTH SALINA STREET, SYRACUSE, N. Y.**
New York Office, 434 Park Row Building