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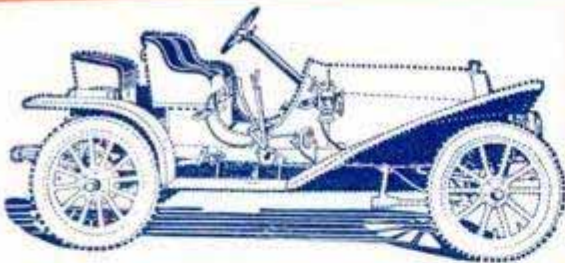
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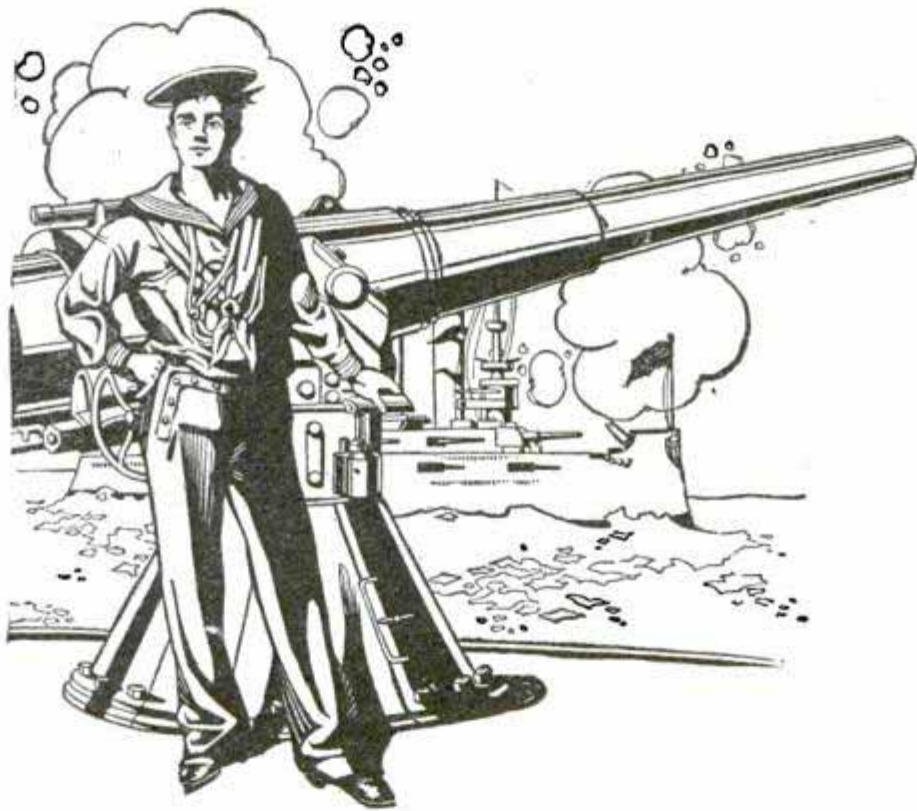
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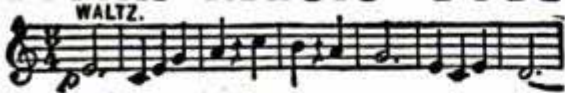
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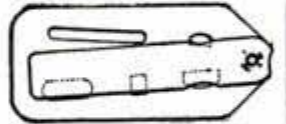
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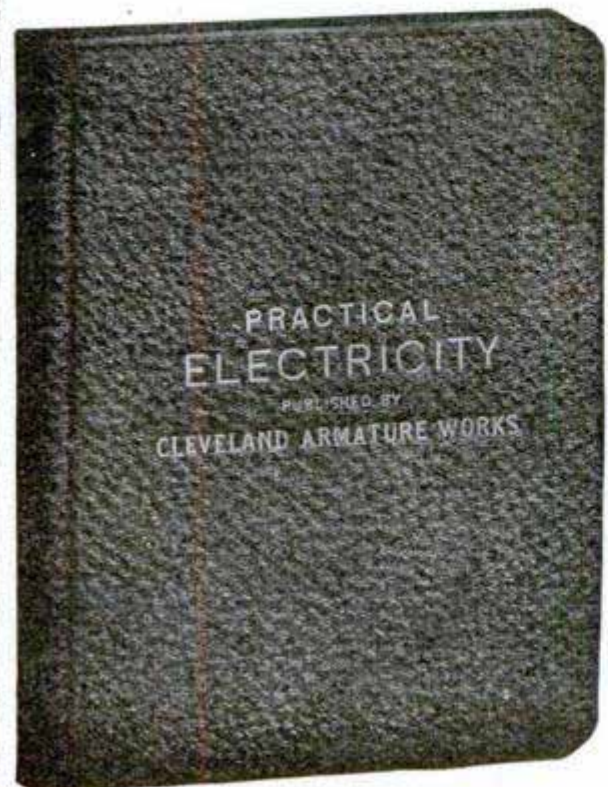
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point where the careful student comprehends the complete designing, care and operation of a dynamo or motor, and I chapter on electric automobiles, outlining their construction, care and operation, and all about storage batteries and how to handle them.

There are XX chapters in all, XIX carrying you from the fundamental principles of electricity on through the various branches to a subject in such a manner as to bring clearly to his mind the points he needs to know regarding same. A DICTIONARY in back of book will enable him to learn the meaning of any electrical word, term or phrase used in this book, as well as hundreds of others in common use. All required tables necessary in the study are in it.



**TABLE OF SUBJECTS:**

CHAPTER	CHAPTER
I—Wiring	X—Counter E. M. F.
II—Electric Batteries. Electric Plating.	XI—Hysteresis and Eddy Currents
III—Magnetism	XII—Armature Reaction
IV—The Magnetic Circuit	XIII—Sparking
V—Magnetic Traction	XIV—Winding of Dynamos and Motors
VI—Magnetic Leakage	XV—Proner Method of Connecting Dynamos and Motors—Self-Excitation and others
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VIII—Calculation of Size of Wire for Magnetizing Coils	
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## A NEW MONTHLY MAGAZINE

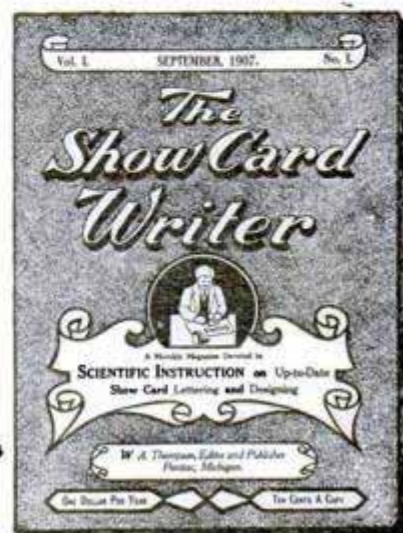
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No Card Writer can afford to be without it a single month. It will be a credit to the craft, an inspiration to the worker and a delight to the eye. Every page, every article, every illustration will be clear and distinct. It will show you how to improve your skill, how to enlarge your field and how to make money.

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# Do You Wear Glasses?

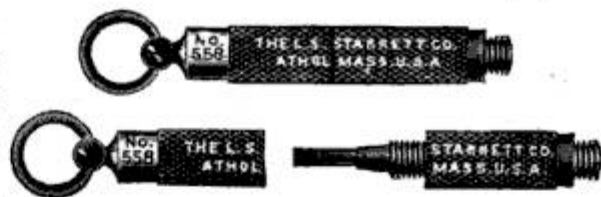
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Perhaps you know, then, how irritating it is to find that the little screws have become loose, also how very often this happens. Here are several little tools for quickly and effectively attending to such cases, made especially for that purpose:



No. 556 Screw Driver for Eye Glasses is made in two pieces and screwed together, telescoping the blade when not in use. Nickel plated. Price, 15 cents.

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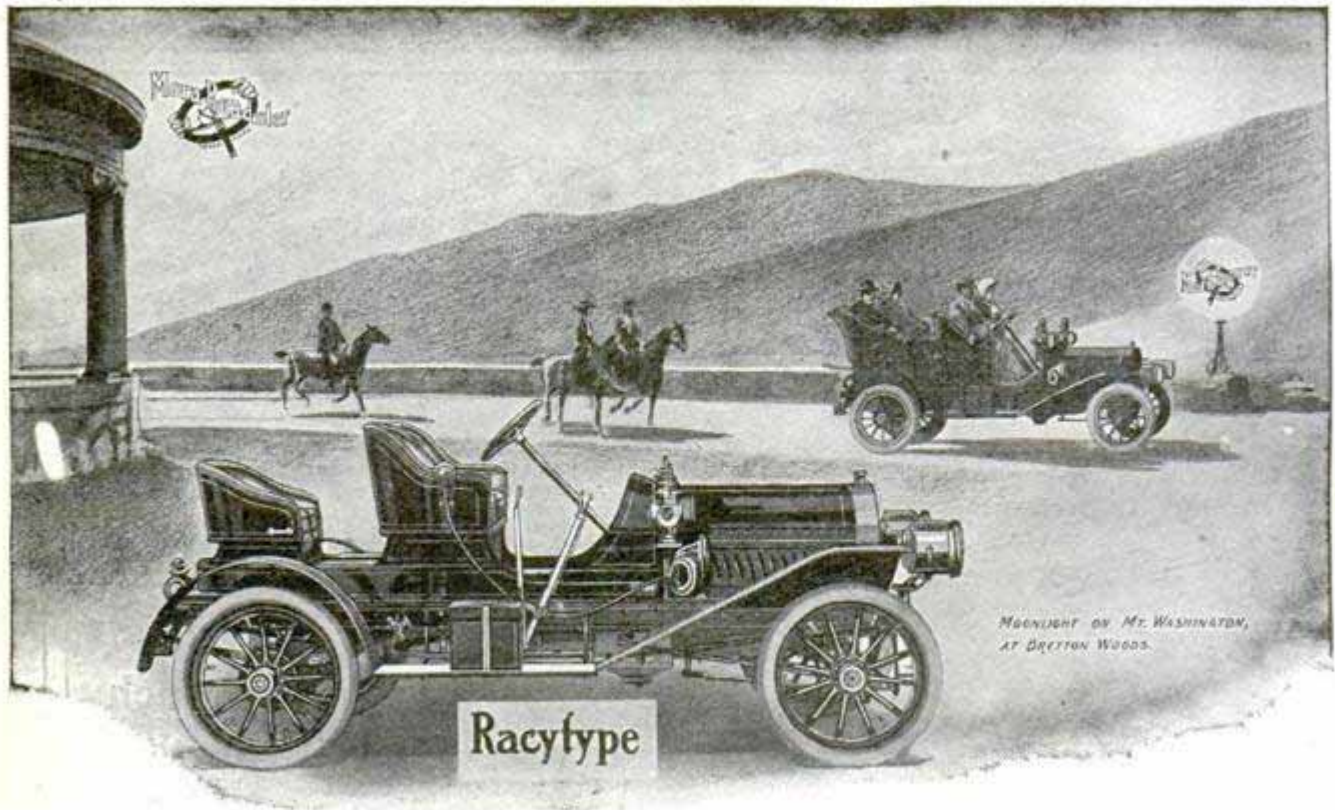


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**MECHANICALLY RIGHT.**

Over eight thousand miles without a single adjustment to power plant; that's the record which motor car authorities challenge all Europe to equal. Moreover the engine is yet in running condition with original New York, Chicago and Cleveland Motor Clubs seals intact.

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The "All Admired" of the "All America" Show

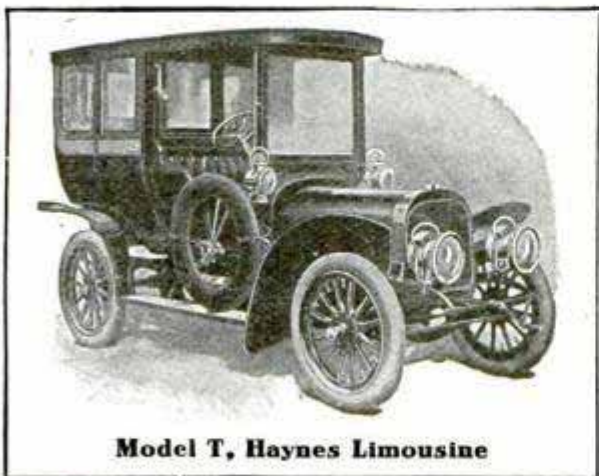
**Mora Motor Car Co.**  
23 Mora Pl., Newark, New York, U. S. A.



## The Sealed Bonnet

# HAYNES

## RELIABILITY

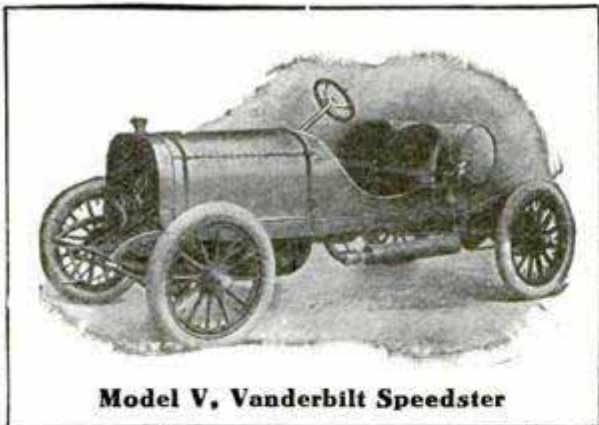


Model T, Haynes Limousine

The makers of the Haynes have been developing their car for 13 years. They know their car through and through. Year after year they have seen their old cars come back after varied use and have spotted here and there chances for improvements.

Their experience has developed for 1907 a car that can be safely advertised for *reliability*—a car that can be *trusted*. It contains no parts not made in the Haynes Factory, no principles that are unfamiliar to the Haynes designers.

In these days, when every blacksmith is buying parts and assembling cars under a private trademark, the fact that the Haynes factories really make *everything* in their car is a guarantee of Haynes *reliability*.



Model V, Vanderbilt Speedster

The Haynes Standard 50 H. P. Touring Car for 1907, Model "T," the highest powered shaft driven car built. Price, \$3,500.

Send at once for full information and advance specifications. Address, Desk P-P.

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## Refinish <sup>Your</sup> Old Floors

### So They Will LOOK LIKE New



Section of flooring—cracks in lower portion filled with Johnson's Crack Filler.

Make your old floors **match** your woodwork or furniture.

To prove how easily, how pleasantly and how **cheaply** you can make your home artistic, we have prepared a handsome illustrated booklet describing **Johnson's Wood Finishes**, which we will send you upon request, so that **every** reader of this

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You can dye your floors practically any shade to match your woodwork or furniture. Colors are **Light Oak, Brown Weathered Oak, Green Weathered Oak, Forest Green, Moss Green Flemish, Brown Flemish, Bog Oak, Mission Oak, Mahogany**.

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**POPULAR MECHANICS      ::      ::      ::      CHICAGO**

# Who was it once said

"The very best advertising a man can do, is to do what he has to do, so perfectly, as to stamp it **The Best**"?

**WHOEVER HE WAS, WAS RIGHT. THAT'S SURE**

Suppose we get right down to hard-tack. Is there any room for improvement in your work? **How do you make your Fastenings to Brick, Stone, Marble, Tile, Concrete, and other Masonry? Unless you use the**



For use with all Lag Screws

OR  
THE

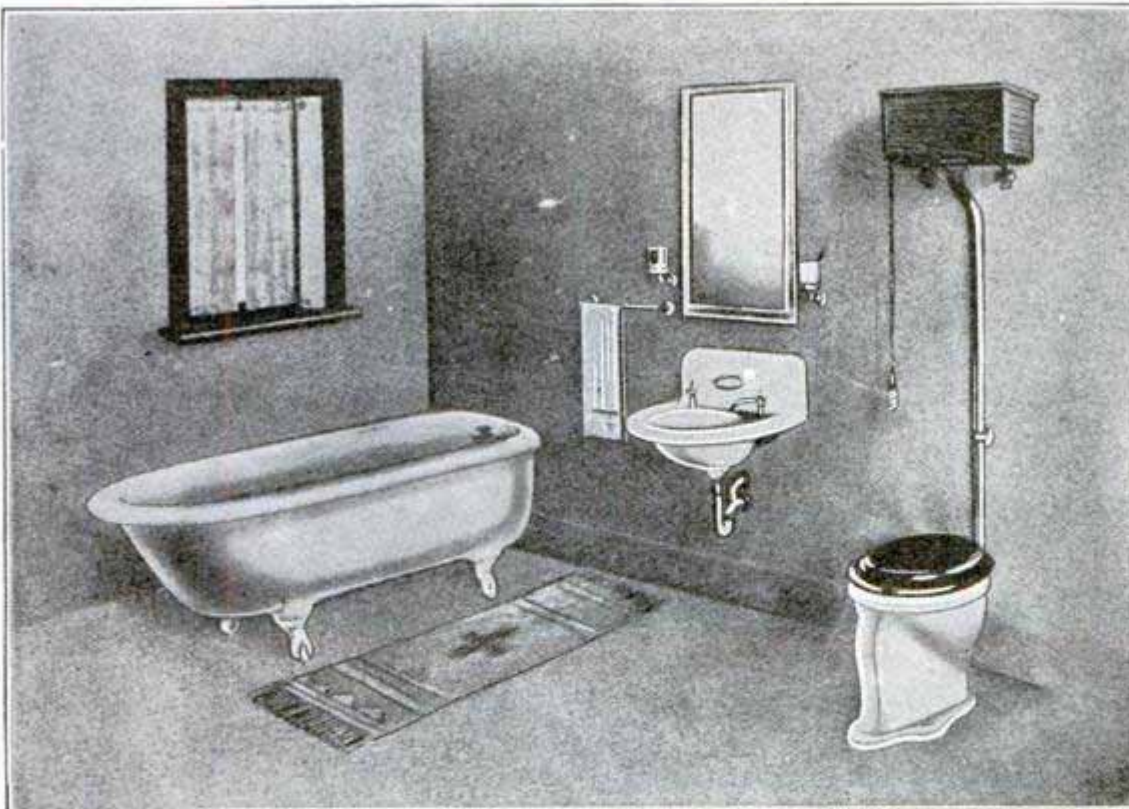


For use with all Wood Screws

There is plenty of room for improvement in that particular branch of your work. Write for our Catalog and Samples and learn how such fastenings are made cleanly, quickly and economically. A Postal will do.

## Star Expansion Bolt Co.

Humphrey, Trask and Second Streets  
BAYONNE, N. J.



## Plumbing Material

DIRECT TO THE  
CONSUMER

At less than wholesale prices you also save the plumber's profit.

Send us a list of your needs. All we ask is an opportunity to figure on your wants.

We carry everything necessary for installing this class of work. Soil pipe, lead and water pipe and fittings of all kinds, etc., etc.

All Goods are Brand New, High Grade and Perfect.

Complete Bath Room Outfits only	-	-	\$36.50	Laundry Tubs only	-	-	\$5.00
White Porcelain Enameled 18 x 30 Sinks only	-	-	\$ 2.00	Bath Tubs only	-	-	\$6.00

SEND US YOUR BILL FOR OUR ESTIMATE

WRITE FOR OUR FREE ILLUSTRATED **CATALOG No. 35**

**CENTRAL MACHINERY & SUPPLY CO., 547-559 State St., Chicago, U. S. A.**

# The Earning Power of Money Invested in Kornit

**Most Satisfactory Progress Being Made At Our New Factory**

**H**ERE is a Financial Opportunity to make an investment in an up-to-date, energetic, money-making, industrial manufacturing company, which owns all the United States patents, processes and exclusive rights for producing Kornit, a product never before manufactured nor sold in this country. The demand for Kornit is great and the profit of manufacturing and selling is ENORMOUS. Read every word of this announcement and ACT AT ONCE.



## THE STORY OF KORNIT

*By President CHARLES E. ELLIS*

**K**ORNIT 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 com-

pany 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 electrical market

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



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

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, umbrellas, 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 knives and penholders, 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 is manufactured and sold every working day in the year IT WILL ENABLE THE KORNIT MANUFACTURING COMPANY TO PAY 16 PER CENT DIVIDENDS EVERY YEAR. Of course, if four tons a day are sold the dividends would be 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.

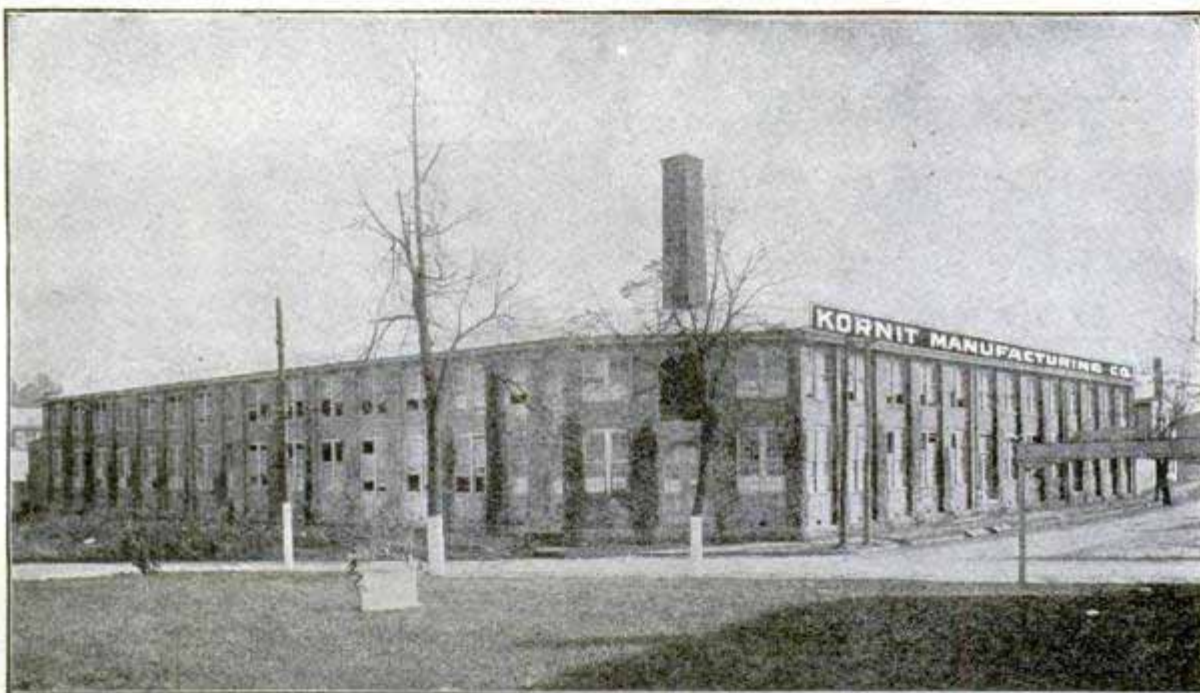
THERE WILL BE SUCH AN ENORMOUS DEMAND FOR KORNIT AFTER IT BECOMES INTRODUCED THAT FROM YEAR TO YEAR THE DIVIDENDS EARNED WILL BECOME LARGER AND LARGER. THIS IS

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 Are Building A Fine Factory

**O**N March 1, 1907, our Factory, which had just been thoroughly equipped and completed, was burned to the ground!

Since that time we have purchased the Real Estate and are now building OUR OWN Factory. It is probable that it will be finished



KORNIT FACTORY, NEWARK, N. J. (BELLEVILLE STATION), ENTIRELY CONSUMED BY FIRE MARCH 1, 1907.

**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**

and in complete working order by the time this issue of Popular Mechanics reaches you. All our machinery is ordered and the greatest part is already completed ready to install as soon as our new Factory Building is ready.

A few shares obtained now may be the foundation for a fortune of 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 me and tell me how many you would like and how soon it will be convenient for you to do so, provided I will reserve them for you. As soon as I receive your letter I will answer it **WITH A PERSONAL LETTER AND WILL ARRANGE**



MATTERS AS YOU WISH TO THE BEST OF MY ABILITY.

REMEMBER, I HAVE A GREAT MANY THOUSAND DOLLARS INVESTED IN THE KORNIT MANUFACTURING COMPANY, and the minute you buy a share or more in this Company we become CO-PARTNERS as CO-SHAREHOLDERS. It is for our mutual benefit to watch and guard each 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 the raw material, which is now almost practically thrown away. Join me in this investment, and I assure you that it is my sincere belief that in the near 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 will buy one hundred shares, and so on. After you have bought one or more shares in the Kornit Manufacturing Company you may feel, as I do, that you have placed your savings where they will draw regular and satisfactory large dividends.

I should not be a bit surprised if these shares paid dividends as high as one hundred per cent in the not far distant future. Consequently, a few dollars invested now in the shares of the Kornit Manufacturing Company will enable you in the future to draw a regular income from the large profits of the Company as they are earned. The dividends will be paid semi-annually, every six months, the first of May and November of each year. This is one of the best opportunities you will ever have presented to you in your whole lifetime. I have invested a great many thousand dollars in the Kornit Manufacturing Company, and I feel sure it is one of the best investments I have ever made. I can truthfully say to you that I fully believe that you will be more than pleased with your investment and that you will never be sorry. Remember, that you have here an opportunity to become interested in a large industrial manufacturing concern manufacturing a product with an exclusive

monopoly, which has never before been manufactured or sold in this country.

Remember, that it is by no means an experiment, as it has been successfully manufactured and sold for over four years in Russia at a large profit, and the manufacturer and inventor recently wrote that the demand is increasing every day beyond the capacity of their manufacturing facilities.

Now is the time for you to take advantage of this magnificent opportunity to make an investment in these shares. I EARNESTLY BELIEVE that in a few years THESE SHARES WILL BE WORTH FROM FIFTY DOLLARS TO ONE HUNDRED DOLLARS each on account of THE LARGE DIVIDENDS which the company will earn and regularly pay each and every six months. It is a well-known fact that shares that pay fifty (50) to one hundred (100) per cent dividends will readily sell in the open market for \$50 to \$100. THE OUTLOOK FOR THE KORNIT MANUFACTURING COMPANY is such that it seems impossible for the earnings to fall far short of these figures. If the company only makes and sells two tons of Kornit a day for the first year and made a profit of only \$200 per ton it would mean a profit of over sixteen per cent (16%) the first year. If this business were doubled the second year, of course the earning capacity would double and the dividends would be over thirty-two per cent (32%). Prominent and well-known Electrical Engineers assure me that this product cannot help and is bound to make enormous profits. I would recommend that you send for as many as you 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

603-605 West 43rd St., New York City, N. Y.

Mr. Ellis, besides being President of this company, is also President of two other large and successful companies, owning shares therein valued conservatively at over \$250,000. Mr. Ellis has other investments in New York City real estate, bonds, stocks and mortgages to the amount of many more hundreds of thousands of dollars. Any bank or mercantile agency will tell you his guarantee is as good as gold. This is a successful man who wishes you for a Co-partner as a Shareholder and Dividend Receiver in this company. Remember, you will do business personally with Mr. Ellis in this matter.

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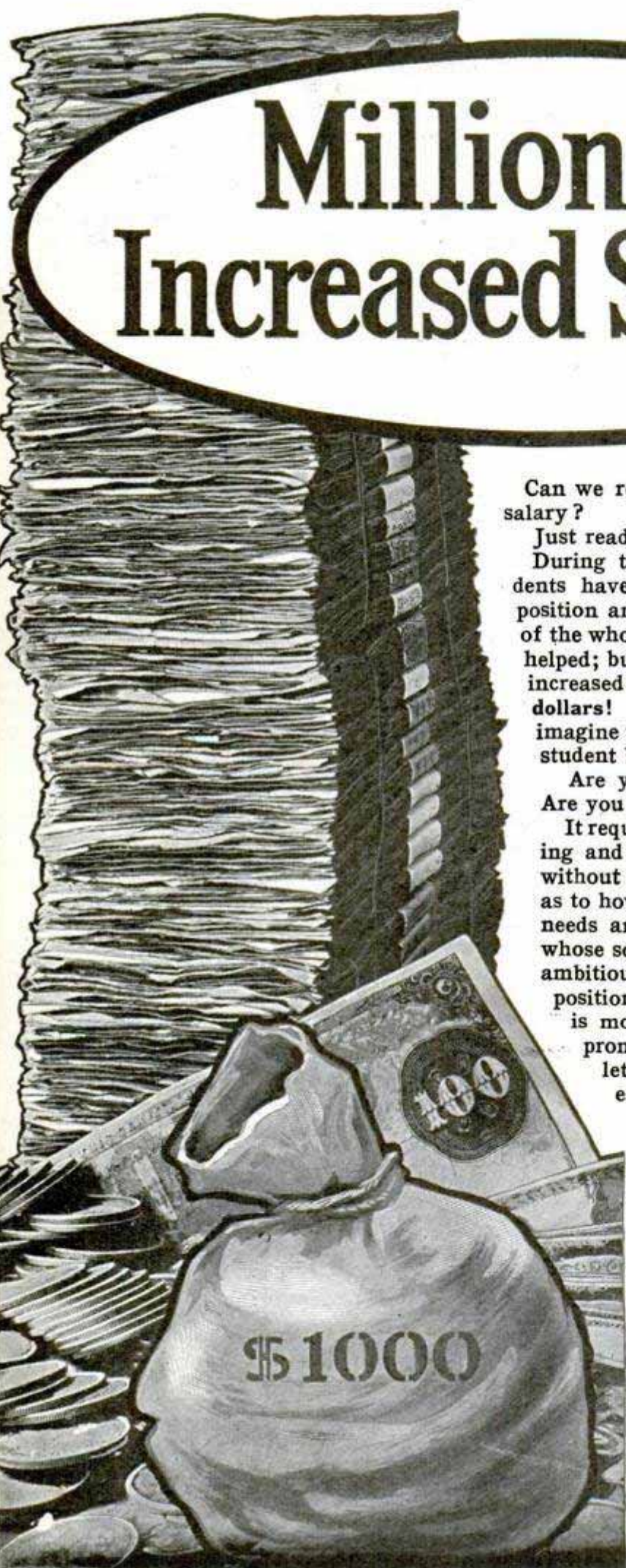
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# POPULAR MECHANICS

Vol. 9. No. 12. CHICAGO, DECEMBER, 1907.

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## INTERNATIONAL BALLOON RACE OF 1907

**German "Pommern" Wins with 873 Miles--Five Dirigible Airships Also Contest--Greatest of All American Aeronautical Events**

By H. H. Windsor

"One, two, three, four, five, six, seven, eight, nine, ten, go."

It was the official starter counting off the remaining seconds of the five minute interval allowed each balloon in which to start on the International race which occurred in St. Louis, October 21.

As the moment approached for the contest, 150,000 excited spectators surged around the inclosure where the nine great gas bags were swaying at their moorings. Two hundred city police and 250 regulars from the U. S. Army were required to hold the crowd back from the wire fence which inclosed a space equal to two city blocks.

The "Pommern," the German prize-winning balloon, was the first to start; as it rose majestically, bands played and the gathered thousands shouted. From away up in the air floated back a farewell. Meanwhile a score of men were moving the next balloon to its place, for each balloon rose from identically the same spot. Exactly five minutes were allowed in which to take position and start. In each instance the starter counted aloud the last 10 seconds, and when the word "Go" was spoken, the balloon had to start or be debarred. So perfect were the arrangements there was no delay in any of the nine ascensions. The first occurred at 4.00 p. m., and 45 minutes later the last one was sailing away in the hope of winning the Bennett cup and a cash prize of \$2,500.

The International Balloon race of 1907 was altogether the greatest event in aeronautics ever seen in this country and, in some respects, in all the history of



Fig. 1.—Balloons Laid Out--Inflation Just Begun

ballooning. The start was made from an inland city nearly 1,000 miles from an ocean, and afforded possibilities for long flight which did not exist last year at Paris when Lieut. Lahm, U. S. A., won in a flight across the Channel and into England, a distance of 402 miles.

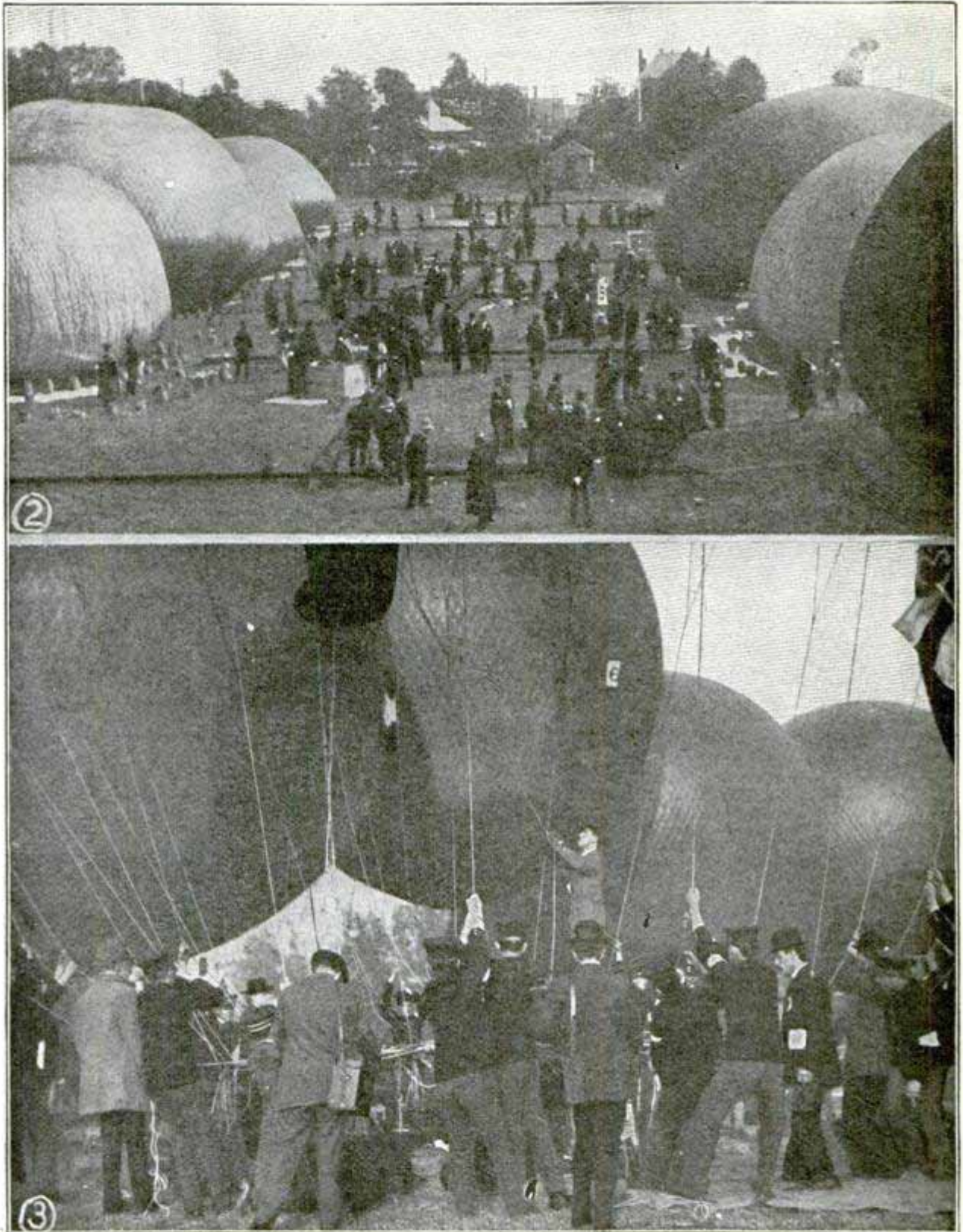
This year preparations were made for a several days' voyage. Not only did each balloon start with several thousand pounds of sand ballast, but provisions were taken for seven days. Even though the balloon came down after 24 or 36 hours, it might land in some wilderness several days' journey on foot to the nearest dwelling, hence ample food and drink were taken. The foreign aeronauts also carried supplies of food tablets to use as a last resort.

It may be well to state here that the balloons in the race were of the old-fashioned round gas bag type of enormous size, but without any means for steering or propulsion. They could, of course, rise to a higher level at any time by unloading ballast, and likewise come down by letting out gas, and in this way seek a more favorable current of air. For instance, when the German balloon, "Pommern," started, it rose almost vertically to about 8,000 ft., and remained there directly over the grand stand for nearly two hours. It had passed through the air currents near the surface and rested at the chosen altitude where there was not at that time any air moving. That this policy (which was applied to this same balloon last year, but without success) proved the best, is seen in the ultimate result, for the "Pommern" won the prize.

The U. S. balloon "United States," in charge of Maj. Hersey, U. S. A., rose only to a height of 80 or 100 ft., barely enough to clear the housetops, and being immediately caught in a surface breeze, bounded away at a stiff pace and was soon lost to sight.

In this connection, it is interesting to note the process of getting ready and starting. The gas used was the best coal gas which could be made. A public utility gas works about a mile distant was chartered and its tank filled with a million feet of gas. A 20-in. pipe line was laid on the surface of the ground which, on reaching the inclosure, ended in nine terminals, one for each balloon. A length of big hose made of balloon cloth connected the supply pipe with each balloon, and so great was the pressure, the work of inflation after the envelopes were once laid out on the ground, was accomplished in 10 minutes. As the big bags filled, 20 men were stationed around each one, to hold the netting which confined the bag, and as it rose, the men let out the net until the mouth of the bag was a few feet above the ground. Then a wooden hoop was brought and fastened to the ends of the cords which formed the net. To the hoop the basket was next attached. The baskets are about 5 ft. high, and contained ballast in bags, instruments, food, water, and heavy coats, leaving scant room for the two men which each balloon was allowed. Other bags of ballast were then hung all around the outside of the basket, amounting in all to several thousand pounds. The next move was to change the ballast until a perfect balance was secured, in other words, until the balloon would practically float in air without going up or down. So perfect was this balance that the throwing out of a single small scoop of sand, using an ordinary grocer's sugar scoop, was enough to start the ascension. Thus it was that when the word "Go" was given, more or less ballast held in the hand, was dropped overboard and the balloon rose. Not as the hot air balloons which go up like a rocket, but slowly, silently, with a majestic dignity which hushed the shouts below and produced a feeling almost of awe. In the case of the "Pommern," which ascended to 8,000 ft. at the start, two full bags were tossed overboard; the others threw out varying quantities, but very much less, and none of the others took so high an elevation at the start.

To re-assure any timid readers who may dread the unexpected descent of a 50-lb. bag of sand out of the starry depths, let it be explained that after leaving



Photos by W. I. Bell, St. Louis

**Fig. 2—Balloons Half Inflated--Fig. 3—Balloons Fully Inflated; Baskets Being Attached; Erbsloch Testing Valve Ropes**

earth, the sand ballast is spilled out loose and patters down about like a hard rain. It was interesting to note that when the basket is above the ground, the occupants may shift their positions without causing the basket to tip; also that just before ascending, the neck of the balloon through which it was inflated, is untied and allowed to hang down open at the lower end. This neck or mouth is about 18 in. in diameter, and being directly over the heads of the aeronauts, they can look up into the gas bag. The object in leaving it open is to afford a safety valve for the

escape of gas, which often expands by the heat of the sun to an extent which would otherwise cause an explosion, ripping the big bag to tatters and hurling the travelers down to a frightful death. Electric flash lamps were carried, but no matches or cigars can be lighted, or anything done to cause a spark while on the trip. In fact these precautions were extended to the entire balloon park, covering 40 acres, and smokers were obliged to extinguish their fires before they were allowed to enter.

After the first ascension, the others were practically a repetition with the varied good-byes, and the band playing the national music of the country whose flag the balloon carried. Five minutes before the start, a messenger arrived all out of breath and handed Maj. Hersey, U. S. A., some weather reports. The Major, who has charge of the weather bureau at Milwaukee, refused to take advantage of his office, but had a copy delivered to each balloon. It was a special report fresh from the wires, giving the prevailing winds in all parts of the country. Just before ascending, the Major traced his expected course on a map; and the course he took, as far as he went, was almost identical with his prediction.

The order of ascension was as follows:

Balloons.	Country.	Aeronauts.
Pommern .....	Germany .....	O. Erbsloeh—H. H. Clayton
United States .....	United States .....	Major Hersey—A. T. Atherholt
Isle de France .....	France .....	A. La Blanc—E. W. Mix
Dusseldorf .....	Germany .....	Baron Von Abercron—H. Heidemann
Lotus II .....	England .....	G. Brewer—Lieutenant Brabazon
America .....	United States .....	J. C. McCoy—Captain Chandler
Anjou .....	France .....	R. Gasnier—C. Levee
Abercron .....	Germany .....	P. Mackel—Herr Polantz
St. Louis .....	United States .....	A. R. Hawley—A. Post

The following table is a condensed statement of the voyage:

Balloon.	Landed at—	Time, h. m.	Miles from St. Louis.
Pommern .....	Asbury Park, N. J. ....	40:00	873.66
Isle de France .....	Herbertsville, N. J. ....	44:00	867.09
Dusseldorf .....	Little Creek, Del. ....	39:15	800.00
America .....	Patuxent, Md. ....	38:30	735.75
St. Louis .....	Westminster, Md. ....	39:00	716.50
Abercron .....	Manassas, Va. ....	37:35	689.75
Anjou .....	Louisa Co., Va. ....	39:15	674.50
United States .....	Caledonia, Ont., Can. ....	26:10	624.25
Lotus II .....	Memphis, Ohio .....	25:00	358.75

For the distance flown the balloon "United States" made the best speed, covering the 624 miles in 26 hr. The "United States" average speed was 24 miles an hour and the "Pommern's" speed 22 miles an hour.

In no previous records have so many long distances been accomplished; how many more hundreds of miles could have been made had not the Atlantic raised its threatening hand will never be known. That three balloons should have each traveled over 800 miles and alighted at points so near is something extremely remarkable. As it was, the winner had only 6 miles the best.

The event was under the auspices of the American Aeronautical Association, with the St. Louis Aero Club in charge of local arrangements. No previous balloon race has been so perfectly planned and successfully carried out. The St. Louis club now announces "balloon week" as a permanent annual event; with \$50,000 in cash prizes to be offered next year.

An exhibition of dirigible airships was given on the second day, in which three ships made ascensions. In general appearance the five airships on the grounds were similar, though of different lengths and sizes. The standard dirigible consists of a horizontal cigar-shaped gas bag, sharp pointed at both ends. A net of strong twine, the size of an ordinary chalk line, passes over the bag, the ends being brought together on each side at intervals of 3 ft. and tied to the car or frame. The frame is like an inverted V, and as long as the bag. It is made of Oregon fir, which is light, strong and supple. Near the middle is placed the gas engine, geared to a hollow propeller shaft which extends to the bow and terminates in the propeller blades. The operator takes his position just back of

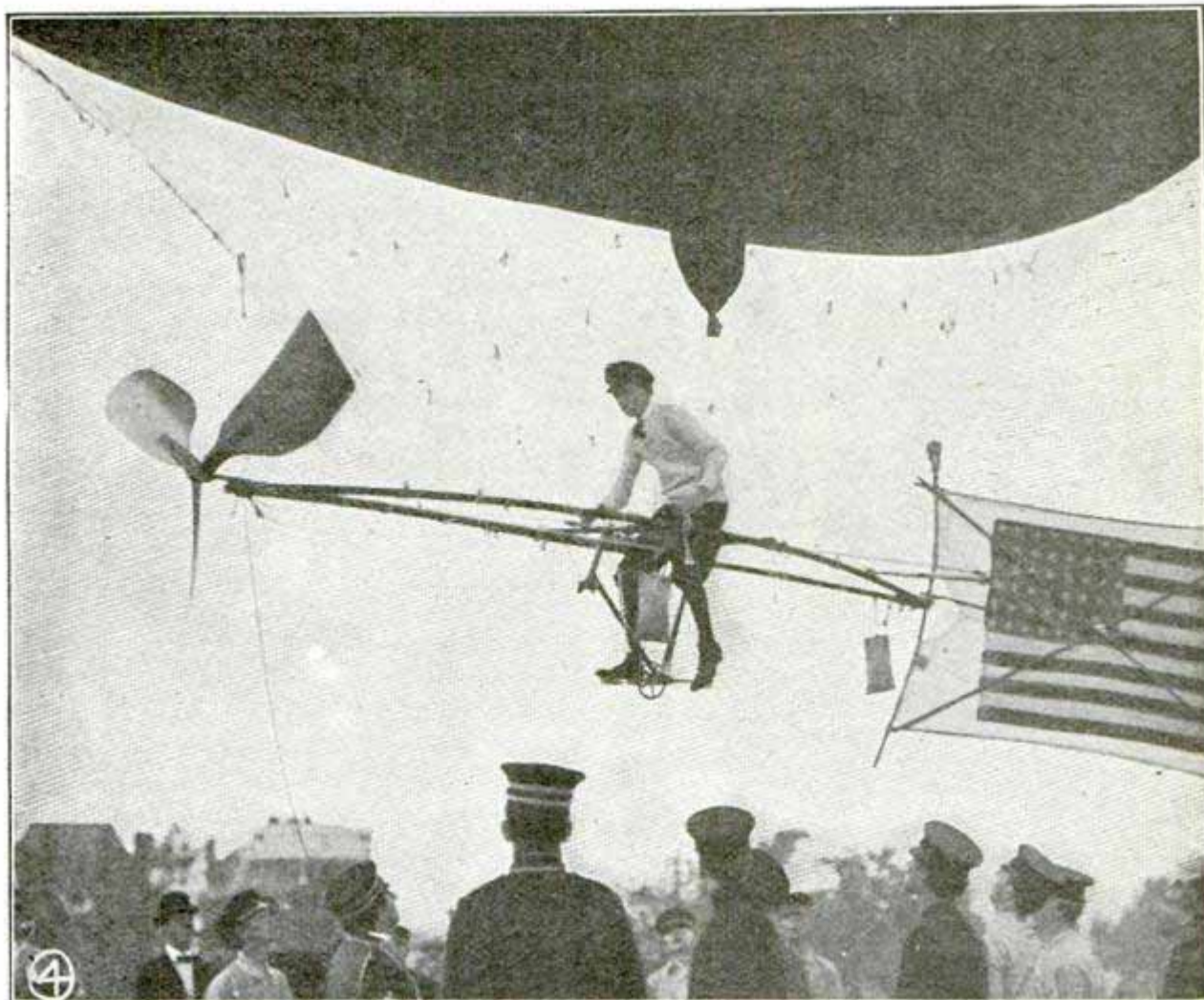


Fig. 4—Cromwell Dixon, 14 Years Old, Starting on His Flight

the engine, straddling the frame with one foot resting on each of the lower strips which form its base. The steering rope passes around a pulley in front of him and extends back on each side to the rudder, which for a 40-ft. ship is about 5 ft. high and 6 ft. long. It is similar in shape to the rudder on a small boat and worked in the same way.

The province of the gas bag is not to lift the ship, but merely to support it in air. Equalization is determined by unloading ballast until the craft practically floats on air like a chip on water. The engine is then started and the operator shifts his position from a perfect fore and aft balance, back toward the stern, which causes the bow to tilt upwards. The propeller then draws the craft forward and upward as a horse draws a wagon up a hill. To avoid going too far in one direction, the rudder is used and the ascent is made in a series of spiral circles, each circle carrying the ship higher. When any desired elevation is reached, the operator slides forward to his original place, which restores the ship to a level, and in this position it will travel without moving perceptibly up or down.

The ease and certainty with which the dirigible turns corners, or plows into the teeth of the wind, as demonstrated at St. Louis, appeared fully equal to the control of a horse-drawn buggy on a good street. In fact the dirigible "comes about" quicker and in a smaller radius than a motor launch of equal length.

When ready to descend, the operator shifts his position forward, the ship declines in proportion with its bow lower than the stern, and like a person coming down a winding stairs, it descends slowly or rapidly, as desired. Some of the demonstrations were extremely rapid in ascent, and descent almost like sliding down a hill, the motion being quickly checked on nearing the ground by the

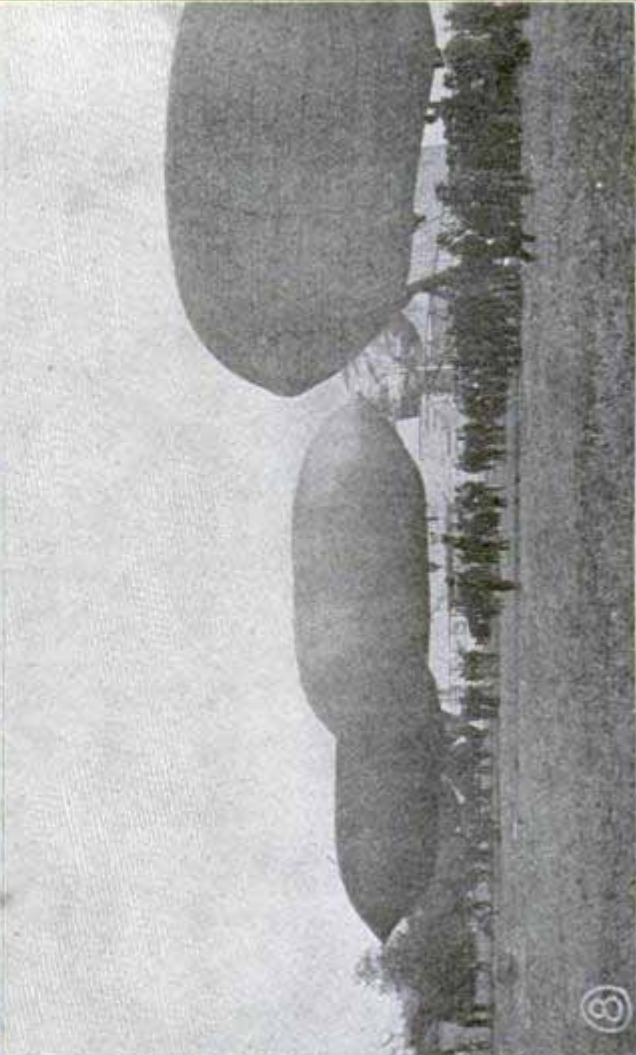
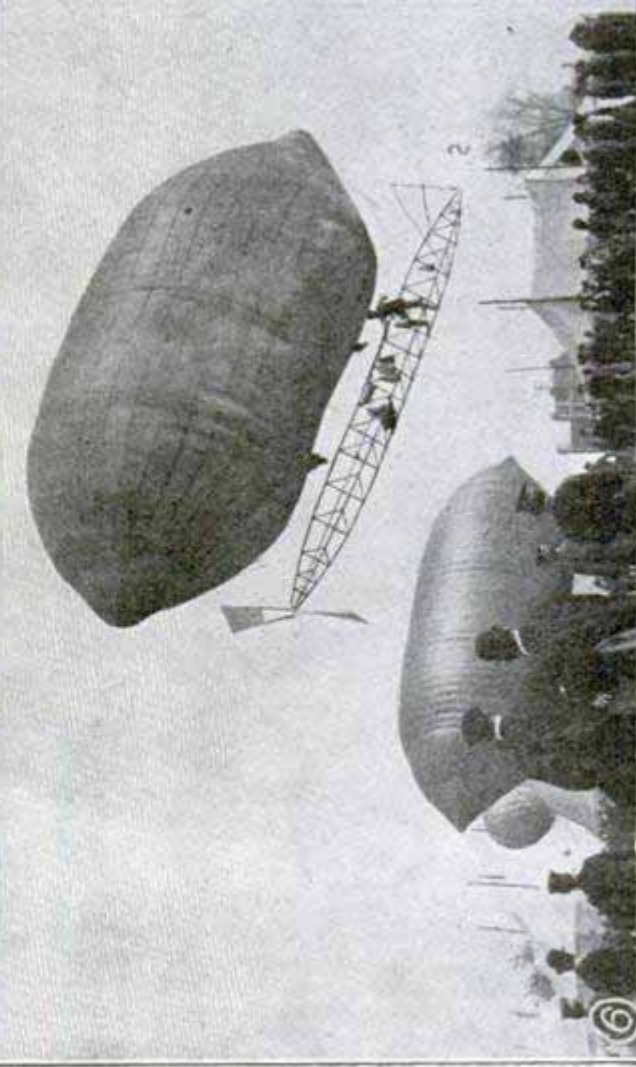
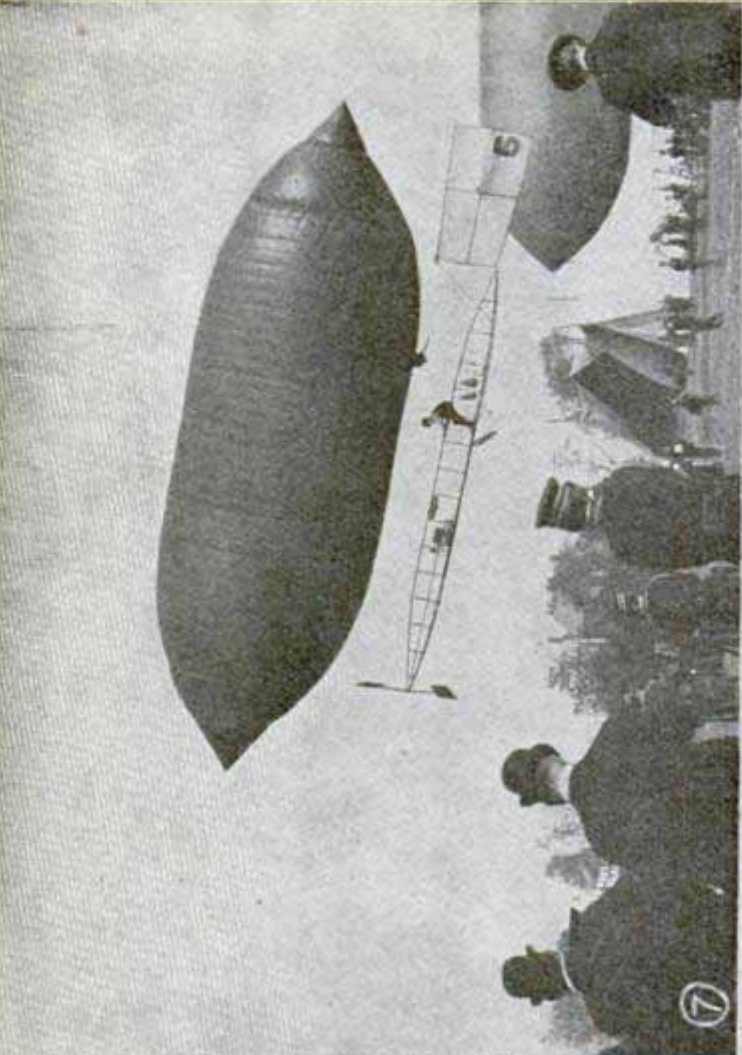
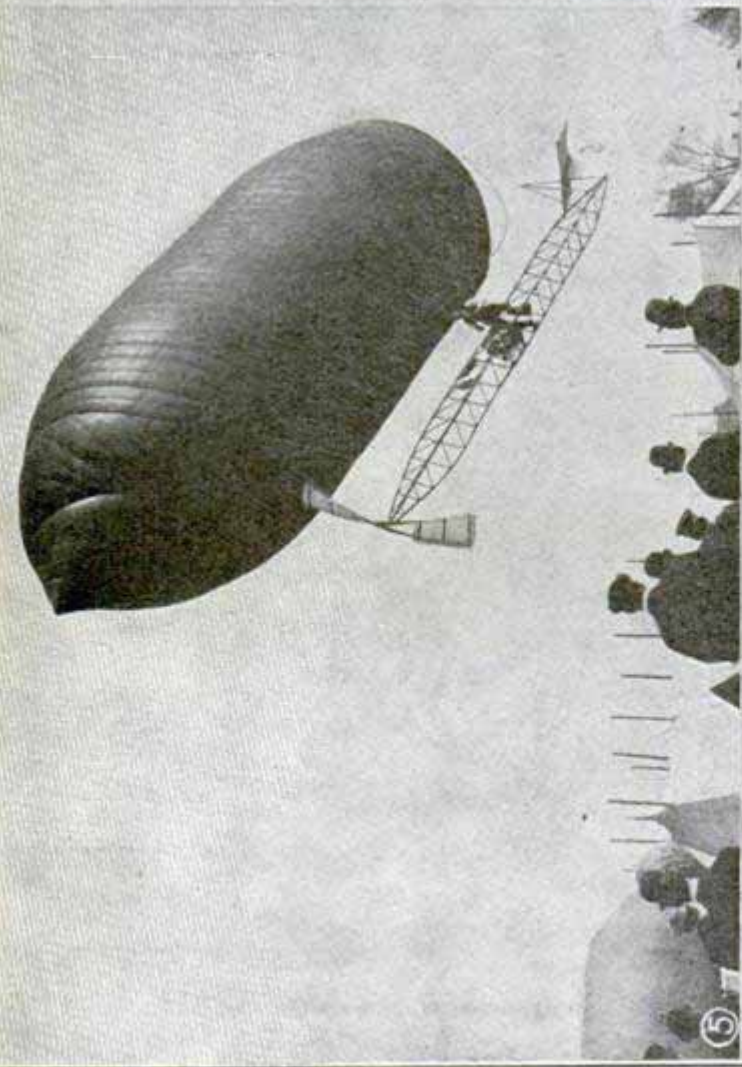


Fig. 5—Jack Dallas; Fig. 6—Horace Wild; Fig. 7—Lincoln Beachey; Fig. 8—Just Before the Race

PHOTOS BY W. I. BELL.



operator shifting his position to balance. An example of this is shown in Fig. 9, where Baldwin has already partly overcome the declination and is at this instant moving backwards to bring his ship to a horizontal position. Apparently the same speed was made in either ascent or descent for a corresponding inclination of the craft.

An exhibition of dirigibles was made the day following the balloon flight. The first was by the youngest aeronaut in the world, Cromwell Dixon, of Columbus, O., 14 years of age. He constructed his own framework and machinery, his mother assisting in sewing the gas bag. This bag is 25 ft. long, 10 ft. in diameter; complete outfit before inflation weighs 75 lb. His propeller is driven by foot power, secured by using a bicycle frame and pedals. The ascension of this bright boy, who has not yet outgrown his knickerbockers, was made with the deliberation and coolness of an old-timer. On leaving the grounds, he narrowly escaped being wrecked in a tall tree, but by emptying ballast, putting the rudder hard about, and a diligent use of the pedals all in a few seconds, he cleared the obstruction. His strength was insufficient to hold out long against the wind, so climbing to an elevation of 1,200 ft., he sailed east over the city, crossed the Mississippi and landed safely in Illinois 8 miles away.

Captain Baldwin then made two ascensions in his California "Arrow," which demonstrated his perfect control, in which the ship was put through a variety of manoeuvres, including a magnificent advance at about 15 miles an hour directly against the wind. In his second ascension, which was especially for the many army officers present, he confined his movements entirely within the limits of the inclosure (about 300 by 500 ft.) at elevations ranging up to 1,000 ft. He used a 12-hp. motor and had his frame hooked up so close his head touched the gas bag. In both descents Captain Baldwin alighted within a few feet of the spot from which he started. Jack Dallas followed him in a flight rising to 1,200 ft., to which he climbed in 90 seconds. He also sailed against the wind, but at the end of 10 minutes his engine stalled and he was obliged to let out gas to get down, landing in a network of live trolley and light wires, from which he was extricated without personal harm or damage to his ship.

On the third day occurred the race of dirigibles for a cash prize of \$2,500. The course was one mile long and the demonstrations quite similar to those of the previous day, except over longer courses and the ships were in the air a greater length of time. Lincoln Beachy came in first and Jack Dallas second; other participants were Captain Thomas Baldwin, whose ship came in third, Charles Baysdorfer, and Horace Wild. The two other airships entered did not appear.

G. H. Curtis had a fine new ship with two 2-bladed propellers, both at the bow, geared to revolve in opposite directions. On account of the other dirigibles having only a single 2-bladed propeller the Curtis ship was ruled out by the judges to the great disappointment of everybody. This ship was sailed in the third heat by Captain Baldwin, but without the twin screws.

The exhibition on the second day and the race on the third day of dirigibles carried convincing proof to the tens of thousands present that the controllable airship is a thoroughly accomplished fact. It is the conviction of the writer however, that the dirigible, while a necessity in modern warfare, is extremely unlikely to become a serious problem for transportation even of passengers, although it is certain to become popular and even common as the most exciting sport. For express or passenger traffic, or even the transportation of the mails, it will not, in the writer's opinion, ever reach the efficiency and reliability of either steam or electric cars on tracks, while for carrying freight the suggestion is absurd.

This statement in no measure detracts from the wonderful accomplishments which persevering and fearless men have worked out; great credit is due them, but it is not profitable to expect results which if not actually impossible, are practically so.

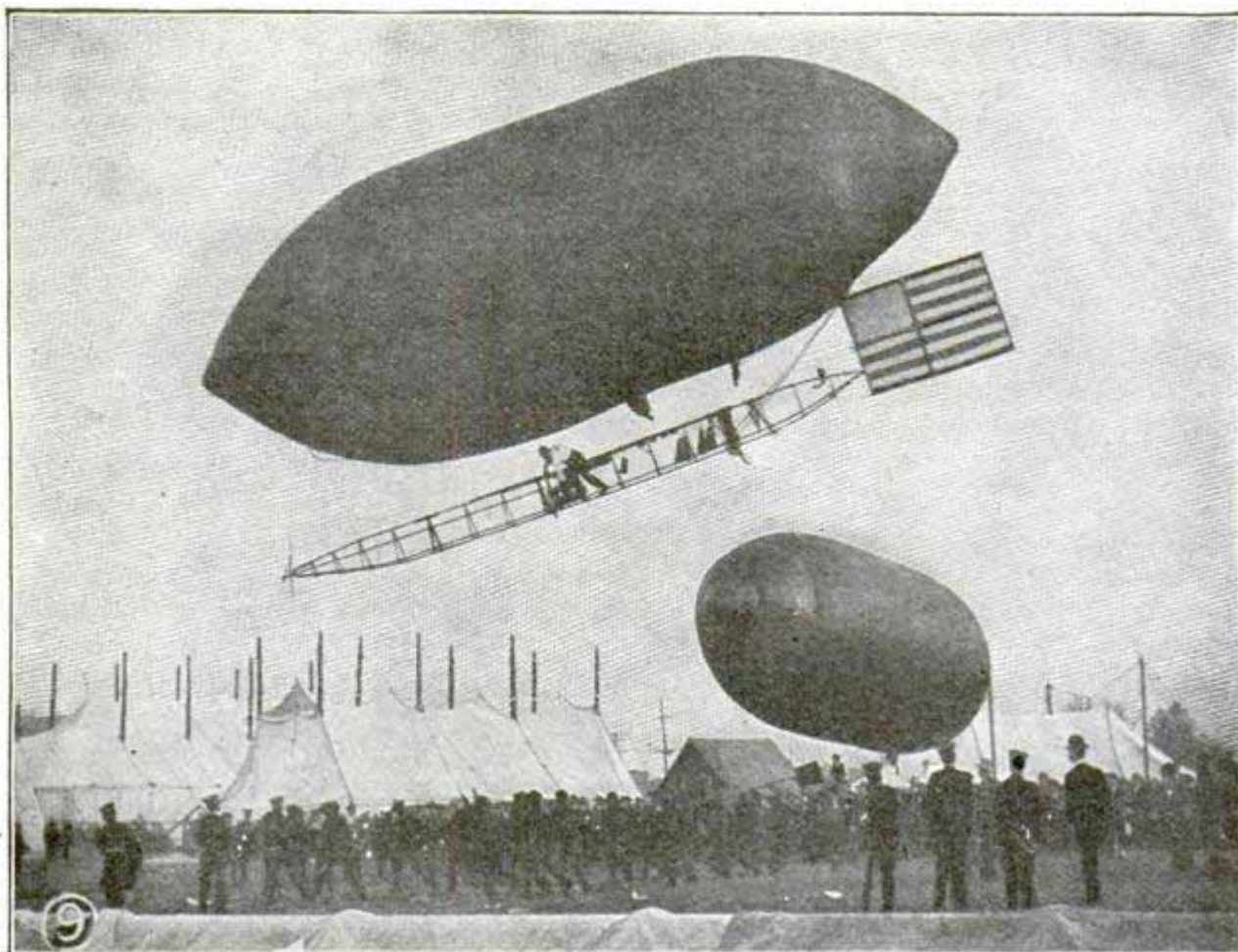


Fig. 9—Capt. Thos. Baldwin Descending--Balloon Tents in Background

Progress has not reached its limit, however, and such experts as Captain Baldwin and Curtis expect an evolution of the present dirigible to eliminate the gas bag, and substitute the motor driven aeroplane, with ability to remain aloft as long as the supply of fuel lasts.

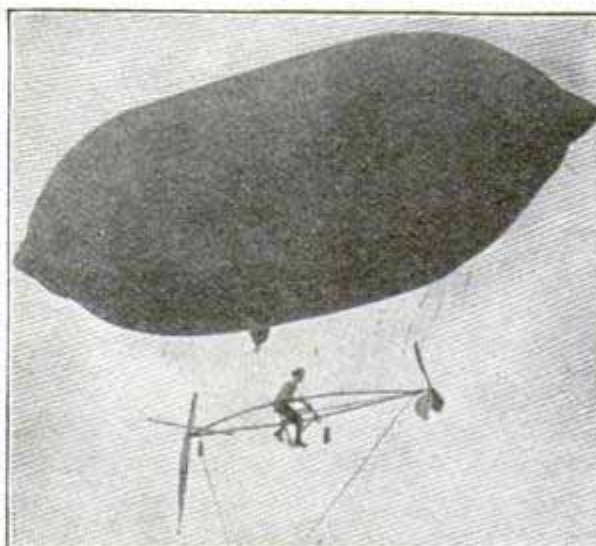
Israel Ludlow, who was crippled for life in his fall of 200 ft. at Ormond Beach, Fla., was present with a large aeroplane, but unfortunately the inclosure was too small, and other unfavorable conditions made a test impossible.

Altogether the 1907 meet was highly satisfying and instructive, and has done more to stimulate professionals and awaken a wide public interest in aeronautics than anything that has ever occurred in this country.

### LONGEST STEEL BRIDGE IN THE WORLD

The bridge being constructed over the Columbia river, at Vancouver, Wash., is said to be the largest steel one in the world. It will be 7,920 ft. in length, and will have 48 piers in all, 10 of these in the river, with the other 38 on an island and the Oregon shore.

The river piers will be sunk 40 ft. below the bed of the stream and be of reinforced concrete construction to within 40 ft. of the bridge floor.



Dixon Flying Over St. Louis

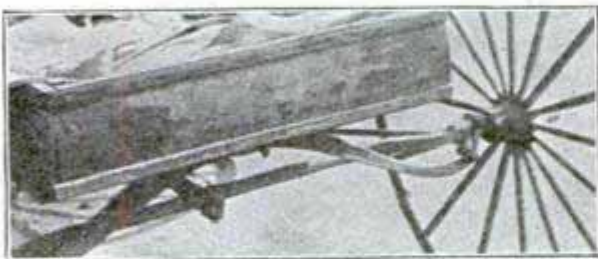
## ELECTRICITY MAY DRIVE HUGE SHIPS

Steadily aiming toward the goal of a 1,000-foot, 30-mile-an-hour ship, a number of English engineers of prominence, are experimenting to determine if it is not possible by the application of electricity to turbines to achieve a speed of 30 miles an hour for ships the size of the "Lusitania" and even larger.

The keynote of the idea is not the turbines coupled to the propeller shafts, but driving high speed electrical generators which will supply current to motors for driving the propellers. To this end a vessel is being equipped with apparatus designed to make the test both practical and complete.

If the experiments are successful the ocean liners of the future may be driven by turbo-generators of 100,000 hp. at a speed of 30 miles an hour. Bridge electrical transmission would then be possible and by a key-board on the bridge the navigator could control every movement of the vessel without transmitting his orders to the engineer.

"It is a well-known fact that the steam turbine is the most efficient when running at high speed," says a well qualified engineer, "while a ship's propeller, on the other hand, will not work effectively at the highest speed, the propeller simply churning the water instead of driving the ship."



**SIMPLEST WAGON SPRING**

Probably the cheapest spring and axle that can be constructed is shown in this illustration. The axle is bent forward about half the width of the spring. The links that carry the load are fastened to the axle close to the wheel hubs.

## "READ ME" ADVERTISEMENT

This magnified reproduction of a newspaper page was placed on the side of his building by an energetic news-



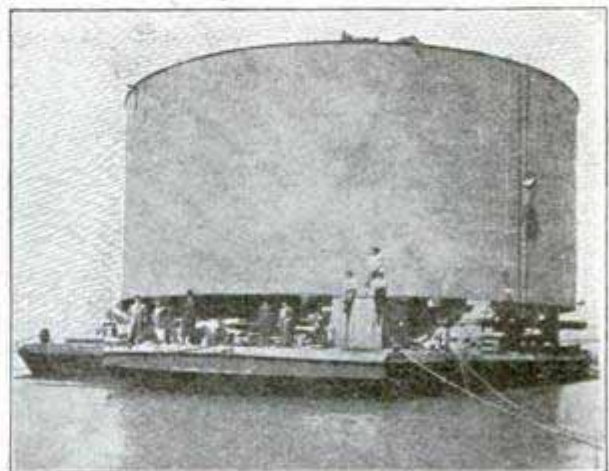
**Unique Advertisement**

paper man as an advertisement. It covers a large part of the wall and can be read at a considerable distance.

## GIANT OIL TANK MOVED BY LAND AND WATER

A rather difficult problem in engineering was recently solved by one of the California gas companies in the moving of a 29,500-bbl. iron tank to a new site. Many plans were considered and abandoned, such as cutting it in section, etc., but at last it was transported through the streets as a house is moved and then floated to its destination as shown in the illustration.

The tank was carefully raised on jacks until high enough to put the cribbing and large timbers in place, and then dragged a mile through the streets, and around one corner to the water's edge. At one point where the

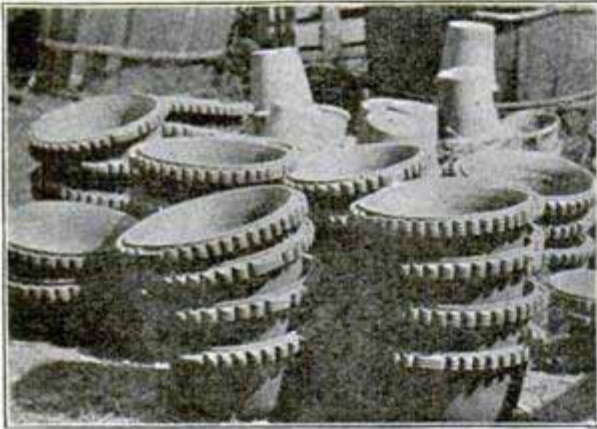


**Voyaging Across the Bay**

tank was taking up not only the street but all the sidewalk, it cleared the building on either side by only 3 in. At Oakland two large barges, 100 ft. long, were lashed together and the tank run aboard at high tide. This stage of the work took 1 hr. 20 min. The voyage across the bay, a distance of 10 miles, was accomplished in 4 hr. The tank is 80 ft. in diameter by 33 ft. high, and holds 1,239,189 gal. Its weight when moved was about 172,000 lb., or 86 tons.

### HANGING FLOWER POTS

These cleverly constructed hanging flower pots are now universally used in



Do Not Drip Water

California. The old style hanging pots had three holes punched outward through the rims for fastening the wire hangers, and the surplus water finding a vent through them made

muddy pools of water on the porches. This design has heavier rims, with scalloped edges to retain the water, and the holes for the hangers are pierced up and down.

### MODERATE PRICE AUTOMOBILE THE MODEL

Although the 6-cylinder, and heavier, more powerful types of automobiles are to a great extent taking up the interest of manufacturers and autoists, very few makers are relying upon these high-priced models alone for the bulk of their business.

"A 20-24-hp. car can go anywhere and do practically anything that one of twice its size is capable of, without carrying around a superfluous ton of weight to use up gasoline and tires," says the Automobile. "Both the autoist and manufacturer are beginning to realize this, so the day of the moderate car can be said to have dawned."

### PASSENGER ENGINE AFTER WRECK

The mangled, twisted heap of iron shown in this illustration is all that was left of the engine, which, pulling a passenger train 60 miles an hour on the Rock Island railroad near Cedar Falls, Iowa, Sept. 13, collided with a freight train standing on a side track. Fourteen persons were killed and as many more injured.



"Fourteen Persons Were Killed"

Photo by James L. Bennett

## AERIAL TRAMWAY OVER OPEN WATER

Danger of Disaster from Ice, But Engineer Not Worried—Marks a New Period in Marine Engineering



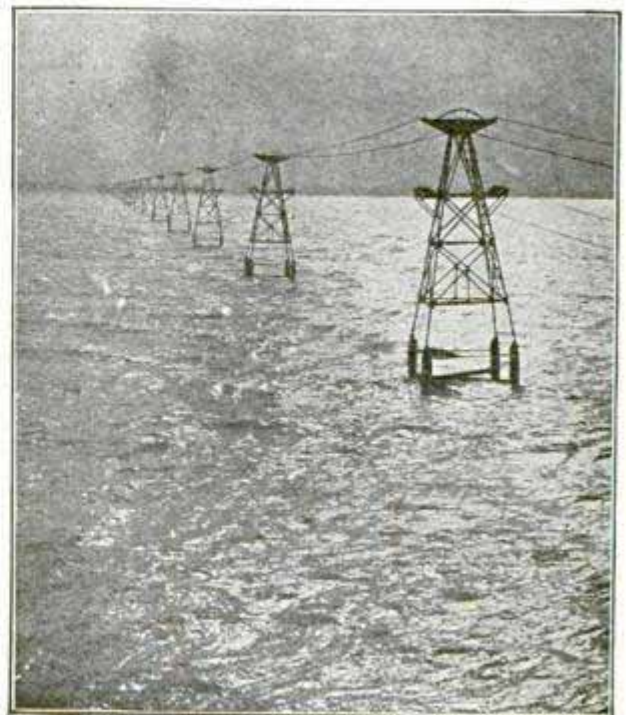
The Aerial Tramway—View Looking Out Into the Lake

In little cars swinging from great steel cables 30 ft. above the lake men and materials are carried by an electric aerial tramway over the storm-tossed and ice-bound waters of Lake Michigan in the task of constructing the new Chicago water works tunnel which will extend over 10,500 ft. into the lake at the foot of Seventy-third street.

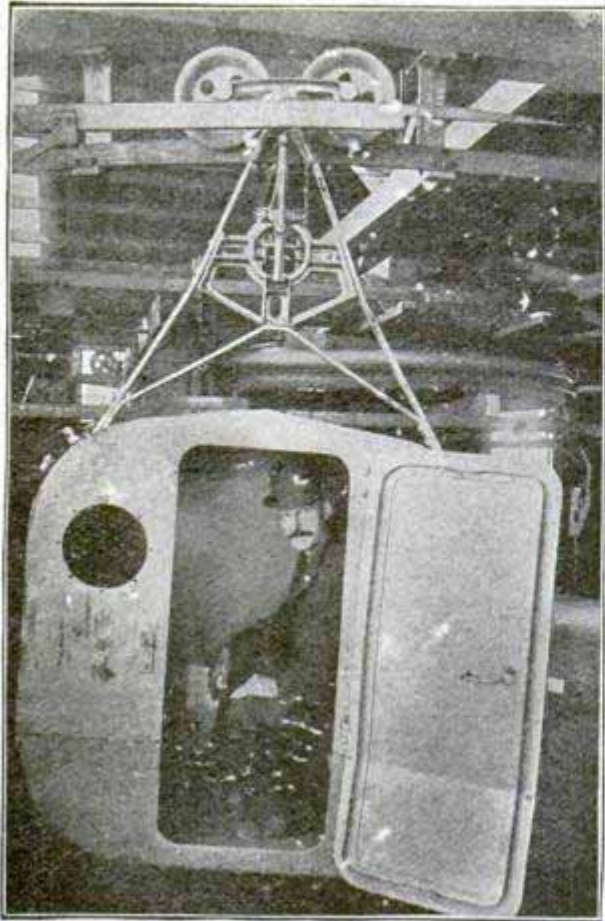
George H. Jackson, who was awarded the contract for driving the tunnel, realized that some means had to be supplied for conveying material to and from the intermediate crib, 8,000 ft. out from the shore terminal, other than the old method of a fleet of tugs and scows, always accompanied with serious delays from running ice in winter and stormy weather. Other engineers said it would not work; for, while devices of this nature have been successfully used in land operations, no one has ever before had the nerve to build one as long over the waters of an open sea. It remains to be seen whether the tramway will withstand the running packs of ice, and if it proves successful, marine engineering will have taken a stride forward.

The tram or cableway is supported by 26 steel constructed towers, 12 ft.

square at the bottom and 3 ft. square at the top. These towers are 30 ft. high and rest on steel piles rising 5 ft. above the water level. Four piles, driven 14 ft. into the bottom of the lake bed, support each tower. At the top of the towers, which are placed about 300 ft. apart, steel cross pieces support the carrying and transmission cables.



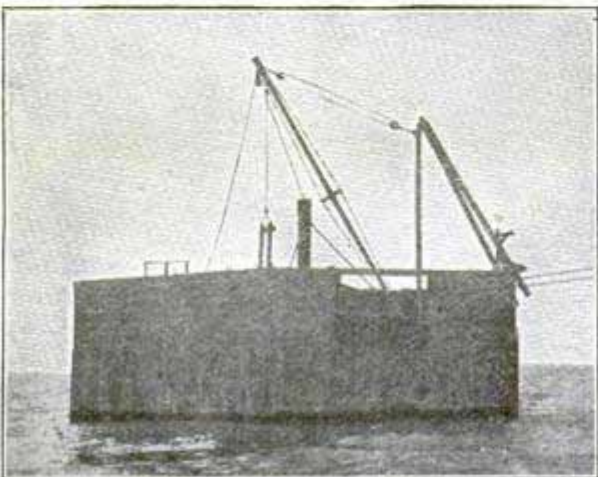
View Looking Toward Shore



Passenger Car Turning at End of Line Where Cable Passes Around a Large Sheave

The cars are swung from the carrying cables on grooved wheels, motion being imparted by the transmission cables, which are always in motion. The diameter of the carrying cable is  $1\frac{3}{8}$  in. and the transmission cable  $\frac{3}{4}$  in. At each end of the line the carrying cables terminate in steel overhead tracks. The transmission cables are driven by a 25-hp. electric motor.

The small steel cars or buckets, spaced along the cable 300 ft. apart, are automatically connected with the trans-



The Two-Mile Crib

mission cable as they go out and automatically released when the terminal is reached. It takes each bucket about 25 minutes to travel from the shore to the intermediate crib. The capacity of the tramway is 400 cu. yd. of material every 10 hours.

The towers are lighted by anchor lights, as provided by the marine laws of the United States government. They are also illuminated with 64-cp. incandescent lamps. If the tramway withstands the buffeting of ice it will receive this winter, it will probably be extended the remaining 4,000 ft. to the permanent crib. The towers will also support the air pipes from the compression plant to the crib. Attached to one of the land towers an 18,000-cp. searchlight plays upon the cars as they come in at night over the tramway. The cost of the tramway was \$75,000.

### NOISELESS ELEVATED RAILWAY UNSOLVED

The problem of a noiseless elevated railway structure over city streets is still a long way from being solved, although many years of protest from property owners whose interests have suffered materially from the constant racket, has made some sort of improvement imperative.

As far as the bridges and street viaducts of steam railroads are concerned the problem has been effectively solved by the satisfactory noiseless results obtained on a bridge just completed near Springfield, Ill. This was accomplished by laying upon a bed of steel 8 in. of ballast upon which the ties were placed, instead of directly upon the iron work. The vibration of the iron work was thus eliminated.

This solution, however, is impractical for elevations above city streets, because it would almost completely shut out the light, as important a factor as the reduction of noise.

During the past year the electric railway companies of this country built 3,782 miles of track and added 4,981 cars.

## STATUES OF SAND

The modelling of statues in the damp sand of seashore beaches draws intense interest whenever a sculptor condescends to use his skill on a heap of material which may in a few hours be washed away by the sea or crumpled to nothingness by the sun.

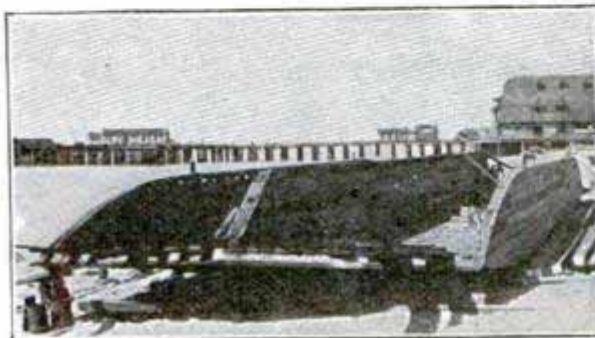
This remarkable sand figure was modelled by Mr. H. Piffard on the beach at Clacton-on-Sea, England. It had no supports and was modelled by the hand and a mussel-shell only.



Modelled with the Hands and a Mussel Shell

## HARNESSING THE TIDES

This scow or float, 60 ft. long by 10 ft. wide, will form part of a tidal wave motor to be erected on the Pacific coast. When completed the sides and bottom will be hollow and the top planked over. It will then be taken out several hundred feet from the shore and rigged between piling at the end of a pier. Four heavy steel ears, or eccentrics, will operate steel cables on ratchets, to convert the tidal oscillations into rotary motion. As power gained in this way would be too uneven to directly generate electricity, the cables will furnish power to run air compressors which will fill a storage reservoir. The compressed air will leave the reservoir evenly and furnish power to generate electricity. The air



Pacific's Waves for Power

compressors will work fitfully, one moment pumping 50 per cent. more air into the reservoir than the next, and so on, as the tidal waves rock the float.

## SELF-PROPELLED CONCRETE MIXER

As the filling-in progresses this concrete mixer moves along the street under self-propulsion, dragging the steel

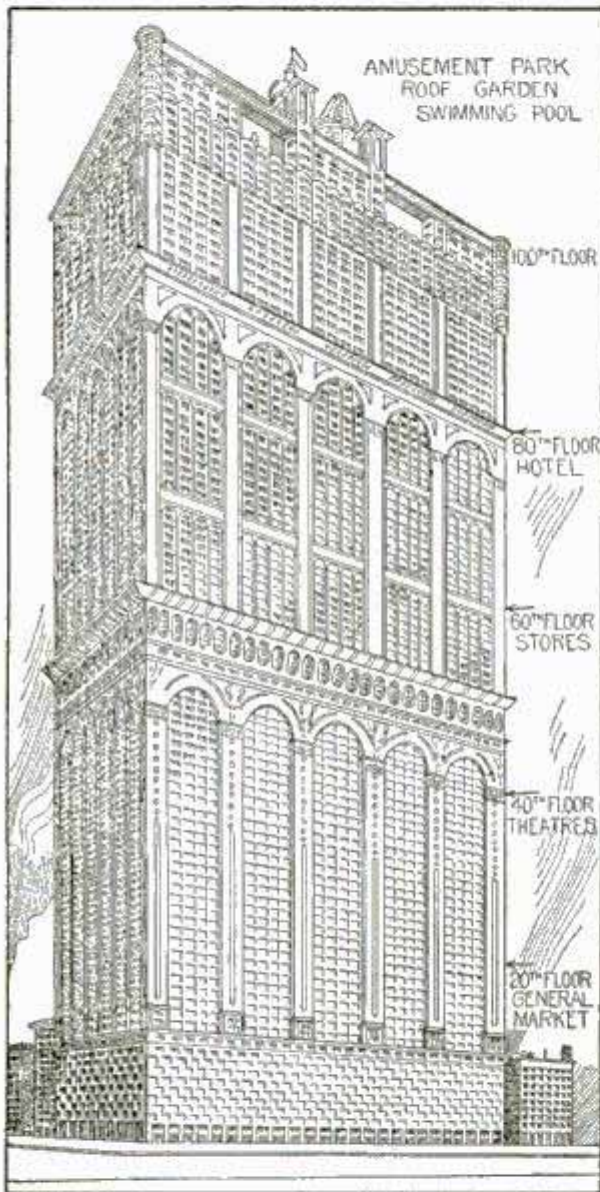


Follows Its Job

apron on which any amount of concrete is being handled, and pushing the wooden inclines from which the machine is fed by men with wheelbarrows. The ground ends of the inclines rest on a pair of wheels about 10 ft. ahead of the machine. The apron upon which the wet concrete falls and is handled by the men is 8 ft. square. The best day's work of this machine, with 21 men, was 280 ft., 25 ft. wide and 7 in. thick.

## SKYSCRAPERS 100 STORIES HIGH POSSIBLE, BUT DRAWBACKS MANY

Reinforced concrete buildings, 100 stories high, towering 1,000 ft. into the air, may yet be seen by people now living, according to a prominent New



York engineer and builder. Before such a feat can be accomplished, however, two great obstacles must be overcome. The lack of adequate fire protection at such a height is one, and the other is the impossibility of providing elevator service under the present systems. Even now in 30-story buildings the weight of the cables supporting the cars is enormous, and buildings of over 40 stories would pass the safety line in this respect.

## GROWTH OF SKYSCRAPERS

When 20 years ago a writer described a mammoth office structure towering into the clouds his picture was but a toy for the imagination. Now it is swiftly approaching a reality. Architects are at work this moment rapidly developing plans for substantially the same kind of structure told of in his fanciful story.

"The 100-story building is sure to come," says one New York architect. "We may not be ready for it yet, but the larger and higher buildings we are certain to have in the near future. The next stage in the development will be the 50 and 75-story building constructed of steel and concrete."

Already the 40-story building has been reached and passed in the completion of the Singer building. The 50-story goal is practically here with the construction of the Metropolitan Life building, which, when completed, will be 48 stories high.

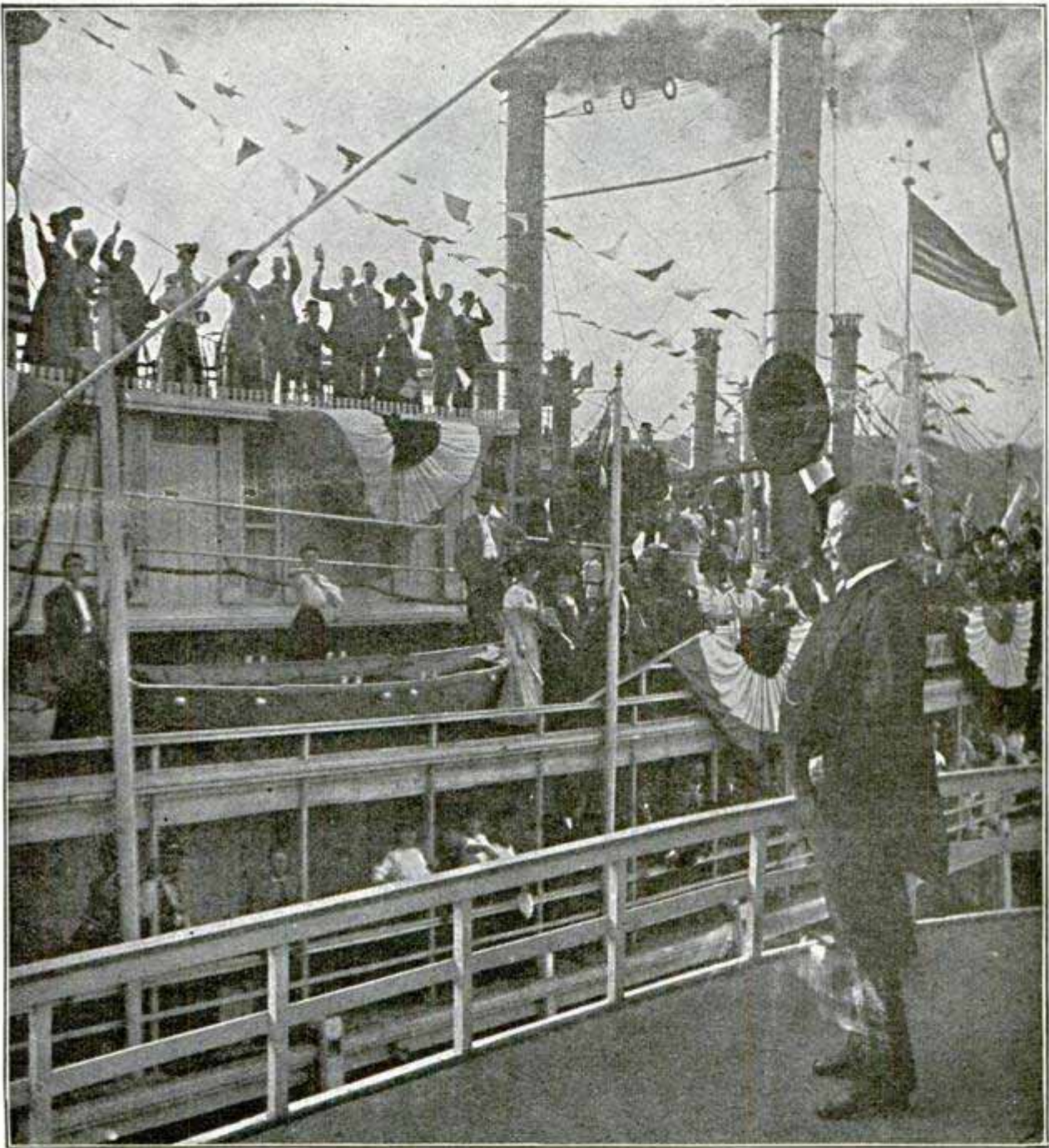
Less than a dozen years ago a 20-story building was a world wonder. Now it is insignificant. The census of skyscrapers in New York, not taking into account the Singer building, gives a total number of 22 buildings more than 20 stories in height, and 405 buildings ranging from 10 to 20 stories high.

## CONCRETE PAVEMENTS SATISFACTORY

Concrete pavements, on the hard, smooth surface of which heavy loads of four and five tons are hauled without difficulty and on which horses can travel at a high speed without danger of slipping, have been found highly satisfactory in many Canadian cities.

Pavements of this nature constructed in Windsor, Ont., cost only 99 cents per square yard made as follows: Concrete foundation; 1 part cement, 3 parts sand, 6 parts crushed stone. The wearing surface consists of two concrete layers: Bottom layer, 1 part cement, 2 parts sand, 4 parts crushed stone; top layer, 1 part cement, 2 parts sand.





From Stereograph copyright 1917 by Underwood & Underwood, N. Y.

President Roosevelt on his trip down the Mississippi. Photograph shows the President acknowledging the enthusiastic cheers and demonstrations from crowds on the passing steamer.

### STORAGE BATTERY LOCOMOTIVES FOR SAWMILL

Storage battery locomotives have been successfully installed at a lumber plant near Potlatch, Idaho, where steam or gasoline engines were impossible owing to the fire risk they would entail. Trolley locomotives were just as impossible on account of the heavy first cost of installation and the complex system of wiring necessary and the size of the plant made necessary some method other than horse haulage.

Each locomotive weighs 7 tons, including the storage batteries. Notwithstanding all the disadvantages under which the locomotives were operated during their trial period they handled the output of the mills for 7 cents per 1,000 ft. in passable weather.

### SUBMARINE TO SEARCH FOR BULLION

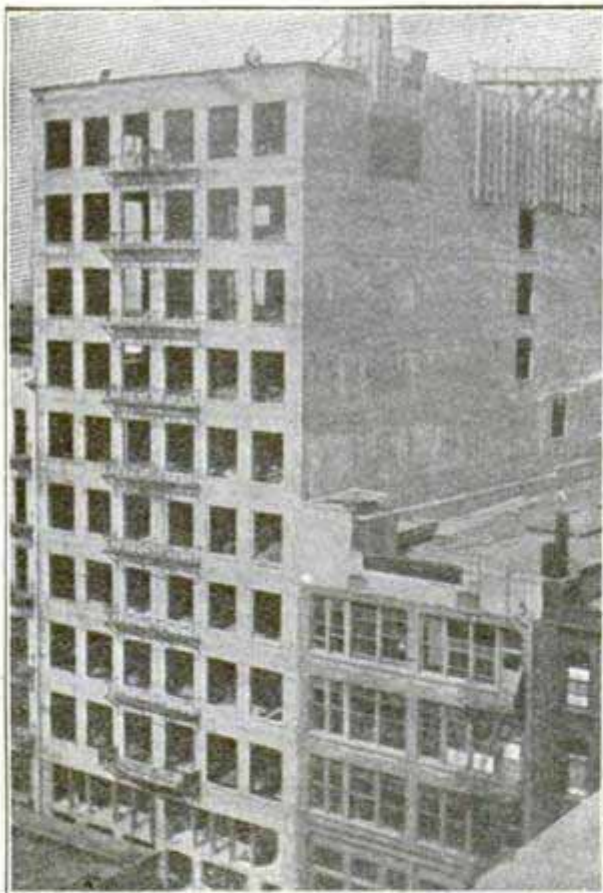
One of the latest American inventions in submarines is a craft which will be used in an attempt to regain

the \$2,000,000 in bullion which still remains in the hold of the "Lutine," the English battleship which sank off the coast of Holland in 1879. The vessel lies in the center of a number of dangerous banks of continually shifting sand, which makes the work doubly difficult.

The submarine is fitted with a special internal apparatus which has regulators, by the aid of which, the operator can control the pressure of the air inside, so as to make it the same as the water. The bottom, it is claimed, can then be opened with perfect safety and the divers proceed to their work.

### CONCRETE SKYSCRAPER

A forecast of the great part concrete will be called upon to play in the construction of the 50- and 75-story sky-



Constructed of Cast Concrete

scraper of the future is given in this illustration. The building, 12 stories high, is constructed of cast concrete, reinforced with a light steel frame of the usual skyscraper type. The steel frame

was completed before the concrete work was commenced.

### OIL WELL POWER PLANT

The accompanying illustration shows a power plant which operates about 20 shallow oil wells. The upright shaft



Operates 20 Shallow Oil Wells

is 5 in. in diameter, and is run by a 30-hp. gas engine which draws its supply of gas directly from the surface of the oil wells. The large eccentric, the crank-shaped device at the top of the shaft, carries 12 steel cables to as many wells. The smaller crank carries six cables. The plant requires no operator after being started.

### COBBLE STONE GATE POSTS

A clever mechanic made these artistic and substantial gate posts out of common material. Cobble stones, plaster and concrete were the ingredients used. The heavy-tuck pointing sets them off to great advantage.



Made of Cobble Stones and Concrete

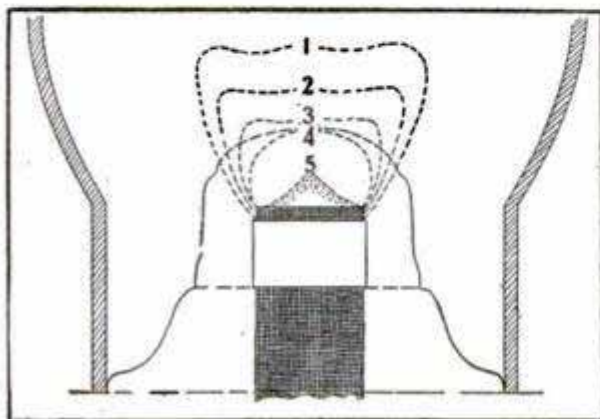
## "LUSITANIA" BREAKS ALL TRANS-ATLANTIC RECORDS

The "Lusitania," the largest ship afloat, now holds the undisputed title of queen of the seas after a run from Liverpool to New York in which she broke every trans-Atlantic record. The official time for this run across the ocean was 4 days, 19 hours and 52 minutes. In this time she traveled 1,780 nautical miles at an average speed of just a fraction less than 24 miles an hour.

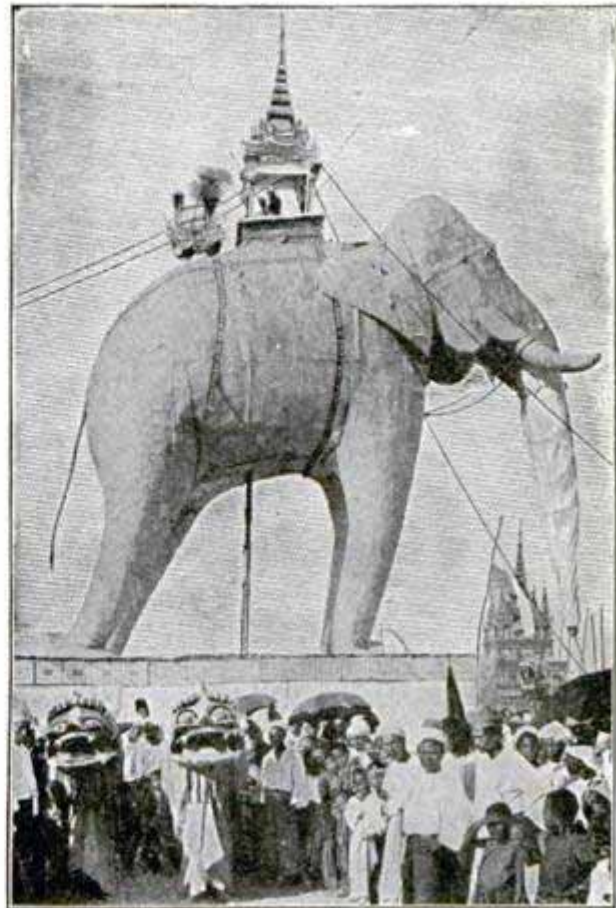
The records which the "Lusitania" has broken were: That held by the "Kaiser Wilhelm II," which crossed from New York to Plymouth at an average speed of 23.58 miles an hour; the record held by the "Deutschland" of 5 days, 11 hours from Cherbourg to New York; and the record held by the "Lucania" of 5 days, 7 hours and 23 minutes from Queenstown to New York. She also exceeded the day's run of 601 miles made by the "Deutschland" on two different days. Her longest day's run was 617 miles.

## SIMPLE TEST SHOWS DANGER OF POOR VENTILATION

The oxygen of the air is as much fuel to the flame as the oil in the lamp, and pure air is as necessary a food for the body as the food eaten. The fact that lack of oxygen proportionately affects both to the same degree has led Prof. F. H. King, of the University of Wisconsin, to conduct a simple experiment with a galvanized iron box and an oil lamp to show how poorly the



How Ventilation Affects Flame



Grotesque to the extreme was the conception of the Buddhist priests, who on the death of their archbishop caused to be constructed as a hearse, a gigantic white paste-board elephant 100 ft. in height. The coffin was hauled to the top of the "white" elephant by means of a cable and thus borne to burial at Mandalay, made famous by Kipling's poem. Instead of weeping for their chief, as is the custom in Christian countries, the priests, wearing hideous masks, danced, sang and rejoiced.

flame burns in a badly ventilated chamber.

The box was provided with circular windows which could be opened to any degree wished. With all windows open and the ventilator in place the lamp burned steadily at the normal size shown by the line marked No. 1. As gradually the ventilation was shut off and the movement of air stopped the flame began to dim until it had the dimension shown by No. 4. With screens placed on all the windows only oxygen enough found its way into the box to barely keep the flame alight, as shown by No. 5.

"Too few people realize the fact that the volume of air we breathe each day outweighs two-fold the combined weight of the dry and liquid foods we consume," says Prof. King.

## MANUFACTURE OF DENATURED ALCOHOL

**Greatly Facilitated by Important Changes in Revenue Rules—The Farmers' Distillery May Now Be as Common as the Farmers' Elevator**

The Denatured Alcohol Law has now been in effect almost a year. Previous to its passage much was said and written which led the public to anticipate that this act would open up wonderful possibilities for the farmer or other small capitalist who might wish to engage in the manufacture of denatured alcohol either from farm products directly or from the waste material of various manufacturing processes. As in the case of most legislative efforts, performance has fallen far short of expectation. This time, however, the trouble has apparently been less with the law than with the method of its administration. Years of perpetual conflict with moonshiners had given the Department of Internal Revenue the wrong attitude, and to the layman planning to build a plant it seemed that the labyrinth of rules intended to govern the operation of denatured alcohol distilling was intended merely for his bewilderment. In fact, for a time not even an expert could tell exactly what a man must do in order to conform to the regulations. As a result the law failed to benefit the very classes for whose good it was primarily intended, and of all the numerous small distilleries that were being planned a year ago to take advantage of the new law scarcely one per cent have actually been built.

That the authorities at Washington are fully cognizant of this failure of the law is certain. That they are making every effort to overcome its deficiencies is evidenced by all the more recent rulings of the Department of Internal Revenue, but is most strikingly shown in the instructions just issued by the commissioner to the members of the revenue service for the administration of the rules governing the operation of industrial distilleries. These instructions summarize all the regulations referring to "industrial distilleries," which are defined as those at which not more than 100 proof gallons of alcohol can be produced in 24 hours, and at which alcohol for denaturation only can be produced. This condensed statement of the regulations is of especial value to the prospective manufacturer of denatured alcohol not only because it gives him a concise summary of the subject but especially because the clear style in which it is written makes it easily comprehensible to the layman.

At every point in these regulations it is plain that no effort has been spared to make plain sailing for the small manufacturer of denatured alcohol. Many of the regulations for the operation of distilleries have been entirely suspended in the case of these industrial distilleries, and so far as possible the artificial element of cost of production due to governmental restrictions has been eliminated. To quote the commissioner's words, "The effort has been, so far as governmental regulation and supervision are concerned, to remove every obstacle to the placing of industrial distilleries on the same plane as the saw mill, the grist mill and the flour mill."

There is no restriction whatever as to the substance to be used for the production of alcohol. That is, one distillery may use as many different kinds of raw materials as happen to be available. The only restrictions as to location are that the plant shall not be located on the premises of a brewery, or within 600 ft. of the premises of a rectifying establishment, or a vinegar factory using the vaporizing process. The distiller must file a statement describing his distillery, apparatus and premises, and must also give a bond equal to the tax on spirits that can be produced at his plant in 30 days. He is not held responsible for his output any farther than to account for material used and the spirits produced, no definite yield of alcohol being required. He is also free to operate his plant

at such times as suit his convenience, and not necessarily under the direct supervision of a revenue officer. Any number of persons may band themselves together for the operation of one of these distilleries. That is, several farmers may own a distillery and take turns in using it, and there seems to be no good reason under the circumstances why the farmers' distillery should not be as common an institution as the farmers' elevator.

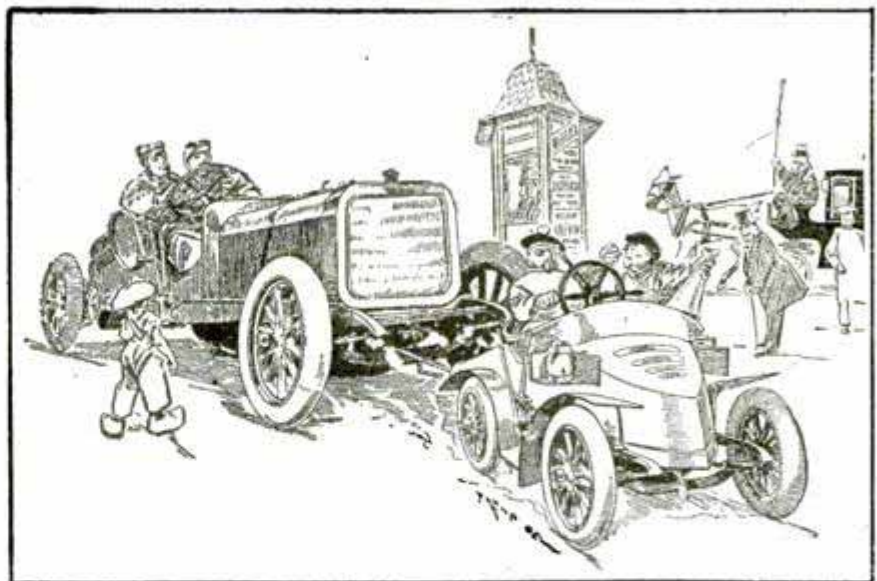
These instructions go beyond the mere statement of regulations and give considerable information of value to the manufacturer of denatured alcohol. Of especial interest is the section which calls attention to the possibility of utilizing old distilleries which on account of state prohibition laws are no longer operated. This latter section we quote in full:

For the information of those interested, it may be stated that as a general proposition it is simply a question whether a thing containing fermentable matter can be more profitably employed in the production of industrial spirits than in the production of something else. The spirit-yielding material in vegetable matter is its fermentable content. It has been demonstrated by experiment that 100 lb. of the following products of the farm will produce alcohol in the following quantities: Rice, 6 wine gal., 190 degrees proof; rye, barley, spelt, corn and sorghum seed, 5 gal.; Irish potatoes, 1½ gal.; cassava, 2½ gal.; turnips, 4-5 gal.; artichokes, 1¼ gal.; sugar beets, 2 gal.; sorghum or sugar cane, 1 gal.; waste molasses, 6 gal.; grape, 2-6 gal.; bananas, 1-3-5 gal., and other fruits from 1 to 1½ gal.

The publication of these simplified regulations should do much toward encouraging the building of industrial distilleries, for, when the whole matter is summed up, there is no regulation which need give the slightest inconvenience to the honest manufacturer. He is not even required to denature his own product but may ship it to central denaturing plants. The quantity and variety of raw material is practically unlimited, and the amount of capital necessary for establishing a plant is small. Taking all these facts into consideration, it is highly probable that before another year passes the public will realize the possibilities of this law and there will be scores if not hundreds of these industrial distilleries in operation.

## AUTOMOBILE TUGS FOR TOWING PURPOSES

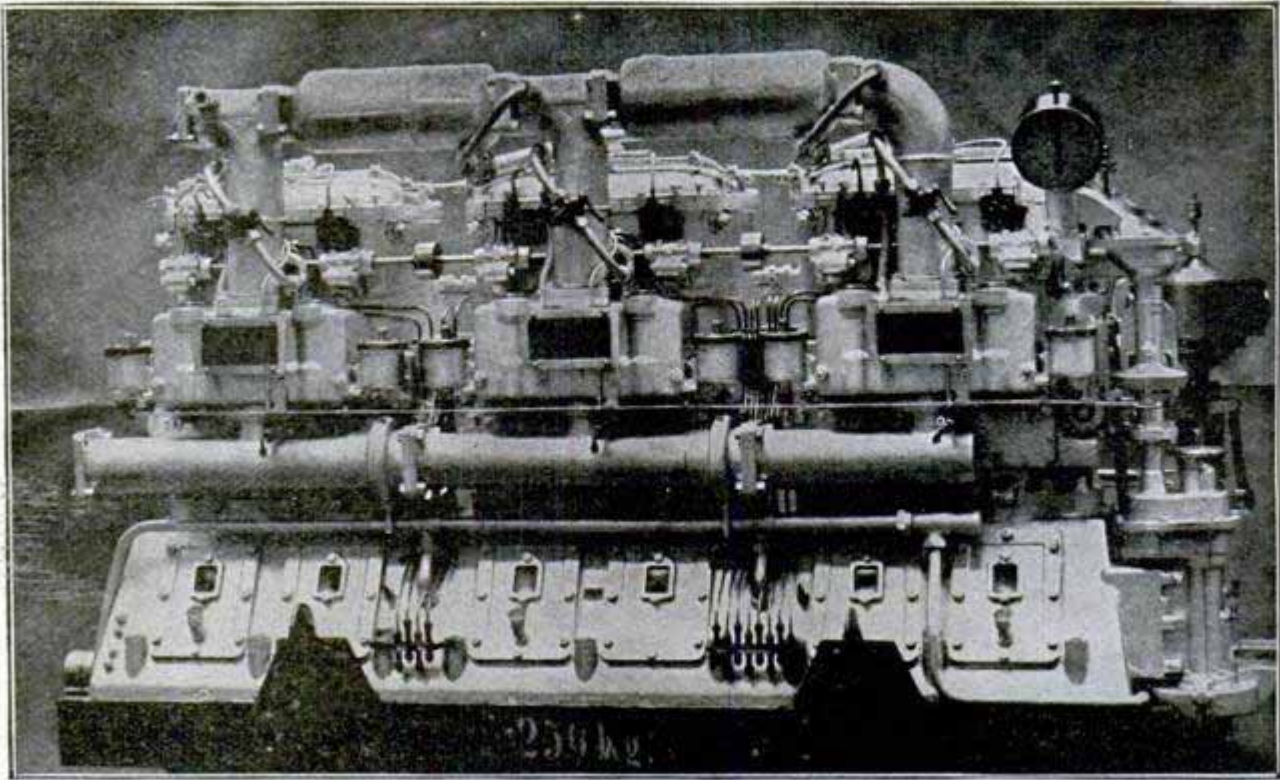
"The Automobile Tug and Towing Company!" It sounds like a joke, but it isn't. Powerful tugs, the puffy, crusty old gentlemen of the marine, have long jerked and pulled majestic ocean liners around at will and now, according to the London Motor, a company bearing the above title has been organized in Paris for the same service on land.



The Automobile Tug

It has been found that the big 80-hp. and 120-hp. cars are as difficult to handle in congested city traffic as a 680-ft. liner in New York harbor or on the Mersey. The mission of the new company is to hook on to these big

land monsters with a small but powerfully constructed tug car and tow them out into the open country. Incidentally, a secondary fleet of tugs will be kept in reserve to rush to the aid of disabled and stranded cars.



Gas Engines of New German Submarine

### PHOTOGRAPHER USES AUTOMOBILE FOR OUTSIDE WORK

A hustler in the photograph business has recourse to an automobile to help him take pictures. By its use he can fill three and four appointments every afternoon, sometimes miles apart. It costs him \$50 a month, but saves him



Courtesy the Automobile

#### Saves Salaries of Two Men

the salaries of the two extra men who would be necessary under ordinary circumstances.

A well known musician living in Brooklyn went for a dip in the ocean about one o'clock one morning last month, and was reported by wireless next day as picked up far out at sea.

### TEXAS PINE FORESTS TO LAST BUT 20 YEARS

To the casual observer who passes through what is called "The Fayette Prairie" in Texas and sees the vast forests of long leaf pines that occupy this region, a suggestion that a lumber shortage in Texas before many years to come is probable, would seem altogether premature. Experts in forestry, however, say that at the present rate of consumption Texas will be barren of virgin pine in 20 years, and what they forecast for Texas applies to all North America, with the exception of the far Northwest, remote from the centers of demand.

The long leaf pine in Texas is being cut out at the rate of 900,000,000 ft. of lumber each year, with a rapidly growing market and output. Early in 1903, in an estimate by a reliable Texas authority, the pine stumpage of the state was placed at 30,000,000,000 ft. While a number of prominent Texas lumbermen seemed to regard this estimate as a little strong, they also were of the opinion that there was enough stumpage in Texas at that time to keep mills, then in operation, supplied for 25 years.

## LONGEST STREET REFRIGERATING LINE IN WORLD

### Ammonia Driven Through Pipes under Traffic Crowded Streets

The inconveniences of ice cooled refrigerator rooms and boxes are eliminated in Kansas City by a wonderful refrigerating plant which has the longest pipe line in the world, carrying frigidity to a great variety of business houses in the same manner that water, gas and steam heat are piped. The pipe line is a mile long, connected with a plant equipped with two 175-ton ammonia compression refrigerating machines, operated by engines fed upon crude oil.

The system of supplying refrigeration through conduits under the streets of the city is by what is termed the three-pipe system and by means of direct expansion of ammonia. One pipe carries the liquid ammonia to the refrigerators, another brings it back in the form of vapor and the third is a pump-out line used for pumping out individual refrigerator rooms and boxes for repairs or other purposes.

The ammonia after being conveyed to the point where refrigeration is to be produced passes through an expansion valve and runs through a series of coils in the refrigerator box. In its expansion it draws to itself all the heat in the box, thus changing its form from liquid to vapor. In its new property it next passes into the vapor pipes and is returned to the plant at ground temperature to be recompressed and condensed for use again.

The pipe lines are laid in a tile conduit with manholes at every street intersection. To avoid connections in the

middle of a block a lateral pipe is run along the curb from each manhole and tapped to furnish service to consumers. All the expansion valves are handled by a competent corps of men who visit



each refrigerated room or box every two hours.

Realizing that ammonia is difficult to handle even in a building and that every precaution was necessary with pipes buried beneath traffic filled streets, all the pipes were joined by means of recessed hydraulic couplings lubricated with graphite and oil. After being thoroughly tested with ammonia each joint was sealed with slip glands and rubber rings. Having made the joints tight, the next care was to provide against strain and buckling. This was accomplished by putting them on roller carriers spaced 15 ft. apart, while the liquor and pump-out lines travel back and forth in a cast-iron yoke clamped to the vapor line.

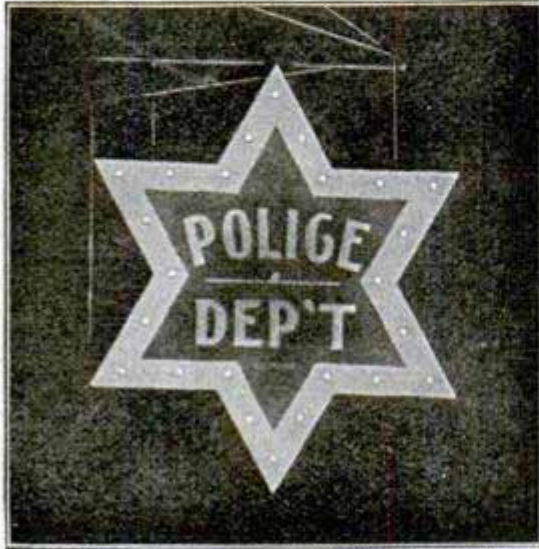
It has been found possible to furnish refrigeration at a cost equal to ice at 15 to 20 cents per 100 lb.



The two turbine steamers "Yale" and "Harvard" have just gone into commission and will furnish a direct all-water route from New York to Boston.

## ELECTRIC SIGNS FOR POLICE STATIONS

The old green light sign of the police station is being replaced in some of the



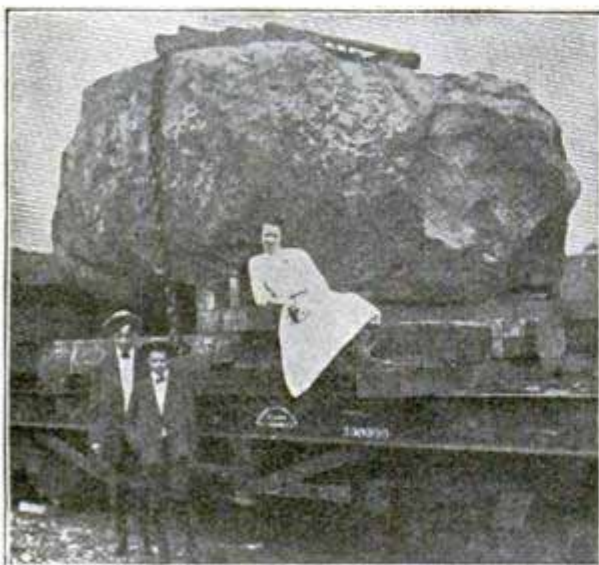
(Courtesy Selling Electricity)

Supplants the Green Light

cities with electric signs which designate the location of stations to persons who, at a distance, have urgent need for police protection. Rockford, Ill., is one of the first communities to set an example for its larger sister cities, who still cling to the old sign, which can be seen only a short distance.

## ROCK TOO LARGE FOR TRANSPORTATION

A concern doing business on a big scale turned the rock shown in the il-



"The Rock Then Weighed 70 Tons"

lustration over to a railroad company for transportation. The rock weighed 100 tons. The railroad, although also in the habit of doing big things, searched through its rolling stock for a car with sufficient capacity, but, unable to find one, insisted that 30 tons be cut away before they could handle it; this was done. The picture shows the remaining 70 tons.

## NEW LIFE-SAVING BELT

A new life belt just tried out before representatives of the British Admiralty Board has been found to contain the distinct advantages of simplicity, strength, easy adjustment and buoyancy.

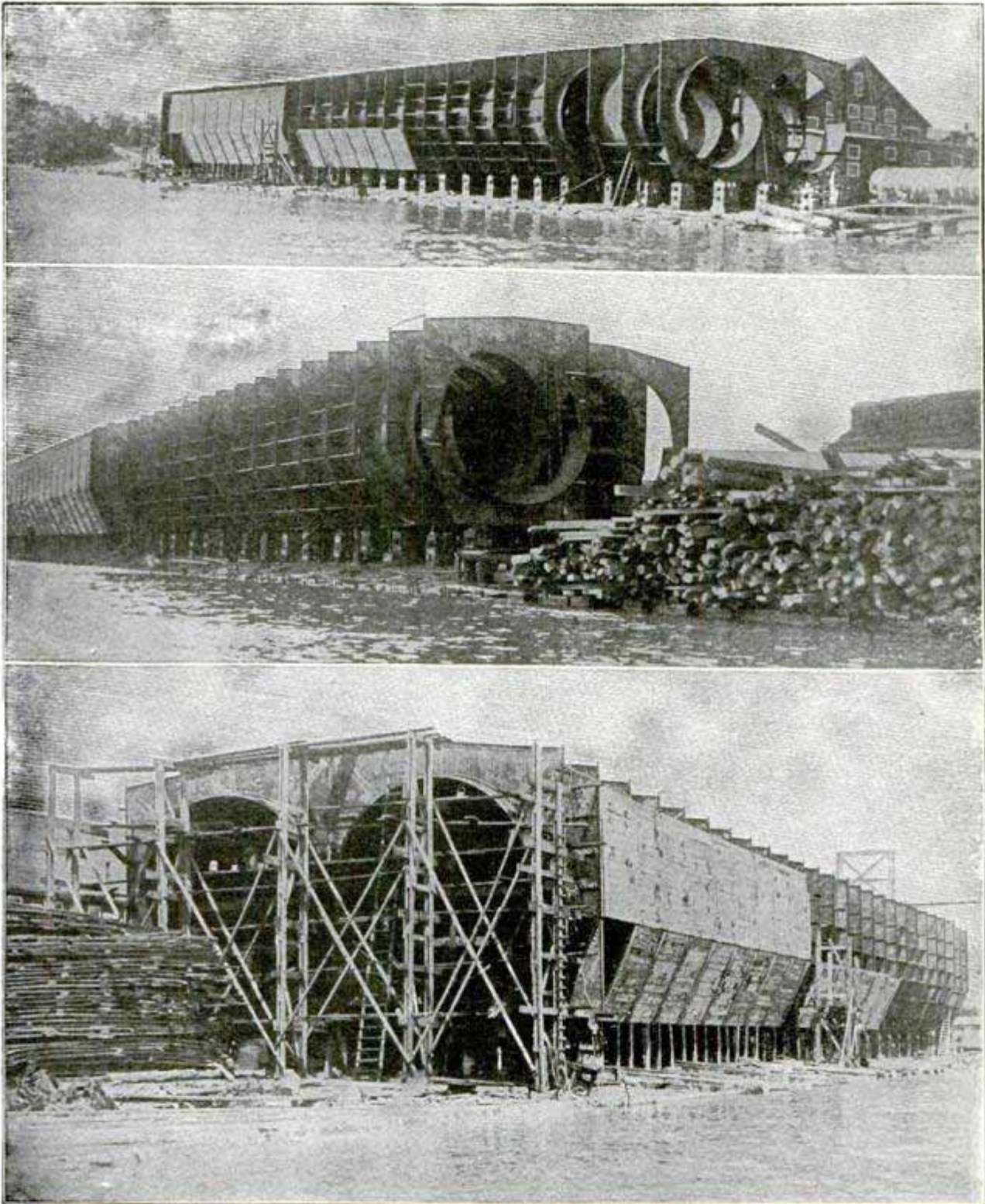


The belt consists of two cushions attached to each other by side straps. When in use one cushion rests on the chest and the other on the upper part of the back across the shoulders, held in position by straps under the arms. Two cushions placed together serve as a comfortable seat on small boats and are ready for instant use when necessary.

## COMPRESSED AIR AS CONSUMPTION CURE

One of the engineers of the Cleveland water department, who assisted in the construction of the Cleveland water tunnel, believes that he has discovered in compressed air the cure for consumption. He has arrived at this conclusion after watching the effect of compressed air on men at work under it. He declares that one consumptive was completely cured and that many men whom the engineers were afraid to place under compressed air because of weakness, thrived upon it. In the New York tunnel he claims that physicians have also found consumptives improving. A number of practical tests are to be made.





The above illustrations show the twin-tube sections which will form the Michigan Central railroad tunnel under the Detroit river. Each section is 250 ft. long and 23 ft. 4 in. in diameter, and will have an inner concrete lining 20 in. thick. The steel frames extending out from the tubes every 12 ft. are the diaphragms which will be solidly imbedded in concrete. At no point will the tubes be less than 41 ft. from the surface of the river. The portion of the tunnel under water will be 2,622 ft. in length.

### ROOF GYMNASIUMS FOR EMPLOYEES

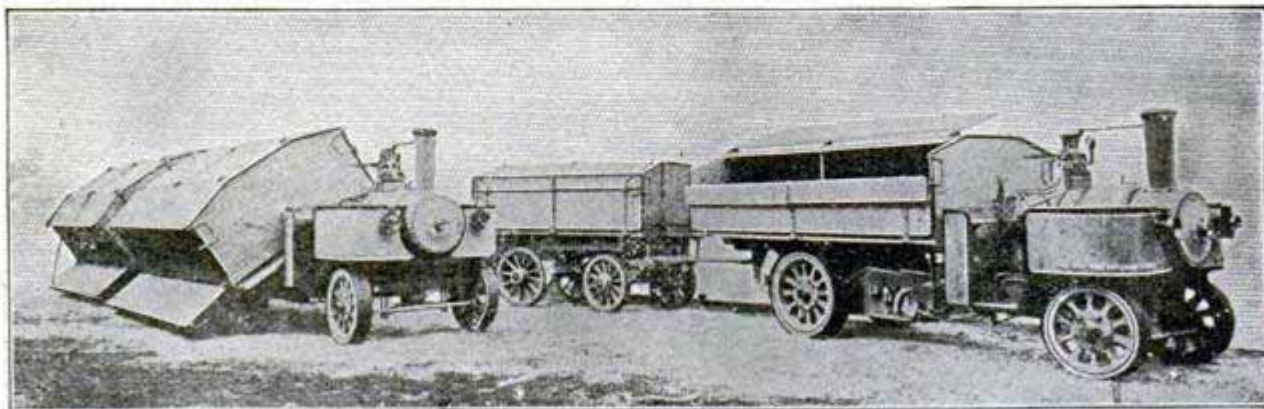
Open air gymnasiums have been established on the roofs of big skyscrapers in many of the larger cities of the country to enable the clerks and other

employees to spend an hour at noon, or after closing hours, enjoying the benefit of physical training exercises in the fresh air. Short dashes, hurdling, boxing and dumb bell exercises are provided and in many instances physical instructors are employed.

### SIDE-TIPPING GARBAGE MOTOR WAGON

The handling of refuse by the side-tipping motor-wagon shown in the illustration is both rapid and economical. The motor is of the steam type with

work on poorly cooked or insufficient food. The portable kitchen is equipped with all the facilities for cooking and serving on a large scale. When the threshermen move to the next station a team is hitched to the cook-wagon and it goes along also.



Side Tipping Scavenger Wagon

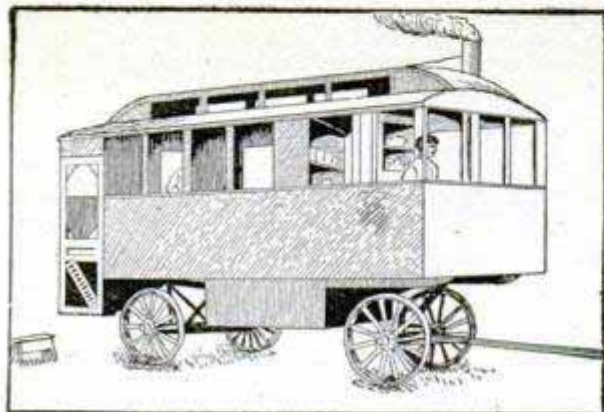
the body carried on a platform over the drive wheels. The large capacity of the wagon and its attendant trailer make rapid progress in scavenging possible, and, being entirely covered, eliminates the odor of decaying rubbish. The contents can be discharged from either side by means of a tipping gear, so arranged that a full or any part of a load can be dumped at any angle desired, without the box slipping.

### IRON CATCHMENT ON SIDE OF GIBRALTAR

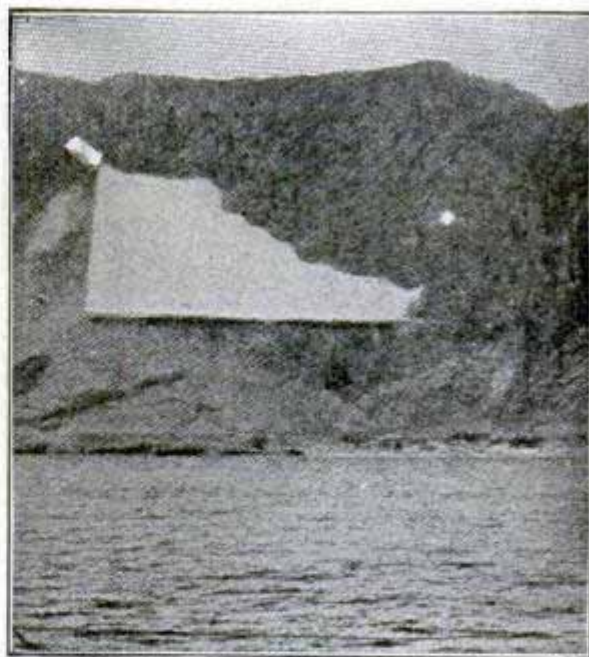
To increase the reserve of water on the Rock of Gibraltar, a catchment constructed of galvanized corrugated iron, covering 10 acres, has been built on the eastern side of the rock. From passing

### COOK-WAGON IN HARVEST FIELD

The woman in the cook-wagon has become the hero of the threshing period. The wise Kansas threshermen have learned that the thresher crew, no matter how efficient, cannot do the best



Popular with Threshermen



Catchment on the Eastern Side of Gibraltar

ships the curious looking white patch against the rock background has led many to believe that Gibraltar is being armor-plated. The iron is fastened to

piles driven deep into the sandy slopes above the village of Catalan. The water collected runs through the rock in a tunnel 2,000 ft. long to reservoirs on the western side. The yield per inch of rainfall is 240,000 gal. The catchment cost about \$130,000.

**PANAMA CANAL LOCKS TOO SMALL**

According to the report of the naval member of the Isthmian Canal Commission, the locks of the Panama Canal as first planned and even later enlarged will be too narrow to accommodate the big vessels now being built or planned.

The building of the giant "Lusitania" and "Mauretania" and the knowledge that other Atlantic transportation lines have already made plans for even more huge vessels is believed to be the basis for the growing belief that the plans must call for longer and larger locks. The locks as originally planned by the Commission were to have been 900 ft. long and 95 ft. wide. Later the engineers in their designs increased the width to 100 ft. and the length to 1,000 ft.

**BED ROOM WITHOUT BED**

A new era in flat construction, in which bed-roomless apartments, made possible by the introduction of sanitary disappearing wall beds, is the feature, is about to be launched upon its journey of popular acclaim or defeat by a firm of western flat builders. It is claimed that flat buildings thus constructed will make two and three room suites serve the purpose of the old four or five room apartments.

The bed when not in use is folded into a closet or recess, ventilated and lighted by a window or vent, creating an all-day sanitary arrangement. The bedding is securely fastened at the foot of the bed and when shut away for the day the sheets and comforters hang slightly separated, thus affording proper sanitation. When not in use the ornamental face of the bed presents to

the eye a large cheval plate mirror and mantel place. When the bed is down, automatically closing doors form an apparently solid wall.

**ENGLISH RAILROAD OF "ONES"**

**One Engine, One Coach, One Conductor, One Everything**

The branch of the Midland Railroad running between Whitacre Junction and Hampton-in-Arden, appropriately known as "The Line of Ones," is one of the most extraordinary railways in the world. It possesses only one engine, one coach, or carriage as it is called in England, and one track. There is

HAMPTON BRANCH. Midland.		
Week Days.		
Miles		min
	Whitacre Junc. dep.	8 25
	Coleshill .....	8 32
6 1/2	Hampton .. .arr.	8 40
Week Days.		
Miles		min
	Hamp'on.....dep.	9 30
4 1/2	Coleshill .....	9 40
6 1/2	Whitacre Junc.	9 45

**The Time Table**

only one train a day and one intermediate station. Each grade of the staff has but one member, and one of these takes the dual part of station-master and signalman. The time table is about the size of a postage stamp.

Another "one" railroad we have right here at home and in one respect beats the English road. One of the largest railroad systems in the United States has a small branch connecting St. Clair, Mich., with Memphis, 16 miles distant. This branch has all the "ones" the English road can boast of and one more: The one engineer has only one arm.

**PRACTICAL ELECTRIC RANGE**

The accompanying illustration shows an electric boiler and salamander, designed and

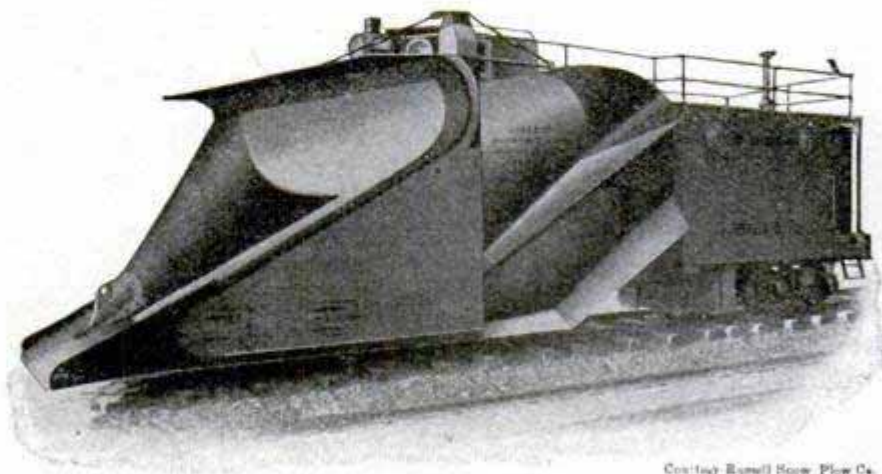
built for a large hotel to compete with ranges heated with gas. This range operates on 110 volts. It is finished in Russia iron, with tile ends and polished steel frame.



**Electric Boiler and Salamander**

## ELEVATOR SNOW PLOW

The removal of snow from railroad and street car tracks is, of course, in these days strictly a mechanical operation, and the builders of these machines have worked out some extremely interesting outfits. The one illustrated is known as a 2-wing elevator plow. It is 46 ft. long, 14 ft. high and weighs 80,000 lb. The various mechanisms of the plow are worked by compressed air, all under the control of one operator. This plow will handle snow 12 ft. deep, cutting a passage the width of a car. In snow of ordinary depth it clears a strip 16 ft. wide.

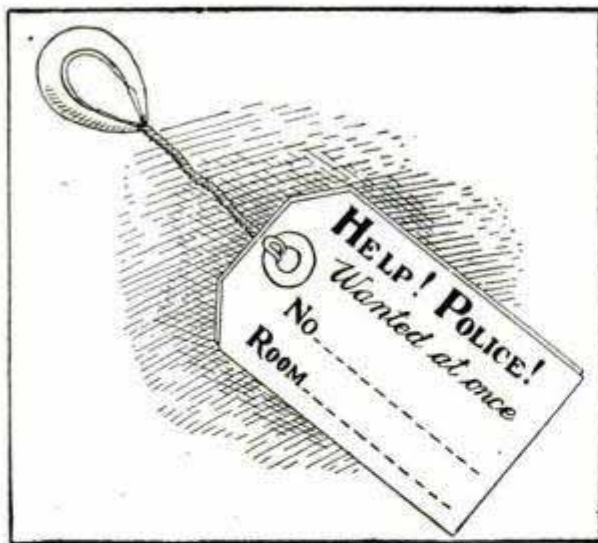


Courtesy Russell Snow Plow Co.

**Weights 80,000 Lb.—Handles Snow 12 Ft. Deep**

## INGENIOUS (?) BURGLAR ALARM FROM BOSTON

A Boston man has invented a truly intellectual contrivance whereby, he honestly believes, the police can be in-



stantly notified when intruders are in a house. It is none other than a tag on which is inscribed the street number and room. This tag is to be pitched out of a window into the street the moment a suspicious noise is heard in the house, the presumption being that a policeman will be waiting to receive it

underneath the window. The cat is to be pitied, likewise the dog, and may the best wishes of all honest men be with the wind if it innocently rattles a shingle or creaks a blind.

## ELECTRICITY FROM NIAGARA TO DO MIGHTY THINGS— ON PAPER

Nikola Tesla, who for the past few years has been playing with Niagara Falls in an endeavor to grasp that mighty power within the hollow of one small hand, has attained, it must be admitted, some wonderful results. Now he comes forward with the statement that he has completed plans for a plant at Niagara with which, by power from these mighty falls, he expects to produce electrical energy, which, forced through the earth, can be tapped to propel machinery or produce light and heat on any portion of the globe.

One billion volts is all he expects to generate at a time. He claims he will make these currents travel 50 per cent faster than lightning, going through the earth in one-half second. To accomplish this he will create electric energy at the plant and produce what is known as stationary waves. These waves will vibrate between two points in his apparatus, and as they vibrate he expects the earth to vibrate in unison. He has a herculean task before him; wish him success.

Fifty-six persons were killed by the traction companies in New York city during one month.

## FASTNET LIGHT LAUGHS AT STORMS

**Its Crest 200 Ft. Above Sea Level Buffeted by Huge Waves**

Exposed to the full fury of the Atlantic ocean during south and north-west gales, the waves dashing with venomous intent against its sentinel lantern 200 ft. above high tide, the new Fastnet lighthouse, balancing its giddy height upon a jagged rock 4½ miles off the most southwesterly point of Ireland, winks its gleaming eye at the passing trans-Atlantic steamers, the monarch of all it surveys.

The old cast-iron tower, 91 ft. high, which for years stood upon the rock, 98 ft. above high water mark, was slowly surrendering to the mighty force of the waves; masses of rock forming its foundation being undermined in nearly every storm. A new tower was found necessary and the engineers, with great daring, chose as its site the ledge of a chasm that had been eaten out by the waves at the point where the fullest fury of the sea was experienced. The base of the tower thus receives the heaviest seas before they arise to their full height, serving as an excellent buffer.



**Lantern in Course of Erection**

The new tower, now completed, is of granite masonry, 147 ft. in height, standing upon a base 60 ft. up the side of a rock pinnacle. At the foundation it is 52 ft. in diameter and from the lowest course of masonry built on the face of the rock to a height of 46 ft. the structure is a solid mass of granite. The entrance to the tower is 58 ft. above high water mark. A heavy teak door guards the entrance, reinforced in stormy weather by two massive gun-metal doors which swing to from the outside. Above the entrance the tower extends 88 ft. to the lantern gallery, and is divided into eight floors.

The lighthouse was first erected in sections at the quarries so that the work of fitting it upon the rock might



**Fastnet Rock. Showing Old Lighthouse and New Tower Under Construction**

be reduced to a minimum. The stones are secured by dovetail joints, so designed that it is impossible for one stone to be wrested out of position without first removing every one above it. Over 2,000 granite blocks were worked into the structure.

Owing to the rise and fall of the tide, and the swift currents swirling around the rocks, landing material and men was a matter of great difficulty. The slightest swell rendered a close approach almost impossible, and ropes lowered from long-armed derricks were used for landing both men and material.

The lantern is of the dioptric type, the light being derived from a series of incandescent lamps, the power of which is intensified by the lenses to about 750,000 candle-power of extreme white brilliancy. A 290-lb. weight falling 49 ft. per hour revolves the light three times per minute. The rays are directly visible for 20 miles.

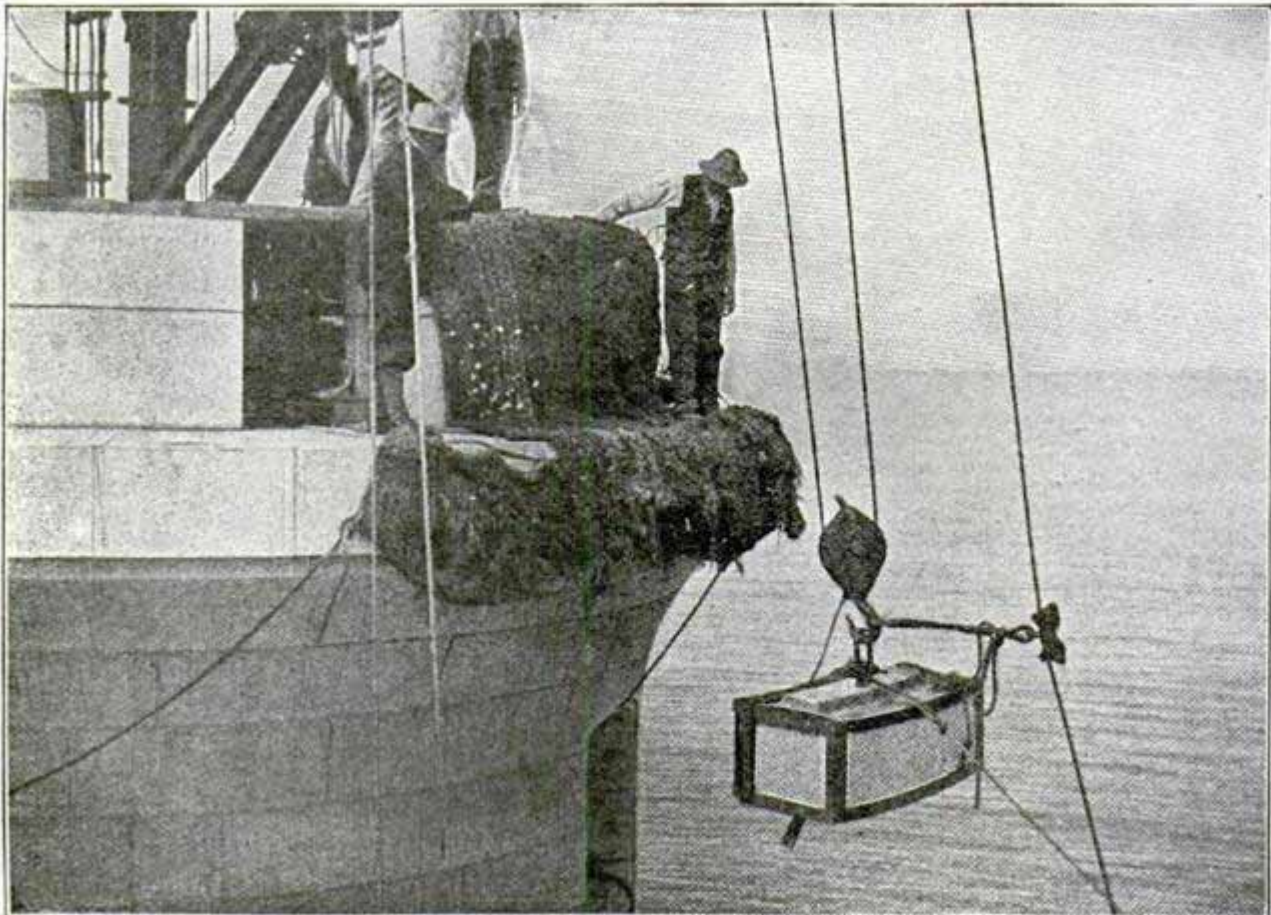
The value of the world's railways is put at \$27,775,000,000.

## ICE CREAM IN BLOCKS FOR TRIP ACROSS PACIFIC

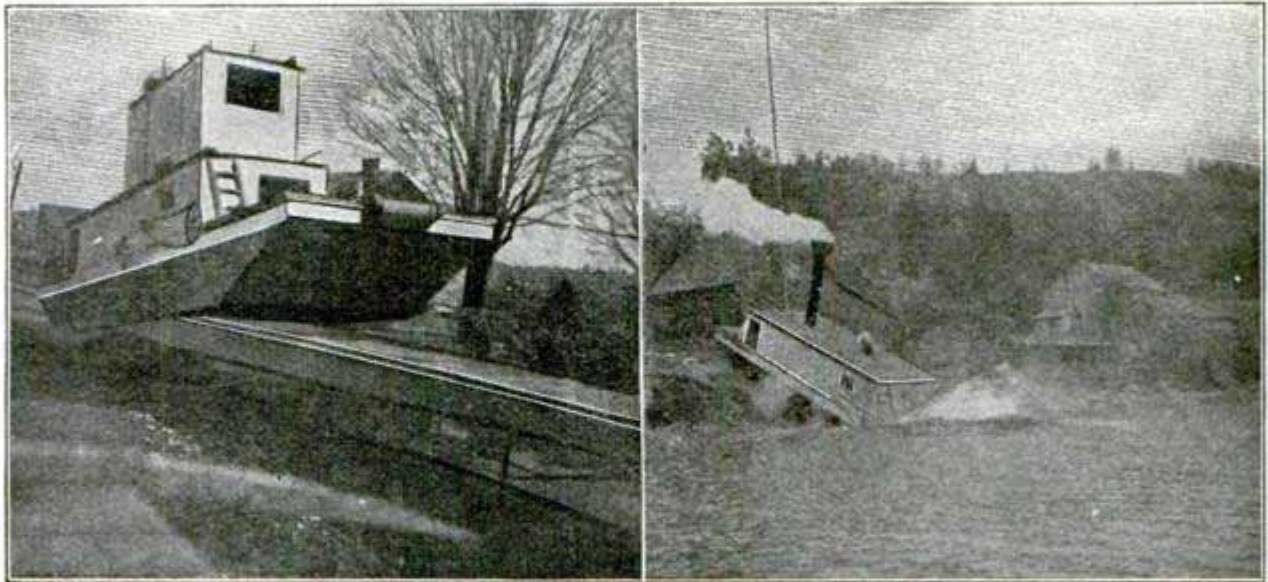
With the steadily increasing demand for American made ice cream en route to and from the Orient, an industry has sprung up in California which furnishes to nearly all the ships of the trans-Pacific lines ice cream in large blocks, sufficient in quantity and frozen solidity to last the entire trip to Hong-kong and back to San Francisco again.

To cater to this demand a plant has been constructed in which the ice cream is frozen without the aid of ice applied in the usual way. The substitute is cold brine which circulates around the freezing tanks after coming in contact with ammonia pipes. By this process ice cream can be turned out at the rate of a batch every eight minutes. The capacity of the plant is 1,000 gal. per day.

Two hundred and twenty-nine vessels met with disaster on the great lakes and adjacent rivers last year.



Fastnet Lighthouse: Hoisting a Stone for Setting in Position



## STEAMBOATS RUN ON LAND AND WATER

**Climb the Bank—Crawl Over Hills—Navigate Swamps—Do Many Other Remarkable Things**

Deep in the wilds of the Canadian timber lands and in a number of the northern lumber districts of the United States wonderful boats climb hills, creep through swamps and woods, traverse small streams from one lake to another, and even climb upon freight cars if long transportation is necessary.

These boats, designated as "Alligators" because of their propensities for making headway on water and land alike, are warping tugs, remarkable in construction, usefulness, and power. Practically a steamboat and steam winch combined, the engine can be thrown in gear to drive the paddle wheels or twin screws, according to which of the two the boat is equipped with, or drive a cable drum which holds a mile of  $\frac{5}{8}$ -in. steel cable used for warping and crossing portages.

At the end of a water journey the cable is carried to a tree some distance inland and at one side of the path designated for the boat to pass over. Passed through a pulley-block it is carried back to the boat and run through a pulley-block at the bow. Then returned inland again it is fastened to a tree on the other side of the path and just opposite the first tree, thus making it possible for the boat to travel a

straight course without dodging the anchor trees. The engine is geared to the cable drum and the cumbersome but powerful craft commences its rock strewn journey.

No roadway is required, logs and skids being thrown a few feet apart across the pathway to keep the shoeing from grinding on the rocks. In this manner the boat can travel from one to two miles a day and take a grade of one foot in three when necessary.



Courtesy Alligator Steamboat Co.

**On Dry Land**

The hull is built scow-shaped, 45 ft. by 11 ft. over all. The bottom is constructed of 3-in. white oak plank and the sides of 6-in. pine. At intervals of 12 in. iron bolts run through from top to bottom. On the bottom two runners are placed 6 ft. apart, shod with steel. Part of the bottom and all of the bow is covered with steel boiler plate.

One of the most remarkable features of the boat is the arrangement of its boiler. Hung on an axle in the center of the boat, it is tipped forward or back by the simple working of a screw, thus keeping on a water level while going up or down hill.

Of the two styles of boats the twin screw is the latest and in many respects the best. The screws are set with a flexible joint, as shown in the illustration, and when a portage is to be made a lever raises them clear of obstructions. The screws are protected from floating logs by guard irons. The screw type of boat only requires 10 ft. of space in portaging or passing through floating timber, whereas the side wheel arrangement requires 16 ft. The en-

gine is 20-hp. and propels the boat six miles an hour towing a boom of 60,000 ft. of logs. The boats draw only 26 in. of water.

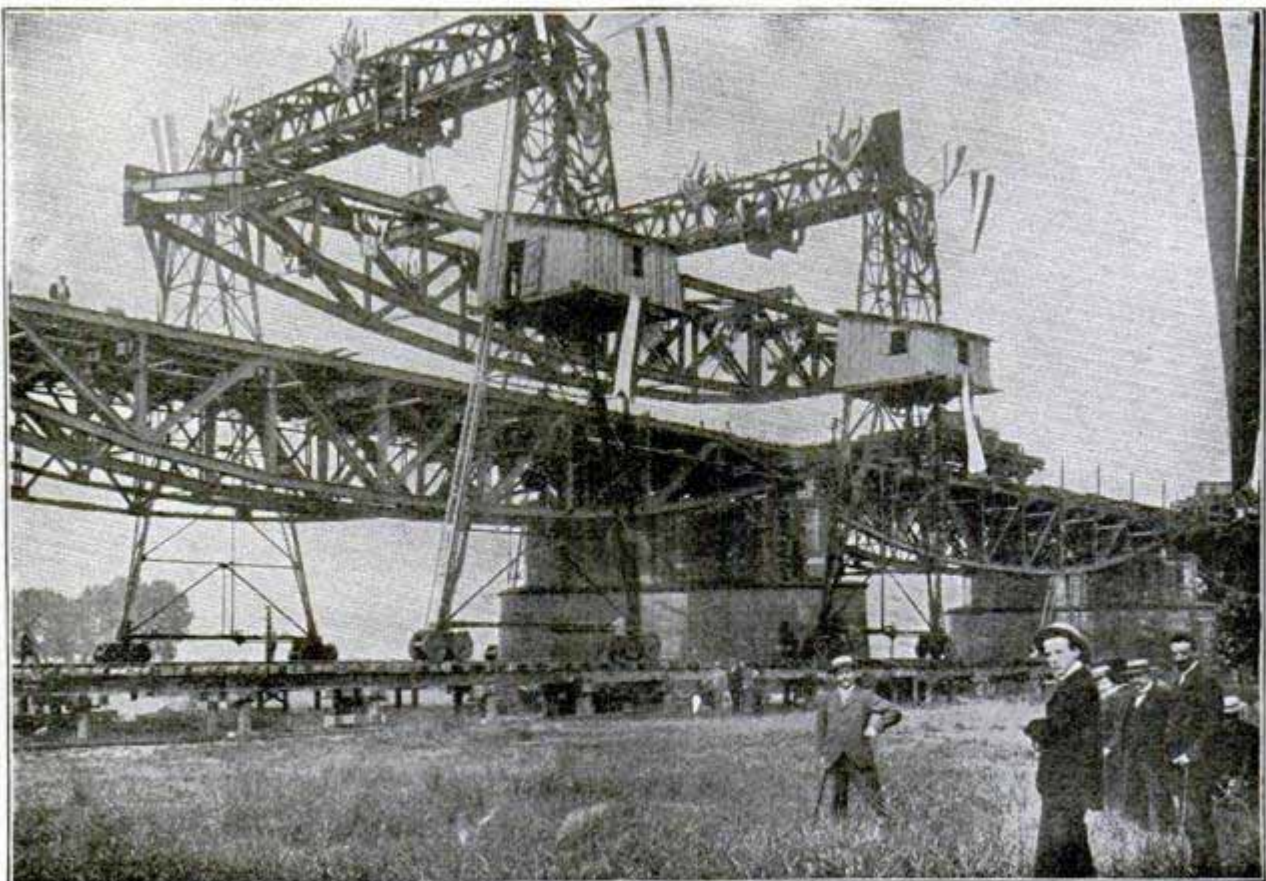
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A Cleveland inventor proposes to revolutionize the manufacture of big guns by putting the riffling, or spiral bands, the purpose of which is to give the projectile a rotary movement, upon the projectile itself instead of on the interior surface of the guns.

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### BIG CRANE FOR BRIDGE WORK

In the reconstruction of the old railroad bridge across the Rhine at Mayence, Germany, a double track was built on the lowlands on each side of the abutments and an overhead traveling crane with four supporting legs, as shown in the illustration, was used in placing the new spans. Two of the three main river spans are 350 ft. long and the third 300 ft. On each side of the river are shorter spans, mounted on short massive stone abutments.



Reconstruction of Old Railway Bridge Across Rhine at Mayence



## SHIP LARGER THAN "LUSITANIA"

Work will soon be commenced on a new ocean liner for the Hamburg-American line, which will be larger by 5,000 tons than the "Lusitania" and her sister ship, the "Mauretania." The plans, which have already been turned over to one of the great shipbuilding companies at Belfast, Ireland, call for a 50,000-ton vessel, 800 ft. long. No attempt will be made to build the ship for a speed greater than 21 miles an hour, as the directors of the line believe the maximum of comfort is the most desired by the majority of ocean travelers.

The "Europa," the name the new ship will bear, will be the first huge ocean liner to be equipped with both reciprocating engines and turbines. Both styles of engines will be used for steaming ahead and the reciprocating engines will alone furnish the power for running astern, as the turbines cannot be reversed.

Besides the general arrangements for the comforts and pleasures of the passengers a tennis court will be provided. The new ship will be ready for service in 1910.

## PORTABLE STEEL FAN

A portable fan, with kerosene oil as a motive power, has been introduced in Bombay by a German inventor. The



new fan is propelled by a small vertical steam engine fed by a kerosene lamp, and is particularly available in places where there is no electric current distribution. The outfit is about the size of a small coal stove with an ordinary electric fan on the top of it. The contrivance is regarded as convenient, economical and safe, and its compact-

ness makes transportation easy. The cost of operation for 24 hours is said to be only 2 cents. The retail price of the fan complete in India is \$61.

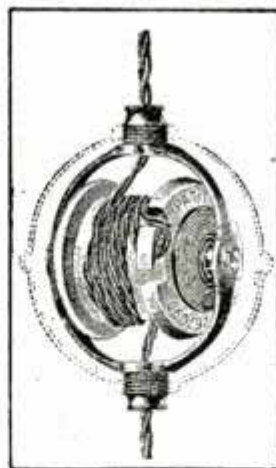
## NEW WAY TO BOIL EGGS

An egg cup in which the eggs are boiled as well as served, one of the best features of which is the certainty of the freshness of the eggs, has come into use in many households. The patent cup is made of china and fitted with a solid German silver screw top. From one to three eggs are broken into the cup, submerged in water, and allowed to boil a minute or two longer than is customary in the shell.

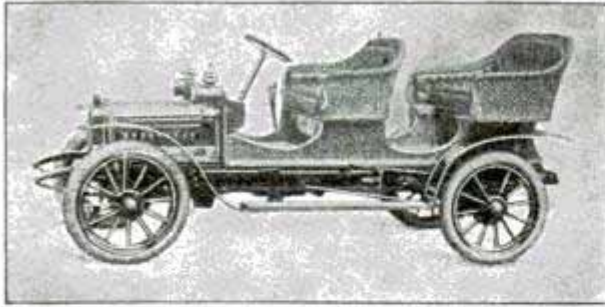


## ADJUSTABLE PENDANT FOR DROP LIGHT

An interesting device in the shape of a patent cord absorber for electric light fittings has been placed on the market, an improvement on the ordinary adjustable pendant fitted with a counter weight. The device consists of a porcelain reel with a clock spring inside which winds up the cord. Several sizes are made to suit fittings of less than a pound up to 10 lb. The device is inclosed in a metal ball.



Statistics compiled by the Interstate Commerce Commission for the year 1906 show that 1,521,355 persons were employed by the railroads in the United States. The total wage paid was \$900,801,653. The number of railroad corporations was 2,313 and the total single mileage 224,363.

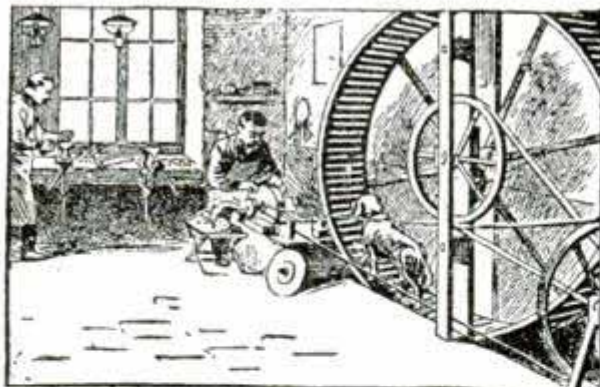


**RATTAN FOR AUTO-BODY**

Rattan as a material for building automobile bodies is being used almost entirely by one manufacturer, who claims that it weighs one-third less than a similar construction of wood, is durable, and dust and water proof. The rattan is rubber lined and the leather upholstery, kept in place by patent fasteners, is easily removable for washing.

**DOGS TURN WHEELS OF COMMERCE**

In this great era of gas and electricity, harnessed to drive the wheels of commerce, the time when beasts of burden generated motive power on wheel or tread-mill has almost been forgot-



*Courtesy Sporting Goods Dealer*

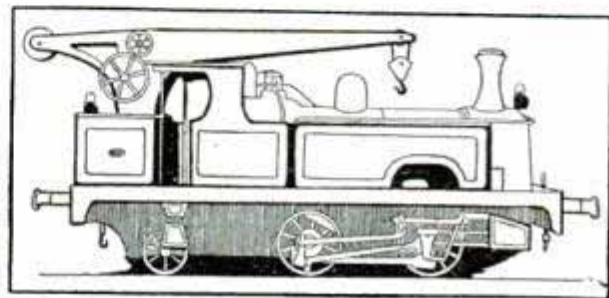
**Still Used in France**

ten as a make-shift of the past. And yet in many parts of the world, not so very remote from the centers of civil-

ization, electricity for motive power in small shops is still of the future. In Thiers, the Sheffield of France, numbers of ancient, grimy two and three-men shops still depend upon dog-turned tread-wheels for motive power.

**LOCOMOTIVE CRANE USED IN INDIA**

The illustration shows a locomotive crane used on the Oudh and Rohilkund railroad in India. The crane has a



**Will Lift 6 Tons**

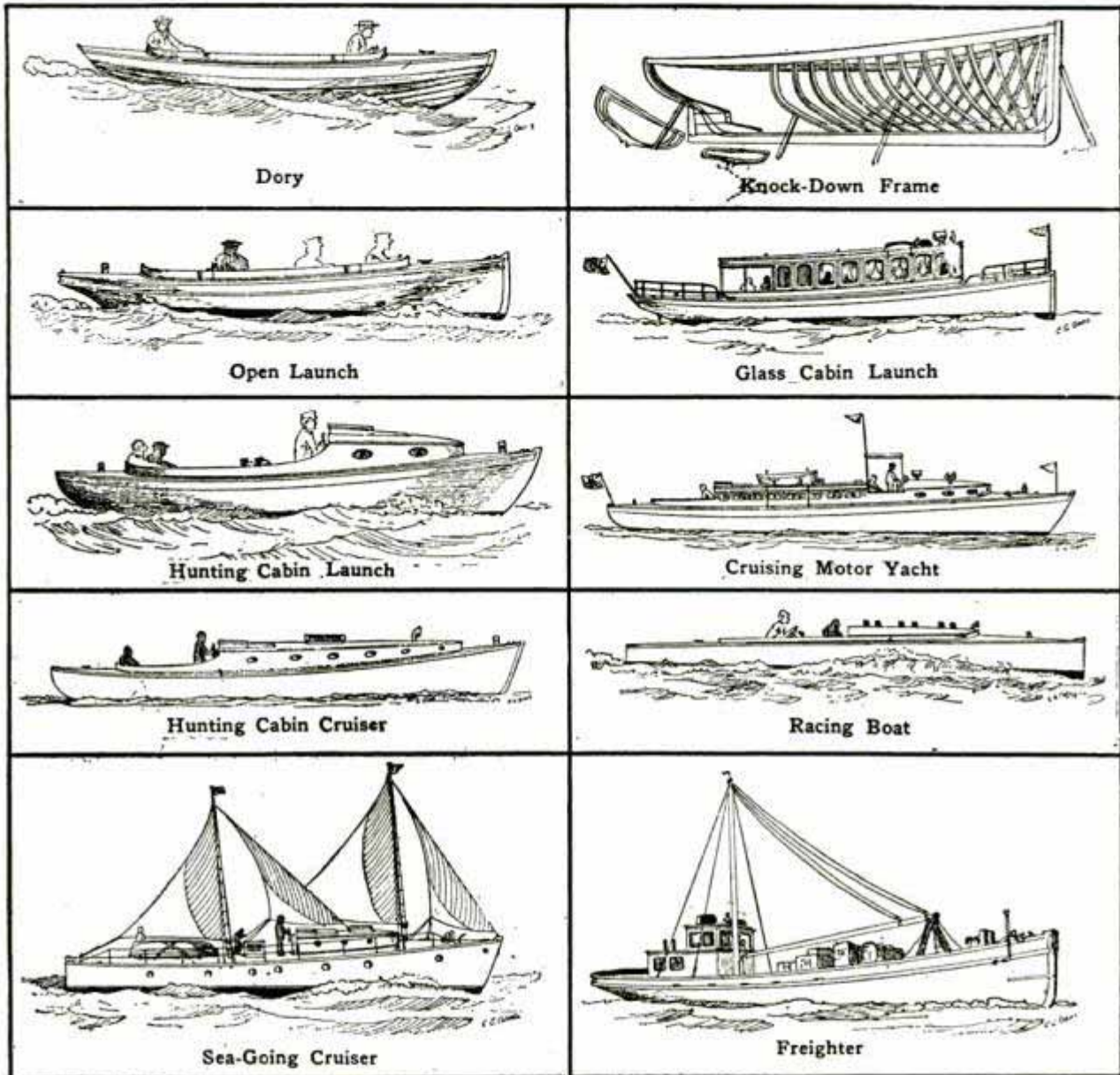
radius of 14 ft., at which it is capable of lifting 6 tons. The outfit is used both for wrecking purposes and as a portable crane for handling heavy pieces of freight at remote stations where the facilities at hand are inadequate.

**COST OF NAVIES**

Millions upon millions of dollars are shelled out of the strong boxes of the world powers every year preparing for war—conceded to be the greatest surety of peace. England still retains the lead for naval expenditure, but the United States, although its navy is barely third in size, is a close second for the year 1907. The table gives the comparative advance in naval expenditures of the powers during the past 10 years:

NAVAL EXPENDITURES.				
	1897.	1907.	Increase.	Per cent.
Britain .....	\$109,000,000	\$165,000,000	\$ 56,000,000	50
France .....	51,000,000	63,000,000	12,000,000	25
Russia .....	32,000,000	45,000,000	13,000,000	40
United States .....	31,000,000	108,000,000	77,000,000	250
Japan .....	28,000,000	42,000,000	14,000,000	50
Germany .....	22,000,000	65,000,000	43,000,000	200
Italy .....	20,000,000	28,000,000	8,000,000	40
Austria-Hungary .....	5,000,000	6,000,000	1,000,000	20
	<b>\$298,000,000</b>	<b>\$522,000,000</b>	<b>\$224,000,000</b>	<b>75</b>

## GROWTH OF THE MOTOR BOAT



Types of Motor Boats for Pleasure and Utility

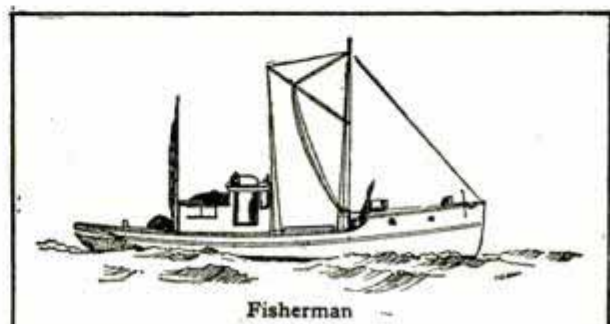
Courtesy Motor Boat

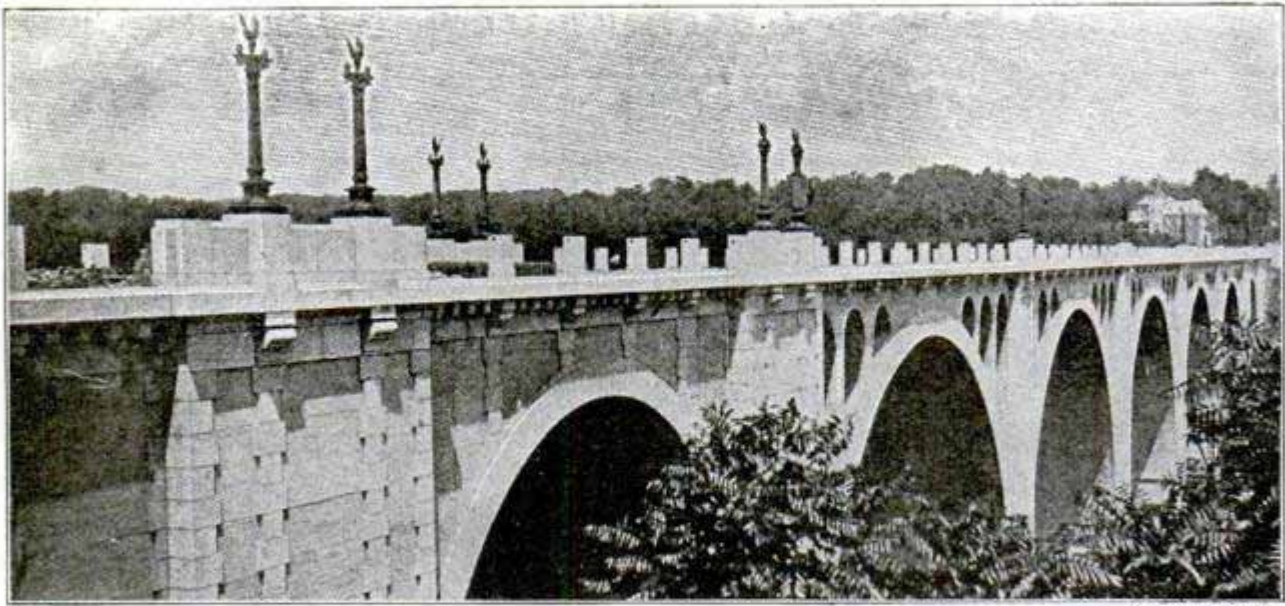
Motor boats, in endless variety of shapes and arrangements of cabins, are rapidly making their appearance on almost every stretch of water in the civilized world large enough for pleasure or profit craft. Commencing with the dory or row-boat, which is the smallest, the models advance in size until the ocean-going cruiser and river freighter are reached.

Many persons prefer to put their own boats together when they know how, and to accomplish this result several firms are making a specialty of furnishing at reasonable rates all sizes and shapes of parts of launch hulls. It is possible to buy the keel alone, or the keel and all frames bent to shape,

which is the most difficult part for the novice, or the whole craft will be built, taken apart, crated and shipped to any part of the world.

Others, more ambitious, use the paper patterns and get out all the wooden parts themselves, purchasing the iron work and power equipment.





Courtesy Cement Age

## LARGEST CONCRETE BRIDGE IN THE WORLD

The largest concrete bridge in the world, a huge structure which has attracted world-wide attention among engineers, is just nearing completion at Washington, D. C. Connecting Connecticut boulevard, one of Washington's most fashionable drives, over Rock Creek valley, this wonderful bridge is already regarded as a celebrated example of the utility of concrete.

Constructed of molded concrete blocks and monolithic concrete masonry, it is dependent upon itself for support, having no steel framing for reinforcement. At its highest point the bridge is 150 ft. above the bed of the ravine and its total length, with approaches, is 1,400 ft. Congress appropriated \$850,000 for construction of the bridge proper.

### WELLMAN'S POLAR TRIP DEFERRED A YEAR

Walter Wellman has given up the attempt to reach the North Pole by airship this year after a start in which the "America" was caught in a fierce snow storm which threw it back over a glacier at the lower end of Foul island, barely escaping destruction three times against the high, mountainous coast. The landing was effected by stopping the motor and letting the ship drift over the glacier by using the guide rope

serpent and retarder, both of which worked admirably.

When the serpent appendages had dragged their sinuous lengths up the side of the glacier the emergency valve and ripping knife were used to good effect. The descent was made upon the surface of the glacier half a mile from the sea and the attempt of the year 1907 A. D. ended.

"The fierce snow storm in which we were lost for two hours would not have hindered the expedition if our compass had not failed us," said Walter Wellman. "The ship worked beautifully and we will surely get there next year."

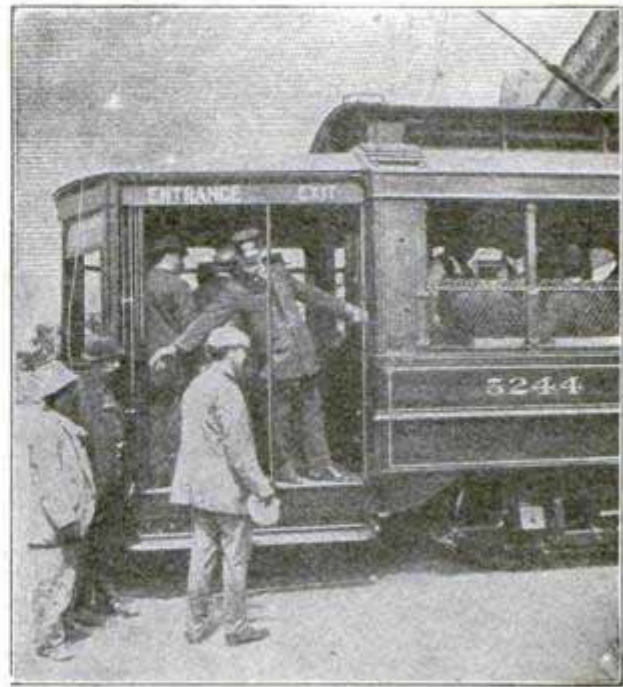


The Big Canvas Balloon Shed

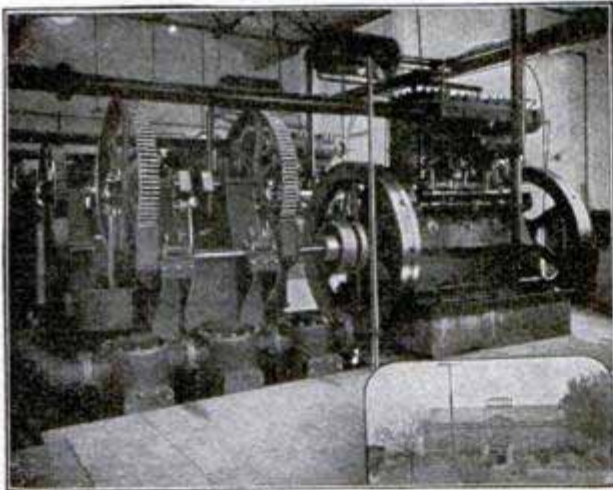
## HIGH PRESSURE FIRE SYSTEM

The first real test of the new high pressure salt water system for fighting fires in New York was recently made at Coney Island when a big fire, fiercely fed on sham houses, papier maché and other combustible material, was effectually checked in 90 minutes. Without the aid of this system Coney Island would have been totally wiped out.

The system is nothing more or less than pumping plants which supply salt water from the nearest source at an immense pressure to the hydrants they feed, two minutes after the alarm of fire is turned in. The alarm resounds at the pumping plant the same moment it is received by the fire department. An electric switch is thrown which ig-



The latest idea in collecting street car fares is to pay as you enter the car. This requires special platforms.



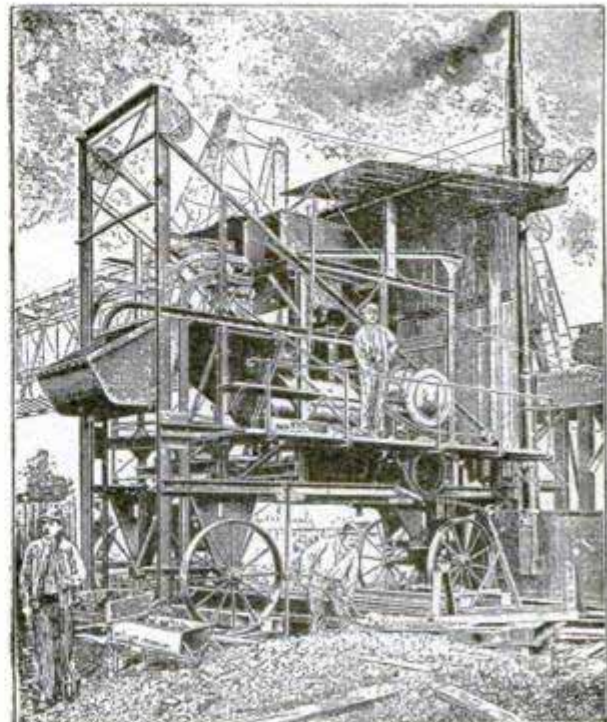
Gas Engine Pumping Plant

nites the gas standing in the cylinders of the engines and a moment later 1,500 gal. of water a minute from each pump is being forced to hydrants at a pressure of 150 lb.

The station at Coney Island has three pumps, operated by internal combustion gas engines. A waste pipe carried the surplus pressure into Coney Island creek. The pressure is so great that six men are necessary to hold the nozzles. Each high pressure hydrant provides three hose connections and by an arrangement called "Siamese couplings" three lines of hose can be attached to each connection, making nine high pressure streams of water from each hydrant.

## MACHINE WHICH SIMPLIFIES MIXING OF CONCRETE

A machine is now in operation in France which makes possible the mixing of "beton," a kind of concrete, by one operation instead of the two before necessary. This concrete is a combination of cement, sand or gravel, and flint. The great essential has been the

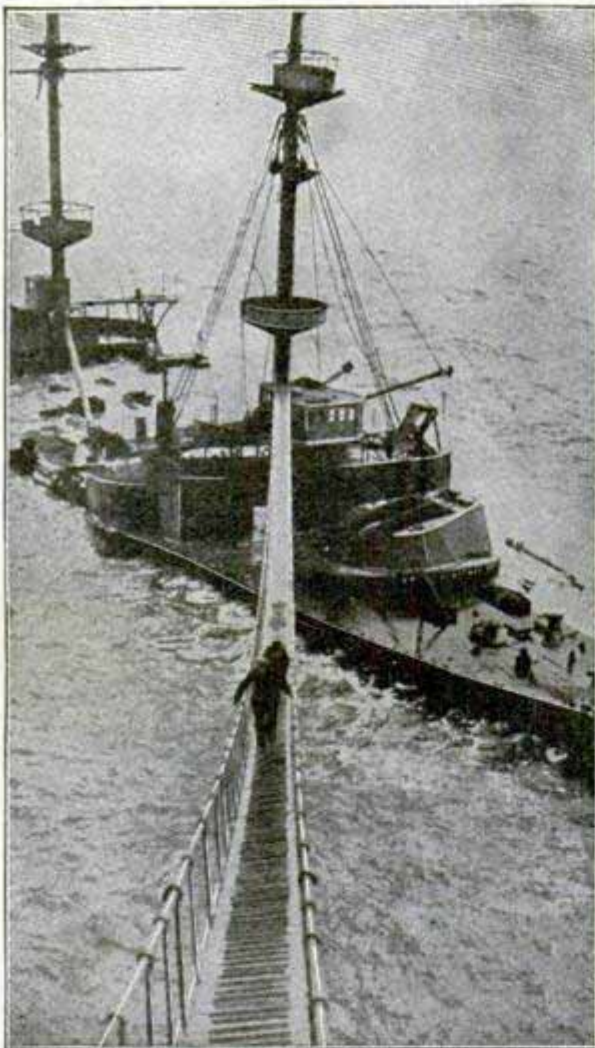


French Concrete Mixer

mixing of the three ingredients as perfectly as possible according to the force of resistance wished. Formerly it was necessary to do this in two stages. The actual mixer is a horizontal cylinder, which with a drum rotates at a speed of 40 r. p. m., mixing the cement, gravel and flint in the desired proportions.

### PICKING THE BONES OF A WARSHIP

An aerial footway, 1,500 ft. long, has been stretched from the cliffs on Lundy island to the chart house of the British barque "Montague," cast away in a storm last year, for the purpose of



The Footway is 1,500 Ft. Long

picking from the bones of the ill-fated warship all that remains of value. Piece by piece the carcass will be reclaimed from the sea and transported by this footway to the shore.



An attempt to reach the South Pole by automobile and Siberian ponies is being made by Lieutenant Shackleton, who sailed for the Antarctic in July. The car to be used was constructed to withstand the extreme cold and provided with three different sets of wheels for use on surface of varying softness. The car will be operated by a spirit composition, which is expected to work satisfactorily in very low temperatures. Siberian ponies, also an experiment, are to be used jointly with the automobile.

### BIG BUCK ELECTROCUTED

Robbed of the sport of bringing down their own game by the onward rush of progress, and then robbed of the game itself by the onward and upward rush of the game warden, six hunters in the Santa Cruz mountains returned from a day of sport recently with a hard-luck story of the hardest kind.

A mighty buck, brought to bay by the dogs in a narrow rift between the mountains, attempted to jump across. The wires of an electric company, charged with 60,000 volts, blocked the way and the deer became entangled, meeting instant death. Two of the dogs leaped toward the deer and coming in contact with the wires were also instantly electrocuted.

The hunters and the game warden arrived on the scene at the same time. As the game laws of the state prohibit

## PERILOUS WORK IN MID-AIR



From stereograph, Copyright 1907, Underwood & Underwood, New York

Hanging one of the diagonal braces of Blackwell's Island bridge, now under construction. The view affords a good idea of the perilous character of much of the work. The man on the brace is enjoying a ride 200 ft. above East river, with the splendid panorama of New York city and suburbs unfurled before him.

hunting deer with dogs the hunters were promptly arrested and compelled to pay a heavy fine. Worst of all, the game was confiscated, after the current was shut off.

A Grand Trunk freight train was wrecked on the lower steel arch bridge over Niagara gorge in August. Four cars dropped into the whirlpool rapids and the bridge was damaged.



### ENGLISH HOTEL AUTO-BUS

The leading hotels in England and on the continent are putting in service large motor buses to meet trains. The one illustrated is of the single deck type and runs between Cardigan and Newcastle Emlyn, Wales, meeting the trains of the Great Western railway.

### SEA BEACH ON OCEAN LINERS

A sand pit has been provided on one of the Canadian trans-Atlantic liners for the amusement of the children of emigrants on board. In rough weather the children have the pleasure of being tumbled about in the sand, where formerly they were compelled to stay



Sand Bank in Mid-Ocean

quiet for fear of being bumped against the hard steel decks and partitions of the ship.

### CONCRETE-STEEL TIES

Laid on ordinary ballast and bed on one road, and on a concrete bed on another, a type of concrete-steel tie which gives promise of solving the tie problem, is now being subjected to the test



"A 'Tie' Consists of Two Blocks of Concrete"

of heavy traffic. Test ties placed on a stretch of the Chicago & Alton road on ordinary ballast, nearly two years ago, have maintained its line, gauge and surface during the entire time.

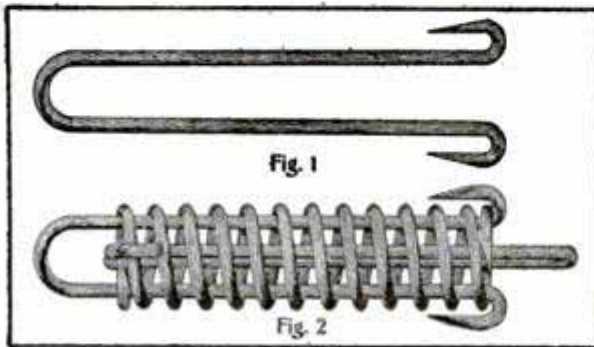
The tie consists of two blocks of concrete, moulded on the ends of a pair of 3-inch 3-pound steel channels, which are spaced 2 in. apart. On top of the concrete-steel ties hardwood blocks, designed to cushion shocks, are secured with cast-iron sockets molded into the concrete. These distribute the pressure and serve as spiking blocks, ordinary spikes being used. The cost of the tie when manufactured in large quantities is estimated at \$1.30.



# SHOP NOTES

## Home-Made Draft Spring

A draft spring for use on the evener or tongue of agricultural implements, to relieve the jerk on the horses' shoulders, may be made from any old

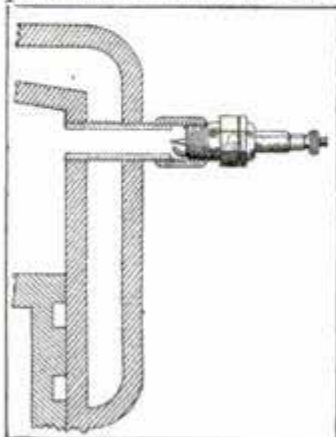


Draft Spring

corn plow or machinery spring. Two loops are formed as shown in Fig. 1 from  $\frac{3}{8}$ -in. round iron. Insert one loop from each end of the spring as in Fig. 2. The clevis or pulling trace may be fastened in either end.

## Hot Tube Ignition Changed to Electric

Gas and gasoline engines are now made to use battery ignition as well as the hot tube, but some one may have an old style engine that is only provided with a hot tube. The accom-



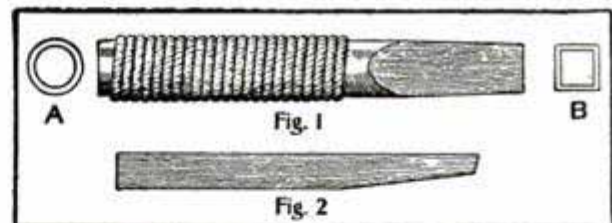
panying sketch shows how a correspondent in The American Blacksmith fixed up an old engine of this kind. A  $\frac{3}{4}$ -in. hole was drilled through the water jacket into the ignition chamber and a  $\frac{1}{2}$ -in. pipe screwed into this hole. As  $\frac{1}{2}$ -in. pipe is seven-eighths of an inch on the outside a  $\frac{3}{8}$ -in. top was used

to cut the threads. A jump spark plug was screwed into a coupling and this coupling turned on the projecting pipe. This will give about  $2\frac{1}{2}$  in. to compress the gas to the spark. A good jump spark coil, with a vibrator in connection with the battery, was used. As this requires a circuit to make the spark, one wire must be insulated from the engine so that it will come in contact at the right time, and the other fastened to the engine. Attach the insulated wire in such a way that it will come in contact with the exhaust cam just at the compression.

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## Handle for Hand Turning Tools

The handle, A, Fig. 1, is made from a piece of steel tube about 7 in. long and  $\frac{1}{2}$  in. in diameter. With a few blows of the hammer form the tube



Handy Tool Handle

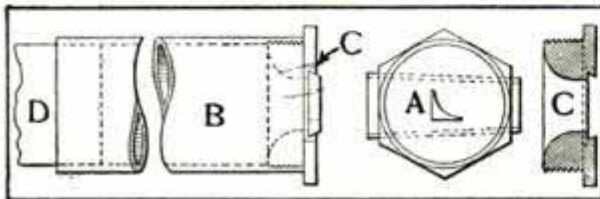
at one end into a square as shown in B. The tools (Fig. 2) are formed by grinding, and are made from  $\frac{5}{16}$ -in. tool steel. It will be found that the tool will fit securely in the handle when the latter is brought down quickly in a vertical position on an anvil or any solid piece of iron. This causes the angles at the base of the tool to jam into the circular part of the tubular handle. When it is required to release the tool, insert a small rod into the handle and strike the rod with a hammer. The tube may be wound with whipcord so as to increase the grip and to avoid handling the bare steel.



"Bramble Border—From the London Decorator"

### A Tool for Shaping Wax Fillets

In the cut is shown a wax fillet tool that shapes the wax to a correct fillet instead of round as the usual way, says

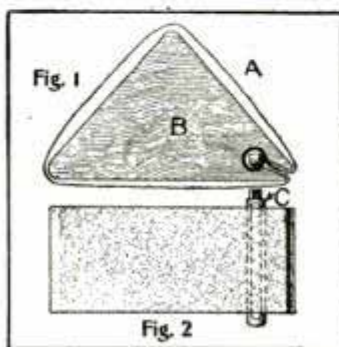


Makes Desired Shape

Machinery. The brass tube, B, is  $1\frac{1}{4}$  in. by 8 in., threaded at one end to receive a brass plug, C. This plug has a dovetail cut in it as shown. In this dovetail may be fitted brass plates, as many as are required for the various sizes of fillets. These plates are cut out as shown at A. By placing the brass fillet plate required in the brass plug, and heating the tube in the regular way, a much better fillet is made than with the round wax. A wood plunger, D, is used to push the wax in the tube through the hole in the brass plate.

### Sandpaper Block

Cut a block of wood triangular as shown at B, Fig. 1, with sides about 3 in. in length, making the corners slightly round. Bore a hole in the block B



and cut a slot leading from the hole to a corner of the block. This slot must be wide enough to admit two sheets of sandpaper. Into the

hole that is bored fit a key, C, Fig. 2, made of steel with a slot cut in it the full width of the block. The sandpaper, A, is passed around the block and both ends inserted in the slot of the block and the slot of the key. Turning the key will make the sandpaper tight around the block.—Contributed by S. C. Bunker, West Orange, N. J.

### Removing Stains From Marble

Blood stains may be removed by brushing with alabaster dust and distilled water, then bleaching with chlorine solution.

Iron mold or ink spots may be taken out in the following manner: Take  $\frac{1}{2}$  oz. butter of antimony and 1 oz. oxalic acid; dissolve them in 1 pt. rain water; add enough flour to bring the mixture to a proper consistency. Lay it evenly on the stained part with a brush, and, after it has remained for a few days, wash it off and repeat the process, if the stain is not wholly removed.

To remove oil stains apply common clay saturated with benzine. If the grease has remained in long the polish will be injured, but the stain will be removed.

The following method for removing rust from iron depends upon the solubility of the sulphide of iron in a solution of cyanide of potassium. Make clay into a thin paste with ammonium sulphide, and smear the rust spot with the mixture, being careful to just cover the spot. After ten minutes wash off this paste and replace by one consisting of white bole mixed with a solution of potassium cyanide (1 to 4). After about  $2\frac{1}{2}$  hours wash this off, also.

Should a reddish spot remain after washing off the first paste, a second layer may be applied for about five minutes.

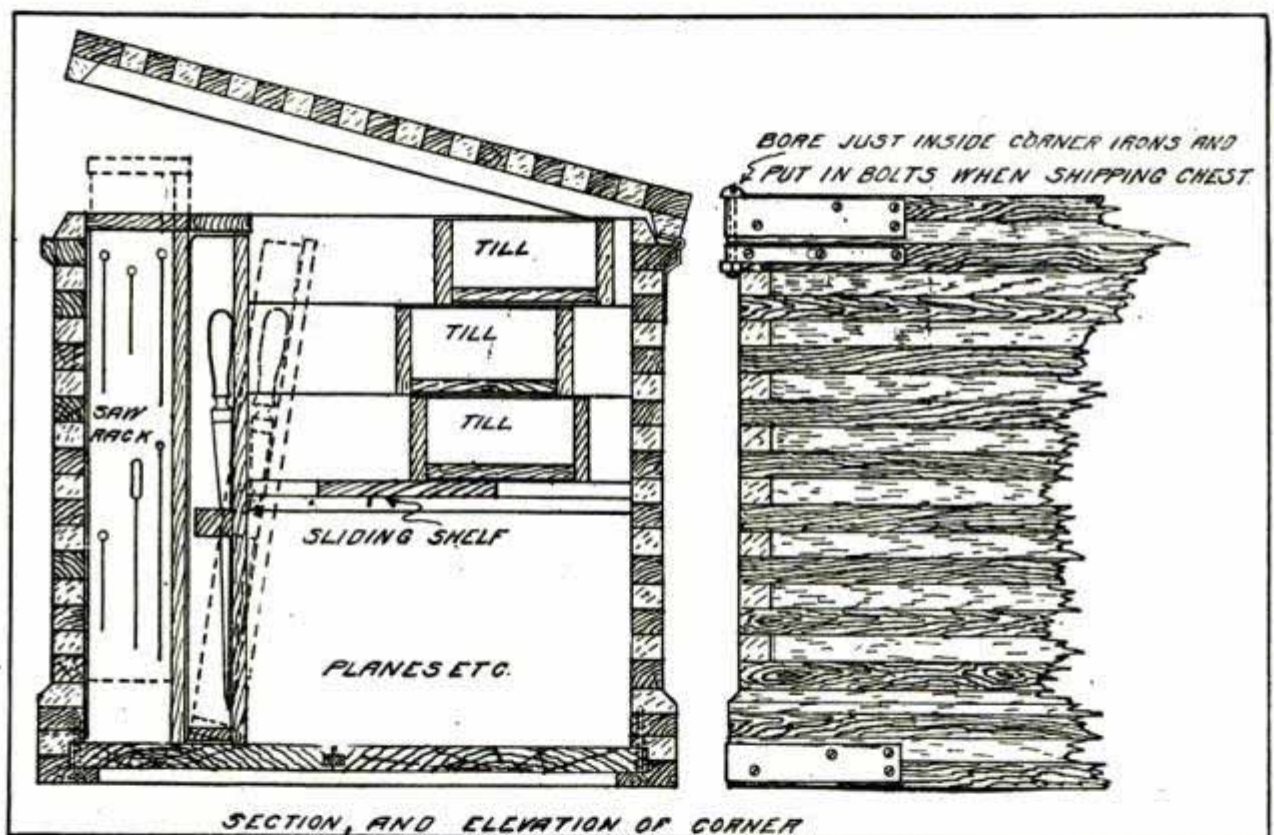
### Etching Zinc

Nitric acid will etch zinc. It will depend upon the kind of work as to the strength of the acid. Nitric acid must be diluted about one-half with water, and for some kinds of work will require more than this amount of water. Parts of the zinc that are not to be etched with the acid can be covered with asphaltum. Fine work must

### How to Make a Carpenter's Tool Chest

The chest is made of cherry and maple strips. The arrangement may be made to suit the tools the builder may possess. The size of the chest illustrated is 18 in. square and 32 in. long inside. This length is sufficient to take in squares and saws. The saw rack resembles a drawer sliding vertically, the saws sliding through kerfs in the pieces which correspond to the sides of the drawer.

The swinging chisel rack is 1 $\frac{3}{4}$  in. shorter than the inside of the chest to

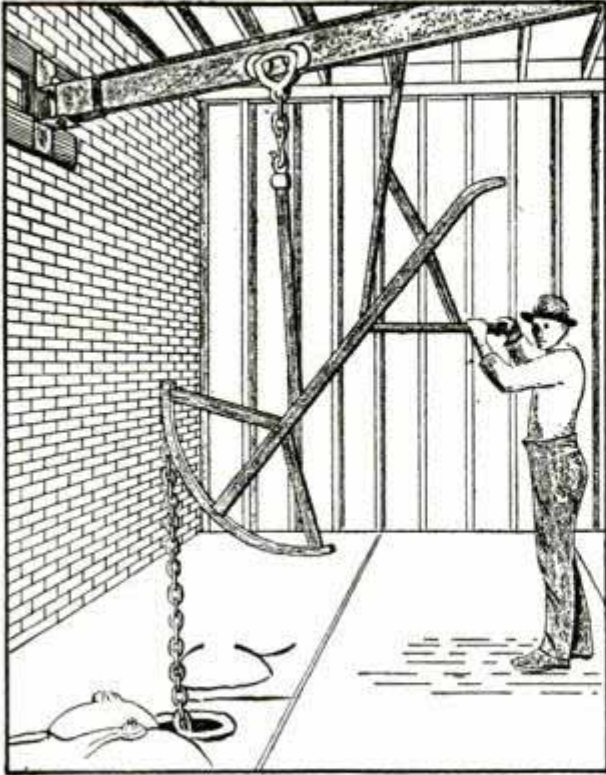


Details of Carpenter's Tool Chest

be done with a pen or brush using printers' ink diluted with benzine. The ink must be made thin enough to flow from a pen. While the ink is still wet, sift powdered dragon's blood on the zinc. Remove the surplus dragon's blood by turning the zinc over and shaking it. Dry the ink and dragon's blood by slightly heating it over a flame. The acid will then etch the parts uncovered. When the etching is complete wash the zinc to clean it from the acid and remove the ink or asphaltum by using alcohol.

allow it to swing out past the till runs, as shown by the dotted lines.

The sliding shelf below the tills forms a compartment, when the tills are pushed to one side, in which to put clothes and loose tools. The elevation of the outside corner shows the iron corner bands, also how a bolt may be put through each corner to take the strain from the lock and hinges when shipping. The construction of this chest makes it so that each class of tools has a place and all are protected from injury.



G. Arroyo Copper and Brass

First Wall Crane Ever Built for Brass Foundry

### Silver Plating without a Battery

Dissolve eight silver quarters (money) or silver of equivalent amount in two ounces of nitric acid (strong), and to this add 4 oz. of common salt dissolved in as little water as possible. A heavy precipitate is silver chloride. Decant the liquid, add more salt solution to see if all the silver has been taken out. Wash the silver chloride precipitate with water and then dissolve it in a solution composed of 2 oz. potassium cyanide and 3 oz. sodium hyposulphate in 6 oz. of water. Filter the solution, if necessary, and make up to 2 qt. with pure rain water. You may, by the aid of this mixture, plate all sorts of things as watch chains, rings, medals, watches, ornaments, steel, iron and german silver articles as spoons, spectacles, etc. Hang the article to be plated in the solution suspended by a strip of lead or immerse the articles and boil them for ten to twenty minutes, according to the thickness of the plating desired. The articles to be plated must be free from grease, fat and dirt and by this method take a durable and handsome silver plating.

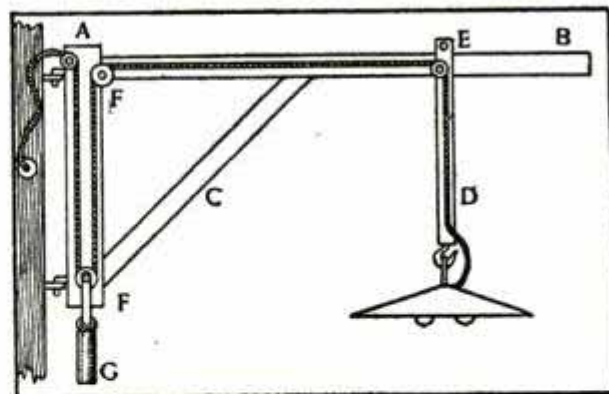
### Temporary Wagon Wheel Nut

To keep a wagon wheel on the spindle after losing the nut is quite a thing to accomplish. Try wrapping heavy twine on the thread, pulling it tight in the winding, and greasing it well. It will be a surprise the distance that can be traveled without the wheel coming off from the axle.—Contributed by Leonard Graper, Greeley, Colo.

### An Adjustable and Portable Electric Light Bracket

The use of an electric light over the bench always requires some little time to adjust and find something to hang the cord over to get the globe in the right place. A small light bracket or crane, constructed as shown in the sketch, will make a handy device to bring the electric globe in proper position quickly.

Cut a piece of wood, A, 2 by 4 in., 4 ft. long, and attach to it a horizontal piece of wood, B, 1½ in. by 2 in., of any length desired, braced with a piece of the same material, C. Bend a ½ in. by 1 in. band iron, D, in the shape of a U and drill a hole in the ends at E and



Adjustable Bracket

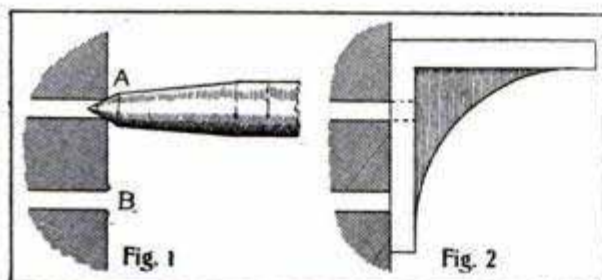
insert a roller that is just a little longer than the wood B is wide. At the other end, or the bottom end of the U band iron, fasten a hook or eye, to which is attached an adjustable cord connecting the lamp holder and shade. The points marked F are pulleys over which the flexible electric wire moves to take up the slack by the weight, G.

The piece of wood, A, is provided with two hinge hooks to hook into screw eyes that may be fastened in any convenient place on the wall or post near a vise or machine. A plug and a sufficient length of flexible wire will connect it to any near-by electric light socket.

The U-shaped band iron can be moved back and forth on the wood, B, and the bracket swung around in a semi-circle, giving access to different positions of the electric globe.

### Locating Holes to be Drilled in a New Casting

In fitting a new casting on a machine it is not an easy matter to locate the holes to be drilled. If a large center punch or a round staking tool



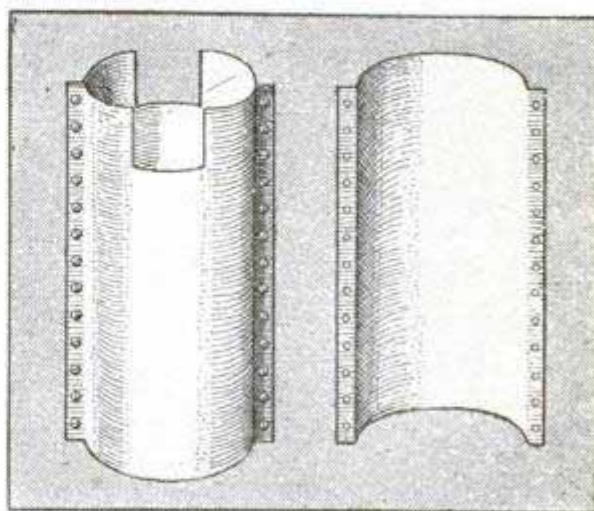
Locating Holes in a Casting

be driven in the holes as shown in sketch at A, Fig. 1, it will make a small ridge around the hole as shown in B. Take the new casting and chalk the side that is to be fitted to the machine. Place this chalked side at the proper place against the holes (Fig. 2) that have been rigged by the punch and strike the casting lightly with a hammer. This will make a small ring where the hole is to be drilled which can be centered with the dividers.

### Metal Forms for Round Concrete Columns

Every cement contractor has encountered the difficulty of making wooden forms for circular concrete columns. The trouble may be overcome by using sheet metal, which gives a mold more handy than the old wooden type, and which is slightly less in cost.

Use two sheets of No. 16 gauge plate and bend each to a semi-circle of a radius equal to that of the column. Flange the two side edges about an inch and a quarter, and drill holes in these



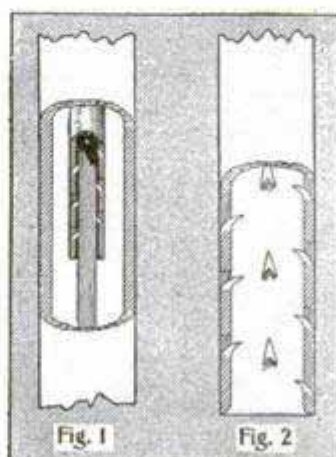
Concrete Molds for Pillars

at intervals of about  $2\frac{1}{2}$  in. The two sheets can then be placed together and secured by fillister head bolts.

Holes are cut at the top to accommodate the various wooden floor beam forms. The inside of the sheet iron should be coated with oil to facilitate its removal after the concrete has set. Immediately after pouring the concrete the form should be braced by timbers to the floor, which will prevent the column from bulging or assuming an elliptical shape.

### Removing a Broken Pump Rod

The bottom part of the broken pump rod is always hard to remove, and especially so if it is in a tubular well.



trisagular notches as shown in Fig. 2.

A tool for pulling this broken part out of the well can be made from a piece of gas pipe  $1\frac{1}{4}$  in. in diameter. Place the gas pipe over a piece of shafting that will almost fill it and with a cold chisel cut

Bend the points out by driving the chisel under them. File the points sharp and drive them in with a punch. This will give them the position as shown in Fig. 2. Enough pipe can be attached to this pronged piece to make it reach the broken pump rod. Drive the pipe over the rod as shown in Fig. 1, and it is ready to be pulled out.

## How to Make a Handy Wire Reel

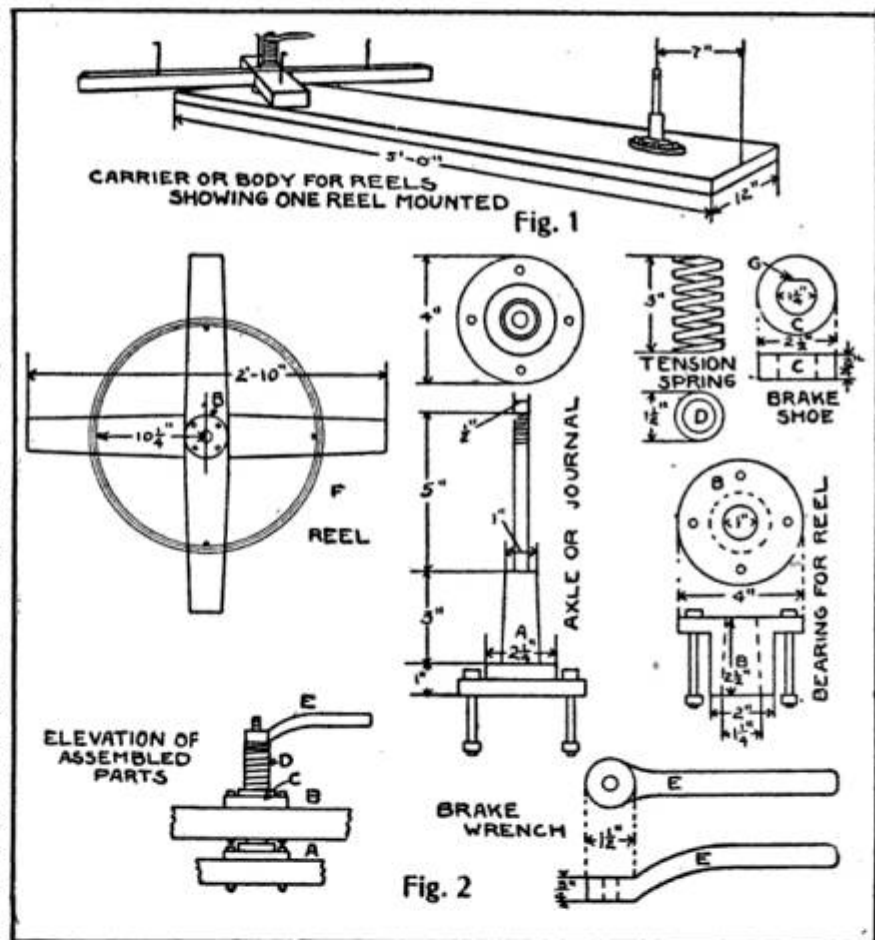
Costs from \$5 to \$8

When an exchange manager has occasion to do some line work at a distance from the central office and the amount of material necessary for the job does not warrant using the time of the entire construction gang and the heavy double-team construction wagon, a small light pair of reels can be conveniently used. These can be economically constructed by anyone who has a little mechanical skill. Fig. 1 shows the completed stand with one of the pair of reels mounted thereon.

To an oak plank, 2 in. thick by 12 in. wide and 5 ft. long, a tapered axle or journal of cast iron—A, Fig. 2—is fastened 7 in. from each end. The reel is made from the same kind of wood, although any hard wood will do for either, by mortising two pieces 2 in. thick by 4 in. wide and 34 in. long and bolting them together with bolts through the bearing casting, B. The hole in the casting B is made tapering to fit the tapering part of the journal, A. The brake shoe, is also made tapering with a flat interior side, G, which fits against a corresponding plane surface on the journal and prevents its turning with the reel. The spiral spring, D,

and the adjusting nut, E, complete the parts necessary, aside from the spreaders which are made of double end bolts bent over and fastened through holes bored in the reel arms. The customary guard is put on the reel to strengthen the arms and prevent the wire catching under them, but is not absolutely necessary.

The material which enters into this construction may all be secured locally at a low figure. When put together as described it makes a strong, light reel with a good bearing that will insure smooth running and good wearing qualities. This outfit weighs and costs only as much as one of the ordinary



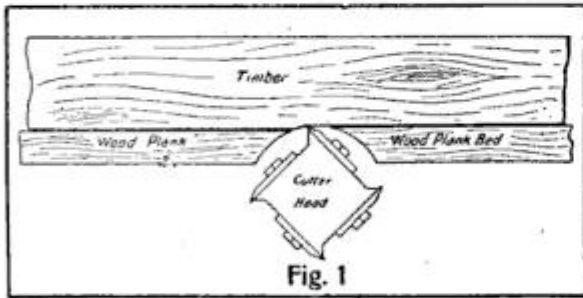
Parts of Home-Made Reel

pay-out reels, says The American Telephone Journal. The cost will run from five to eight dollars, according to the skill of the maker and the proximity of a foundry or a machine shop.

When stringing wire it can be easily fastened to the wagon box, or if put on the ground will not tip over and tangle up the coil if the wire gets caught, as often occurs with some types of reel.

## Planing Large Timbers

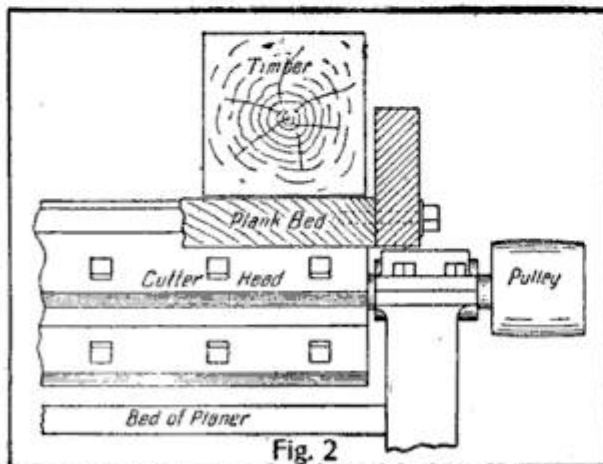
Few planing mills other than those connected with saw mills have planers that will take the timbers larger than about 8 in., yet many mills where jobbing is done, or those in connection with lumber yards, are often called upon to dress large timbers. A



small planer may be used to dress large timbers by attaching an extra bed, says the Wood-Worker.

In the accompanying sketches, Fig. 1 shows the side of a large timber being dressed, also a section of the cutterhead and the plank forming the bed on which the timber travels while being dressed. The sketch shows about all that is done to transform the planing machine temporarily into a jointer or hand planer. Fig. 2 is a view across the machine, with the end of the timber shown. It is easy to rig a temporary bed upon any planer where the feed rolls do not extend higher above the bed than the cutting circle of the head. If the tops of the rolls are above the cutting line, and cannot be lowered, they must be removed.

In view of the fact that many timbers become warped in seasoning, it is well to make the wood bed a trifle high



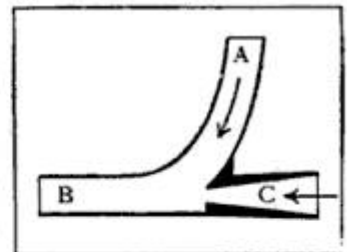
at the cutting center, in order that the hollow side of the timbers can be dressed without cutting off the ends to get at the hollow part, as would be the case if the timbers were passed over a regular jointing machine.

The top rolls on the planer can in many instances be so raised that the timber rests upon them, and they act as the feedworks for moving the stock over the cutters. Another good way to move very heavy timbers over the cutters without too much hand labor is to have a rope with a loop or hook to catch the timber, a pulley to pass the rope over, and use the feed rolls as a capstan. The plank bed can be well made, and in most instances put in place in a short time, and when the work is done, set aside for future use.

## Under-Water Exhaust for Motor Boats

To muffle the exhaust from a motor boat engine it is better to lead the discharge horizontally from the stern than to point it directly down, which causes back pressure. The plan illustrated in Amateur Work is a good one, and is made of bent pipe. The exhaust from the engine enters at A and passes down and out into the wake at B. Movement of the discharge is facilitated by the enlarged mouth, C, which faces forward, the water moving from C to E and out, thus causing a partial vacuum at A. In the case of small engines it is better to exhaust into the air until the boat is under fair headway.

On the subject of under-water exhaust the Motor Boat says: If the exhaust pipe be carried direct from the motor through the hull below the water line, without the use of a muffler or expansion chamber, and the pipe opens out flush with the outer skin of the boat, the resultant action of the exhaust is somewhat similar to the fa-



miliar phenomenon of the gun barrel bursting when the muzzle of the gun has been obstructed in some way. The gun barrel does not burst because the obstruction at the muzzle is held there with strength sufficient to withstand the force of the explosion but because the pressure on the gun barrel in the vicinity of the exploding charge becomes great enough to rend it before this pressure can be communicated through the medium of the air to the slight obstruction at the muzzle, and so displace it. In the same way, when the exhaust valve begins to lift, the pressure of the water at the outer mouth of the exhaust pipe is much less than the pressure of the outgoing charge of burnt gas, but this sudden explosive discharge through the valve does not have time to communicate its full pressure to the lower resistance of the water, and it spends its force in the immediate vicinity of the valve, most of it working back against the piston on its upward exhaust stroke. In other words, this explosive discharge, like most other explosive phenomena, does not seek the path of least resistance at the moment of discharge but spends its force on the nearest resisting media.

**Turning on a Planer**

A certain large fly wheel that was broken had to be turned in order to shrink a band on the hub. The shop did not have a lathe that would take the wheel in the swing, and it was decided to do the work on a planer, says a correspondent in American Machinist. A flange bushing, B, was bolted to the planer table C, and the fly wheel placed on this bushing. The fly wheel was driven, by means of a quarter-turn belt, from a pulley, D, placed on a piece of shafting in a lathe set in front of the planer. An extension planer,

tool, E, was used so as to reach out to the center of the fly wheel. The cut was set with the cross feed, and the down feed was worked by hand.

**How to Make a Cement Coping**

In the sketch Fig. 1 shows how to construct a form to make a cement coping on brick walls. Use two 6-in. boards, AA, and nail on a 1 by 2-in.

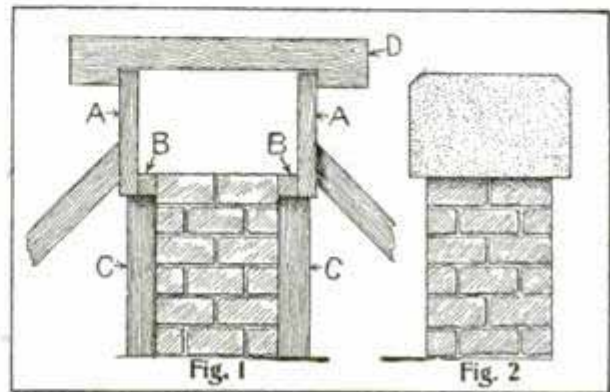
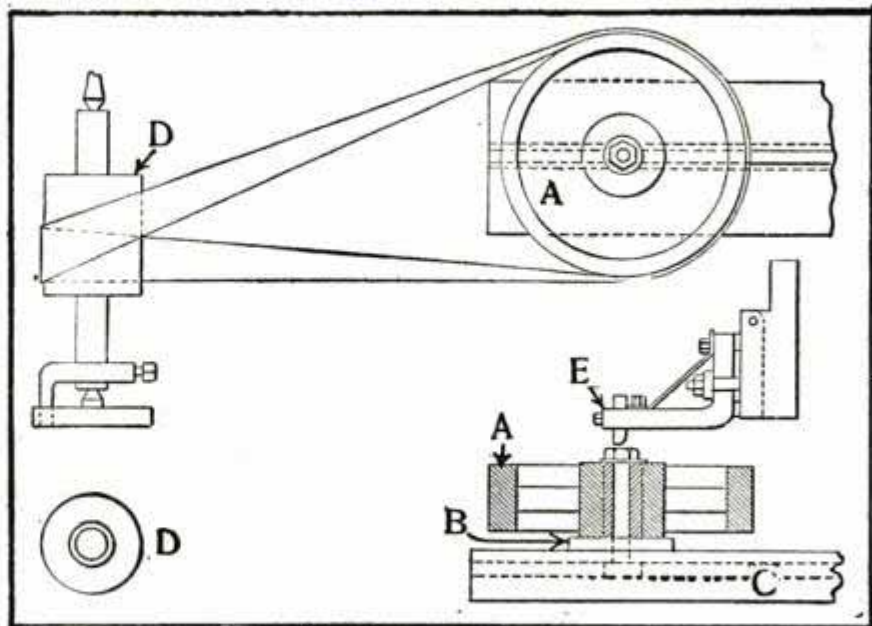


Fig. 1--Form

Fig. 2--Cast

strip, BB, on the bottom of each to form the projection of the stone. The strips may be of any width to show the thickness of the stone desired, but 4 in. thick is about right for 8 and 12-in. brick walls. Under the side boards put strips, CC, perpendicular to the ground, to hold the form at the proper height. Brace the form as shown to keep it from spreading when the ce-



Turning on a Planer

ment is put in. Short forms will not need bracing, but any form 6 or 8 ft. long should have at least one brace on



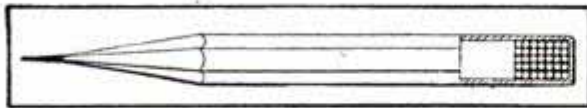
each side. A board, D, notched just right to fit over the top of the mold, will do for a brace in some places, says Cement World.

After the mold is put in place take some thick cement mortar and stop all cracks where the mold does not fit the bricks. This should be well done so the water will not drip through and deface the brick work. As soon as the mold is ready mix the sand and cement in proportions of 1 part cement and 2 or 3 parts of sand. Mixing 1 part cement and 3 parts sand will make a good job, but 1 part cement and 2 parts sand will be extra good. Mix the cement and sand dry before putting any water with it.

Put the cement into the mold and with a trowel work it down well along the sides and fill the mold as you go, and rather quickly. After the mold is full, level the cement off on top and trowel to an even surface. After the cement has set sufficiently to stand without running, then, with a trowel, clip the top corners and smooth them down.

### To Prevent Lead Pencil Point from Breaking

A small shell partly filled with a piece of lead, steel or shot, and forced on the end of a drawing pencil, may



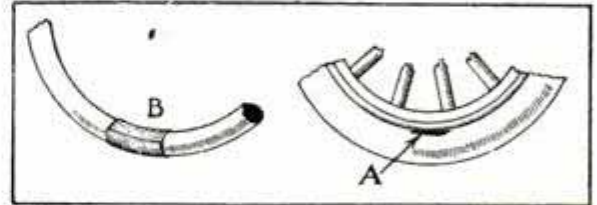
To Save Pencil Point

appear to be a queer contrivance, says Machinery; but this end being the heaviest will naturally fall to the floor first, and will prevent the lead point from breaking.

A method of bluing small steel goods by dipping is to melt saltpetre in an iron pot, then immerse the previously polished and cleaned articles until sufficiently blued. Remove and cool at once in paraffin oil and afterwards dry out in sawdust.

### How to Make a Temporary Tire Repair

It may interest some readers to know how to make a temporary repair of a rim cut in a tire which causes the inner tube to blow through the casing, as shown at A in the sketch. After the



Temporary Tire Repair

inner tube is repaired, wrap a heavy piece of leather, about 10 in. long and wide enough to more than cover the hole in the casing, around the tube, B, covering the patch, says a correspondent in Motor Talk. This will encircle the inner tube about one and one-half times, but after being placed in the casing, the inflating of the inner tube will press it back tight against the walls of the casing, so that when fully inflated it will lap about 2 in. By lapping the leather it prevents pinching the inner tube.

### How to Make Gold Leaf Stripes on Glass

Sign writers often have calls for a glass sign with one or more gold leaf stripes around the sign. These stripes can be quickly made by using a tool shaped like a paddle cut from a piece of soft pine or basswood. Dress the edge of the paddle down with sandpaper to a straight sharp edge, and cut notches, as shown in Fig. 1, suitable to the size and number of stripes de-

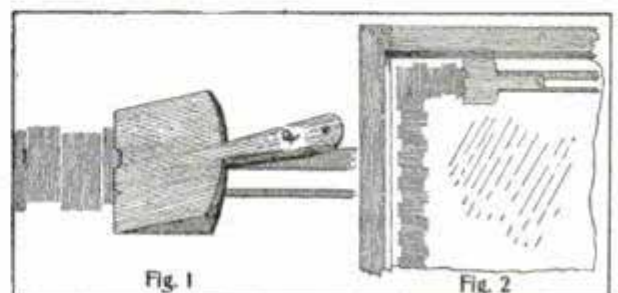


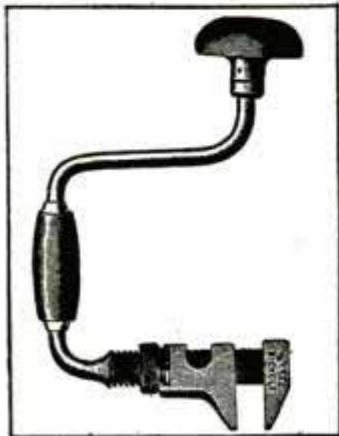
Fig. 1

Fig. 2

Making Gold Leaf Stripes

sired. Soak the paddle in water until it is thoroughly wet. Lay the gold leaf in the usual way, and with the wet paddle make the stripes by cutting away the gold leaf, as shown in Fig. 2, using a straightedge as a guide.—Contributed by H. E. Mangold, Compton, Calif.

### How to Make a Handy Wrench

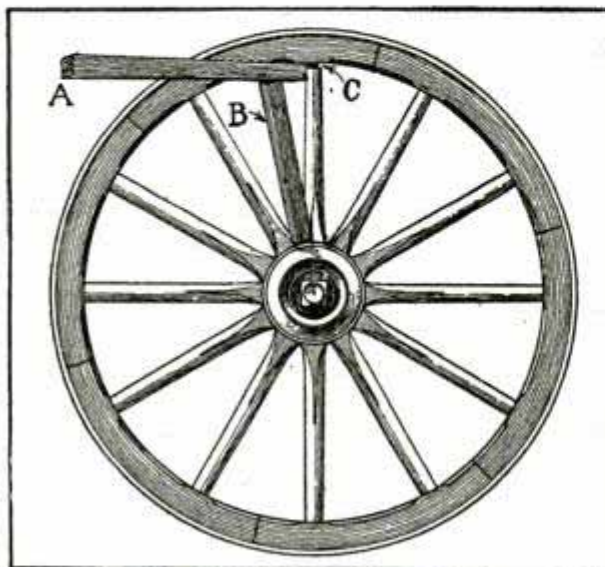


Take an old monkey wrench and remove the wood handle and weld the metal part of the handle to a piece of  $\frac{5}{8}$ -in. round iron and shape in the form of a bitstock. This will be found a

very handy wrench.

### How to Tighten Loose Wagon Wheel Spokes

When wagon wheel spokes become loose or the tenons are worn where they are fitted into the felloe, lift the felloe from the spoke with a lever, A, and a post, B, as shown in the sketch, and either place a leather washer around the tenon at point C, or invert the wheel and run melted lead or babbitt around it.



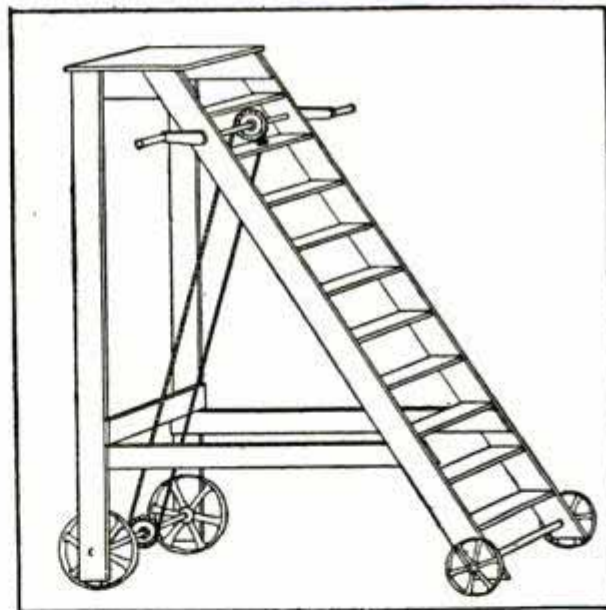
Tightening Wagon Wheel Spokes

### How to Make a Durable Whitewash

When lime slakes, if the thing is properly done with hot water and a cover over the vessel, it will boil fiercely, and as soon as the slaking is done the wash should be used. If some tallow be added to the boiling lime, says the Master Painter, it will make a wash that will wear like paint. Salt tends to harden the lime, and is useful for doing damp places. There are two kinds of lime, the magnesian lime being the proper one for whitewashing purposes

### Ladder on Wheels for Oiling

The accompanying sketch will need no explanation to the oiler. It will enable him to transform his present lad-



Very Handy—Lasts for Years

der into something better, says a correspondent in American Miller, or give the hint for constructing one that is vastly more convenient than the ordinary means of reaching overhead machinery.

### How to De-Magnetize a Watch

Hang the watch to a string and twist the string so as to rotate the watch rapidly near the pole of a strong magnet. While it is whirling, gradually take it away from the magnet. This will pro-

duce the desired effect, says a correspondent in Southern Machinery.

The method used for de-magnetizing with alternating current consists of a coil of wire with a hole in the center large enough to admit a watch, the coil being connected to a source of alternating current, and when the watch is dropped in and pulled out, it is de-magnetized.

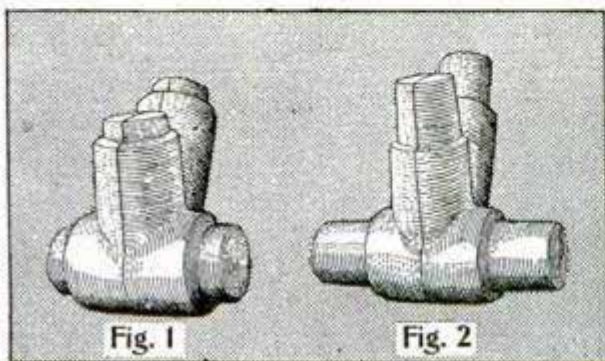
### Extension Bit Used for Cutting Leather Washers

A very accurate and satisfactory tool for cutting leather washers of any size under 3 in. is to use a common extension or expansive bit. If the stationary cutter is not as large as the hole desired, cut the outside rim of the washer with the lip of the sliding cutter and then set at the proper position and cut the hole. Use the bit in a bitstock the same as in boring.

### Making Core-Prints

It is a common occurrence to find patterns with core-prints on them so short that it is almost impossible to set the core. A pattern of this kind is shown in Fig. 1. The core-prints are left very short and much difficulty is experienced in obtaining a good bearing surface in the nowel when the core is set, says The Brass World.

Short core-prints should be avoided. They only serve to produce bad castings. The core is more apt to shift and it cannot be set as accurately as one which is made with core-prints of sufficient length. In setting the core,

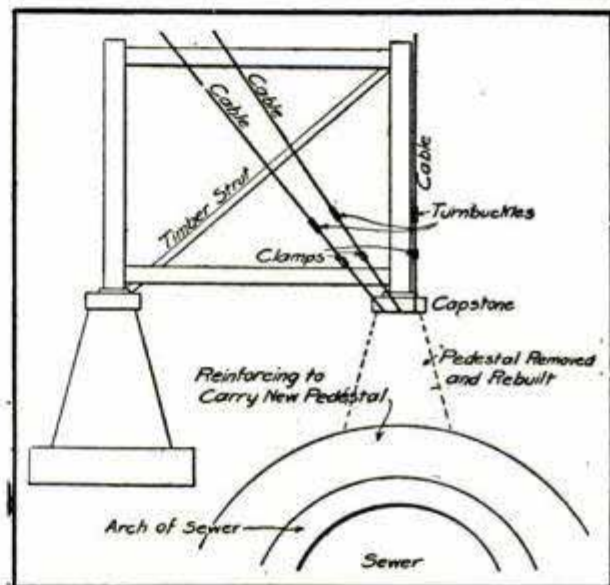


Making Core-Prints

short core-prints usually result in the breaking of the sand away from the edge of the mold. In Fig. 2 is shown a pattern with core-prints of a better length.

### Holding a Trestle Leg up While Working under It

A description was given in a paper read before the American Society of Civil Engineers of a method used by the contractors in holding up one leg of a viaduct, the masonry under which came directly in the new sewer. The viaduct carried the street traffic. Traf-



Supporting Leg of Viaduct

fic on the viaduct was not interrupted except by erecting barriers so as to deflect the traffic to the other side of the roadway where the weight would be carried directly to the undisturbed foundations. The post which rested upon the pier to be removed was suspended by passing a cable from the foot of the post diagonally upward to the top of the opposite post, and other cables to the tops of both posts composing the next pair of the trestle bents. By means of turn-buckles, the weight of the columns and the capstone of the pedestal attached was lifted free from the pedestal. Timber struts were also put in along with the cables in order to take up vibration. The arrangement of the cable and struts is shown in the sketch. The construction of the sewer was carried

forward as near as practicable to the pier to be removed, and the excavation and the foundations at the sides were carried forward a short distance on either side and beyond the pedestal. The pedestal was then removed, leaving the capstone hanging to the foot of the viaduct column, and the sewer structure was carried through to completion without interference underneath. After the arch had been completed, the upper portion of the pedestal was rebuilt upon the back of the arch, and, after the arch had sufficiently hardened, the turn-buckles were gradually loosened and the weight brought to bear upon the new structure.

### How to Make Wooden Stave Pipe

On account of the high prices of cast iron, wrought iron and steel, engineers have been constructing wooden stave pipe for a number of years. A certain stave pipe 30 in. in diameter which is used for power purposes has been in service for 45 years. The construction of such a pipe is shown in Fig. 1. It is made of staves with concentric inner and outer surfaces and radial edges. The ends of the stave are scarfed about  $\frac{3}{4}$  in. deep, and a steel plate of No. 12 or No. 14 gauge, and slightly longer than the width of the stave, is inserted as shown at S, Fig. 1. The staves are held in place by round or oval steel bands, the spacing of the bands depending upon the pressure. Sometimes a small bead is left on the edge of the stave, which, being forced against the adjoining stave edge, will fill any slight depression or irregularity of the surface, thereby reducing the chance of leakage, says Wood Craft.

The bands are secured by a coupling shoe, the more common form of which

is shown by Fig. 2. The band has a T-head which locks into the under slot of the shoe, and the other end is threaded and provided with a washer and nut. Shoes are usually made of cast or mal-

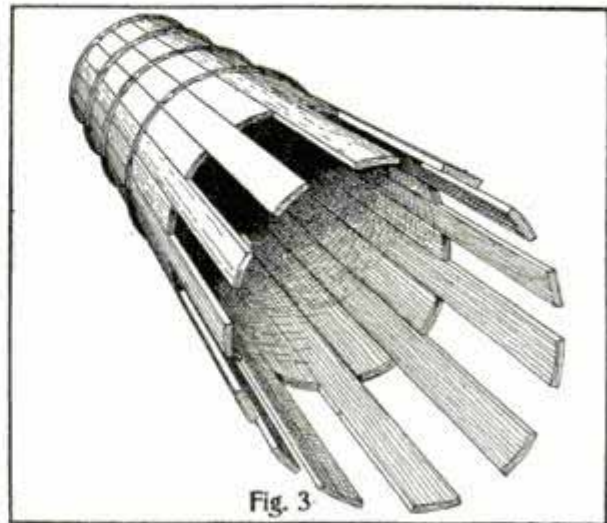


Fig. 3  
"The Joints Are Broken"

leable iron and rods of soft or medium steel. The rod is swelled just below the head to prevent danger of breaking at that point; and the thread-

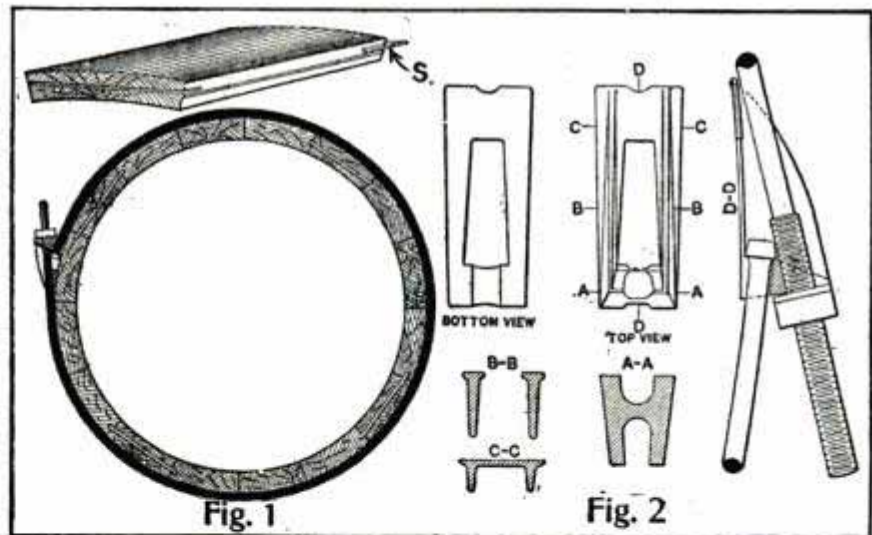


Fig. 1  
Fig. 2  
Wooden Stave Pipe

ed end is either upset so that the diameter at the base of the thread is about as large, or slightly larger than that of the rod, or else the thread is pressed or rolled.

In constructing the pipe, staves are placed over a form, care being taken to break joints at least 18 in., as shown in Fig. 3. The bands are spaced uniformly, and then held in place by turning up the nut, and at the same time rapping the band smartly with a mallet so

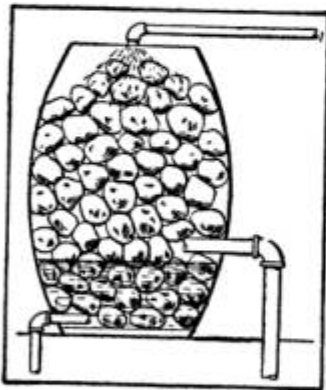
Nominal diameter Inches.	Stock sizes for staves Inches.	Thickness of staves Inches.	Economic sizes of bands Inches.
10	1½ x 4	1 7/8	5/8 x 7/8
12	1½ x 4	1 7/8	5/8 x 7/8
14	1½ x 4	1 7/8	5/8 x 7/8
16	2 x 6	1 3/2	5/8 x 7/8
18	2 x 6	1 3/2	5/8 x 7/8
20	2 x 6	1 3/2	5/8 x 7/8
<b>0</b>			
22	2 x 6	1 3/2	5/8 x 7/8
24	2 x 6	1 3/2	5/8 x 7/8
27	2 x 6	1 7/8	5/8 x 7/8
30	2 x 6	1 7/8	5/8 x 7/8
36	2 x 6	1 7/8	5/8 x 7/8
42	2 x 6	1 7/8	5/8 x 7/8
48	2 x 6	1 7/8	5/8 x 7/8
54	2½ x 8	2 1/8	5/8 x 7/8
60	3 x 8	2 1/4	5/8 x 7/8
66	3 x 8	2 1/4	5/8 x 7/8
72	3 x 8	2 1/2	5/8 x 7/8

Economic Proportions for Pipe Design

as to secure the necessary indentation of the staves. Curves are made by forcing the pipe up or down or sideways after the bands are placed and holding it in the desired position while turning up the nuts on the bands. The lasting qualities of the pipe depend upon the complete saturation of the staves, and the thorough protection of the bands, saddles, etc., by an asphalt or similar coating. So long as the staves are kept saturated, they will last indefinitely. The life of the bands will depend upon the coating.

**A Novel Exhaust Heater**

An old oil barrel was placed on the roof of a boiler room to be used for the purpose of an exhaust heater, says a correspondent in Engineers' Review. The exhaust pipe from a deep well and a boiler feed pump were conducted into the barrel which was filled with rocks and broken pieces of iron, as shown in the sketch. The water ran down over the stone and iron and was thus heated when it passed out of the bottom to the boiler feeder.

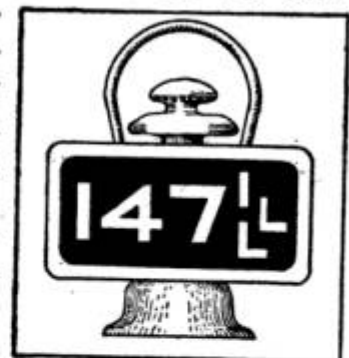


**Shoemaker's Wax**

Take 4 oz. pitch, 1 oz. resin, ¼ oz. good tallow, heat well over a slow fire in an old saucepan. As the composition is combustible, great care must be used in keeping the flames away from it. Stir the mixture until the resin melts and mixes with the others. Then pour into a pail of cold water. When cool enough to handle put one hand underneath the wax and turn the edges to the center to form a ball. Take it out, make it into a roll and pull like taffy until it is of the color of pale resin. Lay on a slab, taking care that it does not stick. Roll out and cut into strips 1 in. wide and 1½ in. long. The wax must be hard in warm weather and soft in cold weather. To make it hard use more resin; to make it soft use more tallow. Keep the wax in water.

**A Rear Number and Light for Automobiles**

Substituting a square frosted glass for the usual round one on the rear lamp and painting it black leaving the number and letters plain makes a fine number card and lamp combined. During the day the frosted figures will show nicely, while at night the light will shine through them.—Contributed by F. J. Yorke, Chicago, Ill.



**How to Clean Tile Floor**

Use clean soap suds to which sufficient lye has been added to make it strong in attacking dirt, but not so strong as to injure the fiber of the scrubbing brush. Wipe the soap suds up and sprinkle fine white sand over the parts that still show grime. Use a soft pine board in rubbing the sand on

the tile, says Building Management. The sand that will stick to the board should be removed from time to time. If necessary, a second scrubbing with suds and lye is to follow the treatment with sand. Ink spots and stains will not be removed in this way, but they can be taken out by a treatment with dilute solution of muriatic acid made stronger than that commonly used for removing cement from the surface of the tile after they have been set. This strong acid should be wiped up and not allowed to remain on the tile too long. As the lye is quite strong, it is necessary for the workman to wear rubber gloves.

### Animated Electric Signs

A new field has been opened to builders of electrical signs in producing characteristic displays such as a kicking mule, an eagle flapping his wings, or, in fact, any idea wished for, an animated picture advertisement that is simple enough to be built of electric lights.

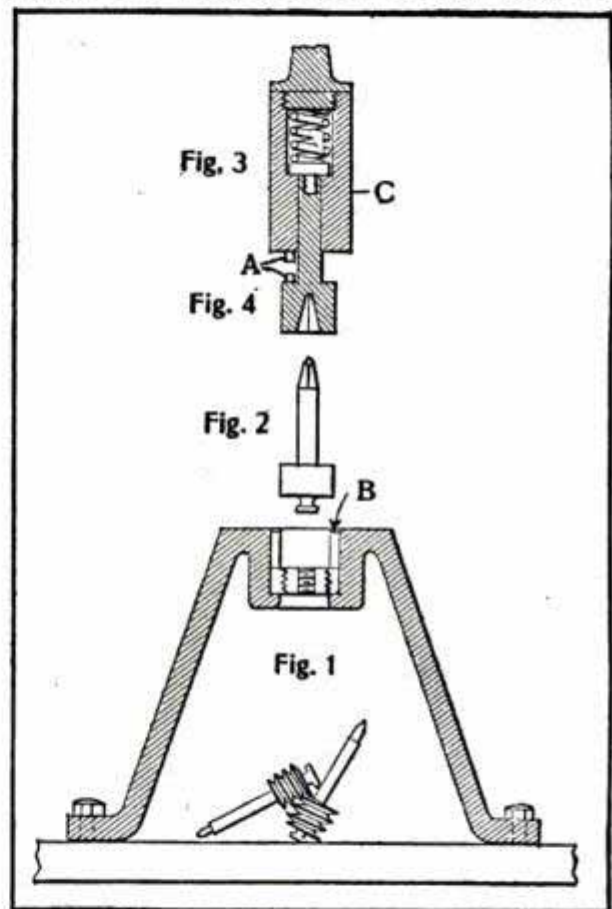
The kicking mule device, for instance, is built on a perfectly black background large enough to accommodate effectively the necessary number of lights. By working the flash machine, which has a speed of 150 contacts a minute, the mule is made to wag its ears and tail and go through many other movements as a darkey approaches and tickles him, finishing the display by kicking the darkey over backwards.

As less than half the lamps are burning at the same time the cost of operation is moderate. The flashers for some figures are very expensive and for others nominal. The kicking mule

flasher would cost about \$125 and the flapping eagle \$40.

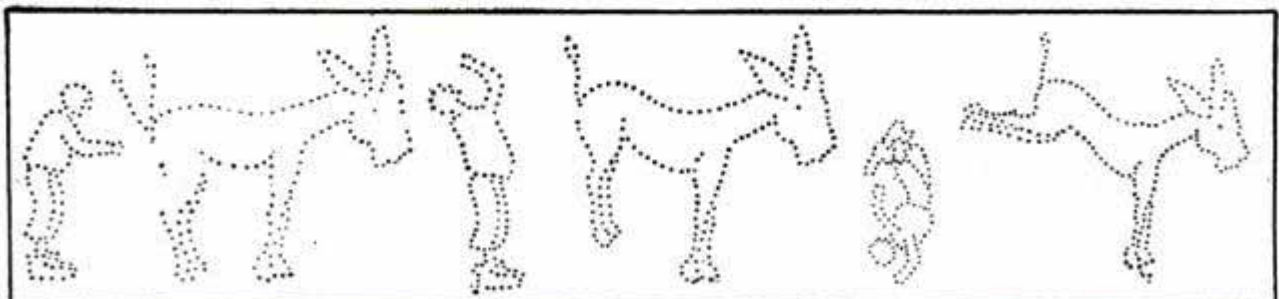
### Threading Faucet Stems

A skeleton frame of cast iron is made, as shown in Fig. 1, which contains the die and is bolted to the platen or table of the drill press. A steel bushing, B, is fitted on top of the die to be used to guide the stem. Fig. 2 shows the faucet stem which has al-



Threading Faucet Stems

ready been turned to the proper size. The upper end of the faucet stem has a square taper, designed to fit the handle with which the faucet is opened and closed, says American Machinist. This is particularly useful for driving the stem when threading.



Showing Three of the Progressive Flash Movements

## POPULAR MECHANICS

It will be noticed that Fig. 4 contains a square hole which slips over the square end of the stem the instant the drill press handle is pulled down. It is unnecessary to stop the press to connect, as the collet, C, and the drive are so arranged that it does not revolve after the square hole has engaged with the square end of the faucet stem, until the two pins, A, come together. Then, by pulling down the handle of the drill press, the stem will be forced into and through the die, dropping down out of the way as soon as the threaded end is clear.

The top of the drill press spindle is set so that the stem will be forced down far enough to clear the die, but the driver will not come in contact with the fixture in any way.

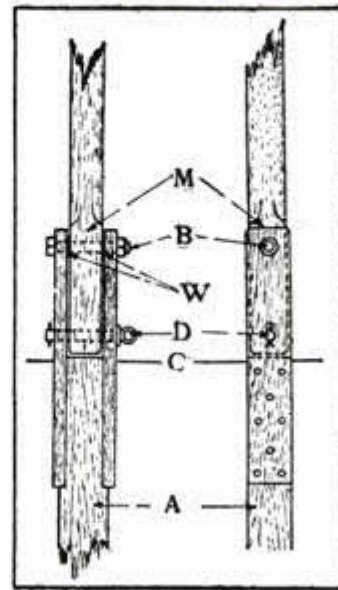
### The Cause of Cracks in Aluminum Castings

The most frequent source of the cracking of aluminum castings is caused by overheating or "burning" the aluminum while melted. The demand for aluminum castings has now become so large and many of them are so thin and complicated, that founders continually have trouble in making them. The aluminum alloy most generally used for casting is one which contains aluminum and zinc. The presence of the zinc renders the casting difficult and far more liable to crack than when not used, says The Brass World. The brass must be employed to obtain the highest strength.

There are several rules that must be firmly obeyed in making aluminum castings, and they are, to melt the aluminum with a slow fire so that the top of the metal will not become "burnt" before the remainder of the metal is melted, to avoid overheating the metal after it has once melted, and pack the ingots in the crucible as compactly as possible so that portions will not stick up and become exposed to the action of the flame. Do not have the aluminum melted before the mold is ready. This is one of the most common sources of trouble.

### How to Make an Adjustable Spar

The accompanying sketch shows how to make a spar that can be laid down

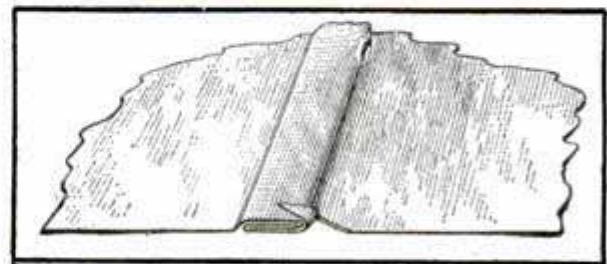


over the cabin of the boat when not in use. The side pieces should be made of oak, carried down below the cabin top, C, securely fastened by  $\frac{3}{8}$ -in. bolts to a squared post, A, which may be stepped in the usual manner. A forged band placed around these side pieces

and the post will give added strength, says Motor Boat. The spar is fastened by one large bolt, B, and a removable pin, D. Two large washers, W, are inserted between the spar and the oak side pieces. It may also be advisable to put brass plates on the spar where the bolt passes through it. This will prevent any wear to the hole in the spar.

### Making Stove Pipe

A certain stove dealer sells and uses his own make of stove pipe, which he claims is a better quality, both in material and workmanship, than he could purchase, says the Metal Worker. A blank pattern of each size of pipe is



"Turn a Sliver to Hold"

kept to set the gauges on the squaring shears. A quantity of material is cut each time. The pieces of metal are then folded for about a  $\frac{5}{16}$ -in. lock in a common iron folder. The metal is

formed in rolls, then swaged by a hand groover or machine. The small end of the pipe is slightly drawn in over the end of a stake. Either put a small rivet through the lock at this end, or turn a sliver over the lock to prevent the collapse of the seam as shown in sketch. The pipe should not be crimped, as it will not stay in place as well as a good fitting telescope joint. A bead may be made on each end of the pipe the depth of the joints.

### Lining an Engine Up with Shafting

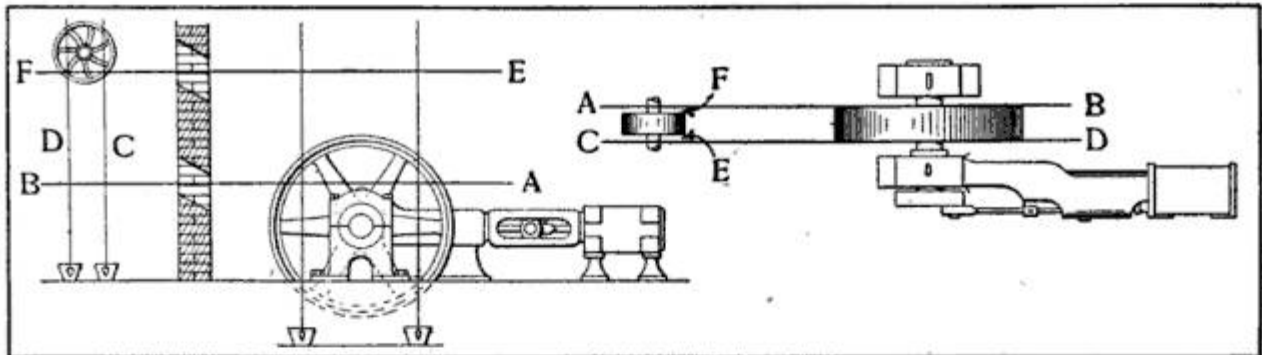
If an engine is not in line with the shaft, the operation of the belt on the driving pulley will never be satisfactory. Fig. 1 shows a method of lining up an engine and shaft when it is impossible to place the line against the side of the rims of the pulleys. Two

plumb lines, the line AB must be placed a short distance from the plumb lines CD, but at an equal distance from both lines.

In case it is impossible to line up from the flywheel to the plumb lines, the line EF may be run through the opening in the wall as shown, which touches or is placed at an equal distance from the rim of the wheel on each side of the line shaft. Then plumb lines are dropped so as to touch the line EF. If the plumb lines also touch the flywheel rim at both top and bottom where it crosses the edge of the rim, the pulleys are in line.

If the pulleys are of different widths of face, the distance, E and F (Fig. 2), between the rim of the pulley and the lines should be evenly divided on both sides of the pulley.

If the line touches the rim of the flywheel on one side of the crankshaft and



View at Left—Lining Engine and Shaft Vertically

View at Right—Lining Engine Horizontally

plumb lines are placed close to the rim of the driven pulley, so that they merely touch the rim, the lower ends of the plumb bobs being submerged in pails of water, which is to prevent vibration, says a correspondent in *Engineers' Review*. The line AB is run close to the plumb lines so that it just touches them, the ends being carried to a point beyond the driven pulley and also beyond the engine flywheel. The distance between the line AB and the flywheel on the engine shaft will of course indicate the amount the engine must be moved in order to bring both pulleys in line.

In case the engine flywheel has a greater face width than the driven pul-

is  $\frac{3}{8}$  of an inch distant on the other side of the shaft, it indicates that the opposite end of the engine must be swung around to equal one-half the distance, or  $\frac{3}{16}$  of an inch.

Figure 2 shows a simple method by which an engine may be lined up with a line shaft. The first thing to do is to stretch a line, AB and CD, from a point beyond the pulley on the line shaft to a point beyond the flywheel of the engine. If both pulleys have the same width of face the line should just touch the side of the pulley on both sides of the shaft, and if the engine is in line, the line will also just touch the rim of the flywheel on both sides of the crankshaft.





# Amateur Mechanics

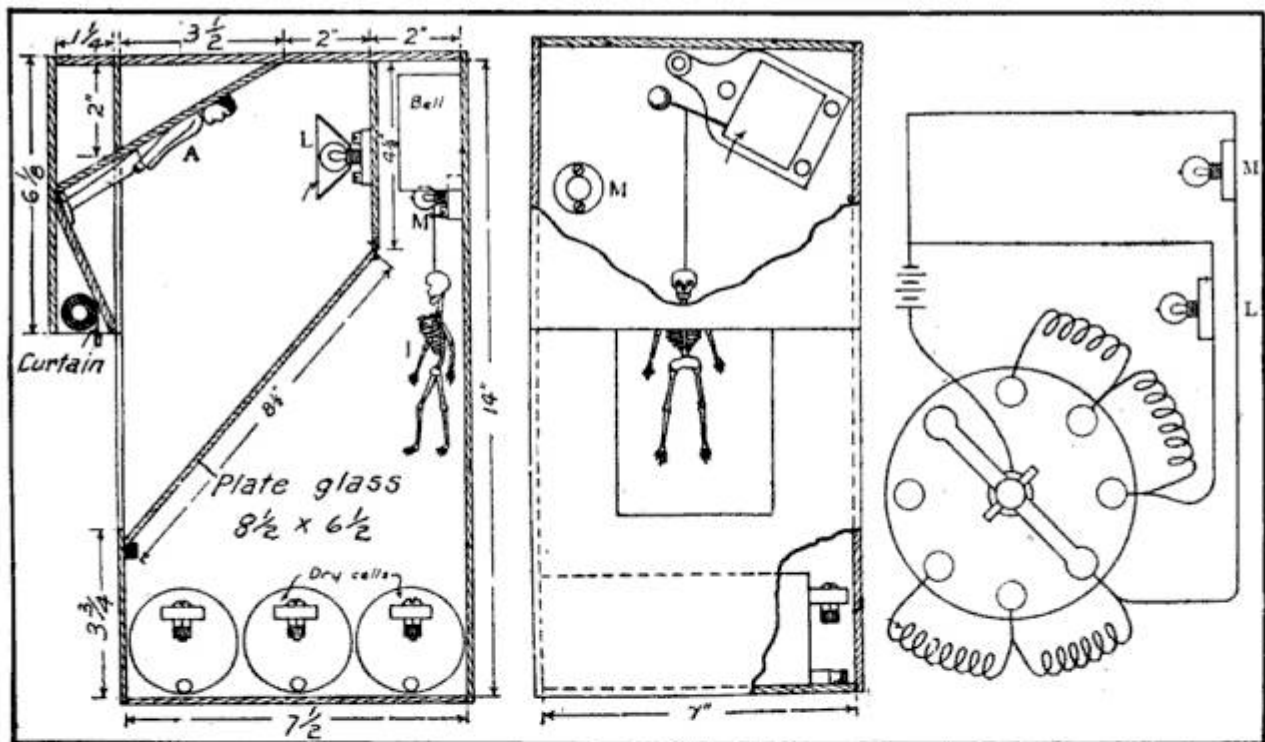


## A Miniature Pepper's Ghost Illusion

Probably many readers have seen a "Pepper's Ghost" illusion at some amusement place. As there shown, the audience is generally seated in a dark room at the end of which there is a stage with black hangings. One of the audience is invited on to the stage, where he is placed in an upright open coffin. A white shroud is thrown over his body, and his clothes and flesh gradually fade away till nothing but his skeleton remains, which immediately begins to dance a horribly rattling jig. The skeleton then fades away and the man is restored again.

cupant are seen through the glass very plainly. The lights in front of the glass (behind the scenes) are now raised very gradually as those behind the glass are turned down, until it is dark there. The perfectly black surface behind the glass now acts like the silver backing for a mirror, and the object upon which the light is now turned—in this case the skeleton—is reflected in the glass, appearing to the audience as if really occupying the stage.

The model, which requires no special skill except that of carpentry, is



Construction of the Pepper's Ghost Illusion

The explanation is very simple, says the Model Engineer and Electrician. Between the audience and the coffin is a sheet of transparent glass, inclined at an angle so as to reflect objects located behind the scenes, but so clear as to be invisible to the audience and the man in the coffin. At the beginning the stage is lighted only from behind the glass. Hence the coffin and its oc-

cupant are seen through the glass very plainly. The lights in front of the glass (behind the scenes) are now raised very gradually as those behind the glass are turned down, until it is dark there.

The box containing the stage should be 14 in. by 7 in. by 7 1/2 in., inside dimensions. The box need not be made of particularly good wood, as the entire interior, with the exception of the glass, figures and lights, should be colored a dull black. This can well be done by painting with a solution of

lampblack in turpentine. If everything is not black, especially the joints and background near A, the illusion will be spoiled.

The glass should be the clearest possible, and must be thoroughly cleansed. Its edges should nowhere be visible, and it should be free from scratches and imperfections. The figure A should be a doll about 4 in. high, dressed in brilliant, light-colored garments. The skeleton is made of papier mâché, and can be bought at Japanese stores. It should preferably be one with arms suspended by small spiral springs, giving a limp, loose-jointed effect. The method of causing the skeleton to dance is shown in the front view. The figure is hung from the neck by a blackened stiff wire attached to the hammer wire of an electric bell, from which the gong has been removed. When the bell works he will kick against the rear wall, and wave his arms up and down, thus giving as realistic a dance as anyone could expect from a skeleton.

The lights, L and M, should be miniature electric lamps, which can be run by three dry cells. They need to give a fairly strong light, especially L, which should have a conical tin re-

flector to increase its brilliancy and prevent its being reflected in the glass.

Since the stage should be some distance from the audience, to aid the illusion, the angle of the glass and the inclination of the doll, A, has been so designed that if the stage is placed on a mantle or other high shelf the image of A will appear upright to an observer sitting in a chair some distance away, within the limits of an ordinary room. If it is desired to place the box lower down, other angles for the image and glass may be found necessary, but the proper tilt can be found readily by experiment.

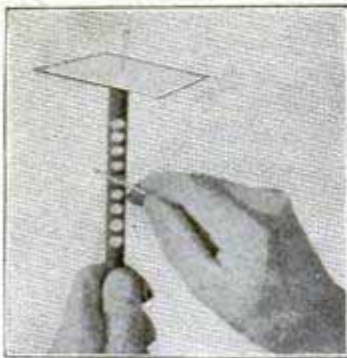
The electric connections are so simple that they are not shown in the drawings. All that is necessary is a two-point switch, by which either L or M can be placed in circuit with the battery, and a press button in circuit with the bell and its cell.

If a gradual transformation is desired, a double-pointed rheostat could be used, so that as one light dims the other increases in brilliancy, by the insertion and removal of resistance coils.

With a clear glass and a dark room this model has proved to be fully as bewildering as its prototype.

### The Turning Card Puzzle

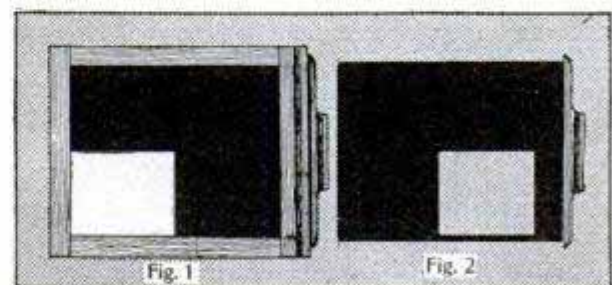
To produce a rotary motion from reciprocating motion take a lead pencil or other smooth stick and cut notches about  $\frac{3}{16}$  or  $\frac{1}{4}$  in. apart and about  $\frac{1}{8}$  in. deep. Punch a hole exactly through the middle of a card, enlarge the hole a little



and put a common pin through it, into end of pencil. Hold securely in the hand and rub a match or toothpick up and down over the notches and the card will revolve very fast. With some people to the right; with others to the left.

### How to Make Four Pictures on One Plate

Secure two extra slides for the plate holders and cut one corner out on one of them, as shown in Fig. 1. Make a hole in the other, as shown in Fig. 2. With a lead pencil draw on the ground glass, one line vertical and one hor-

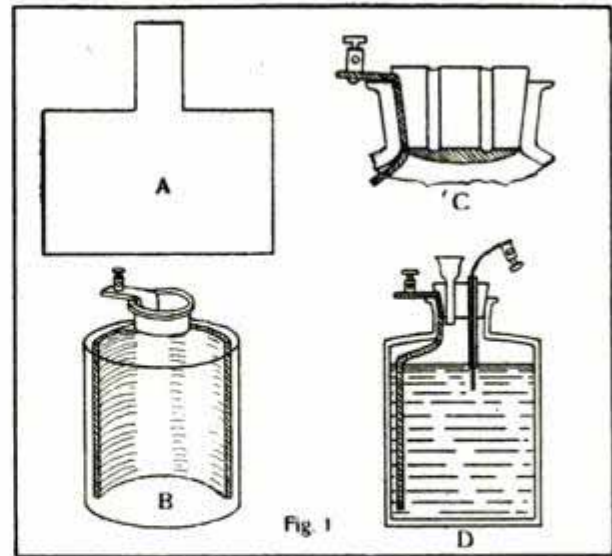


izontal, each in the center. This will divide the ground glass in four equal parts.

Focus the camera in the usual man-

ner, but get the picture desired to fill only one of the parts on the ground glass. Place the plate holder in position and draw the regular slide; substitute one of the slides prepared and expose in the usual way.

If a small picture is to be made in the lower left-hand corner of the plate, place the prepared slide with the corner cut, as shown in Fig. 1. This slide may be turned over for the upper left-hand corner and then changed for slide shown in Fig. 2 for the upper and lower right-hand corners.—Contributed by D. L., Elizabeth, N. J.



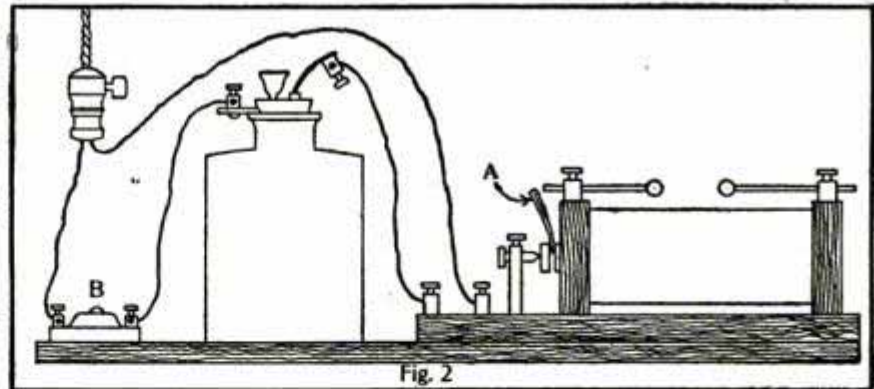
### How to Make an Interrupter

The Wenult interrupter is an instrument much used on large coils and is far more efficient than the usual form of vibrators. It can also be used with success on small coils as well as large. Although it is a costly instrument to purchase, it can be made with practically no expense and the construction is very simple.

First procure a wide mouthed bottle about 4 in. high, provided with a rubber stopper. This stopper should be pierced, making two holes about  $\frac{1}{4}$  in. in diameter.

From a sheet of lead  $\frac{1}{16}$  in. in thickness cut a piece shaped like A, Fig. 1. Common tea lead folded several times will serve the purpose. When in the bottle this lead should be of such a size that it will only reach half way around, as shown in B. To insert the lead plate, roll it up so it will pass through the neck of the bottle, then smooth it out with a small stick until it fits against the side, leaving the small strip at the top projecting through the neck of the bottle. Bend this strip to one side and fit in the stopper, as shown in C. A small binding-post is fastened at the end of the strip.

Having fixed the lead plate in position, next get a piece of glass tube having a bore of about  $\frac{1}{32}$  of an inch in diameter. A piece of an old thermometer tube will serve this purpose. Insert this tube in the hole in the stopper farthest from the lead plate. Get a piece of wire that will fit the tube and about 6 in. long, and fasten a small binding-post on one end and stick the other into the tube. This wire should fit the hole in the tube so it



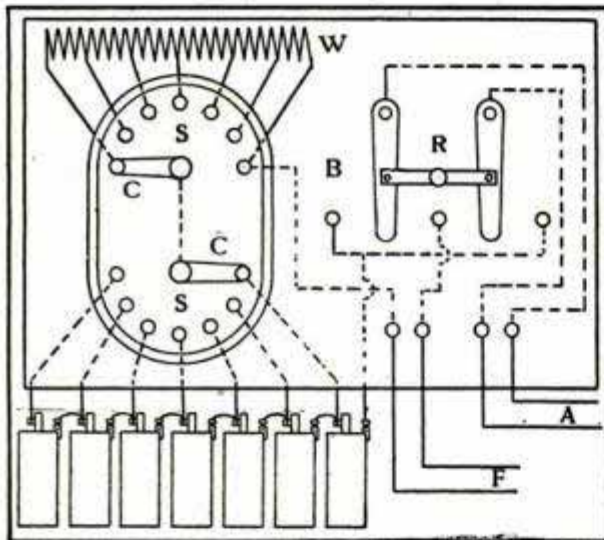
can be easily moved. In the hole nearest the lead plate insert a small glass funnel.

The interrupter as it is when complete is shown at D, Fig. 1. Having finished the interrupter, connect it with the electric light circuit as shown in Fig. 2. Fill the bottle with water to about the line as shown in D, Fig. 1. Adjust the wire in the small glass tube so that it projects about  $\frac{1}{8}$  in. Add sulphuric acid until the water level rises about  $\frac{1}{8}$  in. Turn on the current and press the button, B. If all adjustments are correct there will

be a loud crackling noise from the interrupter, a violet flame will appear at the end of the wire and a hot spark will pass between the secondary terminals. If the interrupter does not work at first, add more sulphuric acid through the funnel and press the wire down a little more into the liquid. A piece of wood, A, Fig. 2, should be inserted in vibrator to prevent it from working.—Contributed by Harold L. Jones, Carthage, N. Y.

### A Controller and Reverse for a Battery Motor

Secure a cigar or starch box and use to make the base, B. Two wood base switches, S S, are cut off a little past



Motor Reverse and Controller

the center and fastened to the base with a piece of wood between them. The upper switch, S, is connected to different equal points on a coil of wire, W, while the lower switch, S, is connected each point to a battery, as shown. The reverse switch, R, is made from two brass or copper strips fastened at the top to the base with screws and joined together by a piece of hard rubber or wood with a small handle attached. Connect wires A to the armature and wires F to the field of the motor. By this arrangement one, two or three and so on up until all the battery cells are used and different points of resistance secured on the coil of wire. The reverse lever when moved from right to left, or left to right,

changes the direction of the armature in the motor from one way to the other.—Contributed by J. Fremont Hilscher, Jr., West St. Paul, Minn.

### Athletics for Young Men

The accompanying illustration shows a group of young Americans enjoying themselves by building a human pyra-



Ph. by W. Vanderlock, Paterson, N. J.

### The Human Pyramid

mid on the sands of a New Jersey bathing beach between dips in the briny deep.

Don't pull a lamp hung by flexible cord to one side with a wire and then fasten to a gas pipe. I have seen a wire become red hot in this manner. If the lamp hung by a cord must be pulled over, use a string.

Don't wrap paper around a lamp for a shade. You might go home and forget it and a fire might be started from the heat. Use a glass or metal shade. That is what they are for.

## MAKING ANTIQUE WOODS TO ORDER

The antique in oak, or anything else—except maids—has grown very valuable. Naturally, the producer on finding that the real article could not fill the ever increasing demand of the public turned to the manufacturer and now antiques can be made to order.

The process of disguising common white wood by means of chemicals so that it will appear antique is one of the easiest of antiquating processes.

pecially when the furniture is massive, the wood is taken into a secluded place and shot full of bird shot. The shot sinks out of sight in the wood and gives it the appearance of being worm-eaten with old age.

## STEAMERS COLLIDE IN DETROIT RIVER

With her bow crushed in like an egg shell as far back as the pilot house, a distance of 40 ft., the steel steamer "John W. Moore" lies on the bottom of the Detroit river between Mamajuda



At the Bottom of the Detroit River

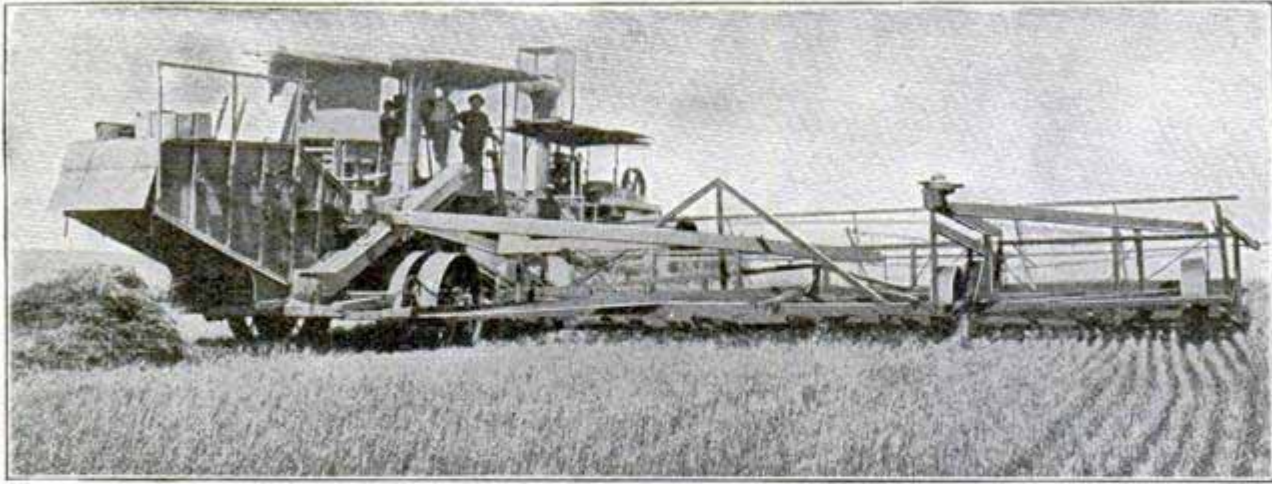
Take the oak, for instance: The boards, mouldings, panels, or whatever pieces are required, are made of oak which has just had time to dry sufficiently to prevent excessive warping.

A dark room is prepared on the floor of which bowls and plates of liquid ammonia are placed. The furniture to be aged is placed in this room and the room hermetically closed. After the wood is left thus for a few months the coloration will extend to a depth of nearly a quarter of an inch. The depth and shade of the coloring is regulated by the lapse of time the wood is allowed to stay in the fumes of the chemicals.

In England when it is wished to make the effect still more realistic, es-

and Grassy island, as the result of a terrific head-on collision with the steel freighter "Queen City." The sunken vessel is declared to be a total loss and has been abandoned by the underwriters.

The "Moore" was bound up with a cargo of coal and the "Queen City," with consort, bound down heavily loaded with iron ore. Two minutes after the crash the "Moore" sank in 25 ft. of water. In that short period of time the crew, with the exception of one man who was asleep in his stateroom, escaped to the roof of the after cabin and the wheel house. The "Queen City" in an almost sinking condition ran into drydock.



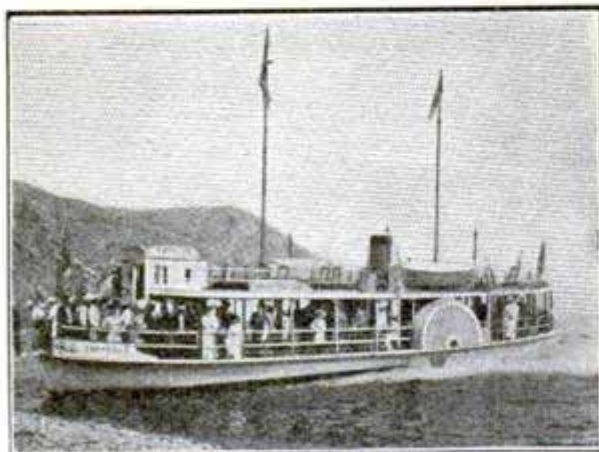
## HARVESTING SCENE IN WASHINGTON

The illustration shows a harvesting scene in the grain fields of Washington. The machine cuts a swath 34 ft. wide, and heads and threshes the grain at the rate of 100 acres per day. To operate it an engineer, fireman, separator tender, header tender, and two sack throwers are required.

## GLASS BOTTOMED BOATS WINDOWS OF THE SEA

From Avalon, the little town on Cataline Island, Southern California, called the magic isle, four absolutely unique motor boats carry hundreds of pleasure-seeking passengers out into the bay to see the depths of the ocean through the glass bottomed hulls of the craft.

It is a marvelous sight. The water in the bay is so clear that if the surface be unruffled a person can see the bottom of the ocean quite distinctly in many feet of water. Round the rocky



Courtesy Motor Boat

A Window of the Sea

points are submerged beds of sea weed, affording a wonderful view.

The idea started with an inventive fisherman, who substituted a pane of glass for the keelson of his boat. His idea took hold, and four motorboats, 75 ft. over all, with a beam of 25 ft., were constructed. Glass tanks, both fore and aft, afford room for scores of persons to view the sea bottom at the same time. The boats, which are side-propelled, are built so that they can be beached for landing and taking on passengers.

## NEW INSTRUMENT TO DETERMINE WHEN BRIDGE IS SAFE

An instrument has been perfected by Dean F. E. Turneure, of the engineering department of the University of Wisconsin, to determine and register automatically the strain on various parts of railroad bridges as rapidly moving trains pass over them.

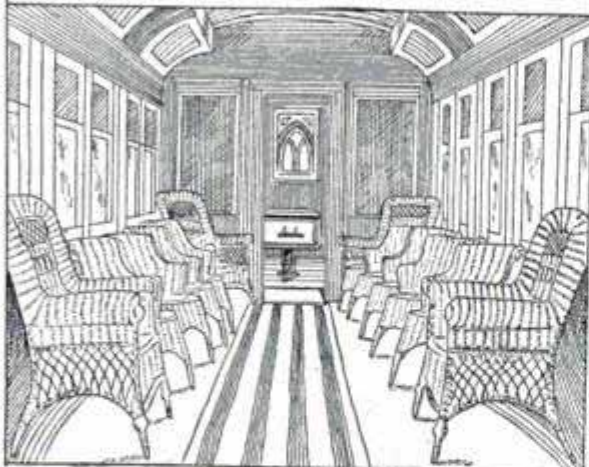
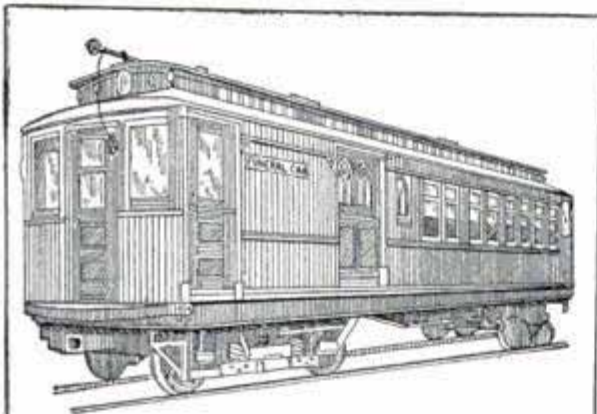
A number of the instruments are now being made and an extensive series of observations will be commenced as soon as possible. Several railroads have offered special trains and other necessary assistance for the work. The experiments will be carried on by a number of experts, with Dean Turneure at their head.

At present the estimate of strain on the various parts of bridges is largely a matter of guesswork, even by the most experienced engineers, and no one can really tell when a structure has be-

come dangerously weak from deterioration or strain. It is even possible that bridges are being replaced by new ones which are still sufficiently strong for safety, while others supposed to be secure may be on the verge of breaking. The new instrument is expected to determine these conditions.

### ELEVATED FUNERAL CARS

Although funeral cars have been a fixture on many electric street car lines for a number of years, it remained for the Chicago Metropolitan Co. to install the first specially constructed funeral car for elevated railways. The main body of the car is arranged to accommodate 32 persons, and in the forward apartment enough chairs are placed to accommodate the immediate mourners and the casket.



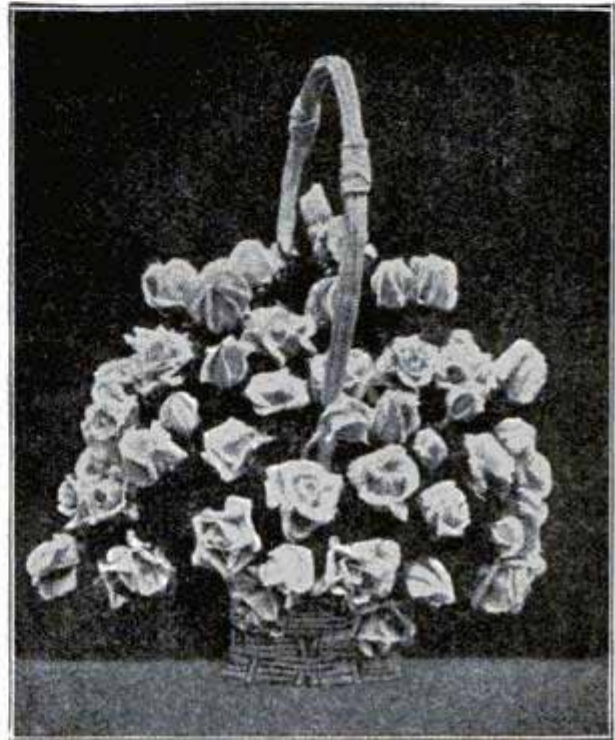
Runs on "L" Road

This funeral car service transports an average of 20 funerals each week from the congested sections of Chicago to the outlying cemeteries. The car makes the run to the most distant cemetery, 15 miles away, in 40 minutes and the round trip in two hours. The all

day journey by carriages is thus eliminated. The price charged for the service is \$25.

### ROSES MADE OF BUTTER

A basket of roses, made completely of butter, basket and all, is being exhibited through England by the gov-



Roses, Basket and All Made of Butter

ernment of Victoria, one of the states in Australia, to remind the mother country of the great agricultural wealth that abounds there. Over \$15,000,000 worth of butter is now sent annually from Victoria to England.

### LOOK BEFORE YOU LEAP AND THEN DON'T

Observing the bridge on fire, the hustling engineer of a passenger train on the Canadian Pacific near Rideout, Ont., applied the brakes and jumped. Finding that he had miscalculated and that the train would pass onto the burning structure he ran and caught the engine again, threw the throttle wide open, and pulled the train across. No one knows what the fireman was doing, but the brakeman swam back across the river to flag another train.



## GREAT COKE FILTERS NEAR BERLIN

A bird's-eye view of the great coke filter fields near Berlin, Germany, resembles scores of pie-tins turned upside down in the sun to dry. Each pie-tin is a preparation of coke, over which, as is seen in the illustration, four streams of water spurt through closely perforated pipes, which execute a circular movement over the forms. The supply of pure water thus obtained is used in Berlin. On dry days 24,000,000 gal. of water pass through the filters.

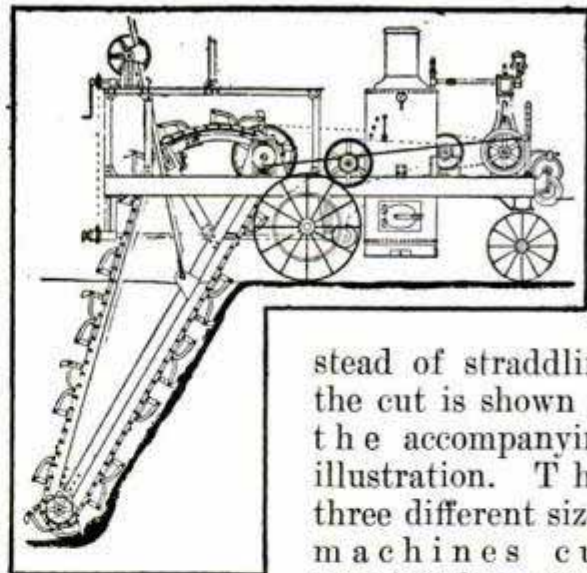
remains to be proved. The molds are constructed of cast iron, formed in sections and fitted together so they can be readily removed as soon as the concrete hardens. The first cost of the molds is considerable, but any number of houses can be made from one set.

## CONCRETE HOUSE BUILT IN A DAY

Thomas A. Edison, of electrical fame, has completed at a cost of \$30,000, his design, or series of molds for a 3-story concrete house to be erected in one day at a cost not to exceed \$1,000. Next summer he will build the first of a number of these "model homes." Whether they will be "model" in both senses of the word or not

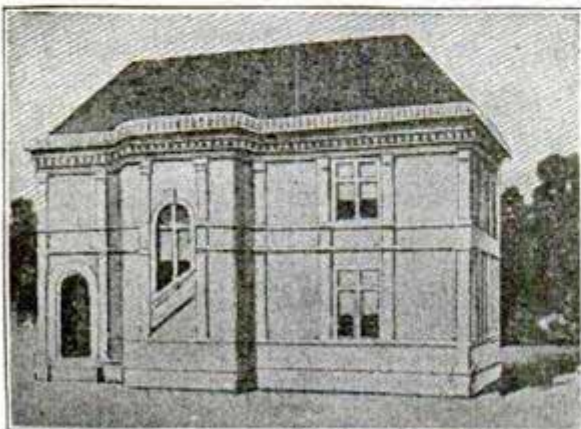
## NOVEL TRACTION TRENCHER

A novel traction trencher which runs forward ahead of the excavation in-



stead of straddling the cut is shown in the accompanying illustration. The three different sized machines cut trenches from 28 to

60 in. in width. The engines are from 16 to 25 hp. and the mechanism thoroughly built to withstand the strain of excavating 30 to 80 cu. yd. per hour. When water and gas pipe obstructions are met with, the elevator digs down and backward under the pipes. The machine can run under its own steam 2 to 4 miles an hour on good roads.



One-Piece Concrete House



## TRANS-ATLANTIC WIRELESS A FACT

Eleven years ago Marconi announced that he had discovered the secret by which messages might be flashed through space, and was scoffed at. To-day he is sending wireless messages across the Atlantic ocean. In 10 years, which is only to-morrow in the world's history, he will be sending, according to a prophesy made by Thomas Edison, 1,000 words a minute across the ocean.

On October 17 the Marconi trans-Atlantic wireless service was put into practical operation. The first message flashed across the ocean was from Sir Wilfred Laurier, premier of Canada, congratulating the English people over the inauguration of the new era in telegraphy, which means to the people of to-day what the laying of the first Atlantic cable did to those of the past century.

The system worked with complete efficiency. There was no hitch or delay, and although the maximum speed promised was not reached, dispatches were transmitted at a rate of 20 words a minute for each instrument employed. From 2 o'clock in the afternoon on there was a constant exchange of messages between the station at Glace Bay, Nova Scotia, and the one at Clifden, Ireland. About 5,000 words were sent the first day. With the instruments now working it is possible to send 800 words an hour.

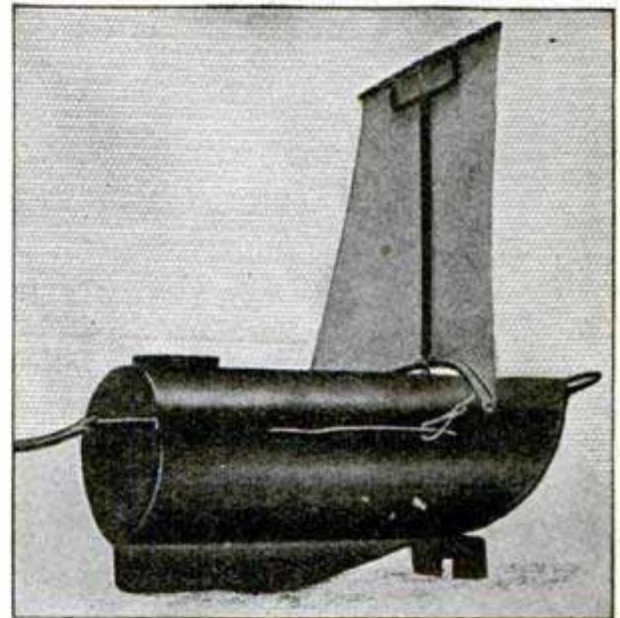
In speaking of the opening of the service Thomas Edison, the electrical wizard, said: "Give Marconi 10 years and he will be sending 1,000 words a minute across the ocean by wireless and will be receiving at the same rate of speed. The only limit to speed now is caused by the absorption of the electrical waves by the wire or cable. There is no such absorption in wireless telegraphy."

The great enterprise was started without formality of any sort. The festivities which were to have marked the event were postponed at the last moment because of the serious illness of one of Marconi's expert assistants.

## WRECKING BUOY FOR USE IN TIME OF PERIL

As the result of the wreck disaster off the Hook of Holland last year in which the Dutch king risked his life with the life-savers to rescue the victims, a Hollander has invented a stranding buoy which is highly lauded by marine authorities.

The buoy, made of metal and fitted with a mast, sail and four handles, is 3' ft. long and weighs less than 25 lb. Boat shaped and so ballasted that it



**Stranding Buoy**

will keep upright in any kind of weather, the buoy, with a light line attached, could be dropped from a wrecked vessel and blown ashore by the storm, making connection with the shore possible.

In case of foundering at sea such a buoy would have more chance of being picked up than a bottle, and could also be used as a lifebuoy, with a store of provisions placed in the body.

The London Marine Engineer says: "It will be recognized that for shallow shores, such as the Dutch coast or the coast of Jutland, the stranding buoy should be of great advantage, and it is somewhat surprising that it has not been suggested before. It could also be used for carrying a line on board a pilot boat in a high sea."

## EVER REPLENISHED GRAVEL PIT

The saying that a well located gravel pit is better than a gold mine is more



than borne out in this instance. The river in which it is located is dry one-half the year and in the other half refills the excavations made, free of charge, from the mountains 25 miles distant. The scrapers dump the gravel onto a wide belt which carries it up to the revolving screens. There the sand falls through to the ground to be later carried away by the water if not wanted, the gravel of small size runs into bins, and the larger stones to a crusher.

## CONCRETE COLUMNS

The steel reinforcements for concrete columns shown in this illustration are prepared on the ground and then raised to an upright position. In most

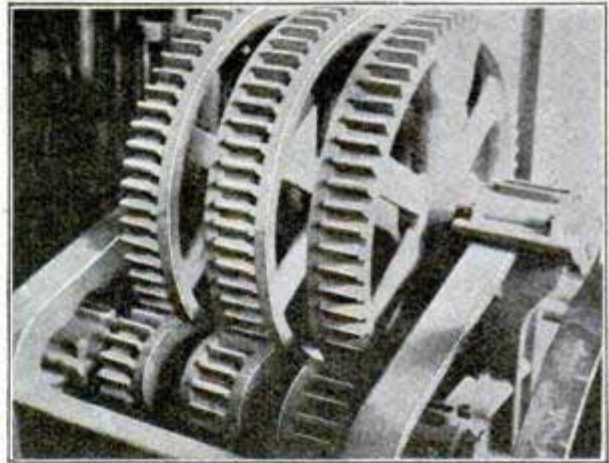


Steel Reinforcements for Concrete Columns

concrete construction, the diameter of the columns at the base is but very little larger than at the top. This is made possible by simply placing heavier steel bars, say 1½ or 2-in., in the lower part of the reinforcement frame. Standing alone the added strength would be very small, but incased in solid concrete the increase in the weight it can carry is immense.

## PUMP JACK FOR MINES

This is a pump jack with special gears for deep wells and mines. The large gears are 32 in. in diameter and have shrouds of 1-in. face. On the other side of the frame is another set of pinions also with shrouds, so that these



For Deep Wells and Mines

large gears really roll on the shrouds, taking the strain off the spokes into which the crank pins are fitted. One set of pinions are idlers. The enlarged spoke has a crank pin, the other crank pin being down between the gears at the left.

The Rhone-Marseilles tunnel, which will contain a canal wide enough for two barges to pass and a track on either side for an electric railroad, will be the widest tunnel in the world. The width will be 70 ft.

According to a dispatch from Copenhagen a polar expedition, with bears as beasts of burden instead of dogs, is under preparation by Captain Amundsen, who in 1905 navigated the Northwest passage.



LOIS L. HOWE, Architect, Boston.

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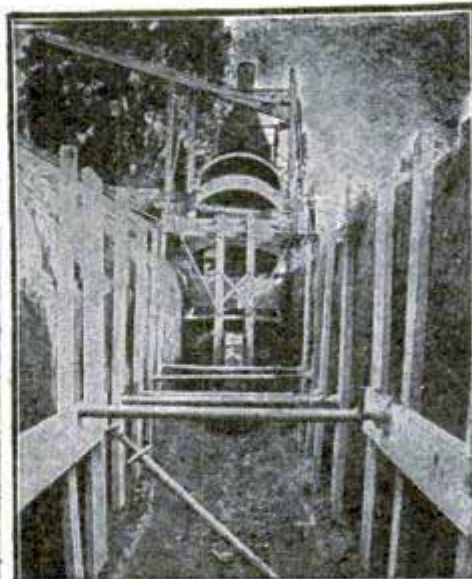
### Automatic Water-Shift — Water-Feed Valve

Reliance Generators are equipped with a rotary water-valve which, not being directly connected to the water feed-pipe conveying the water to the carbide, absolutely prevents the water from reaching the carbide until this valve is brought into operation, automatically, by the downward movement of the bell, which occurs when the gas becomes sufficiently low to require an additional supply. This positively prevents any waste of gas after lights are turned off.

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DAYTON, OHIO

## Have you seen the New Improved BUCKEYE TRACTION DITCHER?



Sold to contractors on 6 days' test before asking for settlement.

Works in hard pan and shale rock, where it can be taken out with the ordinary pick. Passes over the work but once, cutting to a perfect grade if desired.

Write for catalog H, also reprint article giving cubic yards Ditcher will handle per day and the cost of operating.

Read the following testimonial:

24"x7½' Machine.

CANADA

Fincher Creek, Alta, Can., 7th March, 1906.

The Buckeye Traction Ditcher Co., Findlay, O.

Gentlemen:—After using for four months the 24 in. x 7½ ft. Ditcher I purchased from you, I am able to give you the following results:

In good loam the machine can average 1,500 feet of 6 foot ditch per 10 hours, including delays and stops. In hard, dry clay that leaves a polish on the sides the machine can be counted on to cut 900 feet per day. In gravel the size of a man's fist it will dig 750 feet per day; numerous stops are required to pick the stones that may roll into some part of the machinery.

I have dug in ground composed of gravel and boulders larger than a man's head, but it is not economical. I am satisfied that the machine will do the work of 100 men at one-tenth the cost of hand labor.

Yours truly,

J. E. Woods, C. E.

The Buckeye Traction Ditcher Co., Findlay, O.

# HOT WATER IN 2 MINUTES Cost—Two Cents

The Peerless Kitchen Boiler has solved the hot water problem, in city and country homes, hotels, restaurants, clubs, bath-houses, gymnasiums—every place where hot water is required. Burns either gas or gasoline; heats water to 185° and keeps it hot at **one-half cent per hour**. A hot bath for **two cents**. The PEERLESS is simple in construction—only **three parts**—disk, burner, drum. Absolutely noiseless; creates no odor. Occupies but a very small space; easy to install and connect. No pipes to clog or mechanisms to get out of order. The water is kept in constant circulation, the capacity almost unlimited. PRICE, **surprisingly moderate**. Ask your plumber about the PEERLESS, or write for catalog, prices and discounts.



JAMES McCARTNEY

39 State Street, • CHICAGO

**RAILROAD CAUSES DISASTROUS CURIOSITY IN KOREA.**—Since the opening of the railway in Korea, according to the Japan Times, the native curiosity of the Korean people has taken a turn absolutely astounding and unparalleled, except perhaps in a few instances in the United States where people have mortgaged their homes to buy automobiles. On almost every train the third-class compartments are filled with great numbers of native passengers. Foreigners wonder at the almost American hustle which occurs when a train pulls into a station, and are greatly surprised when they find that the native passengers are not on business bent, but merely satisfying an overwhelming curiosity, some of them foolish enough to exhaust every means and run into debt to do so.

On Oct. 16, 1907, the crown prince of Korea took his first ride on the railroad and showed a childlike interest in the proceeding. He was delighted with the speed of the cars, and wondered at seeing smoke pouring out from the locomotive.

**KILLED IN WIRELESS STATION.**—Electrocuted in some manner unexplained, the body of Arthur L. Dakin, a wireless telegraph operator, was found in the operating room of the Marconi station at South Wellfleet, Mass., recently. Dakin went on duty one night and the next morning his body was found in the room where the sending and receiving instruments are located.

**WHAT CAPTAINS DO ON SHORE.**—The quietest and most inconspicuous man in the world is the captain of a big ocean liner when on shore. After the strain and worry of a voyage with a ship that cost millions, bearing hundreds of human souls across a dangerous sea, the sudden relaxation which he feels when his foot touches land is very agreeable. After the usual routine at the customs house and a visit to the office of the steamship company where he hands in his reports, gets the news, and receives instructions, he is a free man.

Instead of a strenuous rush after pleasure he then prefers to enjoy himself in a quiet way, visits friends, goes to the theater once or twice during the week, and perhaps accompanies an old friend to his home in the country, but never very far away from his ship. Always a man of pleasing "front" and finish, he has opportunities to become a social lion on shore, but sees enough of the vanities of social life aboard ship.

Most of the captains now lodge on board their ships to be near at hand in case of fire or other emergency. No captain feels entirely at rest very far away from his ship. It is his pride and chief concern, and no general ever loved his army, or soldier his comrades, with more intensity.

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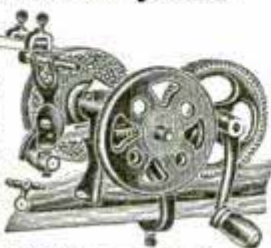
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XXX. Thoroughly practical, powerful and efficient Bench Tool Grinder, speeded to 2,000 revolutions per minute. Has steel shafts, bearings are fitted carefully. It is equipped with a new tool holder, which insures a perfect edge; a skate grinding attachment and a shear grinding attachment. Emery wheel is 6x3/4 inch. Each machine is packed complete and can be very easily carried in a tool chest.



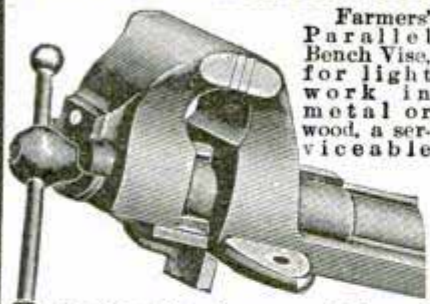
### Davenport Couch \$5.10

This fine Davenport bed couch has a fine drop front with patented lazy tong. Workmanship and material is the best; very easy to sit or sleep on; 6 ft. 2 in. long, 4 ft. 2 in. wide. Seat is 18 ins.



### Oval Slide Bench Vise 95c

Farmers' Parallel Bench Vise, for light work in metal or wood, a serviceable vise for the farm workshop; 3 sizes. Jaws 2 1/4 in., wgt. 6 lbs., 95c. Jaws 3 in., wgt. 12 lbs., \$1.15



### Easy Rocker \$2.95

Here is one of the handsomest chairs that can be found for the price, material and workmanship considered. It is strongly made, finished in gold-leaf oak and birch mahogany. The panels are deeply carved and connected by a highly polished banister. It has a cobbler seat of ample proportions.



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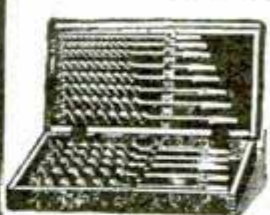
White.' Use only absolutely pure linseed oil for priming.

### 26-Inch Hand Saw \$1.00

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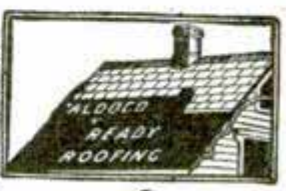


This set of 13 special selected Auger Bits with double spur, sizes 1/4 inch to 1 inch inclusive. These bits are

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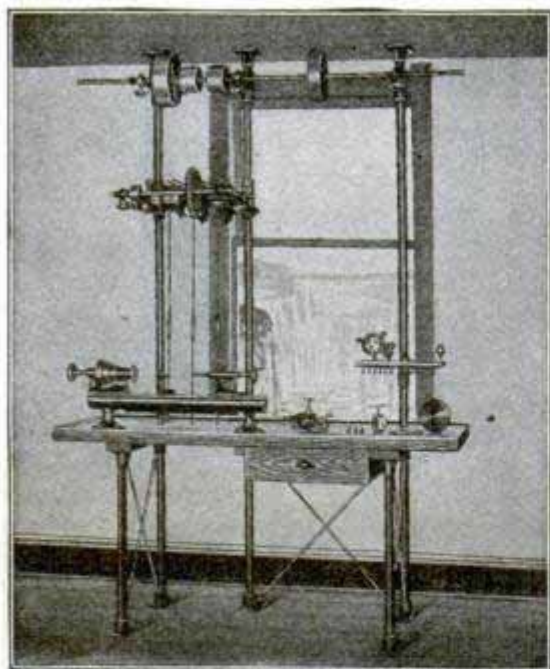
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**FIRST PRINCIPLES OF DRYING.**—A substance becomes dry by the evaporation of its inherent moisture into the surrounding space. If this space be confined it soon becomes saturated and the process stops. Therefore, constant change is necessary in order that the moisture given off may be continually carried away.

In practice, air movement is absolutely essential to the process of drying. Hence the necessity of forced circulation by means of a fan, when positive and equable results are desired. Heat is merely a useful accessory to decrease the time of drying by increasing both the rate of evaporation and the absorbing power of the surrounding space.

It makes no difference whether this space is a vacuum or filled with air, under either condition it will take up a stated weight of vapor. From this it appears that the vapor molecules find sufficient space between the molecules of air. But the converse is not true, for somewhat less air will be contained in a given space saturated with vapor than in one devoid of moisture.

The amount of vapor which a given space will contain increases rapidly with the temperature. It is principally for this reason that heat is such a valuable accessory to the drying process. Upon these principles has been developed the blower type of kiln in which all the heating surface is massed in connection with the fan which forces the warm air into contact with the material to be dried.—Heating and Ventilating Magazine.

**HIGH ALTITUDES AT POLE WARMER THAN AT EQUATOR.**—If you get high enough into the air, the north pole is warmer than the equator, is the astounding claim made by a German scientist at the last scientific congress in Germany.

Prof. Hergesell, of Strassburg University, is the man who makes this claim. This fact, he explains, was determined by balloon ascents in various latitudes under the auspices of the international committee which has been investigating the atmosphere at high altitudes. Unmanned balloons, with automatic instruments attached, reached altitudes of 11 and 12 miles. In the tropics the instruments registered 148° below zero, while in the latitude of central Europe, at the same height, the temperature was only 56° to 85° below zero.

Another fact it is claimed these balloon ascents established is that the greatest cold of the upper atmosphere is reached at heights from 6 to 7 miles. Contrary to the assumption of scientists heretofore, the atmosphere grows warmer above that height, is the declaration made.



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Send us your raw Skins and Hides and we will make them into Coats, Automobile Coats, Jackets, Robes, Gloves, Mittens, Rugs, etc. If we don't suit you we get no pay. We refer by permission to First State Bank and First National Bank. Three Rivers, Mich.

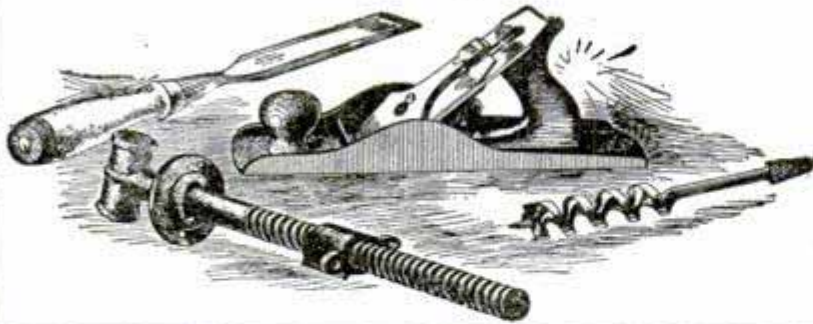
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## Whitewashing Machines

One machine does the work of 20 men. Every factory or shop can afford to have its own machine for spring cleaning. Any man can make money by taking contracts for whitewashing sheds, cellars, factories, etc., if he has one of our machines. Prices: \$12.50 and up. Write for booklet.

**Wallace Supply Co., 24 W. Washington St., Chicago.**

**Just What You Need**  
**Lightning Wrench**  
Pipe and Nut Wrench, Screw Driver, Wire Cutter, Tack Puller in one tool  
Ideal tool for mechanics, no adjustments. Works in places inaccessible with other wrenches. Strong and durable. Mailed postpaid. 6 inch nickel plated 38 cents, 7 inch 48c, 8 inch 58c, 12 inch 88c. Money back if not satisfactory. **SPECIALTY MANUFACTURING CO., JAMESTOWN, N. Y.**

**HOW SALMON ARE CANNED.**—Nobody unfamiliar with the Pacific coast can realize in what enormous numbers salmon are caught there, says the St. Johns (N. F.) Evening Herald. One dismisses with an incredulous laugh travelers' tales of the salmon jostling one another out of the crowded Fraser river in their haste to get up stream, an Englishman all the time thinking of the Fraser as like a Scotch salmon river. Though it would take a good many fish to fill a Scotch river so full, yet, even at that it could not accommodate enough to keep one of the smaller Canadian canneries at work for a season. At one of these smaller canneries 10,000 to 12,000 fish can be dealt with in a day in a busy season, and there are canneries, some of enormous capacity, all along the coast, in the States as well as in Canada. Yet, in spite of the multitudes of fish taken, there does not seem to be any diminution in the numbers left. The Dominion Government enforces close times strictly, says the Queen, and much is also done in fish hatcheries to protect the young fish till they grow sizable; salmon can be netted only for a few weeks in July and August. Even then there is a close time from 6 o'clock every Saturday morning till 6 o'clock on Sunday night. It is a pretty sight on a Sunday, when the sun begins to dip, to see the fleet of fishing boats all out on the broad, smooth Fraser river waiting to cast their nets the moment the 6 o'clock gun is fired at New Westminster. The fishermen are mostly Japanese. This is only one fishing ground out of many, and the Steveston canneries in Puget Sound, a few miles' tram ride out of Vancouver City, though the largest in Canada, are by no means the only flourishing business of the kind. Steveston is quite a large town, a Chinatown in great part, for Chinamen and native Indians do most of the canning work.

The yearly production of aluminum is estimated at 10,000,000 lb.

## MAKE A MOTOR BOAT OF ANY BOAT IN 5 MINUTES



Here's a little 2 h. p. marine motor (40 lbs. complete) that you can attach to the stern post of your boat in 5 minutes without any tools. Drives an 18-ft. row boat 7 miles per hour (runs 8 hours on one gallon gasoline). Can be detached from boat just as quickly and stored in box in which it is carried. Simplest motor made—Does not get out of order

Write for catalog with full description and price.

**WATERMAN MARINE MOTOR CO.**  
1507 Fort St. West, Detroit, Mich.

Many of the leading CENTRAL STATIONS and INDUSTRIAL CONCERNS in the United States after thorough tests are convinced that

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are right. HOW ABOUT YOU?



**SAVE**  
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Every style of enclosed fuses refilled. Do not let your engineer or electrician throw them away. Catalogue of net prices sent on request. Send for Catalogue No. 7. Just out.

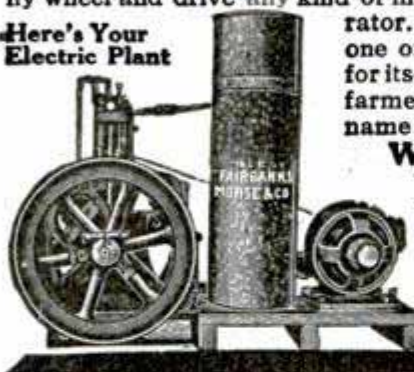
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Electric Light is very economical if you have this outfit—a Fairbanks-Morse Engine with Dynamo. The Dynamo current operates incandescent or arc lights, electric fans, pumps, motors, etc. Shift the belt to the other fly wheel and drive any kind of machine—grinder—churn—buzz saw—separator. Save yourself time and labor by installing one of these outfits on your farm. Soon pays for itself. Simple, safe, reliable. Ideal outfit for farmers. Lowest running and repair cost. Our name your guarantee.

Here's Your Electric Plant



Write for **FREE Engine Book No. C 449** on **Fairbanks-Morse Engines**

Shows how our engine outfits save farmers money. We make several styles and sizes of engines.

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CHICAGO, ILL.

## Does This

Runs buzz saw, pump, grinder, cream separator, churn, electric light plant, etc.

## Gas and Gasoline Engines

For all power purposes. Electric light plants from 10 to 2000 lights. Engines from 1 to 250 H. P. New or 2d hand. Write us for prices.

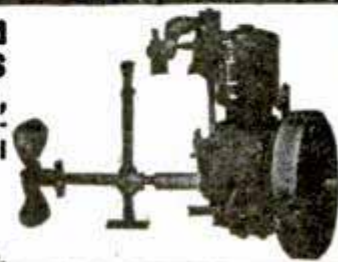
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2 to 30 H. P. • 2 and 4-cycle, latest improvements; best material; lowest prices. Also sell castings, with drawings.

State your want.

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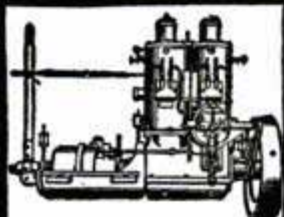


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Over 30,000 H. P. in operation.  
GENERATOR SETS, PUMPS,  
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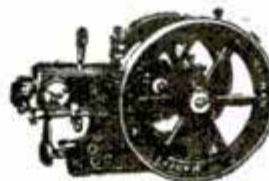
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## The ECONOMIZER carries any load up to 2 h. p.

That name means something. Five years' sales and not a single dissatisfied customer, means something. It's all in the engine—no shoddy goods. Want to know more?

Address,

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with power users are all of the direct kind.

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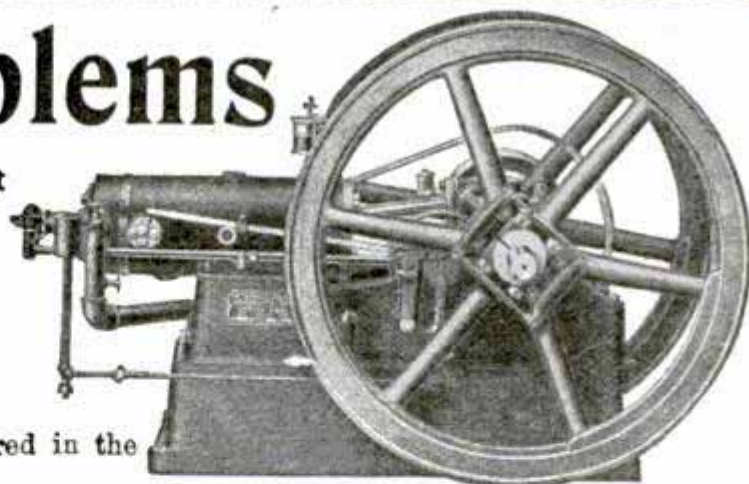
Can anybody run it?

Is the running cost low?

Is it safe?

Is it adapted to your purposes?

These questions are all satisfactorily answered in the



## I. H. C. Gasoline Engines

They are built on correct mechanical principles and only the highest grade material and thoroughly skilled workmanship are used in their making.

They can be depended upon to respond promptly, with abundant power, whenever call is made on them. A combination of efficiency, dependableness and durability that is found in engines of no other make.

Made in the following sizes:

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Until you investigate "The Master Workman" a two-cylinder gasoline, kerosene or alcohol engine, superior to any one cylinder engine; revolutionizing power. Its weight and bulk are half that of single cylinder engines, with greater durability. Costs Less to Buy—Less to Run. Quickly, easily started. Vibration practically overcome. Cheaply mounted on any wagon. It is a combination portable, stationary or traction engine. SEND FOR CATALOGUE.

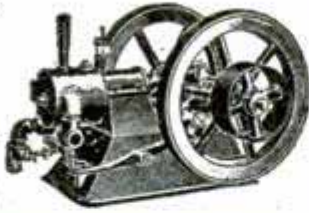
THE TEMPLE PUMP CO., Mrs., Meagher and 15th Sts., Chicago. THIS IS OUR FIFTY-THIRD YEAR

No Better Gas or Gasoline Engines made than the

## FOSS ENGINES,

Simple, Substantial, Efficient. Catalog on request.

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GOES LIKE SIXTY  
SELLS LIKE SIXTY  
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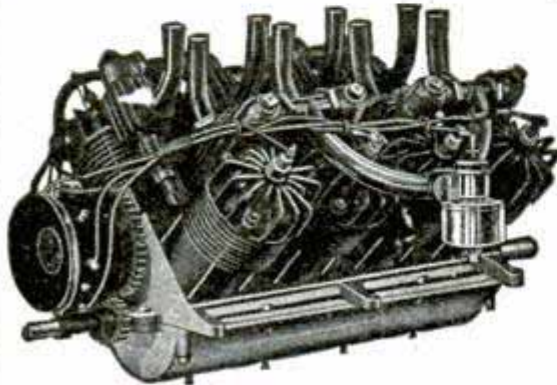
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For Pumping, Cream Separators, Churns, Wash Machines, etc. FREE TRIAL. Ask for catalog—all sizes

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30 HORSE POWER, 8 CYLINDER  
WEIGHT 150 LBS.

Where light weight and great power are required.  $3\frac{1}{2}$  to 40 horse power air cooled motors. Larger motors to order. Send for Catalogue C. Our motors have been adopted by the United States War Department.

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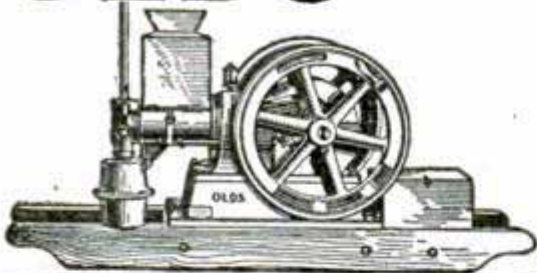
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Gives more power with less trouble and expense

Ask Department M for catalog

C. F. SPLITDORF, 261 Walton Avenue, NEW YORK

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—U. S. Gov't Report

You take no risk in buying an Olds Engine, because you are protected by the strongest guarantee made by any engine maker.

It is the lowest priced good engine made by a factory 25 years in the business.

There is an agent near you to see that everything is right and kept so.

We have a liberal proposition to anyone wanting a good engine.

Be sure to write us about it before you buy elsewhere.

Send for our catalog showing Type A Engines, 3 to 8 h. p. and Type G 8 to 50 h. p. for gasoline or distillate.

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**WATERWHEEL DRAINAGE IN ENGLAND.**—The following letter has been received from W. Clifford, Jeannette, Pa., in which he says that waterwheels have been used in England for drainage purposes for at least 40 years:

"In your October issue you give an account of a huge wheel used for draining a marsh in Michigan. A precisely similar arrangement has been in operation, to my knowledge, for 40 years on Hatfield levels, 15 miles from the town of Doncaster, England. It is placed at the outfall of a drainage system of some 10,000 acres. The wheels, two in number, are exactly as sketched by Mr. Mills. The last time I saw this plant the wheels were nearly stopped by the bodies of myriads of dead fish, which had been poisoned by some tillage put upon the land and washed into the drains by a heavy downfall of rain. The waterwheel is only a few miles from Hepworth, the birthplace of John Wesley."

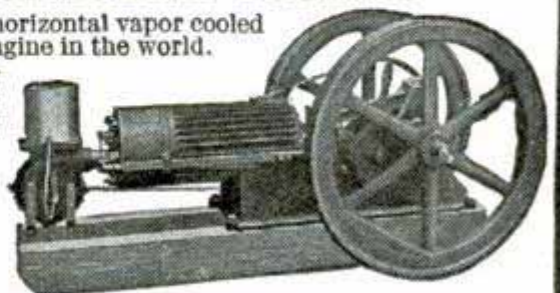
**LOVERS' LANE ON OCEAN LINER.**—One of the new ocean liners plying to southern ports has as an innovation a lovers' lane. The lane leads to a seat situated aft under a staircase, where there are screens and handy push buttons to cut off the electric lights.

## WATERLOO VAPOR COOLED GASOLINE ENGINES

The only horizontal vapor cooled gasoline engine in the world.

Absolutely frost proof and cannot freeze.

Patented May 15, 1906



The king of all gasoline engines. Our catalog will tell you all about them, also our power and sweep feed grinders. Send today.

WATERLOO GASOLINE ENGINE CO.

# DU BRIE Marine Motors

A High Grade Engine at Reasonable Price.

Made complete in our own factory with best modern machinery by skilled mechanics under experienced direction, resulting in a PERFECT ENGINE for YOU.

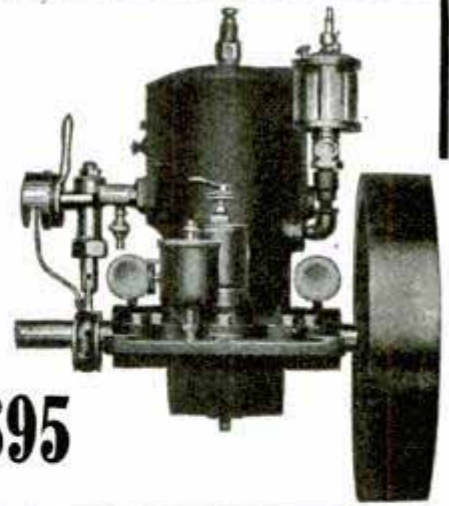
The present is a particularly favorable time to order. Send for Catalogue and find out why.

Ten Sizes 2½ to 27 H. P.

**DuBrie Motor Co. 2½ H. P. \$60, 6 H. P. \$95**

425 Guoin Street, Detroit, Mich.

Complete Equipment



1½ H. P. \$58<sup>00</sup>

Look at the Neat Design!

The finest little 1½ H. P. Engine on the market.

Handsomely finished.

Bore 3½ inches; stroke 3 inches.

These engines will develop over 2 H. P.

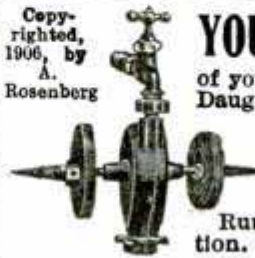
Write for Catalog "P" of 1½ to 16 H.P. Motors.



**AMERICAN MOTOR CO.**

EAU CLAIRE, WIS.

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**YOU CAN PROLONG the LIFE**

of your Mother, Wife, Sweetheart, Sister or Daughter, by urging them to use OUR Sewing-Machine MOTOR, operated by water, to run their Sewing-Machine. Motor supplied with patent stopping and speed regulating attachment, from \$8.50 up, CASH.

Runs the Sewing-Machine without exertion. Anybody can attach them.

Liberal Discount to DEALERS and AGENTS

Live Agents who sell (50) fifty during 1907 will be presented with HANDSOME GOLD WATCH.

Pat. June 23, 1899 Pat. Sept. 14, 1907



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If your water pressure is 25 lbs. or over, buy a

**WATER MOTOR, 5-in., \$25<sup>00</sup>**

Larger Sizes Proportionately Low

Attach to any faucet, and will run fan, lathe, sewing and washing machine, air compressor, etc., etc. Reliable agents wanted.

**A SAMPLE MOTOR FREE**

to the right person in each town. Write for terms, stating water pressure.

**ENGINEER WANTED**

to send for catalog of Indicators, Reducing Wheels, Planimeters. Address,

**LIPPINCOTT M. S. CO.,**

Newark, :: :: New Jersey

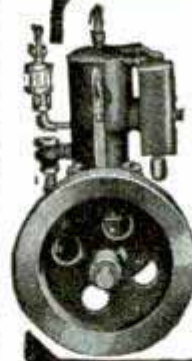


# Perfection

**MARINE MOTOR**

2 H. P. \$45

For real service, for looks, finish and power the Perfection beats any motor ever sold at anywhere near its price and can't be beat at any price. Simple, speedy, reliable and reversible. No cranking. Price is for engine complete with full boat equipment—not bare. Fully guaranteed and guaranty backed by one of the largest plants in the business. Can you afford to buy on any other terms? Handsome catalog of all sizes, free.



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**WHEN YOU WANT ANYTHING**

AND DON'T KNOW WHERE TO FIND IT

**WRITE POPULAR MECHANICS**

**Gies Reverse Gear**

Successor to the reversible propeller

**Solves the Reversing Problem.**



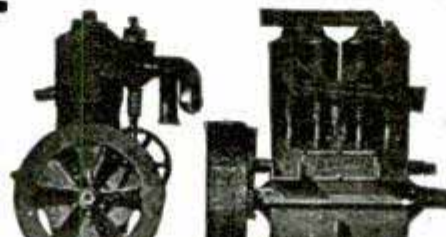
Gives absolute control of the motor-boat at a 1 times. 1 to 80 H. P.—\$15 to \$90. More made and sold than all other reverse gears combined. Catalogue on request.

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**MOTORS**

For Marine and Vehicle Use

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1½ to 60 H. P. (Air and Water Cooled)

Experimental Work Solicited

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IT'S THE SERVICE  
YOU GET OUT  
OF AN ENGINE  
THAT COUNTS

## Stover Motors

2 cycle  
3 port  
4 6 8 and 12 H. P.

Easy to start. Develop full power. Run quietly and smoothly. Nothing "trappy" in their appearance. Nothing complicated. Not a "cheap" motor, but a low priced one. Write for catalogue and prices to

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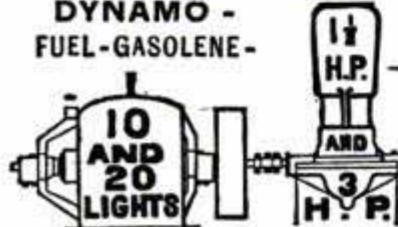
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EVERY WEEK  
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THE BUFFALO  
MECHANICAL &  
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3 to 5 H. P. GASOLINE MOTORS  
(BARE)

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Our Free Catalog C4 is worth your having.

Send 10 cents in stamps for our book "Ignition, Vaporization, Installation and Operation of a Motor."

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**CONCRETE \$128**

**MIXER** Measures and mixes 2 to 3 yards per hour by hand—3 to 6 yds. with engine. Price with engine \$260. Brick Machines \$35 up. Stone Machines, Sewer Pipe, Molds, etc. Catalog Free.

DYKEMA CO.  
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Lightest, most practical, easiest applied (and most powerful for weight), 4 cycle Gasoline Motor Propeller in existence. Can be attached and detached to any boat in a moment, and can be raised or lowered to run in shallow water when necessary. When in operation the engine is entirely submerged, the water in which it operates forming the cooling jacket, which is a most effectual one. It is fully 1½ H. P. and will propel a 16-foot boat at a speed of about 7 miles per hour. Can be operated easily by any boy or girl and run for 1 day with 1 gallon of gasoline, but the tank on engine holds only enough for a little over a half day's run.

Write for Catalogue "L" for full description and price.

**SUBMERGED ELECTRIC MOTOR CO.**

L. W. PIETSCH, Gen. Mgr.

MENOMONIE, WIS.

Chicago Office, 1229 Michigan Ave.



### THE NEW ADVANCE MOTOR

This is the finest battery motor ever put up to be sold at a popular price.

A new design; has two field coils; new improved brush holders. Size, 3¼x3 inches.

PRICE  
\$1.00

Send for free Catalog on Everything Electrical and Automobile Specialties.

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## PALMER MOTORS

1½ to 25 Horsepower; One, Two and Four Cylinder; Jump or Snap Spark Ignition; Two or Four Cycle. Send for Catalog.

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### THE BRAINY MAN AND A GASOLINE ENGINE.—

About four years ago an enterprising young man in a small town located in a thickly settled and prosperous farming community bought a 10-hp. gasoline engine. Five miles was the nearest point where any feed grinding could be done and it occurred to the young man that a gasoline engine and a feed grinder in his town could be made a paying proposition. It not only turned out to be a paying proposition for him, but for the farmers also. All the farmer had to do was to bring his grain, unload, and load up ground feed in exchange, thereby saving from one to three hours. Before the young man had installed his engine the farmers had not recognized the advantage of the gasoline engine, but within two years after, they came to the conclusion that he was making too much money and that they might readily learn to run one of their own and do their own grinding as well as their neighbor's.

This was a blow, but he continued smiling and happy. He turned his energy to lighting and soon was driving a dynamo with his engine which was supplying sufficient current to light the stores of the village and many of the houses. He connected wires to other parts of the town and soon had enough business for the full capacity of his engine. He then put in a storage battery which he charges in the daytime and which enables him to supply double or more the number of lights possible with the engine alone. By running his engine all day on a storage battery of 20-hp. capacity of five hours, he can fill it up in 10 hours. It will then furnish for five hours nearly twice as much current as the engine. This gives his engine work all day and part of the night. It is keeping the engine continually at work, which makes it the most profitable investment.

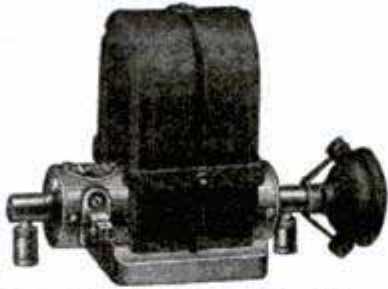
This shows that we need not become discouraged and throw up our hands when our neighbors buy engines of their own and take part of our work from us. There is room for an enterprising fellow in every community and a resourceful man will make a gasoline engine profitable under almost any circumstances.

This young man not only got a profitable return from the lights he furnished each night, but as he also wired the dwellings and business houses which he supplies, he realized more profit. He is laying the foundation for constant and profitable employment for himself and his engine.

## WHY NOT STOP YOUR TROUBLES?

### A "Wizard" Tubular Does It

Armature incased in WATER-PROOF non-corroding brass tube. All brass screws. Friction, Belt or Governor drive. Brush holders removed without loosening screws. All parts polished brass. Contact and Jump Spark. A trial will convince you.



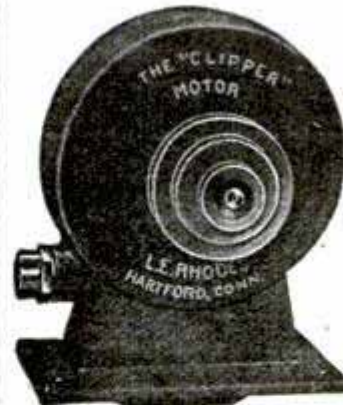
Most popular and satisfactory Magneto on the market. Prices as popular as machine Governor does away with Batteries and Switches.

**Hercules Electric & Mfg. Co., Indianapolis, Ind.**  
30 DAYS' FREE TRIAL. 724 Langsdale Ave.

## "GET THE BEST"

which means

### The Clipper Water Motor



We do not claim it THE CHEAPEST, but we do claim it THE BEST.

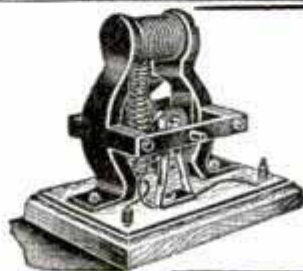
Send \$7.50 and get one of these 6-inch motors—regular price \$10. Send P. O. order, Regist'd letter or N. Y. draft.

**L. E. RHODES HARTFORD, CONN.**

**98¢ FAN MOTOR COMPLETE**

This electric fan is substantial and practical in all details and nicely finished, fan is removable so motor may be used separately. We furnish extra grooved pulley with each. We are Cut Price headquarters for everything electrical. Send for large free catalog. Dealers wanted everywhere.

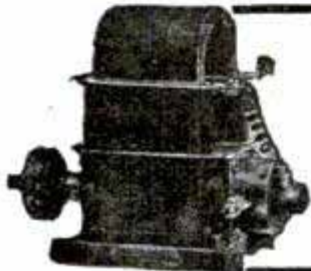
**THE VIM 68 LAKE ST. DEPT. E. CHICAGO**



### THE White Eagle Electric Motor Postpaid, 75c

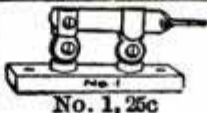
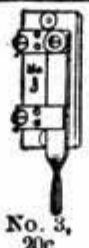
We make working models of inventions. Send for illustrated catalogue of Model Supplies.

**The Pierce Model Works**  
134 Pierce Avenue Chicago, Ill.

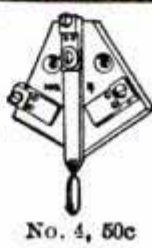


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The most Reliable Sparkers on the Market. Take the Place of Batteries



**"Quick Action" BATTERY SWITCHES**  
Discount to Trade



### Jump Spark Coils FOR ALL PURPOSES

Single, Double, Triple and Quadruple for Stationary Engines and Automobiles. Guaranteed in every particular. Fine Vibrator.

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Firemen and Brakemen Earn from \$100 to \$185 a month. Graduates of this school in great demand. Actual railway officials teach you by mail during your spare time, at small cost. Free catalog, etc.

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Write to-day.

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No other machine can do it successfully for lack of original patents owned by us. No twist motion in our drive. No belt or switch necessary. No batteries whatever. for make and break or jump-spark. Water and dust-proof. Fully guaranteed.

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Catalog free with full information.



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The World's Headquarters for Dynamos, Motors, Fans, Toys, Batteries, Belts, Bells, Lamps, Books. WE UNDERSELL ALL. WANT AGENTS.

### DYNAMO-MOTOR, \$3.50

(A Dynamo and Motor in One)

As a dynamo, it will light four 6-c. p. lamps easily; operate induction coils; charge storage batteries; decompose water, electroplate, etc. As a motor, will operate sewing machine, jewelers' lathe, emery wheel, circular saw, advertising devices, and other useful appliances.



**NEW ADVANCE MOTOR, new design, has two field coils and improved brush holders. Price 70c, postage 20c. Send stamp for catalog, No. 8 of new things electrical.**

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## A RAILROAD OF YOUR OWN

is possible if you buy Electrical Outfits from us. Send 2-cent stamp for 80-page catalogue—a wonderful book of electro-mechanical knowledge, illustrating hundreds of Electrical Toys and utilities. If you want the best Motor made for boys of every size and age, send \$1.75 for our Model B3 Jim Dandy Practical Motor, sent post-paid. Send 2-cent stamp for catalogue to

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## ELECTRIC BOOK FREE

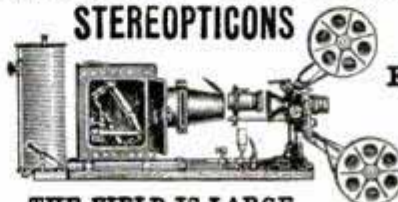
Shows all the Newest High Grade Electrical Supplies and Novelties at Lowest Prices in the world. Full of Holiday Suggestions. A. C., Dewey Electrical Co., Milwaukee

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**STEREOPTICONS** You Can Make BIG MONEY Entertaining the Public.

Nothing affords better opportunities for men with small capital. We start you, furnishing complete outfits and explicit instructions at a surprisingly low cost.

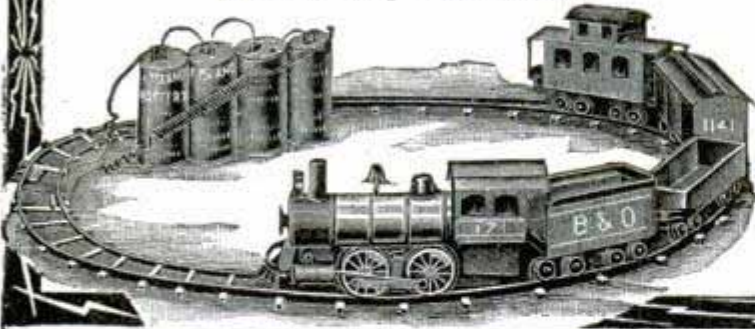
**THE FIELD IS LARGE** comprising the regular theatre and lecture circuit, also local fields in Churches, Public Schools, Lodges and General Public Gatherings. Our Entertainment Supply Catalogue and special offer fully explains everything. **Send Free.**



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### Real Scientific Novelties

Practical, Complete, Harmless, Durable  
Just the Things for Christmas



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THERE'S great fun owning a railroad and bossing the job. Our Models of *Locomotives, Trains, Trolley Cars, Dynamos, Lamps*, etc., are practical and durable inventions. They amuse and instruct. They point many a boy to a useful career. Equipped with dry batteries, no acids or liquids used, perfectly safe and harmless. Prices from \$1 up.

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Largest Manufacturers Electrical Novelties in the World.

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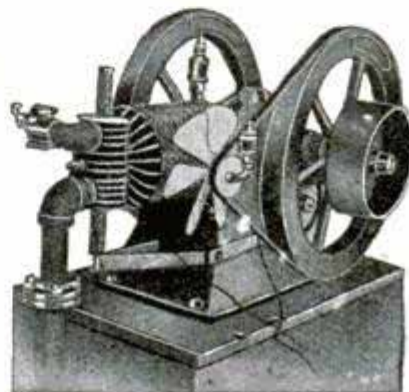
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1½ H. P. to  
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1¼ and 2¼ H. P. equipped with short connections for spray pump and walking beam attachment for pumping water from wells. Will work against 200 pound pressure all day without heating. Gasoline in base of engine.

Write for agency

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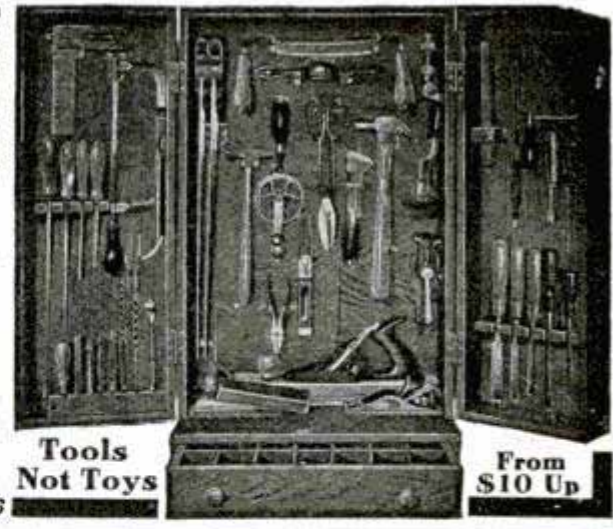
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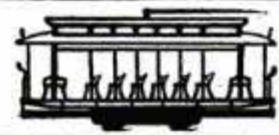
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He paused to rebait his hook. As he flung the line over the wharf he continued reminiscently:

"Yes, sir, onct I was plumb fool enough to go aboard one of them craft, but it ain't happened again. You see, my nevvly, Bill Simes, bought one while I wuz a visitin' him, an' nothin' would do but that I should be along on the trial trip. It was surely a fine-lookin' craft, from the lanterns on the bow to the pilot's license over the stern.

"Marcia—that's Bill's wife—an' her sister went up the gangplank an' settled themselves in the tunner, or some such word, while Bill an' I went for'ard. Bill took the helm, we up anchor, an' wuz off.

"We went slow at first, so as not to collide with other craft, an' Bill had to keep his weather-eye open, I can tell you. First it wuz hard apout, an' then hard astarboard, an' we had to beat our way among trolleys an' trucks an' all kinds of shoals.

"Finally we did reach deep water—open country, Bill called it—an' then we crowded on all sail an' went flying along before the wind at thirty knots. As we wuz skimming along at this lively clip we wuz overhauled an' ordered to heave to. I natchelly thought of pirates, an' wuz fer crowdin' on more sail, but Bill said it wuz a revenue cutter an' brought his craft up in the wind.

"Bill apologized fer breakin' the laws of navigation, promised to take in sail, an' we bore away on our course again.

"I wuz just figgerin' on takin' some of the money I had salted down an' buying myself a sister ship to this craft, when there came a rip-tearin' sound from somewhere in the hold an' we were caught in stays. Well, Bill took off his pea-jacket an' crawled under the keel, an'

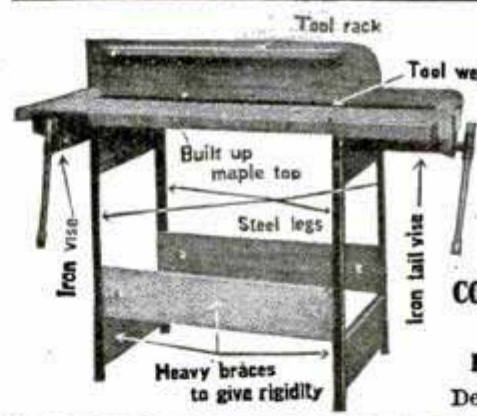


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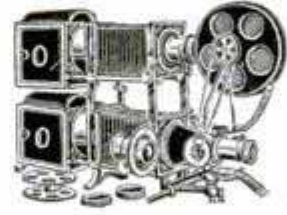
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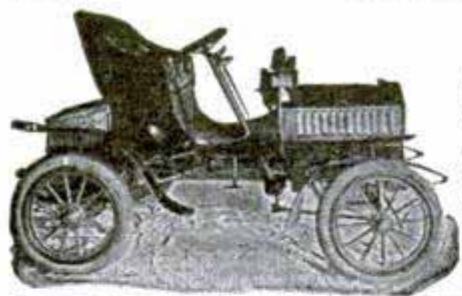
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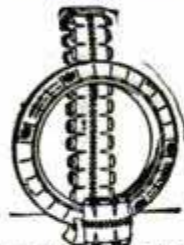
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worked an' worked, an' ground the windlass, an' nary a groan would she give.

"Marcia she an' her sister began to ask all sorts of questions an' the more they asked the madder Bill got. There we lay, becalmed-like, an' as luck would have it we were miles from port an' out of the reg'lar track of vessels.

"It grew dark, an' I wuz fer sendin' up sky-rockets, but Bill just called me an ol' fool. Think of it! Me that wuz captain of the best clipper ship that ever left this port!

"Then a rain came up, so we managed to crawl under some tarpaulins on deck while Bill worked down below. Finally, just as we began to think we were marooned fer sure, we saw the lights of a raft bearing down on us, an' I hailed her with a 'Ship ahoy!'

"We wuz glad to see it. I can tell you, fer we wuz all hungry, with not even a bite of hardtack aboard, an' it had rained so that the water was runnin' out of the scuppers, an' I thought we would founder, sure enough.

"So the other skipper got a cable, an' Bill came up from below. By this time he an' Marcia weren't on speakin' terms. We made fast to the stern of the other craft an' wuz towed into port, hungry an' soaked to the skin. I guess in addition to havin' our vessel drydocked in the garage Bill had salvage charges to pay, too.

"So, now, son, you see why I ain't got any more hankering after them things. Give me a schooner or a sloop, or even a dory, but no automobiles fer me!"—The Ocean.

**TRAIN SWEEP AWAY IN VANISHING RIVER.**—By a sudden rush of water from a pocket in the snowcapped mountains of California, forming what is known in that part of the country as a "disappearing river," a Santa Fe freight train was washed off the track. When the river dried up only the engine was found on the track. At Bengal, Cal., where the accident occurred, the water



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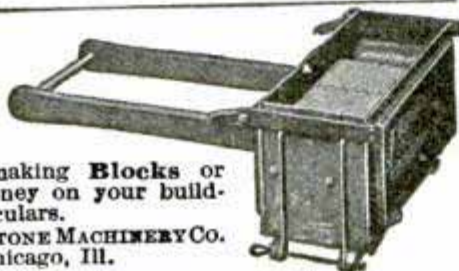


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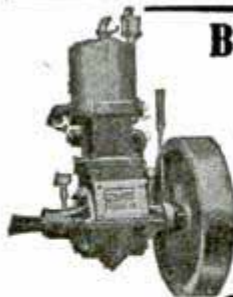
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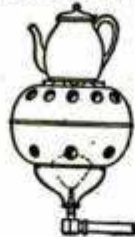
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The expert takes as a basis of his figures a 20-hp. engine. This will haul with ease a gang of 10 plows with 12-in. bottoms. Travelling two miles or better it will turn over 2½ acres every hour, or 25 acres a day of 10 hours. To operate this apparatus two men will be required at wages of \$2 per day per man, or \$4 per day for the plowing.

The fuel consumed in 10 hours will be 35 gals. or less, which should cost by the barrel about 15 cents per gallon. Thus it would cost \$5.25 per day for fuel, and \$4 per day added for help, bringing the cost of plowing 25 acres to \$9.25, or 37 cents per acre. If gasoline sells for 20 cents a gallon the cost would be 44 cents per acre.

The traveler who makes these calculations says that it will take a pretty smart team and man to plow 2½ acres in 10 hours. As in that section of Kansas where the experiments were made, a team and man are considered worth \$3 per day, it would cost \$1.20 per acre to plow in the old way, as against 37 cents if gasoline is 15 cents a gallon and 44 cents an acre if fuel is 20 cents per gallon.

According to these figures it would take 10 teams with a man to each team to plow as much in a day as the auto-tractor and two men. Twenty horses would cost as much or more than the first cost of the engine, the trouble in caring for the machine is considerably less than that of teams, and if the engine is well made, it should last as long as the animals. The repairs on the engine would be offset by the things other than feed that enter into the cost of keeping teams.

There is food for thought in these figures, which are furnished by a gentleman who has given the matter a great deal of time and attention. As farm help is yearly becoming harder to secure, the balance is all in favor of the engine.—Farm Machinery.

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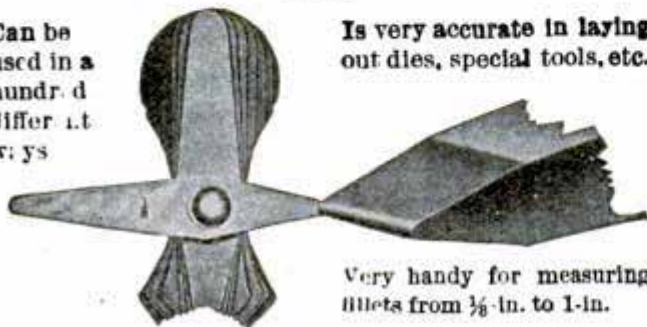
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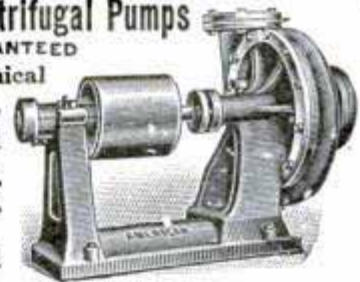
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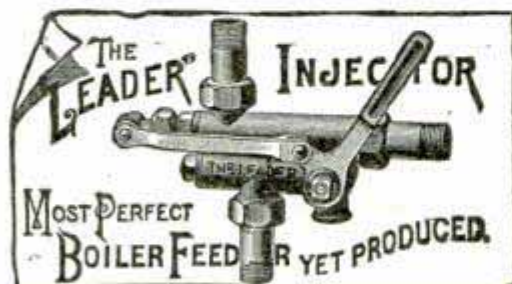
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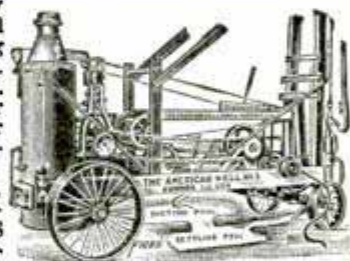


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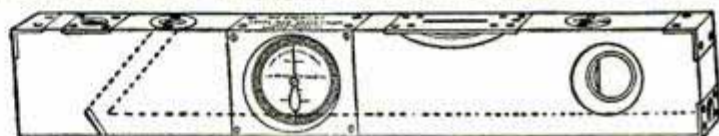
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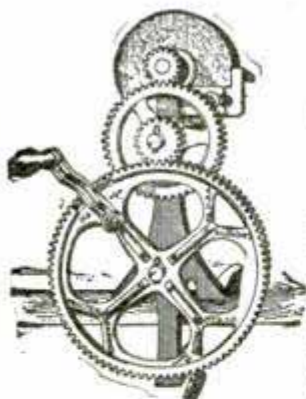
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**WHERE THE SOAP WRAPPERS WENT.**—Some 100,000 cakes of soap are used per year in the Brooklyn public baths, and recently one of the bright young fellows with whom Borough President Coler is surrounded informed him that the makers of a certain brand of soap that is largely used would give a bar of soap for every five wrappers of their soap returned to them. Mr. Coler immediately saw in his mind's eye 20,000 cakes of soap saved to the borough in a year, and he sent for the man in charge of the baths. Said he: "What do you do with the soap wrappers?" "I save them," answered the man. "Bring them here tomorrow," was the final response.

The soap man shifted from one foot to the other and seemed to be ill at ease. On the following morning the soap man came again.

"Mr. Coler," announced he, nervously and gloomily, "the soap wrappers are here."

"Where?" asked the president, observing that the man carried no package.

For answer the soap man beckoned Mr. Coler to a window. Below in Joralemon street was standing a big truck load of furniture. There were a handsome oak sideboard, a brass bedstead, a whatnot, two or three rugs, several barrels of crockery, a Morris chair and a lot of other things.

"There are the soap wrappers, sir," said the gloomy and apparently troubled official.

"What do you mean?" asked the puzzled borough president.

"The company which makes the soap," he explained, "gives premiums in exchange for returned soap wrappers. Learning of this, and thinking that the city had no use for the wrappers, I saved them and furnished my flat with the premiums I obtained. As I could not bring you the wrappers I brought down the premiums. I had to rip up my whole flat to do it."

Mr. Coler smiled. He was satisfied that the man, who was one of his most efficient subordinates, had been innocent of any intentional wrongdoing, and told him to take the furniture back to his flat. From that time the wrappers have been returned to the manufacturers for cakes of soap.

The incident suggests once more the thought, "Why is this affinity we so often hear of between furniture and soap?" We record with glee this indication of a partial sundering of the tie.—Furniture Trade Review.

**TASK FOUND FOR UNUSED LAMP POSTS.**—Use has been made of the derelict gas lamp standards in Dublin, Ireland, to hold flower baskets filled with plants. The baskets are made of cast iron and burnished copper. The growing flowers and green trailing plants make a splendid display and lend color to the dingiest of streets.



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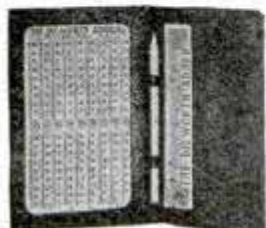
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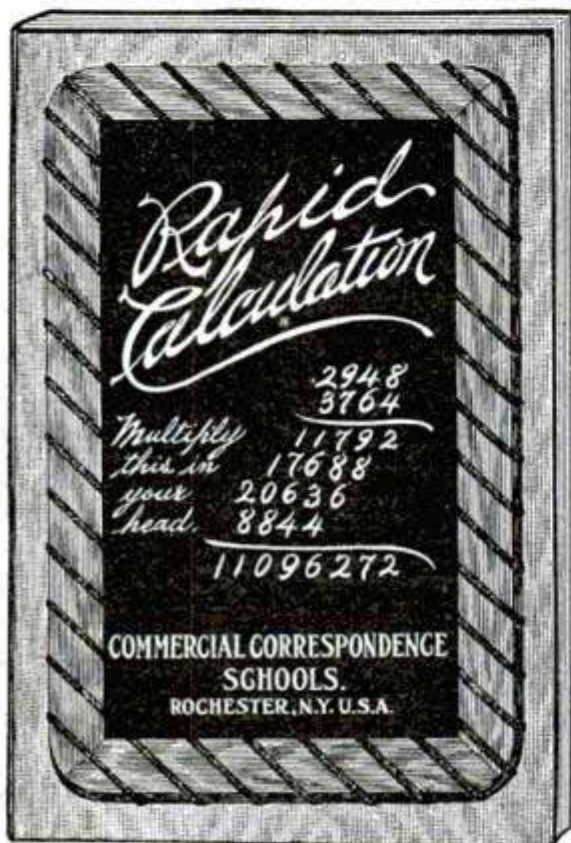
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**AVERTS GUN TURRET DISASTER.**—The lives of a score of men might have been sacrificed and the "U. S. S. Connecticut" partially wrecked during the recent target practice off Cape Cod had not Lieut. William P. Cronan thrust his right hand into the breech as the lock was being closed upon loose grains of explosive. His bravery caused him the loss of his index finger but saved the gun crew.

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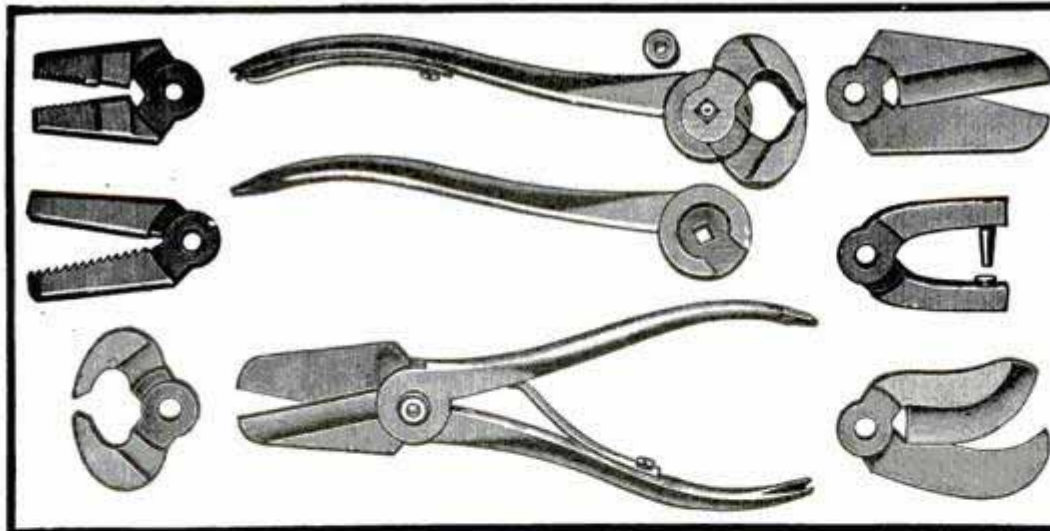
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### WINNING OUT ON A PATENT.

(By William M. Clark, in American Machinist.)

Twenty years ago Jack Davis found his way out of the woods. Jack was a conscientious, all-round machinist who inherited an inventive instinct from away back. He had contrived a number of novel devices, none of which, however, had brought him very tangible returns. I first met him, a slim, nervous young fellow, when acting as foreman in a shop where I was having some strenuous mechanical experiences. Ever since we have been on terms of intimacy, and his winning out on a patent may prove an object lesson for the ambitious young mechanic.

Two or three years after I first knew Jack, he went to work for a concern that manufactured a sewing-machine attachment for making up knit underwear. This device automatically trimmed the seams of garments very neatly, quite near to the line of stitches. It was done by a pair of tiny scissors set close behind the needle, which continuously clipped away the waste fabric during the process of sewing. The manufacturers had secured a patent on the scissors arrangement and seemed to be doing well. They were in some way backed by the Skinner Trading Company, upon whose sewing machines the attachment was exclusively used.

But Jack found out that the clipped edges of the fabric, so close to the seam, proved harsh and irritating to the skin, and considerable complaint was made by dealers about garments sewed and trimmed in this manner. True to his inventive instinct he began to look for a way to make a better seam. There was a demand for something different. He worked over the problem for months, but had arrived at no satisfactory results. There was a dim idea floating around in his brain, but it would not materialize and he was becoming discouraged.

One day a man was sent out from the shop to a near-by factory to look after some machines that needed repairs. Before going, he gathered up a bunch of tools to take along. These he wrapped and tied into a secure package and was looking for a knife to cut the stout cord he had used.

"Chuck your knife over to me a moment," he called to Jack, who was at the next bench. Jack felt in his pockets but his knife was missing, and he answered back, "Chew it off, Jim."

"All right, Smarty, I will." He placed the loose end of the cord over a vise, struck it a sharp blow with a hammer held at an angle, and the stout twine fell apart.

Jack had done the same thing a hundred times. But this time the action had a peculiar significance. In a flash the vague idea in his mind materialized, and a way to trim a seam without scissors appeared to him.

He nursed his discovery carefully and that evening, at home, began experimenting again. It was two or three months before he had completed a working model that "chewed off" or separated the fabric by compression, close up to the stitches. He attached it to his wife's sewing machine and it worked perfectly, making a seam as soft and agreeable as any other portion of the garment.

There was nothing found to interfere in a preliminary search by his patent attorney, who was particularly en-

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thrustastic over the outcome and encouraged Jack to believe that if they didn't run up against something in the patent office not yet issued, the way was clear for a broad claim.

The mills of the patent office grind slowly. Three or four months passed before the examiner reached the case. Then he threw a bomb-shell into Jack's path. A similar device, not yet allowed, turned up, that antedated Jack's only two or three weeks. The thing that Jack feared had occurred during his indecision. Another had stumbled on the same thing, or else his invention had leaked out and someone else had gotten ahead of him.

Mr. Campbell, his patent lawyer, promptly notified the patent office that he would contest the priority claim, and called upon Jack to find at least one disinterested and trustworthy witness to support him. Jack had been so secretive in the matter that he could not recall anyone who had seen his device or to whom he had spoken about it.

"Well, think it over," said Mr. Campbell, "perhaps you may remember someone we can call upon. We must be able to establish definitely an anterior date. If we can do that, our way is clear for a patent."

In the meantime a master was appointed to hear the testimony, upon whose report the examiner's decision would be made. Within a week the case would come up. Jack had yet no one to corroborate his claim that the actual construction of his device had been worked out some months before the date of his application for patent.

Then something happened. Going to lunch one day, Jack met Jerry Symons, an old shopmate whom he had known for years, but had lost sight of for several months. After the usual greetings Jerry blundered out, "How is the patent coming on, Jack?"

"Patent! What do you know about my patent?"

"Don't you remember the night I called at your house to get you to say a good word for me at Craig's?"

"Why, Jerry, I had forgotten all about it until this moment."

"Well, I didn't forget, Jack. I made good money at Craig's until my falling, you know"—raising his elbow and bringing his hand to his mouth—"got the best of me again. You were pattering away over a sewing-machine contraption that evening, and while you didn't explain it to me specially you started up the machine, which trimmed off the edges of the cloth as it was sewed, just as neat as wax. You showed me afterward that the seam was as soft as velvet. It doesn't take an old toolmaker who's been around machine shops all his life very long to see how a thing works. Why, it was great. You had the

(Continued on page 1416)

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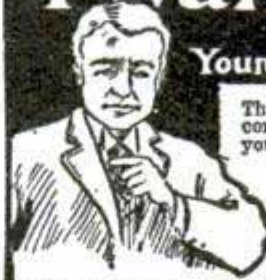
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(Continued from page 1414)

scissors attachment beaten a mile. But, honest, Jack, I never whispered a word about it to a soul."

"How long has it been since you saw it, Jerry?"

"It must be five or six months. I got the job at Craig's and went to work next day, and the time-keeper there can give me the date to the hour."

"Well, come with me and let's get lunch some place where we can talk, and I'll tell you the whole story."

After a long talk and a good dinner Jerry accompanied Jack to Mr. Campbell's office, where he submitted to a rigid preliminary examination as to his constructive knowledge of Jack's device and the fixing of a prior date. The master's report to the patent office resulted in the issuance of the patent to Jack.

But another formidable boulder appeared across Jack's path. After he received his patent he opened negotiations with a Mr. McFarland, who hailed from the west. He was past middle age, flourished long, auburn side whiskers, was largely interested in various enterprises and bore the reputation of being at least a half a millionaire. Besides he looked as if he were a fighter. The plan in view was to place the new trimmer into the hands of manufacturers, who, instead of buying the attachment outright, should be required to pay a monthly royalty or rental for its use. McFarland was to furnish sufficient capital to equip a plant with facilities to make the trimmers and supply the demand. The royalties received were to be shared equally. But definite arrangements had not been made.

Then a representative of the Skinner Trading Company called to see Jack.

"I wish to talk over a late patent issued to you," he began. "You may not be aware that we own a device which is practically the same thing."

"Is your device in use anywhere?" inquired Jack.

"Well, no; we consider it of little value for factory purposes—too slow and uncertain in its action. We took it over from the patentee for a small sum, as we do most sewing-machine attachments offered to us. You ought to see our collection."

"You say this trimmer you have is slow and uncertain. Then it is unlike mine, which is rapid and trims clean and sure."

"Would you object to showing me your attachment?"

"I am sorry I haven't it here today."

"Well, it is immaterial. Our experts have thoroughly investigated your patent and I am instructed to say that any attempt to place it on the market will be met by prosecution for infringement. However, as you have been at some expense in the matter, we are willing to take your patent over, as we have done in other instances, and pay you a nominal price, say \$300, for the assignment of the entire right, title and interest in same. If you decline our offer, and in the event of your disposing of a single attachment, we will begin suit, simply to protect our manufacturing rights. I am ready to close with you today. Tomorrow my proposition may not be so favorable."

Does an Irishman hate snakes! Well, so did Jack hate lawsuits. He thought fast. He had no money to fight the Skinner people. It was not likely that McFarland would go any farther. He wasn't buying lawsuits. Hadn't he

(Continued on page 1418)

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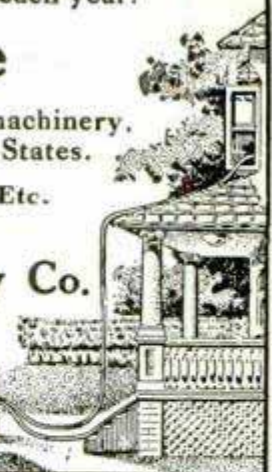
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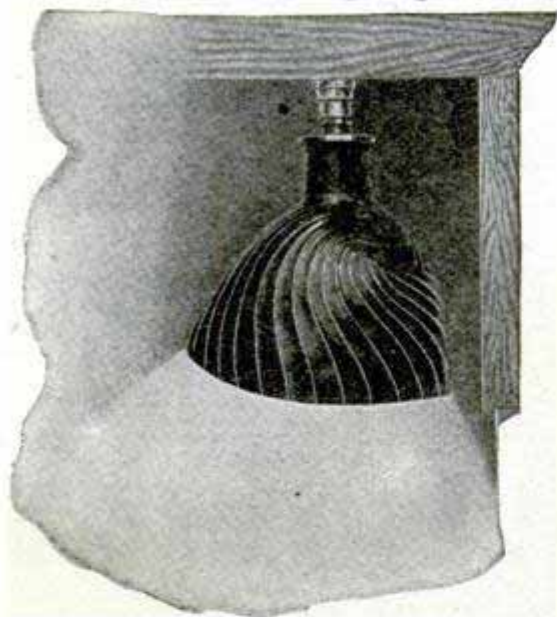
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(Continued from page 1416)

better take what he could get? The amount would about make good what he had spent on it. But Jack put up a bold front and replied:

"We had best let the matter rest for the present. If you care to call in tomorrow, do so. I'll be here all day."

After the Skinner man had gone, Jack suppressed an impulse to call him back. Then he caught his second breath and resolved to see Mr. McFarland and lay the whole matter before him. If he turned him down, he still had the Skinner people.

McFarland listened calmly to Jack's recital of the Skinner proposition. Then he said:

"They tell you they have the same thing and it's no good, yet are willing to pay \$300 for another one. They want you to believe that they are bald-headed philanthropists. To me it looks like a game of bluff. If you are willing we will close our deal on the terms practically agreed upon. Then when that smart duck comes in tomorrow, tell him you have considered his proposition to buy your patent and that your price is \$25,000. As to his threat to sue for infringement, say that you have taken steps to defend your rights. If they have anything like your trimmer, we will compel them to bring it out."

The substantial value of a patent is usually greatly enhanced when the validity of its claims has been sustained by a court of justice. To hasten such a test of Jack's invention, Mr. McFarland had a few trimmers made. These he placed on sewing machines in a factory where the scissors device was in use. The ruse was successful. Within two or three weeks, suit was begun by the Skinner company for infringement and damages. This trial was mostly a battle between lawyers and experts. Jack was the principal witness in defense of his invention, his testimony, however, being turned against him on several hours of irritating and malignant cross-examination by the Skinner company's lawyers. While Jack vowed he would thrash those two lawyers within an inch of their lives, when he caught them outside, he kept cool, sometimes proving as caustic as his inquisitors. When he left the chair, Mr. McFarland reached over and whispered:

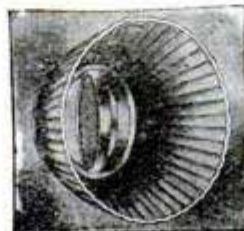
"You did bravely, my boy. They haven't a leg to stand on. Our case is as good as won."

And so it was.

Instead of thrashing those malignant lawyers, Jack, at Mr. McFarland's suggestion, addressed a note to the Skinner people, thanking them for their action against him; that the results of their suit had given a boom to his invention among the manufacturers, which \$10,000 spent in advertising would not have done.

Jack is out of the woods. Long ago he removed from the little \$10-a-month house that sheltered his family for years. In his new and handsome modern home in the suburbs, prosperous and portly, he smokes his pipe in peace.

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# HINTS TO INVENTORS

It is a well-known fact that there are more dollars in a good patent than in some of the best gold mines. What mine has returned as much as the Bell telephone, sewing machine, the phonograph, electric light, and so on in countless numbers? And it is not only the more intricate inventions that reap the harvests but the very simple ones as well. Do you know that the inventor of that little iron cap on the heel of your shoe realized over \$1,000,000 for his idea? Or do you know of the thousands of others who have done almost as well, if not better?

And yet you question, "What is there left to invent?" Ah, that is the hardest problem! What is there that will return the inventor a profit?

We have published a new, second and greatly enlarged edition of "Hints to Inventors," by Robert Grimshaw, Ph. D., M. E., the celebrated authority on technical subjects, telling what to invent. This book of over 200 pages, printed on Puritan laid book paper, handsomely bound in green vellum, is a veritable cyclopedia of knowledge for anyone of mechanical or inventive mind.

The hints in this book were obtained by asking several hundred manufacturers in various lines what inventive problems in their factories needed solving. In this way Dr. Grimshaw has collected information invaluable alike to the inventor looking for new lines, manufacturer looking for new things and the man with ambition to be an inventor. This information is presented in such a way that the reader is not only shown what is needed, but is made acquainted with what has already been done toward solving the various problems and in many cases valuable hints along what lines to work and what to avoid. This naturally stimulates sensible inventions, while discouraging those having no chance of success.

In addition to these hints, the book also contains chapters devoted to the value of models—selling patents—what royalty proposition to avoid—how to select a patent attorney—perfecting and developing inventions—a list of inventions for which prizes are offered, etc., etc.

The following is an extract of a letter from Mr. R. S. Newton, of Newton Centre, Mass., an inventor of almost national reputation:

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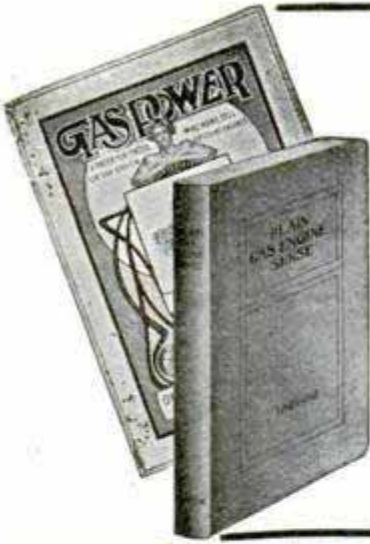
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**HAND BOOK OF PRACTICAL MECHANICS.** By Charles H. Saunders. For use in the draughting room. Contains tables, rules, formulas; and solutions of practical problems by quick methods. Published by author, 216 Purchase St., Boston, Mass.

**HINTS TO INVENTORS.** By Robert Grimshaw. 210 pp. Vellum binding. Price, \$1.25. Tells what inventions are needed and how to perfect and develop new ideas. Has chapters devoted to inventions needed along electrical, chemical, metallurgical, mining, railways, marine, military, machine construction, machine tools, recording and vending machines, lighting and many other lines. What has actually been done along these lines is gone over, and in many cases valuable hints are given. Inventors will find the work of both interest and help.

## PATENTS AS INVESTMENTS.

On September 24, 1907, the United States patent office issued 614 patents on mechanical, electrical and chemical inventions, as shown by the Official Gazette, the government publication devoted to patents and trade-marks. From the same authority it appears that of 164 of said patents (more than 25%), a part or the entire interest was sold to individuals or manufacturing companies, before the patent papers issued from the patent office. To anyone who has any experience in selling patents, it is a well known fact that it is much more difficult to sell a patent right before the patent issues than it is after the inventor has the patent papers to show. It is therefore fair to assume that at least 25% of these patents will be sold in whole or in part after the letters patent are received by the various inventors. Now then, it is quite common to grant licenses under patents in lieu of selling interests in them, and, by the way, it is often the safer practice for the patentee. But no record of licenses is kept in the patent office, hence there is no way of ascertaining the proportion of patents in which licenses are granted. Doubtless some of the patents sold are afterwards farmed out through licenses, but from the writer's experience of 30 years with patents, he believes that an estimate of 10% of patents so handled is most conservative. Another 10% represents patents taken out by men who intend to manufacture and market the thing patented, and in such cases there are no licenses nor assignments. Thus we can conservatively assume that about 70% of the patents issued are either sold outright, licensed under royalty arrangements, or

(Continued on page 1424)

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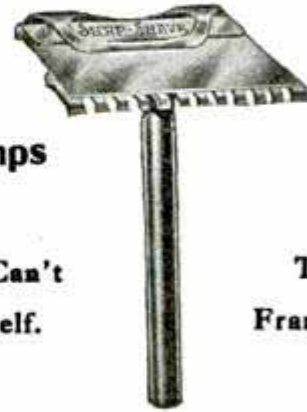
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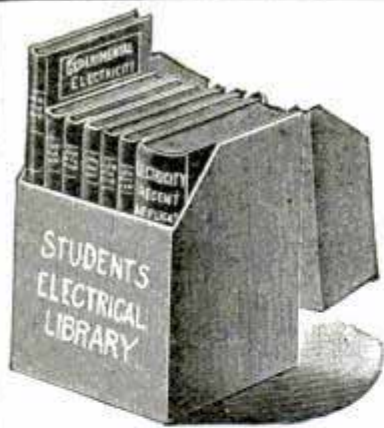
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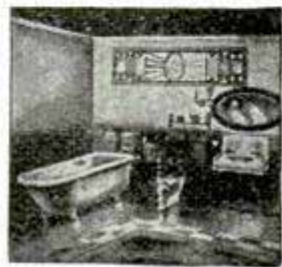
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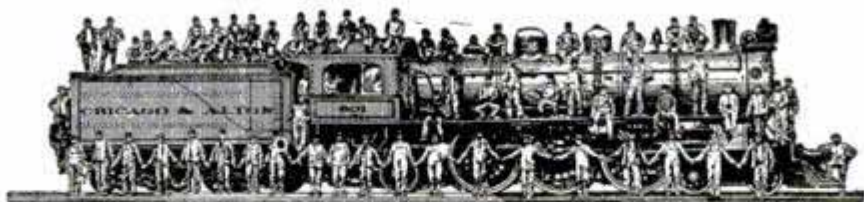
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handled by the patentees who are manufacturers of their own inventions. That this assumption is borne out by the records of the patent office, is shown by the fact that there are more assignments of patents recorded in that office than there are patents issued each week. Of course several different assignments may relate to a single patent, but, on the other hand, it is common practice to include more than one patent in a single assignment. Frequently, through ignorance or carelessness, or the desire to conceal the real ownership of a patent, the assignment is not recorded in the patent office, and no one can estimate the number of such cases. Some of the assignments relate to inventions on which applications for patents are made and rejected or abandoned. But after making due allowance for all such cases, the records show that interests are sold in a very large proportion of the patents granted, in spite of the popular notion to the contrary. As these assignments do not contain the real consideration in most instances, there is no way of knowing what the inventors received for their patents, but in most cases they were satisfied or they would not have executed the assignments.

I challenge comparison between these figures and a like number of transactions in real estate, mining stocks, industrial stocks and other forms of popular investment and speculation. The average patent costs about \$75, and a good model about \$25 more. How many avenues are there for the safe investment for sums as small as \$100, except in savings institutions and banks that pay only \$4 a year for the use of the money? How many people buy \$100 lots and sell out at a handsome profit? What proportion of the money of the small investor in mining stocks ever brings any return except the gaudy paper of the stock certificate? If any comparison is attempted, I think the profits of the average inventor and patentee will show up favorably when due consideration is given to the amount of money invested, the mental and physical effort involved, and the extent of the application of business ability and principles. The trouble, and usually the whole trouble with the failures in the inventive field, is that they lack business experience and will not take the advice of practical men. It is this that causes them to invent things for which there is no commercial demand; that makes them think their inventions are worth millions or hundreds of thousands when as a matter of fact they would be well repaid if they got a few hundred or thousand dollars. It is this lack of business ability, coupled with an uncontrolled desire to make some "easy money," that makes some inventors easy prey for the

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But because there are failures and suckers among inventors, don't imagine they are the only class to produce such results—the daily papers prove that bankers, ministers, doctors, merchants, and even the lawyers, furnish a fair quota of those who are frequently stung by the get-rich-quick bee or the easy-money hornet.

But in spite of all the blunders, the prejudice and the avarice that beset the way of the inventor, it is fact beyond dispute that upon his efforts depends the progress of the world; that his work is found in every branch of human endeavor, and that upon his patented productions billions of dollars are invested and millions expended. If he does not get his share of the wealth which he helps to produce, it is mainly his own fault as indicated above. The man who expects to gain fame and riches on an investment of one hundred dollars, and a little gentle exercise of his brain, is a misfit in the pattern of a practical world, but his failures don't prove that patents are not good investments.

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Director Popular Mechanics Patent Bureau.

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**SLEEPS AT TOP OF POLE.**—The story comes from Baltimore, Md., of a telephone lineman, John Leitner by name, who has a mania for falling asleep on telephone poles. Twice within 48 hours Leitner slumbered peacefully on the top of a pole, and on both occasions the police department was called upon to take his supposed dead body from the wires. In both instances one leg was thrown over a crossbeam, the other twisted around a cable, and his head lay resting on his arms. When the police ambulance arrived the noise awoke him and he quietly descended to the ground.

**MAKES MORE DISCOVERIES.**—J. L. Mellish, the young farmer boy living near Cottage Grove, Wisconsin, who described in a recent issue of Popular Mechanics how he constructed a home-made telescope and discovered a comet which had escaped the eyes of the big observatories, located another comet on the night of Oct. 17. His discoveries are considered of great importance by Prof. G. S. Comstock, of the Washburn observatory. He has informed the observatories of the country of the exploits and discoveries of the youth.



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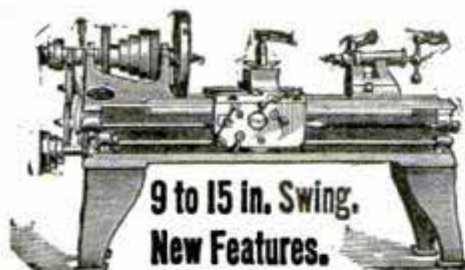
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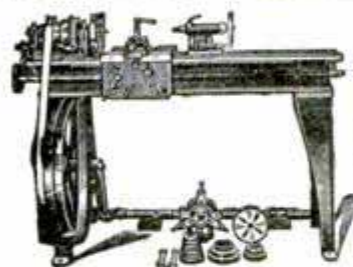


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**FACTS ABOUT THE OCEAN.**—The oceans occupy three-fourths of the surface of the earth. A mile down in the sea the water has a pressure of a ton to every square inch. If a box 6 feet deep was filled with sea water, which was then allowed to evaporate, there would be 2 inches of salt left in the bottom of the box. Taking the average depth of the ocean to be three miles, there would be a layer of salt 440 feet thick covering the bottom, in case all the water should evaporate. In many places, especially in the Far North, the water freezes from the bottom upward.

Waves are deceptive things. To look at them one would gather the impression that the whole water traveled. This, however, is not so. The water stays in the same place, but the motion goes on. In great storms waves are sometimes 40 feet high, and their crests travel fifty miles an hour. The base of a wave (the distance from valley to valley) is usually considered as being fifteen times the height of the wave. Therefore a wave 25 feet high would have a base extending 375 feet. The force of waves breaking on the shore is seventeen tons to the square inch.—Marine Journal.

She wore a veil and goggles  
And drove a motorette;  
They met quite unexpectedly  
Where four roads also met.  
He saw her but a moment,  
And then a pound or two  
Of flying bits of cylinder  
And sign-posts spoilt the view.

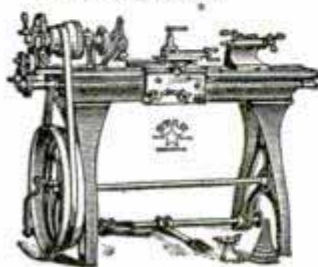
He really did not notice  
The next time what she wore;  
She was not veiled and goggled then  
As she had been before.  
He saw her in the witness box,  
She wept and hid her face;  
And the jury gave her damages  
In a really ugly case.

**SUICIDE BY ELECTRICITY.**—What is believed to be the first case of suicide by electricity occurred near London, England, recently when a man, suffering from religious mania, grasped hold of the terminals of a switchboard and instantly fell dead. A letter indicated his intention of committing suicide.

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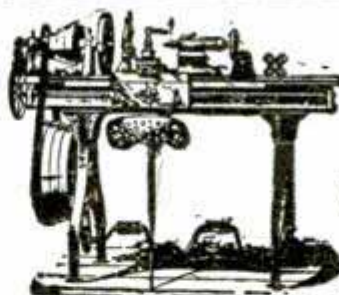
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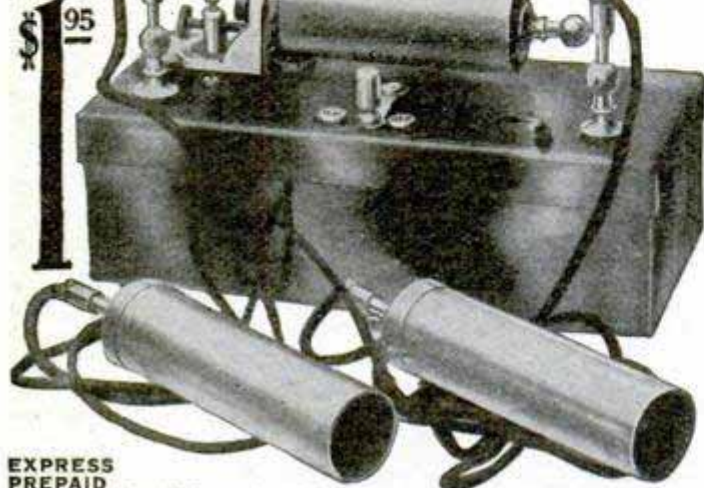
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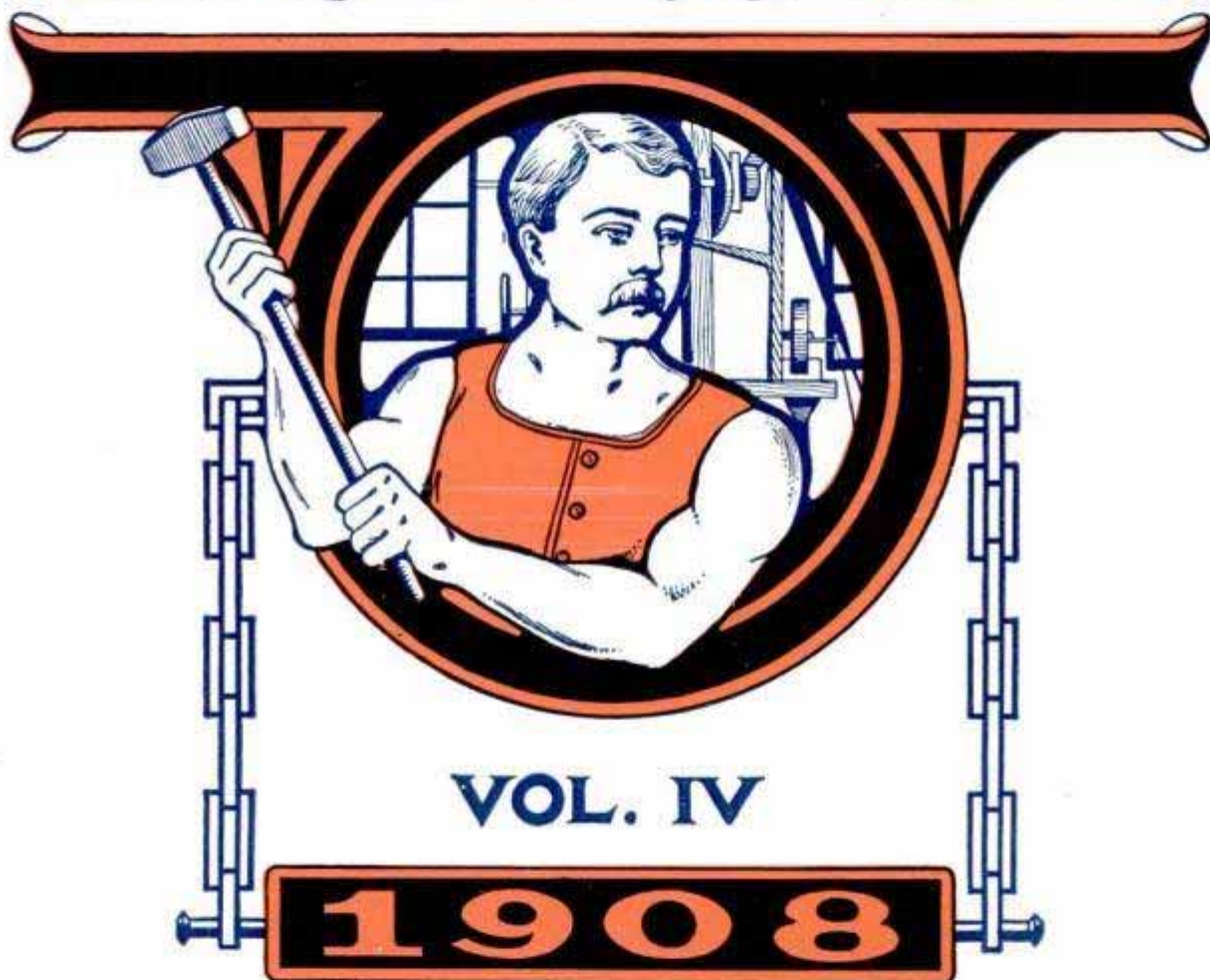
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